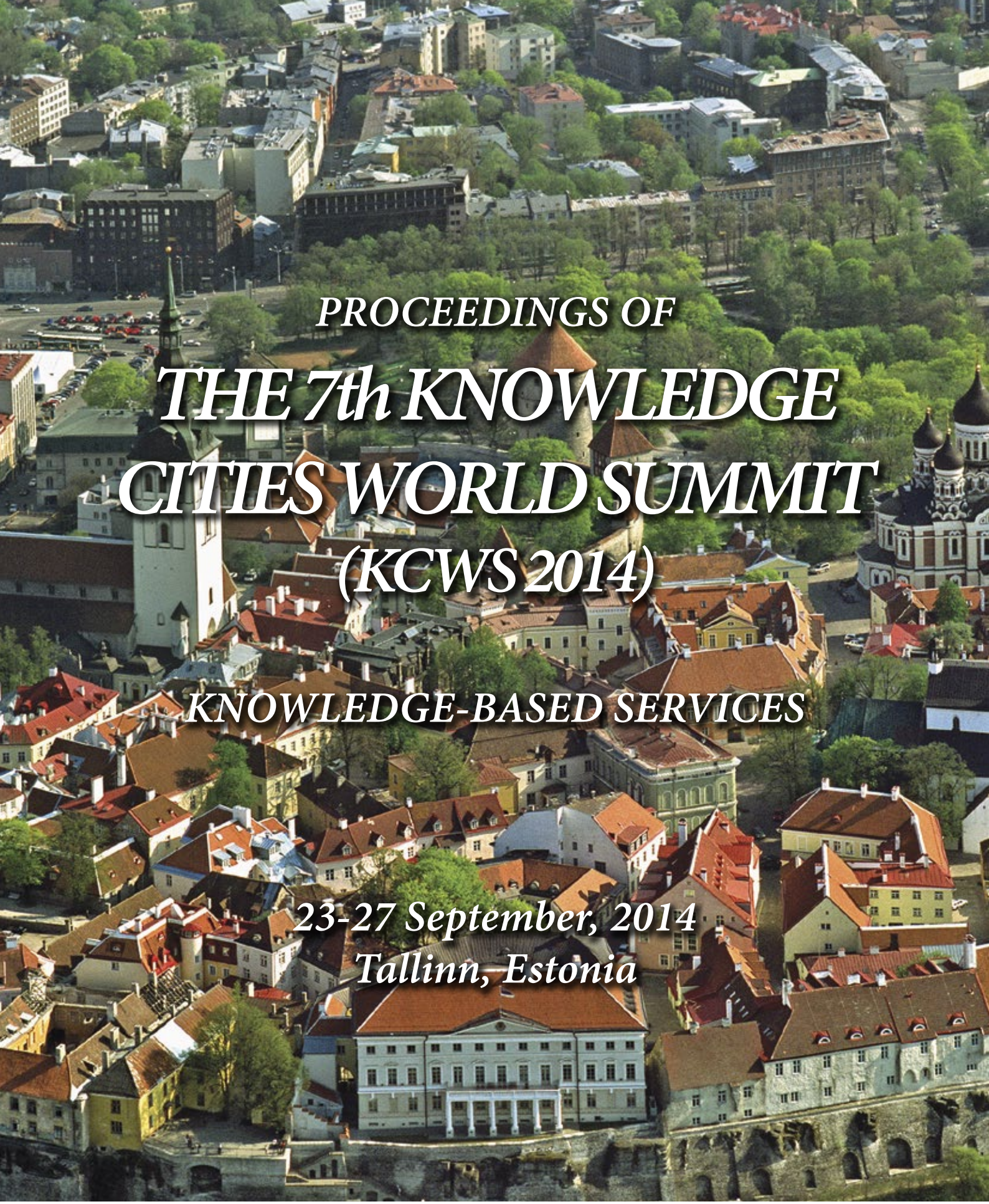

PROCEEDINGS OF

THE 7th KNOWLEDGE CITIES WORLD SUMMIT (KCWS 2014)

KNOWLEDGE-BASED SERVICES

23-27 September, 2014
Tallinn, Estonia

KCWS 2014
The 7th Knowledge Cities World Summit

WORLD CAPITAL INSTITUTE

TALLINN UNIVERSITY

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PROCEEDINGS OF

THE 7TH KNOWLEDGE CITIES WORLD SUMMIT (KCWS 2014)

Editors:
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PREFACE

Throughout the history, knowledge has always been a vital resource for creating and sustaining a strong economy and society. In the era of knowledge economy, knowledge is accorded particularly a pivotal role, not only in economic and societal growth, but also in institutional and environmental development areas. In this era, that is upon us, managing knowledge has also become a hot topic and tends to be the primary focus for many companies that are seeking to gain competitive advantage in a highly globalised world. At the same time, a considerable growth of interest among both policymakers and researchers in knowledge management particularly with a special interest in urban aglomerations or in other words city-regions are observed—such as knowledge city and regions. In a knowledge city or a region the economic growth is ever more driven by the knowledge-based jobs and 'knowledge-based service' sector, which is the overall theme of our 2014 Knowledge Cities World Summit.

The location of the 7th Knowledge Cities World Summit is particularly chosen considering the strength of Tallinn, Estonia that mainly focuses on "Knowledge-based services"—for instance: Tallinn has been awarded as one among Top 7 Intelligent Communities in 2013; Estonia is often called "e-Estonia" to describe Estonia's emergence as one of the most advanced e-societies in the world; Estonians have the privilege to enjoy a large range of e-solutions and services, and; Estonia is willing to be the example for others who wish to follow the same successful path.

We believe the Summit in Tallinn will provide a perfect ambiance and athmosphere for the leading scholars and professionals, along with government officials and students exchanging their ideas and experiences, and thus making invaluable contributions to the literature as well as multidisciplinary fields of knowledge city/region, knowledge-based (urban) development, knowledge managements, and knowledge-based services.

This Summit proceedings is compiled in order to share the knowledge generated during the Summit with wider academic and practitioner audiences. All of the full papers of this proceeding have gone through a double-blind peer review process and been reviewed by our Summit International Editorial Review and Advisory Board members. We, chairs and organizers of the summit, cordially thank the members of the Board for their diligent and constructive work during the review process. We would also like to thank the organisers and particularly Prof. Tiit Land, Rector of Tallinn University, and the Tallinn City Government and Council for providing the support for the Summit to happen.

We hope the papers in this proceeding will be useful for many and contribute to widening of the knowledge community. We look forward to see you at the next Summit.

Be inspired and make a difference!

Tan Yigitcanlar

Katri-Liis Lepik

Merle Krigul

KCWS 2014 Chairs and Summit Proceeding Editors

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PHD CONSORTIUM

CAMPUS AS A CITY, CITY AS A CAMPUS: UNIVERSITY PRECINCTS IN URBAN CONTEXT

Luísa Cannas da Silva, Instituto Superior Técnico, Portugal, luisacanasdasilva@tecnico.ulisboa.pt
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ABSTRACT

This research focuses on the complex role of universities within urban contexts. It aims at understanding the implications of the physical space of the university in the urban dynamics of its hosting city.

It focuses on two particular models of university conception: the campus - as a city - and the city - as a campus. Thus, it analyses the role of the university premises, both considering a scenario of university behaving as an autonomous entity, disconnected from the urban territory, or a scenario where university is scattered through the city's fabric, deeply anchored in its urban integration.

Universities are approached from a morphological point of view, analyzing different models of university insertion within cities, and their influence in urban dynamics.

Integration levels are measured, as are the configurational features that have an impact on the neighboring areas, in order to understand to what extent does university morphology affect the institutions ability to engage in successful urban dynamics.

It is believed that universities can contribute to bring dynamism to otherwise decaying areas, through activities and flows of movement.

Universities are analyzed in three different scales of approach: from the city scale, to the university surroundings, and finally the precinct itself. This methodology aims at providing a holistic perspective on the university impact, from the nearest scale, to global contexts.

KEYWORDS

Campus; University Precinct; Knowledge Economy; University; University integration; University-city relationship.

1. INTRODUCTION

The research work scopes universities and the roles they can establish in urban dynamics. It aims at understanding the effects of the physical environment of the university in the relationships it can establish with its hosting city. It assumes the university's role can vary on complexity according both to the specificity of the institution, but also according to the urban features and policies of the city. It relies on the premise that universities have a dominant role in today's societies, specially accounting the context of the knowledge economy. It also argues that universities can contribute for the improvement of the urban fabrics and the generation of urban movements, synergies and dynamics, among several players.

Universities have been in the core of development — economical, social, *inter alia* — and their role within urban context has changed in order to respond to the third strand of the university mission — that of civic engagement (Berglund, 2009). The role of University facilities in urban dynamics has become more and more complex, not only affecting its direct population, but also interfering in the process of urban development, in parameters such as employment, housing, mobility, leisure and consumer activities. Thus, analyzing the gains and incomes from a broader institutional relation with the city where the university facilities are located becomes necessary, in order to understand the role played by universities on the process of urban development. Universities' activities impact in many ways their vicinity and wider communities to the mutual benefit of both (Knight, 1995, p.242). This may have substantial implications for the built environment since the wider community will have access and make use of university facilities for a range of activities. Universities, as central elements in a knowledge economy, can contribute to urban regeneration, not only directly by improving the built environment quality, but also reclaiming city areas and funds from public regional players.

In a context in which universities have been establishing themselves as active players (Duderstadt, 1999), deeply engaging in urban and social aspects life, it has become significant to understand the extent of university integration within urban territories.

This research focuses on the morphological features of the university, analyzing different models of university insertion within cities, and their influence in urban dynamics. It aims at mapping the configurational aspect that impact on neighboring areas, as well as understanding the extent of the importance that physical integration assumes in city-university relationships.

Two different models of university are emphasized: the campus - as a city - and the city - as a campus. It is sustained that these two models are on the basis of the conception of university premises worldwide, and since they are conceptually different, it is critical to analyze their influence on the universities urban behavior.

Thus, the role of the university premises is analyzed, both considering a scenario of university behaving as an autonomous

entity, disconnected from the urban territory, or a scenario where university is scattered through the city's fabric, deeply anchored in its urban integration.

It is considered that western cities have been subject to decaying processes (Crossland, 1983), due to the decline of the economy, the aging population, among other factors. This decline of dynamism and vitality can severely damage our societal models. Therefore, one of the goals of this research is to understand the extent of the possible contributions of universities to the improvement of aging contemporary cities. It is believed that universities can contribute to bring dynamism to otherwise decaying areas, through creation of flows of people and generation of activity.

Three different scales of approach are followed: from the city scale, to the university surroundings, and finally the precinct itself. It is aimed to provide a holistic perspective on the university's impact, from a closer, nearest scale to a global context. Finally, the university's internationalization level will also be taken into account, but as one of the features of university culture and background, not from a morphological point of view.

2. METHODOLOGY

The proposed methodology comprises different phases and methods of analysis. On a first approach, space syntax tools will be used. Depthmap software (Turner 2004) is used in order to build topological maps (axial maps) (Hillier & Hanson, 1984), which perform as a base maps, considering the scale of the city under analysis. The axial map description operates as a macro analysis of the urban structure. It allows a representation of information on a plane in topological relationship and with measurable horizontal distances, *i.e.* a metric analysis of the catchment area and an angular segment analysis of global integration (closeness centrality) and global choice (betweeness centrality). At same time it has sufficient geographic reference information to identify the location of each university infrastructure.

This tool creates a common working basis from which all of the cities assessed can be evaluated according to the same parameters and criteria. This approach allows comparing different cities, through quantifying and measuring variables such as Integration, which could not be assessed any other way.

On a second phase, the urban location of the university will be revised, according to the types of interactions that the university can establish with its direct surroundings. In-situ observations will be undertaken, in order to survey the kind and number of services and activities provided either from the city to the university and from the university to the city. This analysis will allow understanding the level of local synergies that can be established. I relies on the premise that, even if the university is conceived as an isolated entity, the live of its users cannot be totally independent from the life of city dwellers, since "there are always many systems of activity where university life and city life overlap" (Alexander, 1965, p.61). The urban insertion of the university will be assessed, emphasising on the urban features with impact on university legibility and university life.

On a third phase, university morphology will be assessed, focusing on the features with impact on the urban behaviour of the precinct, i.e. built and void, boundaries, openness, among others. This approach pursues two main objectives: (1) the understanding of what is the campus genotype for the two models in analysis (campus as a city and city as a campus) i.e. what are the features that compose the indispensable traits of an university precinct and (2) the survey of the morphological features that compose a stimulating university environment, able of fulfilling all the needs of the university users, but also providing an efficient base for interaction with the hosting city.

3. UNIVERSITY AND CITY

Different university features are analysed, focusing specifically on their impact on ageing (decaying) urban contexts, on an attempt to understand to what extent can universities be motors of change and improvement, in the context of the knowledge economies.

University integration is the key for generating relationships and synergies. This feature relies on the university morphology, but transcends the physical connection, including social and interactional, as well as economical integration. It is believed that universities should be not only integrated within the urban surroundings, but also act as an integration vehicle, providing the desirable relationships among urban, regional and even global players. For this, integration should not only be perceived as a physical feature, but as a characteristic that is intrinsic and considered on all spheres of university organization.

3.1. University Role

Universities have a dual role regarding their target-public: on the one hand, they must serve academia, providing the best environments for the intellectual activities that comprise their traditional mission: learning, teaching and research; on the other hand, they must act as enablers for interaction, both within academia and with society.

Universities are, on a knowledge economy, considered a key element in urban dynamics (Gibbons *et al.*, 1994; Conceição & Heitor, 1999; Duderstadt, 2002). Their participation can have different impact and engagement levels; nevertheless, just their physical presence already constitutes an element of change.

"Knowledge is now the cities' primary source of power and the challenge for cities is to enhance and to build on the strengths of their knowledge resources" (Knight, 2008, p.1), thus pressing the cities to improve and develop, working

closely with strategic partners. Universities, as the main knowledge providers, are expected to behave as synergetic engines, as motors for growth at several levels, and their presence is generally seen as positive within urban contexts. Also, the surrounding environment can also be a key factor in the success of an academic institution, for the ability it has to attract and retain knowledge workers. This dual relationship highlights the importance of dialogue between knowledge institutions and cities, on an attempt to allow an interconnected growth and development, since institutions and their hosting cities tend to become more and more co-dependant. Research suggests that urban areas are the most able places to attract knowledge workers (Van Winden, 2010). This specific part of the population is generally very demanding as far as living conditions are concerned, and require the universities' hosting cities to provide a series of services and activities not so important for other population segments.

3.2. University Morphology

Universities have different physical arrangements worldwide. There are scattered universities, evolving from an English collegiate model, campus universities, in a model made popular by American universities, and within these two categories, several distinct ways of laying on territories and interacting with the adjacent morphologies. It is attempted to read the significant features of a university precinct, trying to establish the campus genotype, i.e., what are the morphological aspects that make a university precinct. Two perspectives are emphasized: the campus as an isolated entity - campus as a city - and the scattered university - city as a campus.

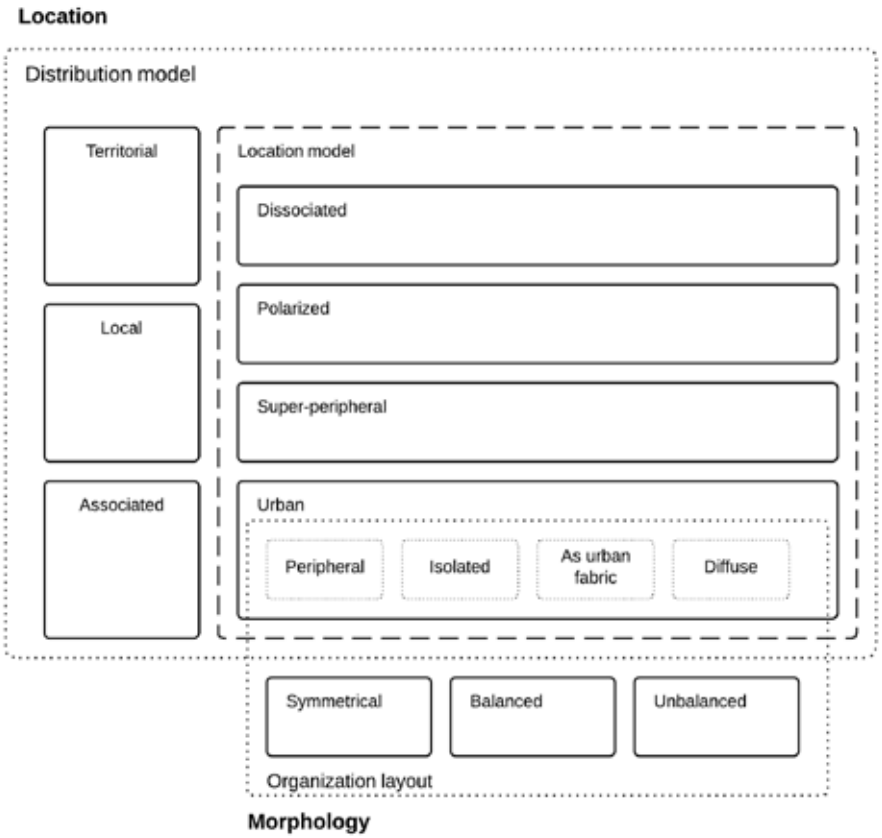
As general guidelines, the principles of the educational campus (Campos Calvo-Sotelo, 2009) were observed. The concept of the educational campus stands that a well-conceived university campus must include ten indispensable traits: utopia and integrated planning; community of learning; spatial harmony; emotional and intellectual harmony; nature and art; clear image and accessibility; sustainability and adaptation to the environment; memory and avant-garde; university/ city relationship; innovative teaching and learning modalities. The author argues that a campus can only be considered educational when it embodies all of these topics and they are present on its conception and function (Campos Calvo-Sotelo, 2009; Campos Calvo-Sotelo, 2010). This approach has provided the central theoretical framework on campus analysis and development.

3.2.1.Physical models

The analysis comprises several campus models and different approaches towards the university and its physical conception. Concepts such as the so-called *Greenfield campus,* or the *New urban campus* (Hoeger, 2007) are analysed, on account of their urban insertion. The first falls in the category of campus as a city, while the second is considered, for the scope of this work as a case of *city as a* campus. This analysis includes two more categories, focused on the campus focus and main mission: *High-Tech campus* and *Corporate campus*. In fact, most authors connect variables when analysing campus structures. For instance, John Worthington (2009) distinguishes three kinds of university environments according to their scale and relationships established: *University City*, *Knowledge city* and *UniverCity*. Worthington exemplifies each category with the cities of Lund, in Sweden, Newcastle, in the UK, and Boston, in the US, respectively.

Another approach is presented by Hashimshony and Haina (2006), who propose a different identification method, based on spatial variables combined in order to form possible university scenarios for the future. The scope of this work comprises the importance of uncertainty on planning this kind of premises and environments, adding a new variable to the previously discussed research works. The authors defined the three uncertainties they considered to be the major forces defining the future university. These are (1) "*the volume of activities that will occur in the virtual space*", (2) "*the degree to which the university will maintain its compact spatial configuration*" and (3) "*the degree to which the university will maintain its closed-ness*" (Hashimshony & Haina, 2006, p.9).

Then four scenarios were established considering five variables characterizing the physical structure and three uncertainties regarding space use: the *Mini-University*; the *New Campus*; the *University-City* and the *Combined Scenario (A+B)*.



Campos Calvo-Sotelo (2011) has developed a categorization system for university campuses, emphasizing on campus morphology along with the relationships and physical distances between university and city. It scopes 4 levels of analysis, from the territorial dispersion, to university location, insertion in the urban fabric and campus configuration, as described in the graphic below.

Figure 1. Campus morphological summary after Campos Calvo-Sotelo (2011)

Caldenby (2009) presents a different kind of categorization of universities based on two perspectives on university development – the *internalist* and the *externalist*. This view diverges from purely morphological analysis, since it traces back to the conceptions of science in itself. Nevertheless, it is possible to clearly identify its principles on the base of the physical planning of the universities.

As far as the internalist perspective is concerned, the author identifies three environmental typologies used: the *college*, the *campus university* and the *external university*. In opposition, the externalist perspective is represented in the *universitas*, the *institutional university* and the *city university*. Despite the differences in size, scale and location, these six identified typologies vary in terms of their conception, being more self-directed or facing towards the exterior. Their physical premises would be, thus, a vehicle to convey university mission and objectives, being a protective environment in the three first mentioned cases, or contrastingly, more open and boundary free environment on the three that represent the externalist perspective.

4. CONCLUSION

This research emphasizes the university campus as a physical entity with the ability to create and maintain important relationships, and to convey the university image.

The ultimate research goal is to analyse the way the university morphology can interfere (in a positive way) in the urban dynamics. In other words, which is the role the campus can perform in a city, for the mutual benefit of both entities? To what extent does campus morphology have impact on the generation of synergies with the hosting city?

It is argued, despite the growing importance of technology driven learning practices, the physical space will always be indispensable for the learning process, for promoting and encouraging innovative learning strategies and human interactions. Thus, the university precinct as we know it has to undertake the same changes as the paradigms in higher education, in order to keep up with the development and shifts in leaning modes. It is necessary to rethink the campus, as a physical urban entity. Besides its teaching mission, the campus is also a vehicle for conveying information, knowledge, and an image of higher education. On a society globally based on knowledge, it is urgent to analyse the impact and the role

the campus must perform, in order to foster processes of social and economic integration, while the university re-affirms its statute of main knowledge producer and provider.

Despite the diversity in typologies and morphologies, the university campus is an entity of growing importance in western societies. Although learning environments and learning spaces have been on the centre of research for several years now, the studies on campus morphology still have a long path to undertake, in order to provide general and relevant conclusions towards campus design and development strategies. Nonetheless, it is interesting to realize that some of the concepts on the basis of Jefferson's *academical village* - such as the importance of interaction and communication - are being more and more valued nowadays, and sustained by several authors (Barnett & Temple, 2006; Mitchell, 2007; Wiewel & Perry, 2008; Jensen, 2009; Gensler, 2012).

A summary matrix was created for the university analysis, as shown in the picture below.

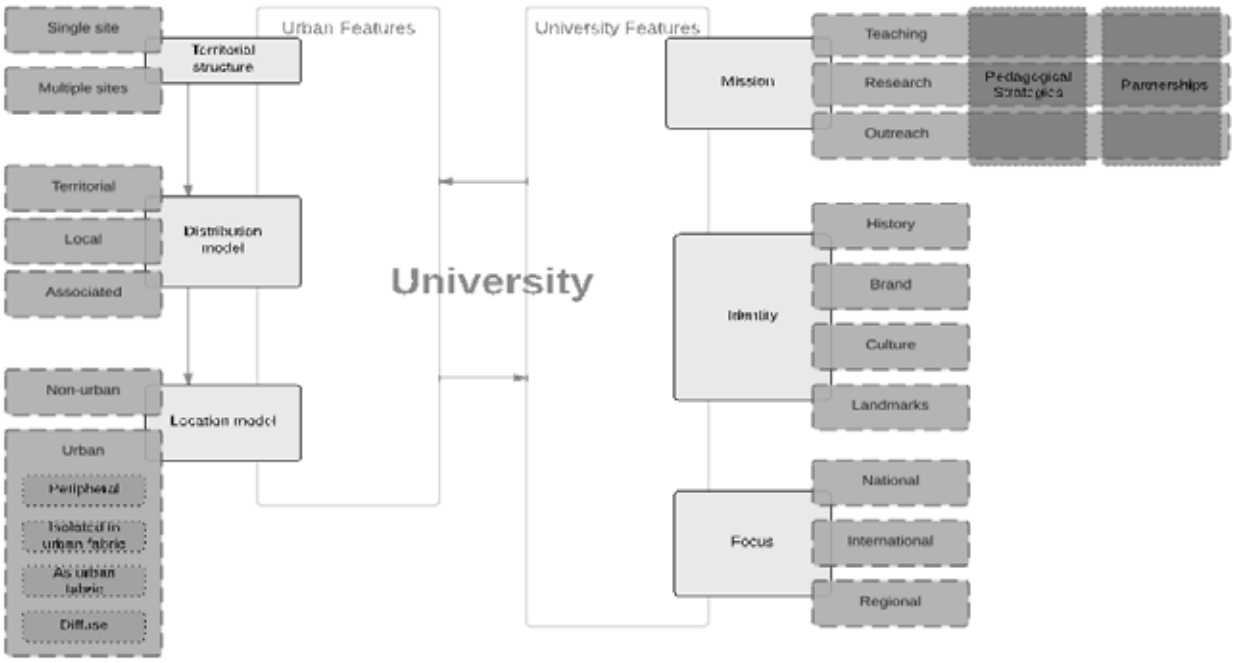


Figure 2. Campus analysis matrix

The variables are divided in two categories: urban features and university features. The first stands for the intrinsic characteristics of an urban entity with the particularities of a university campus, and presents a general approach towards the urban insertion of the precinct.

The second represents the specificities of each institution in particular, for they will have an impact on its physical settings. As far as urban characteristics are concerned, three categories were defined, from a larger to a smaller scale. That is, the precinct is evaluated from its territorial structure to its location model, which depends on its distribution model. In this way it is possible to define both the scope and the impact of the university in its surroundings, as well as analyse its implementation within the territory, from narrower to a broader scale.

Further on, precinct layouts and details are also analysed, for it is considered that features such as the boundaries or types of limits established can greatly affect the ability of the university to establish connections and relationships, as well as foster social integration processes within its physical premises.

For the university features, it is argued that university mission, its identity and its focus will affect the physical space. Each institution has unique features that will affect, for instance, the way students engage in the learning process, the way the university is perceived by society or the level of civic engagement of the university. These variables will affect university scale, openness towards the community and relationships established, generating a bi-lateral influential development of university premises. In addition to being the scenario that makes all the activity possible, the physical space is the vehicle through which the university expresses its culture.

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ANALYSING THE EFFECTS OF KNOWLEDGE ECONOMY EXTERNALITIES IN METROPOLITAN EMPLOYMENT GROWTH

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ABSTRACT

Large cities have some inherent urban and architectural attributes that make them attractive to the concentration of people and various economic activities, especially by the so-called knowledge economy sectors. They involve the transformation of talent and skills of workers, which require a constant spatial interaction. This means frequent face-to-face contacts. Agglomeration economies found in large cities are the determining factors behind knowledge economy growth, which in turn promotes the employment and residential density growth, as a whole. Hence, geographical proximity to the main urban centers of the metropolitan urban hierarchy becomes a causal factor for the growth and concentration of employment in these economy sectors. The aim of the research is to understand and model how knowledge economy externalities affect metropolitan employment density growth, and how the inter-municipal distances to the metropolitan core and the other largest metropolitan cities encourage that process. This phenomenology is studied in the metropolitan regions of Barcelona and Helsinki as follows: in Barcelona by modeling the density growth with employment data, inter-municipal distances and economic inter-linkages for the period 1991-2001; and in Helsinki by analyzing of employment pattern distributions with employment data for the period 2007-2010. Results suggest that the cities, especially the larger ones and their surrounding areas of both metropolitan regions, have a high value of knowledge economy activity concentrations due to the agglomeration economies found in them. Hence, the proximity to these large cities becomes the main factor that explains employment density growth and agglomeration patterns of the KIS employment.

KEYWORDS

Knowledge Economy; Urban Centrality; Geographical Proximity; Economic Diversity; Helsinki; Barcelona.

1. INTRODUCTION

In the last three decades of the twentieth century the cities and the metropolitan areas of industrialized economies experienced a considerable economic shift because of the mass industrialization and consolidation of services as the main source of their economic development (Graham and Marvin, 1996; Simmie, 2001, Harris, 2001). In this new scenario, the so-called knowledge intensive sectors (hereinafter KIS) that also include creative and cultural activities emerge as the main drivers of this process (Harris, 2001).

The KIS employment growth needs specialized knowledge, advanced technology and high skilled workers (OECD, 2001); innovation is a key driver for its advance. KIS activities involve transformation of individual talent and skills of workers; their growth requires constant social and spatial interaction.

Accessing to a codified knowledge that exists on the academic production and access to a tacit or uncoded knowledge found in people and in particular contexts occur primarily in urban centers, where both kind of knowledge are usually acquired by interactions among people (Simmie, 2001). However, transmission of both types of knowledge follows different patterns, while codified knowledge transmission can be carried out over long distances; tacit knowledge transmission requires spatial proximity and frequent face-to-face contacts (Polanyi, 1967; Leamer and Storper, 2001; Boschma and Lambooy, 2002; Storper and Venables, 2004). Geographical proximity arises as a key aspect to the KIS growth, since knowledge transmission is an essential process for the development of innovation.

In this paper the analysis about how physical proximity become a decisive factor for the location of the KIS employment in the core and in the sub centers of the metropolitan regions is analyzed. Agglomeration economies found in these areas, such as economy diversity, high skill workers and great accessibility to international markets and innovation products, are the determining factors that encourage that process. This phenomenology is studied in the Barcelona metropolitan region (hereinafter BMR), by modeling KIS density growth and; in the Helsinki metropolitan region (hereinafter HMR), by analyzing the KIS employment pattern distributions and employment decentralization processes. After this introduction, on the section two a theoretical framework about the relationship between proximity and knowledge economy growth is discussed; on the section three methodology and data uses is offered and; finally, on the section four the main results of the empirical analysis and conclusions are claimed.

2. URBAN CENTRALITY, AGGLOMERATION AND KNOWLEDGE ECONOMY

Knowledge economy refers to the economic production that since the last two decades of the 20th century arose in most of the post-industrial regions as a result of transformation of Fordism production towards the services, especially the knowledge-intensive services (Harris, 2001). Hence, despite the overall decentralization process of the employment, especially in manufactures from these regions to others with lower wages, employment growth in their labor markets remains due to a major specialization (Piore and Sabel, 1984).

Cities, especially those with a greater accessibility and high skill workers, are the urban centers where the big rates of the KIS employment are concentrated. It is happening because of the knowledge economy growth is based on existing knowledge and talent in people, as well as the knowledge that comes from their scientific practices and spatial interaction processes (Simmie, 2001; Varga, 2006; Lambooy, 2010). Schumpeter (1939) initially stated this role that territory has a force that encourage innovation process. He affirmed that demand push, which comes from the actors located in a territory are disseminators of knowledge, such as research centers, universities and small companies.

Post Fordism involved a reorganization of production systems, which is supported in small and medium sized companies that work through partnerships and a labor division between firms. This led to a greater interest in increasing investments in strengthening of human and social capital as well as the accumulation of technological and physical resources in most of the post-industrial regions (Clark, 1982; Lucas, 1988; Romer, 1994). This re-agglomeration of production led to extensive spatial changes in the regional area. Nowadays, firms tend to form clusters as a way to address the business processes of competition and cooperation (Scott, 1988, Porter, 1998). Globally, unique spaces would become in centers of extensive cluster of innovation, such as Silicon Valley and the region of Northern Italy as well as some cities of developed countries that nowadays are considered global cities due to the most important interchanges of knowledge that happen in them (Simmie, 2001, Hall, 2009, Taylor *et al*, 2010).

According to Storper and Venables (2004) face-to-face contacts that happen in the most of the post-industrial regions remain in the heart of the coordination of global economic growth. Two basic properties of face-to-face contacts are behind of that process: firstly, they provide efficient communication technology to the information that cannot be encoded; and secondly, they promote trusting relationships between different economic actors. These properties encourage the generation of environments where people interact and cooperate with other people to communicate ideas. Thus, geographic proximity becomes a determining factor for generation and transmission of knowledge either in a permanent colocation or in frequent face-to-face contacts between firms and workers.

Frequents face-to-face contacts and consequently a KIS employment growth are associated with the existence of agglomeration and localized specialized economic activities (Boschma and Lambooy, 2002). Therefore, acquisition of learning through this mechanism is an increasing function of city size and a related issue of a special urban hierarchy (Glaeser, 1999; Simmie, 2001; Sassen, 2011; Castells and Hall, 1994; Taylor *et al*, 2010). Big cities are the preferred locations for the large companies headquarters and their research units; besides, innovation products are mainly created in these kinds of cities and from them spread in a non-hierarchical relationship into the knowledge interchange nodes around the world. In other words, cities and urban regions that have a great centrality, due to their major accessibility, economic diversity, highly skilled workers and an environment that facilitates cooperation and constant innovation are the places where the KIS employment tends to be located (Graham and Marvin, 1996). Infrastructures found in these cities, as hub airports and high-speed trains highlight the importance that accessibility has to the local and global networks (Hall, 2009).

3. METHODOLOGY AND DATA

In the Barcelona case, I analyze how geographical proximity to the core and metropolitan sub centers encourage the employment density growth of KIS activities, as a consequence of the agglomeration economies for the KIS development found in those areas. Data used correspond to the employment data, inter-municipal distances and economic inter-linkages for the period 1991-2001 (data provided by the National Statistical Institute, INE). In the Helsinki case, I analyzed in a similar way as Barcelona, how agglomeration economies mainly found in the core of metropolitan region are affecting the clustering of KIS employment; in other words, I want to know how physical proximity to the core of the Region is affecting the agglomeration patterns of the KIS. Employment data for the period 2007-2010 was used in the analysis (data provided by the Statistical of Finland). Size of both metropolitan regions was an issue that was considered to the aggregation level analysis. Hence, the measure unit in the BMR was the municipal level; meanwhile in the HMR it was the sub district level.

3.1. Description of the Knowledge Economic Sectors Studied

Economic sectors studied are grouped in 8 sets according to their field of activity. This classification relates to the Organization for Economic Co-operation and Development classification for the whole economic sectors according to their use of high technology and large investments in R&D (OECD, 1999). These groups and their respective NACE 2008 codes are:

- Manufacture of computer, electronic and optical products (NACE code 26).
- ICT services (NACE codes 58, 59, 60, 61, 62 and 63):
- Business services related (NACE codes 69, 70, 71, 72, 73 and 74

- Financial services, including the insurance activities (NACE codes 64, 65 and 66)
- Cultural and creative activities (NACE codes 90 and 91):
- Real estate (NACE code 68)
- Education (NACE codes 72 and 85)
- Human health activities (NACE code 86)

These sectors in the BMR were clustering according to their final consumption in two kind of sectors, as follows: KIS, which final consumers are the government and homes (hereinafter KIS-GH) and; KIS, which final consumers are the enterprises (hereinafter KIS-E). In addition, from the rest of industries no KIS, I detailed which are the economy sectors with a high economic dependency (hereinafter KIS-REL). In order to do that, I made a multidimensional scaling analysis (MDS) with data about economic inter-linkages among all industries. These sectors are: printing and reproduction of recorded media; manufacture of chemical products; manufacture of basic pharmaceutical products; manufacture of electrical equipment; manufacture of furniture; water, electricity, gas, steam and air conditioning supply; construction of buildings and specialized construction activities; wholesale and retail trade; transporting and storage; accommodation; publishing activities and; rental and leasing activities.

3.2. The Barcelona and Helsinki Metropolitan Regions

Both metropolitan regions are important engines of their respective national economies and both highlight in their regional European context for their increasing employment specialization in KIS services and manufactures.

The BMR comprises 164 municipalities, being considered as the commuting area of Barcelona. Territory corresponds to the Metropolitan Territorial Plan, which was approved by the Regional Government on 2010. The BMR has a population of around 5 million people and 2 million of workplaces. It is the second largest urban agglomeration of the Spain and the largest Mediterranean metropolis. Despite that the Region has a polycentric configuration, Barcelona and its surrounding configuring the most important agglomeration of the whole region with around 60% of all its inhabitants. The service sectors dominate in the Region, specially business and financial.

The HMR comprises 12 municipalities; it has a population of 1,3 million of inhabitants and around 700.000 workplaces. Helsinki, Espoo and Vantaa are the three largest cities of the Region; they accumulate around 80% of whole population of the Region and 87% of its workplaces. These three cities integrated what is known as metropolitan area of Helsinki (hereinafter HMA). The service sectors dominate in the HMA, especially business and ICT; the manufacture sectors are basically specialized in electronics.

3.3. Delimiting of the main agglomerations of KIS employment

This process was done in both metropolitan areas by different ways, such as follow: in the BMR, at the level of the municipalities by delimiting the functional economy areas (hereinafter FEA) of the KIS sectors, which are distributed around of complementary sub centers to the CBD for the agglomeration of the KIS employment; and in the HMR, at the level of sub districts by detecting the sub districts that contain a high specialization in the KIS sectors and a remarkable employment density.

The delimitation of the FEA in the BMR was made modeling the monetary flows among all municipalities of the region; these flows give place to the economic areas in which the Region is structured. In order to do this, firstly, I analyzed the economic interdependences between the KIS and all economic sectors; secondly, I modeled economic flows with the information about workplaces existing by municipality and the information by commuting flows of workers by work reasons; finally, from these flows the FEA was created. In order to estimate theses areas I used the maximum interaction value technique of economical flows, which correspond to the main flows that exist among all municipalities of the Region; these flows are showing economic areas with high values of self-contention of economical activity and high levels of economic diversity.

In the HMR, the main KIS agglomerations were delimited through of a factorial and cluster K-means analysis. Factor analysis was made to find strong attributes from the areas where KIS employment is concentrated with data about the employment density, the percentage of KIS employment in each sub district, the specialization index by each KIS sector and the diversity economic index. Cluster analysis was made to find the main areas of the concentrations that factor analysis revealed; these areas match with the sub districts in which the Region is divided.

4. THE VALUE THAT GEOGRAPHICAL PROXIMITY HAS TO THE KIS EMPLOYMENT GROWTH IN THE METROPOLITAN REGIONS

Agglomeration economies found in the core of metropolitan regions and the sub centers are affecting KIS employment density growth. Hence, as will be demonstrate for both case studies, the physical proximity to the core and sub centers is a remarkable factor for the clustering process of the KIS employment.

4.1. Analyzing of the Metropolitan Core Distance Effects on the KIS Employment Density Growth (the BMR Case)

In the BMR decentralization process of the KIS employment from the largest urban agglomerations is mainly concentrated in the nearest suburbs to these large urban centers. The KIS are the economic sectors that are reluctant to leave their central locations because of the value that geographical proximity and access to skilled workers have for their performance. To analyze this phenomenon in detail, as explained in the methodology; firstly, I studied how was the change in the concentration of the KIS employment in the period 1991-2001 and; secondly, using a regression model, I evaluated which factors explain the KIS employment density and related economic sectors.

A conclusion of the decentralization process of the KIS employment in the BMR for the period 1991-2001 is the fact that this process has been mainly influenced by the geographical proximity to the metropolitan center and sub centers. As shown in the Table 1, a decentralization process of the KIS employment reveals a distinctly inertial tendency, especially in the case of the KIS for the companies' consumption; in contrast that happens with the rest of economic activities.

Table 1. Shift in the employment concentration 1991-2001. Source: own elaboration

Geographical area	(KIS-GH)	(KIS-E)	(KIS-REL)	Others
Core (Barcelona) and sub centers	-4,73	-6,65	-7,50	-6,38
Outskirts of Barcelona and sub centers	1,07	3,26	2,92	0,49
Other municipalities	3,66	3,39	4,57	5,89

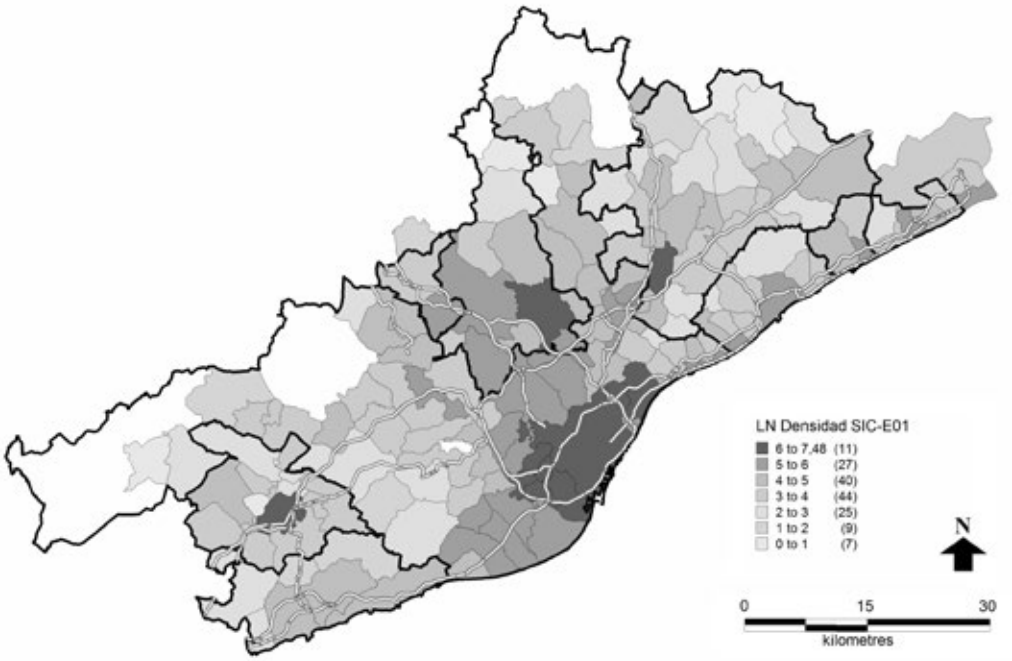
Gini index was applied in order to analyze the shift in the decentralization process of the KIS employment in the analyzed period. Results reveal a high employment concentration of the KIS. In addition, as show in the Table 2, the KIS employment decentralization on the temporal range studied was minor compared to what happened with the employment decentralization of other economic sectors.

Table 2. Gini index for the KIS and other economic sectors. Source: own elaboration

Industries	GINI-1991	GINI-2001	Shift GINI 2001-1991
KIS	0,90	0,88	-0,02
Others	0,87	0,83	-0,03

The distribution of the KIS employment density in the BMR reveals that the largest urban agglomerations and therefore the highest employment concentrations are the areas with the highest employment density values, as shown in the Figure 1. These areas have also high values of economic diversity. Hence, the economic diversity and the distance to the metropolitan core are the main explanatory variables of the KIS employment density in the Region, as it was verified in the regression analysis that is explained following.

Figure 1. KIS employment density BMR, 2001. Source: own elaboration



Regression model analysis revealed firstly, that the distance to Barcelona is the most determining factor, followed closely by the degree of economic diversity. Other explanatory variables have lower gradients; such as: existence of transport infrastructures (commuter train station and highway connection) and the percentage of land for economic activities (Table 3).

Table 3. Modeling of factors that affect the employment density of the KIS industries and related sectors in the BMR (2001). Source: own elaboration

Dependent Variable	R2	Explanatory variables		
		Name variables	Beta	Sig.
LN Density KIS-GH (WP/km^2)	0,58	β_1 (Distance to Barcelona)	-0,351	.000
		β_4 (Economic diversity index)	0,303	.000
		β_5 (Commuter train station)	0,296	.000
LN Density KIS-E (WP/km^2)	0,70	β_4 (Economic diversity index)	0.298	.000
		β_1 (Distance to Barcelona)	-0,268	.000
		β_5 (Commuter train station)	0,249	.000
		β_6 (Connection to motorway)	0,180	.004
		β_3 (% of land for economic uses)	0,109	.048
LN Density KIS-REL (WP/km^2)	0,55	β_4 (Economic diversity index)	0,335	.000
		β_5 (Commuter train station)	0,289	.000
		β_1 (Distance to Barcelona)	-0,210	.008
		β_3 % of land for economic uses)	0,145	.029

In the period 1991-2001 this reinforcement of the centrality of the agglomeration of Barcelona for the location of the KIS employment is verified when the changes in the gradients of the distances that are predicting the variations in the employment density of these economic sectors are analyzed. As seen in Table 4, the distance to Barcelona shows higher gradients over time.

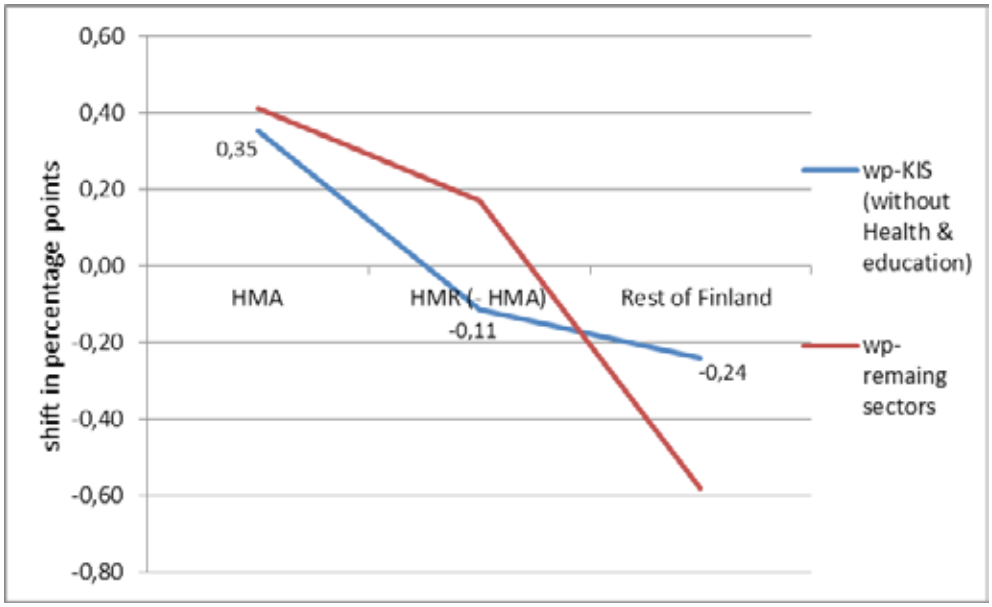
Table 4. Evolution of the gradients of the distance to Barcelona in the KIS employment density in the period 1991-2001. Source: own elaboration

KIS		1991		2001	
Beta		Sig.	Beta	Sig.	
ln-Dens_KIS-GH	dist_bcn	-0,251	,000	-0,351	,000
ln-Dens_KIS-E	dist_bcn	-0,217	,000	-0,268	,000
ln-Dens_KIS-REL	dist_bcn	-0,083	,206	-0,210	,008

4.2. Analyzing of the location patterns of KIS employment in the HMR

Analyzing the changes in the period 2007-2010 that coincides with the period of global economic recession highlights the importance that HMR, and specially the three largest cities of the HMA (Helsinki, Espoo and Vantaa) have for the location of the KIS employment. In the analyzed period there has not been a decentralization process from the HMA to the rest of the metropolitan Region and other places in Finland. In terms of competitive advantage it is still more profitable for firms to be situated in the HMA than elsewhere in Finland. As shown in the Figure 2, employment growth in KIS sectors in the HMA was 0.35 percentage points leaving out health and education since they do not have any specialization in the Region. In contrast, in the HMR and the rest of the country the KIS employment growth was negative.

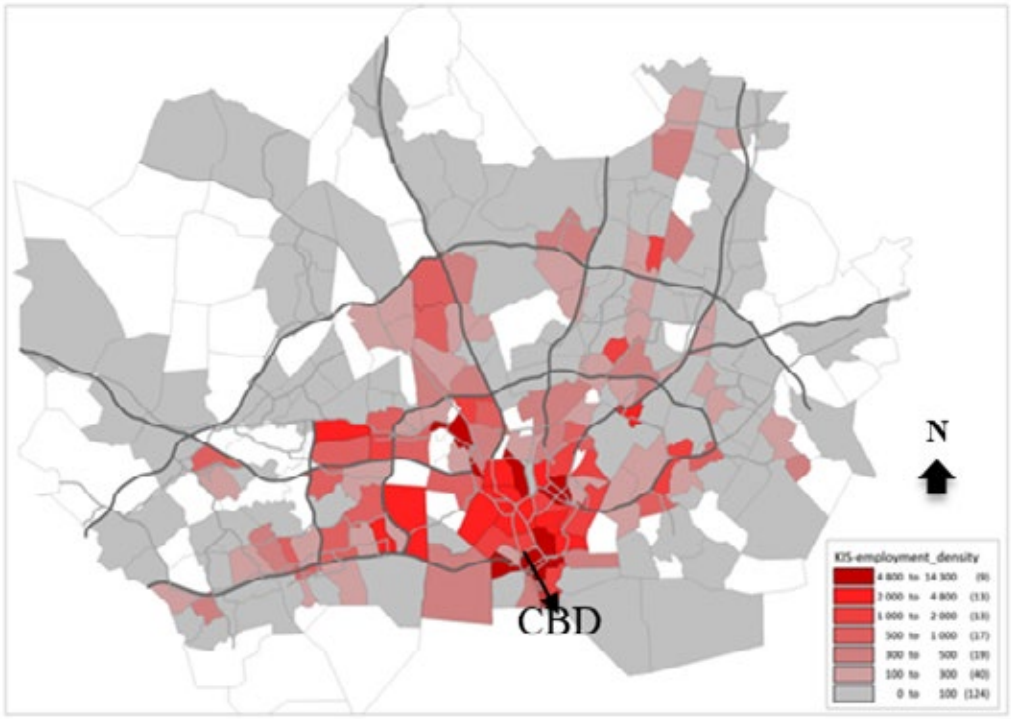
Figure 2. Shift in KIS employment, 2007-2010. Source: own elaboration.



In the HMA, Helsinki has the biggest share of the all KIS employment (70% of all KIS work places); it is followed by Espoo that has a share of 22% of all KIS employment and Vantaa, which has only 8% of all KIS. However, measuring employment share of the KIS sectors in the internal economic structure of each municipality reveals that Espoo has a clear specialization in these sectors; in this city, KIS accumulates 43% of its total work places, while in Helsinki it is 42%. In contrast, Vantaa remained the place less attractive to location of KIS employment in the HMA, despite the fact that the international airport is located there.

The analysis about the employment density of the KIS also stresses the value that the core of the HMR (center of Helsinki and its outskirts) has for the location of the KIS employment in the Region. As Figure 3 shows the biggest densities are located in the sub districts of the core of the Region.

Figure 3. KIS employment density, 2010. Source: own elaboration

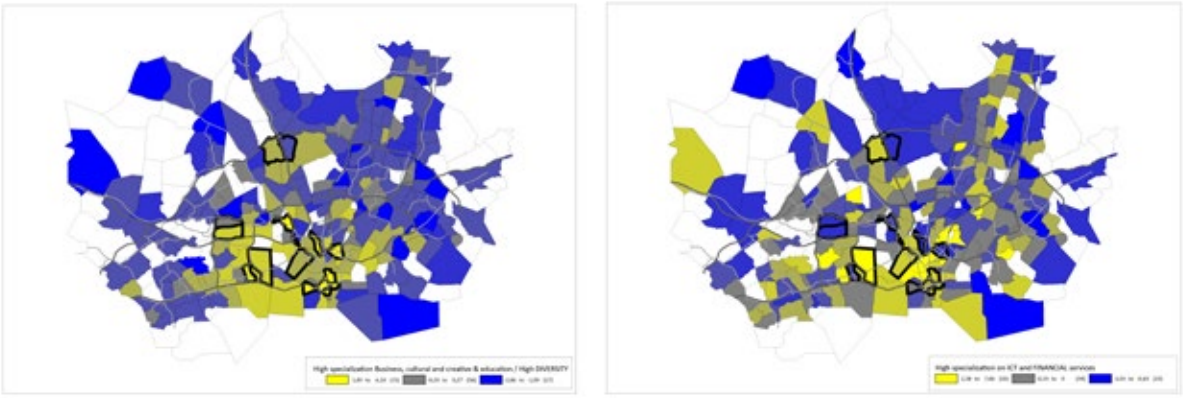


Using econometric tools (factorial and cluster analysis) from KIS employment data by each sub district, clusters that are strong concentration of the KIS employment in the HMA were identified. These clusters are revealing a hierarchical organization of all sub districts according to their size of the KIS employment, specialization index in each KIS industries, employment density and economic diversity. Two main clusters were identified. As show in the Figure 4, there is one cluster that is formed by sub district multi-specialized on KIS and a high economic diversity; it includes 12 sub districts, which are located mainly in the center of Helsinki and its outskirts. A second cluster is formed by sub districts mono-specialized on KIS and low economic diversity; they are situated mainly in no central locations of the HMA.

Figure 4. Principal KIS employment agglomerations, 2010. Source: own elaboration

Factorial analysis also reveals the role that central locations have as highly specialized areas for the KIS, such as: business, ICT and financial, which are the largest KIS industries of the Region. As shows in the Figures 5 and 6, employment specialization in these KIS industries is also highly related to the high values of economic diversity. This reinforces the importance that the agglomeration economies have for the economic specialization but also for the economy diversity found in the central locations of the metropolitan areas.

Figures 5 and 6. Factorials High specialization in Business, ICT and financial services and high economic diversity, 2010. Source: own elaboration



5. CONCLUSION

Cities are centers where converge people and various activities. It makes them suitable areas for the concentration of economic activities that requiring proximity and frequents exchange of information and knowledge. Therefore, the location patterns of the knowledge economy emphasize these proximity values found in cities.

This paper explains for the metropolitan regions of Barcelona and Helsinki the importance that proximity has to the largest urban centers for the location of the KIS employment and their related sectors. As noted, despite widespread decentralization processes of economic activity from the metropolitan centers, employment in these sectors have a remarkable inertia to leave the central locations. Peripheral locations to the metropolitan cores are being benefited by the agglomeration economies in them.

Analysis also revealed that there is a dependency relationship between the locative structure of KIS employment and the size of the labor market and the urban hierarchy of urban centers. In both metropolitan areas, the core is the most important area for the KIS employment location. Agglomeration economies associated to central locations are likely the factors that contributing to the KIS employment growth in them. This highlights the major advantages that the core has in terms of accessibility, proximity and concentration of people and various activities. Therefore, geographical proximity is a determinant factor of the KIS employment density in both metropolitan areas, as well as other issues such as the diversity of economic activity and certain specialization degreed.

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AN URBAN DESIGN PERSPECTIVE TO CLASSIFY KNOWLEDGE PRECINCTS: A TYPOLOGICAL ANALYSIS OF GLOBAL BEST PRACTICES

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ABSTRACT

Purpose: The paper seeks to investigate emerging knowledge precincts under the urban design lens in order to identify recurrent spatial patterns of urban forms and functions to gather an understanding of physical aspects that contribute to the creation of place quality.
Scope: This paper focuses on the physical design and layout of specific precincts. Although socio-economic and other factors come into play imparting the distinctiveness; this paper only focuses on the spatial dimensions.
Method: The research first develops a design typology framework through the lead of literature, and then utilizes it to identify recurrent elements in knowledge precinct design in order to develop taxonomy of patterns and layouts.
Results: The research reported in this paper provides preliminary insights into the various form and functional factors playing role in the design of knowledge precincts and evaluates the elements that contribute to the success of these urban interventions.
Recommendations: The paper recommends the use of particular design-based solutions in order to enhance the place making in knowledge precincts.
Conclusions: The study concludes that despite the locational, regulatory and other contextual differences, the underlying driving principle of providing place quality to people leads to the emergence of identifiable spatial patterns across the knowledge precincts.

KEYWORDS

Knowledge precincts; Design typologies; Place making; Urban design; Global best practices

1. INTRODUCTION

Knowledge-based urban development (KBUD) has been recognized as a strategic approach for the overall sustainable growth and long-term competitiveness of several cities globally in last decades (Knight, 1995; Kunzmann, 2008; Yigitcanlar, 2010). This approach towards urban growth has led the development of specific policies supporting the creation of specialized precincts better defined as the knowledge milieus, that act as the spatial nexus of KBUD, i.e., knowledge precincts (KPs), taking over precedence in the urban development agendas of the cities racing up in global economic competition (Carrillo, 2010). KPs are developed as a mixed-use postmodern urban setting providing the environment of live-work-play-cyber within the same boundaries (Yigitcanlar *et al.*, 2008a; Yigitcanlar & Dur, 2013). Though the social, economic and organizational layers play a significant role, but the success and viability of these precincts in the attraction and retainment of target talent group—i.e., knowledge workers also depends on the way they are conceptualized and designed aiming at place making to provide them quality of life (Pratt, 2000; Sheppard, 2002; Florida, 2005; Yigitcanlar *et al.*, 2007). Hence place making is increasingly bestowed with a high level of significance by the policymakers of knowledge economies worldwide (Yigitcanlar *et al.*, 2008; Yigitcanlar & Lonqqvist, 2013). Many cities like Singapore, Zaragoza and Eindhoven have been branding themselves on the basis of the vibrantly designed living environment in their emerging KPs on similar lines (Landry, 2000; Carrillo, 2004; Fernandez-Maldonando, 2012).

To achieve the objective of providing better place environment to the knowledge workers in KPs, it is essential to investigate them under the design lens as it plays a central role in characterizing and defining the place experience (Buttimer, 1980). One significant strand in the approach taken towards understanding the evolving design and development patterns in the field of urban design is to identify common patterns and classifying them in typologies (Carmona *et al.*, 2010). Development pattern here refers specifically to the two-dimensional layout of an urban area in deliberate formations contrary to the spontaneous aggregations (Marshall, 2005). Defining the term typology, Marshall (2004) pointed out that typology is the system of recognition or classification of types. The analysis of growth form and working out typologies is of particular interest to the policy makers as this activity has tangential advantages attached to it and on the basis of current growth would help to determine the future to-be-optimized case (Kelbaugh, 1997; Marshall, 2005). The study of physical form is also necessary as it affects the behavior of users, i.e., knowledge workers in this case. Hence analyzing it allows understanding the conditions for better place making in KPs.

This paper is a preliminary investigation into the identification of recurrent spatial typologies of KPs. The methodology

adopted for the paper is based on spatial analysis of selected case studies, discussed in literature as successful or emerging KPs. The research takes an inductive approach, first considering the spatial characteristics of individual KPs taken as cases, and then comparing them in order to generalize different urban patterns. The selected cases, which include the few world-wide known and successful KPs, are: One North (Singapore), 22@bcn (Barcelona), Brainport (Eindhoven), Digital Milla (Zaragoza), Hsinchu Science Park (Taiwan) and Cambridge Science Park (UK). The approach for the paper is largely descriptive not prescriptive.

2. THEORETICAL BACKGROUND

2.1. Knowledge precincts

KPs–interchangeably termed as science and technology parks, research parks, industrial parks and innovations parks–refers to an area where knowledge-based activities agglomerate to attain the following two primary objectives: (i) To be a seedbed and enclave for knowledge and to play the role of incubators facilitating the dissemination of knowledge and innovation; (ii) Act as a catalyst for regional economic development that promotes economic growth of the area (Ku *et al.*, 2005; Yigitcanlar, 2006). On the basis of the literature review and best practice case studies, few major common spatial attributes of KPs are identified as follows:

Presence of mixed land use: Most of these new developments have manifested the post-modern urban scene by adopting the mixed use environment as a tool to provide the live-work-learn-play in the same precinct, thus blurring the boundaries between various urban functions and activities, aiming at facilitation for the free flow of knowledge to every urban activity (Page & Phillips, 2003; Yigitcanlar *et al.*, 2008).

Spatial clustering: KPs are planned in a way to allow agglomeration of activities with the common knowledge base (i.e., ICT, media, communications, biotech and others) in close proximity to each other. Thus forming knowledge based clusters or spatial zones. With the help of such clustering, firms benefit from the agglomeration of other knowledge-based industries and workers (Baptista, 1996; Yigitcanlar, 2010).

Transit-oriented development: One of the major characteristics of KPs is the centrality of its location, which is enhanced by providing it the best connectivity in terms of supporting infrastructure that makes it accessible, served and well connected at the regional and global level. Hence most of these KPs are seen developing alongside major infrastructural elements like highways, high-speed metros or the railway lines.

The above spatial characteristics are accompanied by the following defining characteristics of KPs. Managed by the collaboration between public, private and academic sectors, they comprise of knowledge and technology-based enterprises, knowledge workers and research and development units and academic institutions, though the types of R&D and sectors, that they are focused on, may vary. Also they aim to provide high-tech living facilities that promote creativity and diversity catering to a range of lifestyle choices and celebrate the experience of place (Yigitcanlar & Dur, 2013).

2.2. Place making: concept and attributes

A number of theoreticians have sought to identify the attributes that contribute towards better place making in generalized context. With the growing significance of place making as a critical factor for economic success of KPs, the following theoretical foundation based on providing better places stands relevant for the environment of KPss as well. Lynch (1981) indicated vitality, sense, fit, access and control as the five main performance dimensions of good urban design. Jacobs and Appleyard (1987) expressed more prescriptive framework for physical and spatial forms pointing out the major characteristics as livability, identity and control, accessibility, meaning, community and public life, urban self-reliance and an environment for all. A specialized approach for producing more democratic and enriching environments should be adopted for creating responsive places (Bentley *et al.*, 1985). In order to investigate the spaces holistically, Lefebvre and Nicholson Smith (1991) proposed a triad-spatial analytic framework to explore places as—conceived, perceived and lived. The defining attributes for an environment that caters to diversity and a range of users with multiple requirements arising from this approach are permeability, variety (vitality, proximity and concentration), legibility and robustness (McGlynn & Murrain, 1994). Assigning greater value to place, the government publication of DETR/CABE (2000) mentioned seven major attributes defining place making for any environment as character (identity of its own), continuity and enclosure (well distinguished public and private spaces), quality of public realm (enhancing social interaction), ease of movement (accessibility), legibility (clear image and meaning), adaptability (flexible spaces), and diversity (variety and interest). In order to create a place for knowledge workers in the contemporary KPs, it is inevitable to consider its democratic and flexible aspects to cater the needs generated by diversity and the ever changing globalized forces.

3. CONCEPTUAL AND METHODOLOGICAL FOUNDATIONS

3.1. Methodology

Typologies are seen as a formalized and systematized tool of learning from experience and developing understanding by extracting some identical features that relate the development patterns in places lying in different contexts, thus leading to the generalization of phenomenon (Kelbaugh, 2002; Marshall, 2005). The variation in the variables or the attributes considered for the purpose of identifying the different typologies depends largely on the objective behind. As the knowledge generation depends significantly upon the talent, i.e., knowledge worker communities here, urban phenomenon of place making has been given due significance in the development of KPs (Yigitcanlar *et al.*, 2007; Florida, 2012). Here, our objective is to analyze the spatial form taken by the knowledge activities and the resultant spatial approach towards place making for people and firms taking shape there.

The methodology adopted here takes an inductive approach initiating with the individual analysis of the urban pattern of each KP. After establishing the base by identification of the common design attributes, that define these precincts, the next step would then involve the classification of these precincts and arriving at typologies. Thus our approach will be composite that will explore the bundling of elements, dimensions and characteristics to attain the abovementioned purpose. It should be noted that KPs are included as cases are those that are deliberately designed and not the organic agglomerations. Few cases are fully developed and others in the developing phase, so where applicable we shall discuss the case on the basis of its projected growth pattern, thus acknowledging the process as a part of place making.

4. EMPIRICAL STUDY

The study, majorly concentrated on the spatial dimension, is undertaken under the broad head of the two basic foundational elements of spatial development—form and function. Following lead from the literature, the overarching framework investigating form and function is further broken into sub-heads considering the idea of place making at the core (Table 1). The criterion to explore functional aspects depends on the attributes of: (i) Legibility—i.e., image and meaning attached with the particular precincts, and; (ii) Continuity—relationship between land uses and activities. The 'form' has been investigated under the criterion of development pattern to explore the following spatial attributes: (i) Permeability—interconnectivity and flow in design (ii) Public realm—centrality and location of social activities; and (iii) Character—attribution of authenticity and variety in design.

4.1. Function

Legibility: The branding is seen as the promotion of desired set of values and image that attaches a meaning to the development (Zenker, 2011). Thus, legibility is interpreted through this image or branding of the development. In physical terms, one of the aspects it affects is the dominant land use. Few KPs have projected their image as high-tech innovation clusters which gets expressed in their dominant industrial use (i.e., 22@bcn and Hsinchu Science Park) and others have more of research and development sector (i.e., Cambridge Science Park). Few others that have been branding themselves as talent hub or experimental districts show a significant presence of public and social realm (i.e., One North, Digital Milla).

Continuity: The extent to which the boundaries between the functions and activities are blurred determines how vibrant and well used a place is going to be (Carmona, 2003). Though KPss develop as a mixed-use development largely, but depending on the image and meaning attached to each settlement, the degree of blurred boundaries and the prominence of the uses or activities may vary across the KPss. This gets manifested as the presence of mixed uses as zoned or as interweaved. The former refers to places with specialized zones or sectors for each use, physically separated either by a road or other element (i.e., Hsinchu Science Park, Brainport). The latter types are those that have highly interweaved mixed uses which are present in the same building or as a continuous sector with quite blurred boundaries between activities (i.e., Fusionpolis in One North and mixed use developments along central path, Paseo Del Agua, in Digital Milla, Zaragoza respectively).

4.2. Form

Permeability: This will address the attributes of connectivity and flow. The layouts of KPs are aimed at promoting the interconnectivity to facilitate the free flow of knowledge giving rise to permeable urban pattern. This gets manifested in the form of interconnections all through the site either in the form of grids or other spatial forms of interconnected layouts. KPs differ in the degree of permeability. In One North (Singapore), proposals are to pedestrianize even the setbacks of the building parcels to promote the permeability. Cambridge Science Park (UK) is similarly developed as a highly pedestrian and cycle-oriented place. Additionally, the permeability is also expressed in the form of visual connectivity that is emphasized by the use of continuous landscape or opening vistas (i.e., Digital Milla, Zaragoza).

Public realm: The public realm—to promote face-to-face encounters and collisions—is aimed at, what is better known as, unplanned collaborations between not only people, but also the firms (Yigitcanlar *et al.*, 2008). This is executed physically by providing the informal relaxing environment which acts as the catalyst in flourishing the creativity, flow of knowledge and accommodating the diversity. The development of public realm has been given the central importance in all the precincts but manifestation of the principle varies in terms of its incorporation in the layouts. It is observed that assigned

central significance in KPs formed precincts as 'talent' hubs (i.e., One North, Singapore and Digital Milla, Zaragoza).

Character: This constitutes the place making attributes of authenticity and variety. The integration of arts and technology in design in the form of heritage, landmarks or use of high-tech design elements to produce innovation-enabling experimental environments is considered as a tool for place making. This actively involves and attaches the users giving them a sense of identity and control enhancing their learning in the process (Carmona, 2003). As it is seen in the example of Brainport, Eindhoven where technological design acts as the main connecting factor by its manifestation all along the linear axis at various places in the form of landmarks, which are mostly the old industrial buildings converted as heritage buildings (Fernandez-Maldonado, 2012). Digital Milla (Zaragoza) exemplifies this extensively by incorporating many such technological and experimental design elements in its digital public realm like the memory paving, digital water walls, bus stops etc. that define its designed environment based on innovation (Yigitcanlar *et al.*, 2008).

Table 1. Form and functional analysis of contemporary KPs

Criterion	*Case 1*	*Case 2*	*Case 3*	*Case 4*	*Case 5*	*Case 6*
	Type 1				***Type 2***	
Example	One North Singapore	Digital Milla *(Zaragoza)*	22@bcn *(Barcelona)*	Brainport *(Eindhoven)*	Hsinchu Science Park *(Taiwan)*	Cambridge Science Park *(UK)*
Function						
Legibility and continuity						
Branding (image)	Global talent hub	Open source digital city	Innovation district	Light city	High-tech Industrial park	High-tech R&D cluster
Location	Centre of the city	Centre of the city	Centre of the city	Centre of the city	Regional	Regional
Functional use (major)	Work-Live-Learn-Play	Work-Live-Learn-Play	Work-Live-Learn	Work- Live-Learn- Play	Work- Live-Learn	Work- Live-Learn
Land use	Interweave-d mixed-use	Interweave-d mixed-use majorly green areas	Zoned mixed-use, majorly industrial	Zoned mixed-use, majorly industrial	Zoned mixed-use, majorly industrial and R&D	Zoned mixed-use, majorly R&D
Industrial clustering	Biotech ICT Media	ICT Biotech Media Design	Media ICT Medtech Energy	Design ICT Energy	ICT Biotech Energy R&D	ICT Biotech
Form						
Permeability and public realm						
Visual flow/ connectivity	Use of landscape	Use of pathways and park	Use of diagonal boulevard	*N/A*	*N/A*	*N/A*
Connectivity (pedestrian)	High (pedestrian-oriented)	High (pedestrian-oriented)	Medium	Medium	Medium	High (pedestrian-oriented)
Open spaces (public use)	Continuous	Continuous	As a sector	As a sector	Dispersed	Dispersed
Character						

Integration of heritage	Yes (e.g., Colonial bungalows)	Yes (e.g., El Portillo station)	Yes (e.g., City core industries)	Yes, (e.g., Strijp-S / Witte dam)	*N/A*	*N/A*
Arts and interactive technology in design	Yes, (e.g., Vista Xchange)	Yes (e.g., digital public realm)	*N/A*	Yes (e.g., light shows and events)	*N/A*	N/A

Table 2. Spatial patterns of the contemporary KPs

Case		*Examples*	*Indicative layout*	*Development pattern*	*Central spine*
Case 1	TYPE 1	One North *(Singapore)*		Bent grid with central spine	Yes, as public realm
Case 2		Digital Milla *(Zaragoza)*		Hybrid with central spine	Yes, as public realm
Case 3		22@bcn *(Barcelona)*		Regular grids	Yes, as boulevard
Case 4		Brainport *(Eindhoven)*		Radial with industrial core	N/A
Case 5	TYPE 2	Hsinchu Science Park *(Taiwan)*		Loop and grid	N/A
Case 6		Cambridge Science Park *(UK)*		Loop and cul-de-sacs	N/A
Legend		*Central connecting spine* *Knowledge-generation area*		*Major Road in the loop/radial pattern* *Roads and Streets* Public green area	

5. RESULTS

Following the analysis, two major typologies emerge on the basis of the exploration of spatial development pattern and the centrality of place making in the layout (Table 2).

5.1. Type 1: Site centrality-oriented development with central connecting spine

The first two cases, i.e., One North (Singapore) and Digital Milla (Zaragoza) can be classified together under Type 1 where the development is centred along the central spine that acts as the public realm. This spine can be in the form of a landscape flowing continuously between two endpoints (i.e., One North Park in Singapore) or as a central public spine with a range of mixed-use activities (i.e., Paseo Del Agua and aligned developments in Digital Milla). Thus, this can be regarded as one of the physical approaches for bringing the people and place making at the center of the development. Place making here is further supported by presence of lots of inter-connectivity, permeability and the pedestrian-oriented environment.

5.2. Type 2: Development as loop and dispersed sectors with no central spine

In the last two cases, it is observed that few industry-centered developments have grown as enclosures or loop based formations. The cases falling under this category are Hsinchu Science Park (Taiwan) and Cambridge Science Park (UK). These are the environments, which have firms and the R&D sector at the heart of their development. Though a continuous central public spine is absent, place making for knowledge workers is undertaken by developing public activities dispersed all along the site (i.e., Hsinchu Science Park) or by development of pedestrian and cycle-friendly environment (i.e., Cambridge Science Park).

However, case 3 and case 4 present exceptions here. Case 3, i.e., 22@bcn, Barcelona has a central spine based layout. But it is an industry-centered development as evident by its major functional uses. The central spine is in the form of the radiating diagonal boulevard that does not act functionally as public spine. Here the boulevard acts as the anchor and emphasizes the visual flow to open vistas. Public activities are concentrated in a sector. Case 4, i.e., Crossroads, Copenhagen has got initially developed radially with industries at the core and public spine is not manifested physically in the center, but still displays the inclusion of an effective place making. This has been done in this case by:

- Concentrating the public activities in sectors (i.e., Landscape and Leisurescape), thus giving them the scale required to organize large-scale international level events.
- Superimposition of cultural and social layer over the physical layer further strengthens the idea of interplay required between various layers for place making.
- Use of innovative experimental initiatives such as Light-S which is meant to communicate role of public lighting and latest innovations to the people thus disseminating the knowledge.
- Integration of heritage layers (i.e., Witte Dam and Strijp-S) to create interest and strengthen the place-identity.
- Use of landmarks like 'Light Tower' and 'Clock Building'.

Thus it is evident that place making for the knowledge workers in the contemporary KPs is a phenomenon which portrays itself as the superimposition of various simultaneous layers. In conjunction with the spatial layer, other layers such as social and cultural layers act as an equal contributor and a strong tool for encouraging place making in KPs.

5. DISCUSSION AND CONCLUSION

The study here reveals that KPss considered as cases display different patterns, which stay commonly informed by underlying principles towards place making for knowledge workers. The types have been identified on the basis of design and development approach. Few cases like One North and Digital Milla are seen exhibiting the pattern being centered on the public and social aspects such as development of center spine as landscape and mixed-use social activities. In other industry-centered cases like Hsinchu Science Park and Cambridge Science Park, place making has been attained through pedestrianizing the environment and distributing the public realm in sectors over the whole site. Few cases like 22@bcn and Crossroads display an intermediary urban development pattern. Despite the basic economic, social, organizational, spatial and socio-cultural variations based contextual differences in each KPs, it is observed that certain features and attributes can be identified occurring commonly across the contemporary KPs. These involve the underlying principles of permeability, diversity, character, variety, authenticity, centrality of public realm, quality of life and place to create better place-based environment for people and firms both. Such holistic approach aims towards the strengthening of the fundamental pillars of knowledge-based urban development that stands on economic, socio-cultural, enviro-spatial and organizational development of society (Yigitcanlar, 2010, 2014).

The study also concludes that place making in the KPs is influenced via its form and location of functions, but there cannot be a single unanimously accepted spatial development pattern. The development pattern of each site will vary according to the context and conditions. Different contexts will shape and yield different forms and patterns individually and each case will have its own individual characteristics that distinguish it from others.

Further research directions would look into a wider perspective towards typological analysis by considering other attributes to include the perceived and lived space layer like accessibility, usage and the attributes related to urban fabric like scale, density, built form and so on in order to adopt a more holistic approach towards understanding conditions that help in

place making. Additionally, innovation and knowledge spaces can vary at a wide scale from as small as designed innovation building to as large as the cities like Silicon Valley and similar others, which clustered as a spontaneous aggregation. In this paper, we have kept ourselves concentrated to the deliberately conceived, planned and designed district or precinct level development, i.e., KPs. Further research work needs to explore the organically developed agglomerations, such as Silicon Valley, of knowledge as well.

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PARALLEL SESSION 1: KNOWLEDGE-BASED CITIES AND REGIONS

A MONETARY MEASUREMENT OF KNOWLEDGE BASED EUROPEAN CITIES

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ABSTRACT

In last years, boosted by the economic situation that we live in, the cities have become a key factor for economic recovery and growth. The new knowledge-based economy models support knowledge as an endogenous key factor in the growth of economies and open the proposal in the literature of different ways of measuring knowledge cities.

Researches consider all sources of knowledge defined as growth capacity and in most case, summarized in an index that allows establishing cities or regions rankings considering different dimensions. However, there is not in the literature a proposal that measure the growth capacity of knowledge city in monetary terms that it allows a better comparison with other economic variables measured in this term.

In this paper, based on an Intellectual Capital approach, we propose a novel methodology to measure intangible capitals as the growth capacity of knowledge cities in monetary terms. This measurement considers European cities with information available from urban audit database. Later, we built a European cities ranking, where we study differences and similarities between cities and countries classified in clusters. Then, we can analyzes the effect of different levels of development in terms of knowledge city over the main economic variables with information available, with special emphasis in labor market and service sector, because all governments consider this sector as key in the economic recovery. Finally, we study the growth relationship in monetary terms to identify the best police making.

KEYWORDS

Knowledge cities; monetary; labor market; service sector; intellectual capital; European cities.

1. INTRODUCTION

Economic development has progressively produced a change towards Knowledge Society. It is a constant process that has extensions in all fields. In this sense, we can speak of the knowledge-based cities. These cities are established with the aims of: achieving sustainability and improving quality of life, providing the required services; enriching the variety of cultural life and knowledge within the city; and increasing the skills and knowledge of citizens and workers in the city, as the means of human intellectual development (Yigitcanlar *et al.*, 2008). In this sense, we highlight the paper published by Lever (2002) for 19 European cities which shows a broad relationship between the quality of the knowledge-based city comprising of tacit knowledge, codified knowledge and knowledge infrastructure and economic change.

In this way we can define a new model for measuring wealth or development of a society: state, region, or city. This model supports on the hypothesis that should not be considered exclusively tangible production factors such as the level of Gross Domestic Product (GDP) per capita for measuring this development. Therefore, the intangible factors (human and structural) should be considered, especially if we take into account new developments in knowledge management indicators. The result will be a measure with greater dispersion and differences between their observations. Development involves a process of change that takes place in different ways in different societies and at all levels. Therefore, we require measures that provide information about how such development takes place. In this sense, the term 'intellectual capital' (IC) has become enormously important as a complement to explain such economic development.

At the city level we can measure or estimate intellectual capital following this model. It is necessary to establish measures for all endogenous factors, tangible and intangible, of an economic and social space, such as a city, in order to estimate its wealth growth capacity. For the development of such measures it is necessary to take into account at least: human resources available, quality of life, processes or bureaucratic conditions, trade, entrepreneurship, R&D system, innovation, external image and environmental conditions.

When calculating the value of growth capacity or a knowledge cities index, the IC approach is a very useful and valuable management tool at the business level. The knowledge cities approach was presented as a framework theory in the last century. This approach is centred on human resources and links with the environment of a city, but implementing the model is very difficult with the data available (Knight, 1995).

Although the analysis of performance of cities is a very novel subject, more and more people are making a concerted effort towards capturing its essence through testing the growth sustainability of metropolitan areas or cities. The main proposals in the literature, which are basically approximations using cities/regions rankings, are developed considering different dimensions in order to measure the wealth or growth capacity of cities. Several collections of indices or rankings have been developed in the specialized literature; however we emphasize the proposals by: Ergazakis *et al.* (2004); the

World Capital Institute (www.worldcapitalinstitute.org) and López *et al.* (2014). In this line, we follow the classification of knowledge based city indices proposal in López *et al.* (2014) that consider three groups: general or growth indices; human development indices; and sustainability indices.

In this sense, establishing an index of intellectual capital of cities allows the construction of a ranking between cities, the analysis of policies that are more convenient and, likewise, the knowledge of the possible divergences that may exist between cities. For example, we could know whether structural factors such as R&D, image, commercial, are or not are more important than human ones for wealth and economic development, what importance and weight have for each country?, etc.

In this paper, we present a knowledge based model of cities developed by López *et al.* (2014), supported by all sources of knowledge defined as growth capacity and summarized in an index that enables the valuation of sustainable wealth as either a multiplier effect of tangible wealth or GDP per capita at a local level. To define all sources of knowledge, we support knowledge management and IC approaches, successfully tested at business and macro (national) level.

Based on the knowledge of this index, the main objective of the paper is to make a valuation in monetary terms of its different components, in order to make comparisons between cities and to establish the best policies for economic development in terms of sustainable wealth (SW). This measurement considers European cities with information available from urban audit database. Then, we can analyzes the effect of different levels of development in terms of knowledge city over the main economic variables with information available, with special emphasis in labor market and service sector, because all governments consider this sector as key in the economic recovery.

Thus, this paper is divided into a first part to present the methodology for establishing the valuation model of sustainable wealth. Afterwards, we make an initial exploration of results establishing the ranking with three clusters in terms of wealth, also analyze the most relevant relationships between the variables used and SW, for which we estimate a multiple regression model. Finally, we collect the main conclusions and future research lines.

2. METHODOLOGY: A VALUATION MODEL

Starting from the estimation of intellectual capital index of cities, we could valuate hidden wealth of a city. Therefore, firstly we set a valuation model of wealth, tangible and intangible, in monetary terms. Then, we present the background, assumptions and valuation model.

A first question is that in the case of cities do not have information available on the various expenses susceptible to becoming future benefits according to the definition provided by different authors, at the business level. This information, however, specifically for each city could be obtained from the local government budget. The model certainly would complicate excessively because a lot of information are necessary. In this sense, practitioners have developed approaches to measure knowledge into cities, but usually are complex scorecards of indicators to control initial strategies. These monitors have quantitative and qualitative information, and finally aggregate methods are not clear. Models have difficult application, very specific methods and different uses (Ergazakis *et al*, 2006).

In fact, authors as Brennan and Connell (2000) consider, at business level, that traditional accounting system is historic and focuses on monetary amounts, while intellectual capital is future oriented and focuses on qualities, making it difficult to value such assets in monetary terms. Skandia Navigator approach (Edvinsson and Malone, 1997) is the more relevant model to demonstrate a method to value intellectual capital mixing qualitative and quantitative data with an idea of efficiency filter for any cost in accounting system to transformer, in part, this cost in intangible asset. Some authors, as Lopez *et al.* (2008) propose this approach as solution to value intellectual capital at macro level. Valuation in monetary terms have advantages to knowledge management of intellectual capital, and to capture relationships with others macro variables, also, in monetary terms. We propose a naïve model to valuation intellectual capital of cities taking into consideration all the background information.

Valuation approach begins with the following equation in order to define the sustainable wealth (SW) in a city (c), as economic production plus Intellectual Capital value. First variable measure financial management and product, we could use GDP as proxy. Nevertheless, second variable measure no financial or knowledge management and no physical resources; we could use Intellectual capital of city (IC_c) as proxy such as it was proposed in López el al. (2014). Concretely, the authors, using a principal components procedure to assign weighting to each component in accordance with the percentage of variance retained and a geometric mean of human and structural capitals, define a Knowledge City Index (KCI) for each 'c' cities according equation 1.

$$KCI_c = \alpha \cdot \left[\sum_{i=1}^{h} \alpha_i \sqrt{(HC^{in}{}_c)^{\alpha_1} \cdot (HC^{sc}{}_c)^{\alpha_2}} \right] + \beta \cdot \left[\sum_{i=1}^{k} \beta_i \sqrt{(PC_c)^{\beta_1} \cdot (CC_c)^{\beta_2} \cdot (ImC_c)^{\beta_3} \cdot (RDC_c)^{\beta_4} \cdot (EC_c)^{\beta_5}} \right] \quad (1)$$

Where human capital has two resources: individuals (in) and social (sc), and structural capital comprises of: process (PC), commercial (CC), image (ImC), research, development and innovation, or in short R&D+I (RDC), and environmental (EC) capitals. Moreover, α and β are different weights of capital components that are estimated according to a principal component method.

Thus, using this estimation of intangible capitals together with the economic production measure using the GDP we can establish our initial equation as:

$$SW_c = GDP_c + IC_c \tag{2}$$

In accordance to the definition given of intangible capital, considering the above equation, we can make the hypothesis that growth capacity matches the growth rate assumed for GDP that is, considering Intellectual Capital and Knowledge Capital as key factors in sustainable wealth. Therefore, the Knowledge City index is a multiplier effect on tangible product and therefore could be valued under to the following expression:

$$SW_c = GDP_c \cdot (1 + KCI_c) \tag{3}$$

Where, the intangible value (intellectual capital) or hidden wealth of a city (ICc), in monetary terms, in equation 2 would be generated in accordance equation 4.

$$IC_c = GDP_c \cdot KCI_c \tag{4}$$

We apply this valuation model for 158 cities of Europe with available data. Main results, in monetary terms, indicate that intangible factors are a divergent factor. Richer cities, usually, have a more relevant intellectual capital or hidden wealth.

Table 1. GDP versus SW, dispersion comparative**.**

Measure	GDP_c	SW_c
Max	76200.00	116026.98
Min	7400.00	10170.98
R(x)	68800.00	105856.00
S(x)	12530.98	19285.03
$\overline{X}$	30447.77	44641.45
CV	41.16	43.20

Source: own elaboration.

Having valuated sustainable wealth for European cities, we have developed an exploration of results, making a comparison using different clusters and analyzing main relationships with the key factors of labor market and service sector in order to optimize the applicable policies for growth in the knowledge-based cities.

3. COMPARISON OF VALUES BY CLUSTER

Starting First of all, we have grouped the 158 European cities according to their level of sustainable wealth measure in monetary terms per capita at constant euros. Concretely, we have established three clusters in order to differentiate between developed, intermediate and developing cities in terms or this measurement and taking the year 2009 as reference because there is not data more current available. More specifically, we have used a non-hierarchical cluster analysis using the K-means algorithm. We kept three clusters of 18; 73 and 67 members respectively, due to their having greater explanatory power. The groups are as follows:

- Cluster 1. High Level Knowledge-based cities. This group is made up of cities with high SW value.
- Cluster 2. Medium Level Knowledge-based cities. This cluster is large and includes countries with an intermediate level of SW value.
- Cluster 3. Low Level Knowledge-based cities. This cluster is formed by the cities with low SW.

In order to statistically validate the selected clusters, we have used the Analysis of Variance to ascertain the differences in SW among them. Considering that the null hypothesis of homogeneity is rejected (first row of Table 2), we have used the Welch statistic to compare the average. The value of this statistic (first row of Table 3) shows that there is significant differences in the wealth (SW) level among clusters and, therefore, this result validates the solution of the cluster analysis.

All governments consider the service sector and an improvement in the labor market as key factors in the economic recovery. Thus, we have analyzed the performance, in the different clusters of cities established in function of their sustainable wealth, of different key variables related with the service sector and the labor market. These variables have been selected

taking into account the information available for the cities analyzed in this paper and they include for the labor market; the economically active population; the residents unemployed; the residents in self-employment; and the ratio between full and part time employment. For the service sector we have included the annual tourist in relation with the number of beds; the multimodal accessibility; and the land use for commercial activities. Furthermore of these variables we have used the labor market indicator defined as part of the social human capital; and the cultural activity and tourism indicators as part of the image capital in López *et al.* (2014). Table 2 show the variables consider for each indicator.

Table 2. Variables included in each indicator.

Labor market	Total Economically Active Population
	100 – Residents Unemployed
	Residents in Self Employment
	Residents in Paid Employment
	Total Full-Time Employment
	Total Part-Time Employment
	Rate: Full time/Part time employment
Tourism	Total annual tourist overnight stays in registered accommodation
	Number of available beds
	Number of air passengers using nearest airport
Culture	Number of cinema seats (total capacity)
	Number of museums
	Number of theatre seats
	Number of public libraries (all distribution points)

Source: own elaboration

Finally, we have considered also the two structural components of the IC more related with labor market and service sector such as commercial and image capitals.

In order to analyze the differences in the averages reached in these variables between the groups of cities established in the base of their SW, firstly, we have analyzed the statistic that we must use to develop the analysis of variance (ANOVA). Concretely, Table 3 shows the homogeneity test of the variance within groups, a necessary condition in order to be able to use the F statistic to compare their averages. We can see how in several cases the null hypothesis of homogeneity is rejected. Therefore, we have used in these cases the Welch statistic and in the other case the F statistic to compare the averages.

Table 3. Test of homogeneity of variance (Levene's statistic).

Variable	Levene's statistic	Sig.
SW	17.098	.000
CC_{pc}	0.582	.560
ImC_{pc}	1.527	.220
Labor market	3.572	.030
Cultural activity	0.991	.374
Tourism	9.789	.000
Economically Active population	0.254	.776
Residents Unemployed	5.970	.003
Residents in self employment	1.060	.349
Full time/ part time	4.537	.012
Annual tourist in relation with the number of beds	1.623	.201
Multimodal accessibility	1.150	.319
Land use or commercial activities	1.224	.297

Source: own elaboration

The Welch or F statistics displayed in Table 4, at the critical level of 0.05, verify the existence of significant differences between the groups for several variables, that is, there are variables which average values are different in function of the group of cities considered. Obviously, this information is important to analyze the effect of SW in the main variables related with the service sector and labor market and to verify the influence of SW over these variables and therefore, in the economic recovery.

Table 4. Test of average equality ANOVA (Welch statistic).

Variable	Statistic	Statistics Value	Sig.
SW	Welch	42.031	.000
CC_{pc}	F	9.247	.000
ImC_{pc}	F	36.001	.000
Labor market	Welch	23.706	.000
Cultural activity	F	1.981	.141
Tourism	Welch	13.486	.000
Economically Active population	F	3.935	.022
Residents Unemployed	Welch	8.851	.001
Residents in self employment	F	0.244	.784
Full time/ part time	Welch	10.541	.000
Annual tourist in relation with the number of beds	F	1.655	.195
Multimodal accessibility	F	33.548	.000
Land use or commercial activities	F	0.253	.777

Source: own elaboration

Table 5 shows the average as measurement of the level in the values reached, for the variables with significant differences in the ANOVA.

Table 5. Variables Average.

Variable	Average		
	G1	G2	G3
CC_{pc}	43.983	40.527	38.104
ImC_{pc}	56.401	53.911	51.589
Labor market	54.186	50.490	45.399
Tourism	20.295	14.951	10.979
Economically Active population	0.505	0.485	0.470
Residents Unemployed	0.069	0.081	.114
Full time/ part time	3.093	5.555	12.706
Multimodal accessibility	146.170	119.250	90.000

Source: own elaboration

In the case of the variables related with the labor market, we have found significant differences in the economically active population, residents unemployed and the ratio between full and part time employment. In the three cases the differences in the average are significant between the clusters 1 and 2 that is, between the high and medium level of knowledge-cities, in terms of SW. Thus, the higher value in the economically active population appears in the cluster 1 and in the case of resident unemployed and the ratio between full and part time employed in the cluster 3. These results allows to concluded that the cities with highest values in SW have a better situation in terms of labor market and that, the development of SW suppose and higher number of people employed in part time.

In relation with the service sector, significant difference appears between clusters in the variable multimodal accessibility with highest values in the case of cluster 1, that is, cities with higher SW. Therefore, it is vital for the development of knowledge cities: the situation of their communications and the accessibility for human capital and goods and services.

If we use some indicators defined by López *et al.* (2014) related with the labor market and service sector, we have seen that the significant differences appear in the labor market and tourism indicators. In the first case, the differences are

significant between all clusters taking the highest value in the case of the cities with highest SW, that is, anew show the clear positive effect of SW level in the labor market behavior. This situation appears also in the tourism indicator, although in this case the differences are not significant between clusters 1 and 2. The highest value appears also in the cluster with highest SW, that is, the SW have a clear contribution to the level of city tourism that is one of the most important industry related to the service sector and key in the economic recovery for many governments.

Finally, if we consider the two components of intellectual capital more related with the labor market and service sector, such as the commercial and image capitals, the situation is similar, with significant disparities between the clusters. Also, the highest values reached by the cities are including in the cluster 1, that is, the cities with highest SW.

In conclusion, optimal services (specifically tourism, transport and communications) with the conditions of a flexible and dynamic labor market with high activity are the key factors to achieve high values in SW. Thus, we must study multiple relationships between these factors and SW for cities analyzed.

4. RESULTS: RELATIONSHIP WITH ECONOMIC SECTORS

In this paper we need to explore the multiple relationships between service and labor market variables and SW for all cities to consider an optimal police for growth into knowledge-cities.

In this way, we present an econometric model (equation 6) estimated by OLS method for i cities, where variables are homogenized with natural logarithmic scale, and ε is a stochastic variable with null average, constant variance and no correlation. We show main results and description of variables considered in Table 6.

$$\begin{aligned} \ln SW_i \quad = \quad & \beta_0 + \beta_1 \ln(AP)_i + \beta_2 \ln(RU)_i + \beta_3 \ln(FP)_i + \\ & + \beta_4 \ln(MA)_i + \beta_5 \ln(CA)_i + \beta_6 \ln(TR)_i + \varepsilon_i \end{aligned} \tag{6}$$

Table 6. SW Model for knowledge-based cities.

Dependent Variable Ln (SW)			
Variable – Description		**Coefficient**	**T-Statistic**
Constant	Constant	6.624	13.744**
Ln (AP)	Ln (Economically Active population)	0.625	3.092**
Ln (RU)	Ln (Residents Unemployed)	-0.116	-2.693**
Ln (FP)	Ln (Full time/ Part time)	-0.142	-4.402**
Ln (MA)	Ln (Multimodal accessibility)	0.661	8.090**
Ln (CA)	Ln (Cultural Activity)	0.322	4.152**
Ln (TR)	Ln (Tourism)	0.111	1.681*
Sample (cities)		158	
Determination Coefficient		0.655	
F-Statistic		47.643**	

Source: own elaboration. OLS Estimation Method

According to the results we can conclude that all variables together explained well the SW (F-statistic). The model achieves high significance, considering that we use a cross-section sample of several different cities (158), with a value of determination coefficient (R^2) greater than 0.65. Moreover, all variables are individually significant taking into account the t-statistic.

The signs analysis for the variables shows that there are a positive relationship for cases of active population, multimodal accessibility, cultural activity and tourism. In the opposite direction with a negative or inverse relationship are residents' unemployment and the ratio between full and part time employment. In this sense, the ratio must be balanced to the type of contract in part time as policy to improve SW. Therefore, highest values in the variables with positive relationship could improve the city SW, while in the variables with negative relationship the behavior is the contrary.

In relation to the importance of the factors are two values highlighted with regard to the estimate coefficients: in the case of the labor market is active population and for service sector the accessibility to services. Thus, we could consider these variables as the keys to reach a highest SW. In this sense, it is confirmed that there are synergies between the key factors and growth policies of SW require improve working conditions and the accessibility in the knowledge cities.

5. CONCLUSION

Cities need a new pattern of growth to become authentic knowledge cities. For this it is necessary to know which policies should be implemented to achieve this objective. The design of these policies involves having a knowledge model based on

the cities supported by all sources of knowledge defined as growth capacity and summarized in an index that enables the valuation of sustainable wealth as either a multiplier effect of tangible wealth or GDP per inhabitant at a local level. To define all sources of knowledge, we support knowledge management and intellectual capital approaches, successfully tested at business and macro (national) level.

The proposed model allows a monetary valuation of the different components of sustainable wealth. This allows comparisons between cities in order to design the most suitable policies, especially those relating to labor market and the service sector.

Using this model to a sample of European cities, with information available from urban audit database, we could highlight the following results. First, cities that have more sustainable wealth are in a better position on the labor market with higher number of people employed in part time. Therefore, it is necessary to implement policies in order to achieve a flexible and dynamic labor market. Second, the situation of the communications and the accessibility for human capital and goods and services are key factors for the development of knowledge cities. Moreover, tourism sector plays an important role in the growth model of sustainable wealth, therefore should be improved and updated. Finally, there are synergies between the different factors shaping the pattern of model of knowledge cities and the growth of sustainable wealth should also involve improving the connectivity between the cities.

This paper opens future research lines. Thus, we could analyze the relationships considering the different cluster established in order to determine if the key factors are the same regardless of the level of development achieved. Moreover, with data available, we could use a panel data model in order to analysis if results obtained in this paper change over time. The main limitation of this proposal is related with the information available because the model and the policies analysis is developed only for the European area but it is easy to use with information for other cities in order to expand the conclusions obtained.

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A REVIEW ON THE KOREAN INFORMATION STRATEGIES USING STIM MODEL

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ABSTRACT

Purpose: This study intended to analyze the characteristics of Korean information strategies since 1960s.
Scope: The scope of this study is Korean information strategies which have transitioned from a information city, cyber city, e-City to u-City since 1960s.
Method: This study were analysed by STIM model which is based on the concept of Multi-Layered U-City such as service, technology, infrastructure and management.
Results: Conceptually, Korea information strategies have transitioned from virtual city including computerization to ubiquitous city before and after u-Korea strategy.
Recommendations: It is useful for those who start information strategy to consider the characteristics of Korean information strategies for diminishing try and errors.
Conclusions: Korea information strategies transition is thought to be as momentous as the industrial revolution in terms of far and wide effects on urban socioeconomic environment.

KEYWORDS

Ubiquitous City; Smart City; Multi-Layered U-City; STIM Model; Roadmap

1. INTRODUCTION

Korean information strategies have transitioned from a information city, cyber city to e-City then to ubiquitous city (u-City) from 1960s. Korean government has pushed forward to the information strategies such as Cyber KOREA, e-KOREA, Broadband IT Korea, u-KOREA from 1960s(Ha, Kim, Choi, 2002).

As a result of information strategies, Korea Internet and Security Agency reported that internet users of Korea have increased from 19.1 million citizens in 2000 to 40.1 million citizens in 2014. The rate of internet usage has increased as much as 37.4 percent during the last decade from 44.7 to 82.1 percent. The rate of household internet access is approaching 98.1 percent in 2014. The usage of ubiquitous services such as WiFi (91.0%), instant messenger (82.7%) is rapidly increasing.

Recent publications on ubiquitous city evaluated that Korean information strategies are successful roadmap and most of scholars viewed U-City as an exclusively Korean idea. Each information strategies lay different kinds of emphasis for the sustainable development. Therefore it is very useful for those who start information strategy with diminishing try and errors to review the characteristics of Korean information strategies since 1960s.

Therefore this study intended to analyze the characteristics of Korean information strategies since 1960s. The scope of this study is Korean information strategies which have transitioned from a information city, cyber city, e-City to u-City since 1960s. This study were analysed by STIM model which is based on the concept of Multi-Layered U-City such as service, technology, infrastructure and management.

2. MODEL

Nowadays U-City is defined as a ICTs (Information Communication Technologies) and EcoTs (Ecological Technologies) embedded spaces where citizens can get any information and eco services through any ICTs and EcoTs embedded infrastructure anywhere anytime. ICTs embedded intelligent road provide us with traffic congestion or bus information service. Foreigners can get the way finding service through intelligent wall of QR code. Citizens can get fresh air in intelligent building with air pollution watch sensor.

Ubiquitous city is composed of multiple layers such as services, technologies, infrastructure, and management, which is called by Multi-Layered U-City (MLUC). Sometimes without any one layer, ubiquitous city is not properly working, but often ubiquitous city is properly working with any one layer. Through 4 multi-layered ubiquitous strategic plan and implementation, u-service can be provided.

This study was analysed using STIM model which is based on the concept of Multi-Layered U-City. STIM model has four multi-layers such as service, technology, infrastructure and management, which were classified into16 sub-categories in detail (Table. 1). Services are classified into the living, working, playing and, moving services.

Technology has sub-categories such as sensing, network, interface, processing and security technologies. Infrastructure

is divided into built ubiquitous computing infrastructure (BUCI) and movable ubiquitous computing infrastructure (MUCI). U-City management includes infrastructure management, information platform, law, organization and governance. Strategy map was made along STIM model as a result of this study. Strategy map has two axes. X-axis is years. Y-axis contained STIM layer (service, technology, infrastructure and management).

Table 1. STIM Model

U-City Layer	Sub Category	Index
Service	Living	Residential, Education, Environment, Health/Welfare
	Working	Commerce, Business, Manufacture, Administration Support
	Playing	Culture, Tourist
	Moving	Transportation, Distribution
Technology	Sensing	General Sensing, Situation Perception
	Network	BcN
	Interface	Codec Tech, Display
	Processing	Processing Soft Ware, Middleware
	Security	Password/Certification, Information Management, Hacking
Infrastructure	BUCI	Intelligent Building / Facility, ICTs Infrastructure, Integrated Information Center
	MUCI	Device, Robot, Transfer Mechanism
Management	Infrastructure	Intelligent Facility, Network Management
	Information Platform	Information Linking Integrated / System Management
	Administration/ Finance	Management Operation Organization / Funding
	governance	Citizen Participation, Governance

data : Lee and Leem (2010), modified by authors

3. DATA

The scope of this study is covering Korean information strategies which have transitioned from a information city, cyber city, e-City to u-City since 1960s. The data for analysis is the National Information White Paper published by the NIA (National Information Society Agency) from 2002 to 2013. Korea has continuously developed national information strategies since 1960s.

Before 1990, Korean government put the emphasis on making information oriented society such as the computer provision to people, the internet use of citizens, the reduction of regional informational divide and so on. Since 1990s Korean government push forward to internet oriented strategies such as Cyber Korea, e-Korea, and U-Korea. Most of the people are able to own and use a personal computer and to build the national wide backbone network until Cyber Korea agenda for computerization. e-Korea for information city aimed to widespread the internet use and built a high-speed internet network and virtual city. u-Korea initiatives for ubiquitous city focused on the integration of ICTs and the physical city for the convergence of the virtual and real space.

Cyber Korea and e-Korea had the stress on building virtual city promoting the internet use of citizens. U-Korea strategy has turned the focus on U-City development to the integration of ICTs and the physical places in cities with an aim of making the virtual and actual cities converge [Ha, 2003]. In 2007, a law on the construction of ubiquitous cities is enacted to build ubiquitous cities by integrating ubiquitous infrastructures and services.

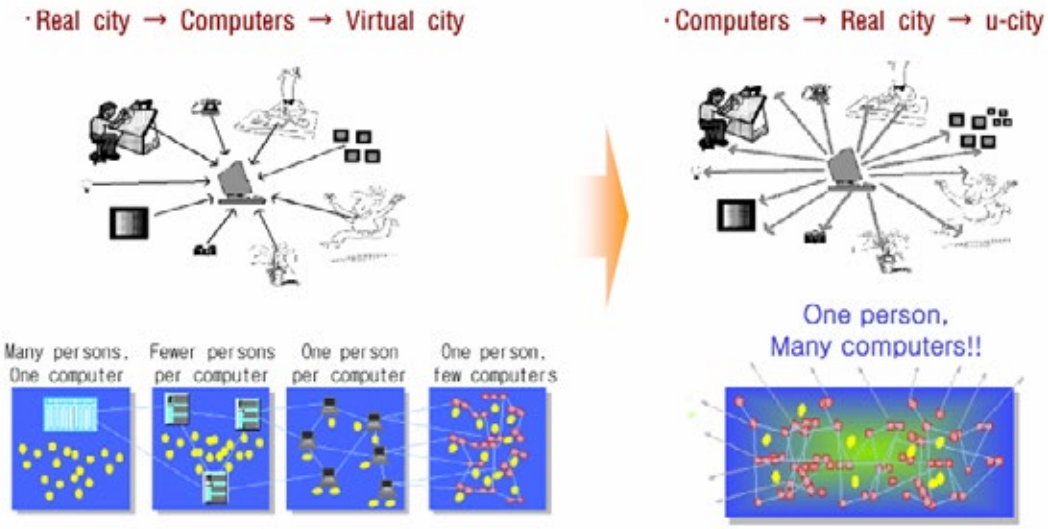
U- city agenda is transformed into ubiquitous eco-city agenda by integrating ubiquitous infrastructure and ecological sustainability principles—i.e., ubiquitous eco-city(Lee, Yigitcanlar, Wong, 2010). U-City has the philosophy such as communication, sharing, and balance under six-vision, and six-principles. Six-visions were focusing on safety, convenience, efficiency, high-quality amenities, cultural values, participatory nature of development and six-principles were also focusing on sustainable orientation of human, nature, equity, market-orientation, moderate co-existence, building the future (Yigitcanlar and Lee, 2013).

Table 2. Information Strategies in terms of STIM Model

Strategies	Computerization (1970s~1999)	Cyber Korea (1999)	e-Korea (2002)	u-Korea (2006)
Service	Administration and Enterprise Field Domain Name Service	Wired Internet Service Spread of Mobile Phone	2G wireless internet (Streaming) U-Service (ITS…)	3G and 4G(LTE) network Convergence Service Space-based Service
Technology	Computer Emergence of Cell-phone	RFID, ISDN, IPv6 CDMA, WiFi	3G /USN, WCDMA Augmented reality	Smart Phone CLOUD Computing
Infrastruc-ture	Spread of computers Telephone network (Model)	National Backbone Network ADSL	VDSL Network, BcN Integrated Information Center	WiFi/Intelligent Infra U-City Integrated Operation Center
Manage-ment	National Master Plan for Computerization	National Agency for ICTs Master Plan	Test Bed for ICTs-based community Privacy Protection Law	U-City Law and R&D U-Eco City R&D & U-City World Forum

4. RESULTS AND CONCLUSION

Conceptually, there is some dramatic change in the process of information strategies before and after u-Korea strategy. Ubiquitous city after u-Korea strategy is quite different from the well-known e(virtual or cyber) city before u-Korea strategy. In the virtual city, urban elements or information go into the computers, but in the ubiquitous city, computer chips or sensors are inserted into urban elements. In terms of computer history, ubiquitous city is the highly evolved from the many persons per one computer, to many computers per one person. Therefore Ubiquitous city is more evolved form than virtual e city.



While ubiquitous city provide (r)evolutionary solution to urban problem and megatrend, virtual city stress on the informatization including computerization. Ubiquitous City suggest to some (r)evolutionary solution to quality of life and public participation, climate change and energy crisis, efficient global business and smart growth. ICTs embedded smart space can create programmable spaces. The tradition space wear ICTs and EcoTs to be smart space where human and space communicate with each other and past, present and future communicate for sustainable future city.

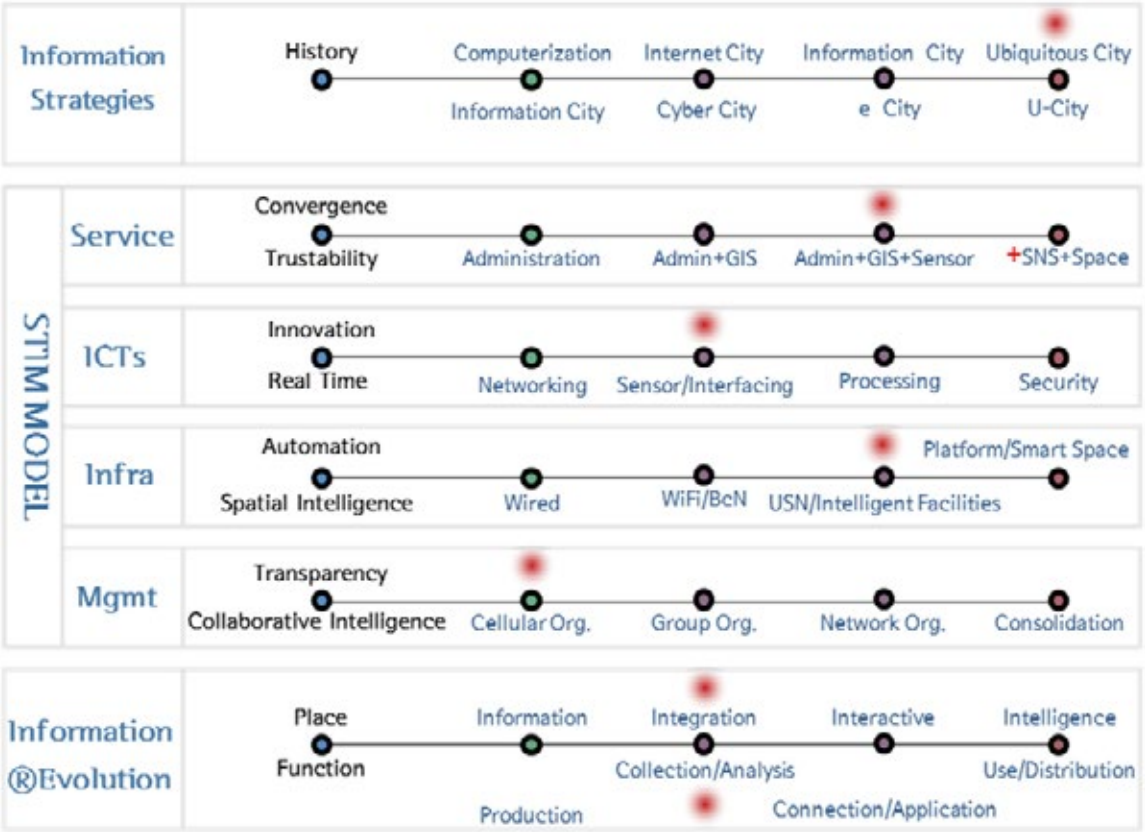
In view of STIM, Korea information strategies suggest different roadmap. Services strategies were evolved from administration (e government) to administration on the map with GIS, to administration on the map with GIS plus intelligent facilities with USN/SNS. Single service is evolved into spatial oriented complex services.

Technologies strategies were evolved from networking technologies for conveying data, sensing technologies for the data production, interfacing technologies for showing data, processing technologies for analyzing data, and securities technologies for privacy and infrastructure management.

In terms of infrastructure strategies, after firstly wired network including high speed internet network ADSL were provided, BcN for conveying text, voice and video data were planned. And then mobile ubiquitous computing infrastructures such as ICTs embedded car, robot, mobile phone, as well as built ubiquitous computing infrastructures such as wireless

network, USN connected infrastructure, and places are being supplied.

In view of management, Ubiquitous city need ubiquitous information operating(management or governance service) centre and platform, where all kind of data from intelligent infrastructures are incorporated to provide the high quality of informational and ecological services through collecting, monitoring, inter-correlating, analyzing and distributing real-time urban information. In 2008, Korean government enacted the law for supporting ubiquitous city construction which included financial support for ubiquitous master plan and model city. 120 billion dollar's R&D fund had been invested from 2008 to 2013.



Reviewing Korea information strategies, the ICTs and EcoTs transition is thought to be as momentous as the industrial revolution in terms of far and wide effects on urban socioeconomic environment. ICTs and EcoTs are changing the socioeconomic value chain. Citizens communicate with smart space, which means that we enjoy breathing fresh air, feeling glorious sunshine, drinking clean water, getting useful information related to safety, convenience, amenity, and public participation service that smart space made. Ubiquitous city can also create new job through sharing economy through the Korea information strategies.

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EMERGING TECHNO-ECOSYSTEMS: KNOWLEDGE NETWORKS THAT SHAPE URBAN INNOVATION SPACES

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ABSTRACT

Purpose: This paper aims to outline the central notions of the Knowledge-City paradigm in which agents, actors and milieus play a key role in knowledge-generative, networked environments, some of them known as Urban Innovation Spaces (UISs).

Scope: It will focus on an integrated perspective of knowledge agents and actors immersed in learning interactions within knowledge-generating spaces. Such focus will serve as the basis for theorizing on transformations of socially networked environments – e.g., knowledge networks, hubs and clusters, networked cities, and similar concepts that could eventually become innovation milieux under certain conditions.

Method: A taxonomy under categories of a Knowledge City methodology is followed to create an account of how innovation milieus are observed in a comparative case of two clusters of the same orientation in two different regions: Rhône-Alps and Monterrey.

Results: Cases presented shed some light in the way clustering processes are perceived, in terms of the networks they elicit and the regional impact they trigger while building cooperative and collaborative projects.

Recommendations: The article will emphasize the importance of knowledge sharing and interactive learning in building citywide knowledge-based infrastructures, such as networks and cluster formations in the area of Information Technologies (IT).

Conclusions: learning as a knowledge-generative initiative that advances and further contributes to the development of the knowledge-based urban development (KBUD) paradigm.

KEYWORDS

Knowledge Workers, Knowledge-based Development, Innovation milieux, Urban Innovation Spaces, Rhône-Alpes France, Monterrey Mexico.

1. INTRODUCTION

Knowledge city-regions promise to preserve and improve the wellbeing of society, leveraging knowledge to create value as their backbone to influence and improve key factors like mobility, environment, people, quality of life and governance. However, in the context of the Knowledge Economy, it has been argued that for a city-region to experience sustained development, it has to link research and manufacturing activities — namely, innovation and production — in the same place. This unassuming proposal can be an unwelcomed challenge for many regional economies, as the study cases in this article will prove. It can therefore be argued that a new approach to city-region planning and development is needed: one that include fostering innovation and manufacturing through small firms. In these emerging models, better known as techno-ecosystems, research centers would push innovation down the supply chain, and support dynamic, design-driven (as opposed to production-driven) networks (Clark, 2013). In these emerging models, learning and knowledge-generating activities are turning into a life-long process for knowledge, skill, and expertise acquisition and, additionally, for strengthening people's meta-cognition abilities within the new techno-ecosystems.

In such context, the first part of this research work attempts a literature review and reflexion on how knowledge agents and actors engage in learning interactions in contexts that can eventually become knowledge-generating spaces or milieux. Under this scope, knowledge systems are seen as a prerequisite for Urban Innovation Spaces (UISs) to emerge. Such scope will serve as the basis for theorizing on transformations of socially networked environments – e.g., knowledge networks, hubs and clusters, networked cities, and similar concepts. The paper will then advance that the key to advance knowledge-based urban development (KBUD) practices, is to foster learning interactions, particularly social learning facilitation in informal and formal networks. Those environments could become spaces for conversations where knowledge is transformed into value within its ecosystem that would eventually benefit the city (Carrillo, 2004). This review will be followed by a deeper inquiry on the role of knowledge networks, on how they add value to innovation processes through access negotiation, autonomy and participation, and how they actually create innovation infrastructure. The fourth part of the paper will introduce and discuss two regional cases of clustering processes, in which UISs could become the kind of networked knowledge that builds a case for sustainable development.

1.1 The Network Metaphor

The notion of knowledge networks is attracting an immense amount of interest within the international community. Networks by nature assume a globally distributed international audience, working 24/7 from the most diverse points of the planet. They are compared to, but distinguished from concepts such as Communities of Practice or CoPs. In CoPs, learning is generally situated and therefore the local context is essential to construct the meaning of such interactions. While an on-line environment might not be able to support situated learning (Lave & Wenger, 1991), the kind of exchange reached within a knowledge network (k-network) is seemingly overcoming typical on-line barriers of meaning construction by generating a common theoretical base and language of exchange. Indeed, user-friendly, internet-based networking technologies have accelerated the development of new forms of exchange: open and public technologies have enabled the creation of strong networked communities, and "virtual" networks by underlining the role of shared community repositories (documents, databases, research outputs) that enable the network to generate a common language or practice. Networks can seemingly overcome the constraints posed by situational learning by establishing ground for common understanding (Brown & Duguid, 2000). However, networks come in different shapes and forms. Indeed, in recent years a number of scholars have attempted to define the elements and characteristics of networks, especially those who add value to the social capital of organizations. For instance, Monge and Contractor (2003), suggest three kinds of value-adding, on-line networks:

Social Networks. Its not what you know, its who you know. These networks are created mainly to exchange social information amongst their members, such as their personal preferences, hobbies and leisure time activities etc.

Cognitive Social Networks. Its not who you know, its who they think you know. These networks are created to strengthen the relationships of its members within their network and beyond, bridging professionals' participation in a variety of interconnected memberships and groups.

Knowledge Networks. Its not who you know, its what they think you know. These networks are created by relationships between people who discover each other through their own knowledge (content, projects, comments, questions, answers): not just social information (who knows what? instead of the who knows who of the typical online social network services).

For the purposes of this paper, the third classification, that of knowledge networks (also known as social knowledge networks) is the more relevant to retain and explore in combination with UISs, as presented in section three. Such insights into the evolution of networks in social forms of organization can bring clarity to the state of the art of emerging knowledge-based models, as the next paragraphs will elucidate.

1.2. Socially Networked Environments

At this point, it seems therefore important to characterize the distinction introduced by a number of scholars on knowledge transfer elements in networks. The focus is on the kinds of networks that not only foster social capital, but also shape learning and knowledge-generating structures, albeit intangible, as those observed in knowledge-based networks and innovation clusters. Scholars like Nahapiet and Ghostal (1998), have made distinctions between the structural, cognitive and relational dimensions of social capital. In a framework developed by Norman Uphoff and Wijayaratna (2000) a range from structural manifestations of social capital to cognitive ones are clearly shown (Grootaert & Van Bastelaer, 2002). It is thought that structural social capital facilitates mutually beneficial collective action through established roles and social networks supplemented by rules, procedures and precedents (Hitt *et al.* 2002). Cognitive social capital, which includes shared norms, values, attitudes, and beliefs, predisposes people towards mutually beneficial collective action (Krishna & Uphoff , 2002; Uphoff, 1999). Cognitive and structural forms of social capital are both seemingly connected and mutually reinforcing (Uphoff & Wijayaratna, 2000). As for the Relational dimension of social capital, scholars have found that it increases the capacity for action, and is an aid to adaptive efficiency, creativity and learning by the degree of participation, associativity and accountability it conveys. This concept is central to the understanding of institutional dynamics, innovation and value creation, and is therefore highly relevant to development contexts (Nahapiet & Ghostal, 1998)

Figure 1. *Interactive learning*

Tie strength	Tacit knowledge (non-codified)	Explicit knowledge (codified)
Weak	Search benefits. Severe transfer problems	Search benefits. Few transfer problems
Strong	Low search benefits. Moderate transfer problems	Low search benefits. Fewer transfer problems.

Source: Adapted from Hansen (1989), in Augier and Vandelo (1999)

In terms of relational social capital, a characterization of networks by their bonding and bridging social capital is associated with those interpersonal relationships that can be labelled as "strong ties" following the classic distinction by Mark Granovetter (1973; 1985). The article by Granovetter (1973) titled "The strength of weak ties" is a classic in this field. One of the main points of the article is that weak ties (i.e. ties between persons who do not know each other so well) are important as channels of new and unexpected information. At the core, this is the strength of weak ties. Correspondingly, strong ties (i.e. relations with more familiar persons), may not provide as new and unexpected pieces of information as the weak ties. One could still argue that weak ties are of great value, as they are linked to the social nature of learning and knowledge creation (See Figure 1). Putnam (2000) has also emphasized how the bonding social capital refers to the intense and tight interpersonal networks. In brief, no one can own social capital only by him/herself, as it lies in relationships between and among persons. In the same tone, Aldridge, Halpern *et al.*, (2002) have characterized bonding social capital as horizontal, among equals within a community whereas bridging is vertical between communities (Dolfsma & Dannreuther, 2003; Narayan, 2002; Narayan & Pritchett, 1999). Moreover, Wallis (1998) and Wallis, et. al. (1998), have referred to bonding capital as localized which they defined as being found among people who live in the same or adjacent communities, and bridging capital, which extends to individuals and organizations that are distant. Bridging social capital is closely related to thin trust, as opposed to the bonding social capital of thick trust (Anheier & Kendall, 2002).

2. URBAN INNOVATION SPACES

In knowledge-intensive settings, social forms, spaces and shapes have emerged in which knowledge seems to flow in purpose-built pipes. Notions like Living Laboratories (Living Labs), incubators or social art spaces have been identified (Wenger, White & Smith, 2009). However, for the purposes of this chapter, a focus has been placed on knowledge-based hubs and clusters, as they closely relate to the networks describe in previous paragraphs.

2.1. Knowledge-based Hubs and Clusters

Knowledge-based clusters have been identified as "the constellation of institutions at the regional level that contribute to innovation processes in their region" (Braczyk, *et al.*, 1998). Such clusters have been closely linked to the notion of Innovation Clusters: "a set of institutions, both public and private, that produces pervasive and systemic effects which encourage firms within the region to adopt common norms, expectations, values, attitudes and practices — in short, a common culture of innovation that is reinforced by the process of social learning (Wolfe, 2002). Hence, clusters are thought to build regional systems of innovation that generates a collective learning process leading to the rapid diffusion of knowledge and best practice (Nauwelaers & Reid 1995, in Wolfe, 2002).

However, to consolidate a definition for cluster, and innovation cluster in particular has been elusive both in the academic and practitioner literature. A number of notions such as "network", "value chain", "industrial district", "local production system", "innovative milieu", "regional innovation system ", "new industrial space", "scientific/technological park", "*pôle de compétitivité*" are found as parallel definitions in the literature on clusters and cluster policies (Hamdouch, 2008). Moreover, differing notions have been inaccurately paired up in the literature at different times and places: "industrial district" vs. "innovation district", "industrial cluster" vs. "innovation cluster" / "technological cluster" / "knowledge cluster", "production network" vs. "innovation network", "industrial region" vs. "learning region", amongst others (Moulaert & Sekia, 2000). It was Michael Porter who popularized a generic cluster notion in his 1990 book The Competitive Advantage of Nations (Porter, 1990). Porter sees clusters as an alternative way of organizing the value-chain. "A cluster of independent and informally linked companies and institutions represents a robust organizational form that offers advantages in efficiency, effectiveness, and flexibility" (Porter, 1990). Following Porter's views, a cluster can be defined as a specific spatial industrial organization based on two main dimensions: (a) The links between actors in terms of geographical proximity, of complementarities and of trustworthy relationships building; and (b) The existence of both competitive and co-operative interactions amongst the co-localized firms (Hamdouch, 2008).

Clearly, knowledge-based environments function both on the basis of inclusion as well as exclusion, and these processes

may assume sharp contours within the entire dynamization of any given system. Networks work as bodies or entities where new knowledge and innovation are generated and disseminated. They seem to have replaced - to a great extent - the rigid institutions in which not so long ago knowledge was created and preserved. However, this can lead to a darker side of network life. It could lead to the creation of global networks, which could multiply and parcel global competition that may lead to polarization, creation of elite networks at the cost of greater exclusion of many groups. Indeed, for a number of international observers (Paquet, 2011; Tuomi, 2004), the key problem of knowledge society will be to cope with inequality and exclusion.

2.2. Knowledge-Intensive Contexts: Agents and Actors

Peter Drucker's pioneering notions of knowledge workers (k-worker) first stated in his seminal Landmarks of Tomorrow (1959) and The Age of Discontinuity (1969) address views on the knowledge society that parallel those of KBD today. At the beginning, the k-worker concept would make reference to anyone who worked for a living at the tasks of developing or using knowledge, such as programmers, systems analysts, technical writers, and also extended to academic professionals and researchers in the information systems disciplines. Nowadays, the term k-worker has also progressively included people outside information technology: anyone who communicates and transforms specialized information such as lawyers, teachers, scientists and learners of all kinds. Workplace learners are amongst those emerging types of k-worker. They have been identified in specific (mostly educational) contexts, as knowledge facilitators (MCNeil, 2004), knowmads and knowledge citizens in the city context (Durrant, 2010). Still, KBD specialists are just beginning to understand what these knowledge workers do and how their work processes and proficiency can be improved.

Amongst these types of k-workers, the knowledge facilitator (k-facilitator) is defined as a learner with the ability to analyze and articulate the data into a form that relates to a workplace or life situation, usually to bring suggestions, new visions or solutions to workplace or life issues. This conceptualization of k-facilitator was indeed influenced by organizational KM contexts, where the role of facilitators usually is to provide input to relevant learners before, during and after programs or projects undertaken by the organization. In such settings, the k-facilitator is seen as a critical role for the efficient organization of learning schemes.

A knowmad is a type of nomadic k-worker (Durrant, 2010; Moravec, 2008). Knowmads are thought to be creative, imaginative, and innovative people who can work with almost anybody, anytime, and anywhere, able to instantly reconfigure their social learning environment (Durrant, 2010). They are also active first-rate knowledge network weavers (Paquet, 2010). But most importantly, they take part in networks that are bringing about "emerging cognitive infrastructure, in the shape of multitude of virtual cities"; these cities will "bring together people with shared values and orientations towards the future, and who are in a position to collaborate to bring something new into the world" (Paquet, 2010). Indeed, actors such as these are generating patterns and lifestyles in which people live, work and learn (Garcia, 2007) yet to be explored in the lines of KBD work.

In the same context, a Knowledge Citizen (K-Citizen) was first defined as "an agent who establishes and develops a relationship where productive value is exchanged, and capable of self-managing his/her knowledge, concurrently contributing to manage knowledge in his/her city" (Martinez, 2010:138). This definition puts an emphasis on the value-generative nature of the citizen. However, more recent definitions of a K-Citizen highlight a type of leader citizen with strong networking skills who "exercises a humble and facilitating leadership style, based on openness, dialogue and participation, with the ability to think at the partnership/network level, give strategic direction and encourage experimentation and diversity" (Mendoza & Vernis, 2008). This makes a K-Citizen Knowledge Citizen a productive leader and innovator, a natural networker with a number of relational and communicational competences, and a visionary with a wide perception of the context and a deep willingness and commitment to contribute to the urban community.

2.3 Innovation Milieux: Brokers and Gatekeepers

In the social networks literature an actor can be considered as a broker when it provides the only connection between two actors. For instance, any flow of information, knowledge, or products from one actor to another necessarily passes through the brokering actor. Recent studies focused in brokerage positions in scientific networks (Burt, 2004; Nerkar & Paruchuri, 2005; Reagan & McEvily, 2003) have found that actors between otherwise disconnected agents are in an advantageous position for identifying arbitrage opportunities, have better chances of creating new knowledge or products, and are more able to capitalize on their existing capabilities (Burt, 1997, 2004; Hargadon & Sutton, 1997; Zaheer & Bell, 2005).

Allen (1977) originally introduced the term "technological gatekeeper" to describe R&D professionals with the intellectual and personal ability to absorb external knowledge and translate it to their internal co-workers (Morrison, 2008). In analogy to the original sense of the term, in an innovation system some distinctive gatekeepers, which could be individuals, firms or universities, link the system to outside knowledge sources. Related with the broker concept, a gatekeeper in social network analysis is an actor holding brokering position between two groups of actors (Gould & Fernandez, 1989). Adopting the system of innovation approach as a conceptual framework (Edquist, 1997) – where the innovative activity as a collective process is characterized by a transfer of knowledge between networked actors – the gatekeepers serve two functions for the innovation system: external knowledge sourcing and diffusion within the local

system (Allen, 1977; Giuliani, 2005; Malipiero *et al.*, 2005). To fulfil this role, a gatekeeper has to interact frequently with partners external to the system and at the same time be integrated within the local system via a sufficient number of internal relations (Graf, 2010).

It can be assumed that interaction learning is at the core of brokers and gatekeepers behavior. For instance, researchers who connect across structural holes (network brokers, connectors, hubs, or entrepreneurs) are exposed to the diversity of opinion and behavior of the rest of researchers in the institution. Assuming that information has a clustered distribution, in which information is relatively homogeneous within groups and heterogeneous between groups, a vision advantage is created (Burt, 2010). In this sense, connecting across more holes means broader exposure and broader exposure provides a vision advantage in selecting early between alternative ways to go, synthesizing new ways to go, framing a proposal to be attractive to needed supporters, and detecting likely supporters/opponents to implementing a proposed way to go (Burt, 2010). In sum, it is through the interaction that brokers and gatekeepers obtain benefits from their positions, or even create the structures in which they are embedded.

3. LEARNING AS KNOWLEDGE CREATION: THE MILIEUX

In terms of knowledge-based development frameworks, some key notions have emerged to characterize knowledge-based environments. A working definition for a Knowledge City is "a city purposefully pursuing knowledge as a means for development" (Carrillo, 2004); while knowledge-based frameworks that involve UISs and/or clustering processes for development (Wolfe, 2002) assume learning as knowledge-generative and innovation-led, in which "social processes engage people in mutually beneficial dialogues and interactions" a kind of "learning-through-interacting" (Lundvall & Johnson, 1992). These perspectives presuppose the social nature of learning, knowledge management and innovation. Innovation is thus understood as the result of interaction between various economic and social processes (Manley, 2008), in which entities need the capabilities of other fellow actors. Emerging shapes and forms of interactive innovation frameworks involving learning and knowledge sharing (Manley, 2008, p. 3) are mentioned in Table 1.

Table 1. Emerging shapes and forms of interactive innovation.

• Development blocks (Dahmen, 1988); • Complexes (Glatz & van Tulder, 1989; Marceau, 1995); • Innovation milieu (Camagni, 1991; Ratti *et al.*, 1997); • Complex products and systems (Hobday, Rush, & Tidd, 2000); • Competence blocs (Eliasson, 1997); • Technological regimes (Nelson & Winter, 1982); • Industrial filigrees (van Tulder & Junne, 1988); • Innovation districts (Pyke *et al.*, 1990); • Sectorial innovation systems (Breschi & Malerba, 2000, chap. 6);	• Regional innovation systems (Cooke *et al.*, 1997); • Technological innovation systems (Carlsson & Stankiewicz,1991); • National innovation systems (Lundvall, 1992; Nelson, 1993); • Innovation networks (De Bresson & Amesse, 1991); • Business networks (BIE 1991); • Value-chains (Walters & Lancaster, 2000), and; • Clusters (Porter, 1990; Wolfe, 2002). • Communities of practice (Lesser y Everest, 2001; Wenger y Snyder, 2000)

3.1 Knowledge-intensive interactions

Indeed, a new set of personal and interpersonal skills is required to avoid possible digital divides and to allow to adequately developing the above mentioned processes in people and in society. Hence, the representation and usage of the main sources of knowledge has to change to enable new forms of learning. In these contexts, books (i.e. unit of text) and film (i.e. unit of audio-video material), will have to act as a seed for a new open structure which will be customizable and will provide the access to data that is available everywhere, but might be subject of permanent extension and change.

Indeed, as collective knowledge continues to grow in volume and complexity, we are progressively challenged to make sense of the co-evolutionary processes between learning (as knowledge creation) and its relationships and interdependencies with the new information and communication media available (Tuomi, 2005). Moreover, with knowledge-intensive activities on-line, and self-paced development processes, we seem to keep building multi-cultural, multi-ideological information highways. Our globe is seemingly turning into a world of parallel systems of meaning (Toumi, 2004a). In this multi-meaning universe, the emerging societies in different parts of our world are increasingly depending on international links and networks to live on: their communication activities become critically important in the social construction of communities that learn (Tuomi, 2004a). At the core of this complex makeover of the social, economic and technical sub-systems, sits the System of Learning on which each of our societies rely on. Our systems of learning are historical societal structures now seemingly developing into Systems of Meaning-Creation (Tuomi, 2004b). Indeed, the learning systems in our societies appear to be challenged by the power of networked communication with varying levels of

intensity. More than an information revolution, the new millennium has openly confronted us with a learning revolution (Sloman, 2001). Intranets, virtual communities and on-line learning are seemingly only the tip of a gigantic iceberg in this emerging revolution. Predictably, given the emphasis of communication in meaning-creation processes, information and communication technologies (ICTs) are indeed playing a major role in the System of Learning of emerging knowledge-based cities, regions and societies.

3.2 Learning & Knowledge networks as the basis for UISs

As the new century progresses, the role of such conventional UISs is transforming to more development-oriented knowledge networks. Knowledge hubs are the key intermediate step between common UISs and knowledge networks, as emerging actors in the regional scenario. A conventional knowledge hub can be described as:

A vibrant public ICT access point which is accessible to communities to gain, share and organize knowledge depending on their needs and environment (adapted from ESCAP 2006, in Ariyabandu, 2009:10).

Knowledge hubs can localize knowledge gained from peer ICT-based access points in other regions and serve their community. They will also contribute to creating knowledge by providing experience gained from the local communities to the benefit of the global networks at large. Indeed, knowledge networks, as knowledge hubs, are thought to trigger many other knowledge functions such as education, employment, agriculture and health besides providing conventional ICT facilities to bridge the digital divide. It is thus thought that rural/marginal community empowerment can be attained if the community is provided with access to information and knowledge to improve its livelihood and seek for sustainable development. However, such process involves the emergence of new partnerships, governance structures, participation and business plans. Such partnership dynamics could capture and manage relevant information, and eventually generate more knowledge from the fragmented and otherwise lost collective knowledge of communities. Hence, a working definition for a social or community-based knowledge network is proposed as:

A group of expert institutions working together on a common concern, to strengthen each other's research and communication capacity, to share knowledge bases and develop solutions that meet the needs of target decision-makers at the national and international levels (Creech & Willard, 2001).

Moreover, it is thought that the development of knowledge networks could facilitate bridging not only the digital divide but also the economic, social and gender divides now polarizing our societies (Ariyabandu, 2009:10). Knowledge networks seem thus to be working out beyond the connectivity promises of last century. Hence, the process of transformation from UISs to knowledge hubs and the eventual role they could play as knowledge networks it's worth exploring, using a model advanced by Calmé and Chabault (2007) depicting four dimensions of UISs:

Figure 2. Urban Innovation Spaces (UIS's) typology

Interaction intensity	Industrial knowledge	Scientific knowledge
Weak	Technical poles	Technopoles (created in the 80's)
Strong	Districts	Milieux innovateurs

Source: Calmé and Chabault (2007)

3.3 Territory: from interface to interaction

Calmé and Chabault (2007) advanced that the construction of local spaces is based on the transition between space and territory. They understand the territorialisation process as the transition from an interface between two organizations, inducing each of them into a specific dynamic interaction. They make a distinction between industrial dynamics on the one hand, and territorial dynamics, on the other hand, before locating passages within interaction modes. This relationship tries to explain how businesses contribute to the structuration of a localized space. This approach focuses on evolution forms and modes of industrial organization referring not only to the large enterprise but also considering the organization as a set of small businesses. The analysis of the resulting synergies of the proximity between these different firms, fuelled a profusion of works around concepts of industrial district, technopoles and the French version of innovative environments: «les milieux innovateurs » (Calmé & Chabault, 2007). In this model, they distinguish four dimensions as depicted in Figure 2 : Industrial District, Technical Poles, Technopoles and Milieux Innovateurs.

An industrial District is defined as a socio-territorial entity characterized by the active presence of a community of people and a population of enterprise in a given geographical and historical space. This concept was reused for interpreting the development of the regions like the center and North East of Italy. It is defined as being a territorialized space in which interactions between actors are developed by the learning interaction they do in multilateral transactions which in turn generate innovation-specific externalities and the convergence of learning to more efficient forms of joint management of

resources.

Table 2. Urban Innovation Spaces (UIS's) Characteristics.

Industrial District	Technical Pole and Technopole	Innovation Milieu
Flexible specialization which translates the capacity of adaptation and innovation of district firms, these assets are based on flexibility strength work and production networks determined by the accumulation of localized know-how;	They consist of a homogeneous whole of actors and agents (public laboratory, research technical, business centres, financial institutions, users and public authorities).	The skills that correspond to a capacity of control of production process and provide the adaptability to changes of any kind;
Organizational specificity: firms are connected by a specialized branch of work and are complementary;	Strong logic of interaction related to the ability of the actors to cooperate, and on the other hand by a dynamic of learning based on the ability of the actors to swiftly adapt to external changes.	The rules are the modalities by which actors´ behaviours and the relationships between companies are assessed.
Relationships between firms of a conflict/cooperation nature: an essential feature of a district lies in diversified forms of cooperation between firms, but this cooperation is coupled with a competition between firms located at the same stage of product development;	Actors and agents are collectively involved in the design, development and the production and distribution-dissemination of good and service production processes	Relational capital is the result of a joint work with relationships which may be formalized or not merchant or not;
A globalised system: the district must be considered as a whole, close relationships exist between the different economic and political spheres.	A regional system with international vision, it´s glocal in nature. Dwells in the space between science and industry.	The opening to the outer world is expressed mainly in the knowledge of the environment of the market and technology innovations.

The characteristics of these UISs typologies are depicted in Table 2. For the purposes of this paper, we will adopt the definition for an UISs as the Innovation Milieu advanced by Calmé and Chabault (2007).

According to these characterizations, it can be affirmed that: The industrial district is characterized by a low degree of learning and a strong organizational density, while learning and interaction appear to be intense in the Innovation Milieu (innovative environment). On the other hand, The technopole model is characterized by a weak interaction coupled however with a high learning, while the Innovation Milieu is thought to create a knowledge-based social fabric that sustains the scaffolding for present and future innovation networks (Paquet, 2010).

4. METHODOLOGY

For the purposes of this paper, the specific concept of "innovation milieu" has been adopted to exemplify UIS's. As mentioned before, an "innovation milieu" is defined as a territorialized space in which interactions between actors are developed by the learning interaction they do in multilateral transactions (Foucade & Torres, 2003). In this study, we focus on two clusters of innovation in the IT sector: IMAGINOVE located in Rhône-Alpes region in France, and Monterrey IT Cluster, located in Monterrey´s metropolitan area, near the Mexico-Texas borderland. The choice of these two research contexts stems from specific interests of a bi-national team conformed by researchers from LEST[1] (France) and COLEF[2] (Mexico) gathered under a common project. Team members agrred to gather annually for four consecutive years in order to interact, learn and construct a common base of meaning for research. Central topic converges around the recomposition of education and work in transnational spaces. One of which includes notions of clusters and networks as emerging social spaces worth studying.

Hence, this study stems from an on-going experience of research meetings and can be characterized as an exploratory cross-sectional multiple-case (Eisenhardt, 1989; Yin, 2009). Following a convenience and judgment sample selection (Marshall, 1996), two innovation cluster were identified as case studies. Because, evidence of case studies may come from

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2 El Colegio de la Frontera Norte, sede regional Noreste, unidad Monterrey.

several sources (e.g. documents, archival analysis, interviews, and participant-observation), in this paper secondary data[1] was collected and analysed from a qualitative perspective. In particular, documents and websites were consulted to gathered relevant information for the analysis.

4.1 Case studies context

The selected case studies are: Rhône-Alpes, and Monterrey clusters. The context of both clusters is briefly described in the next paragraphs.

Rhône-Alpes context

In the eighties, the organization of the French system of innovation and research changed from a policy of "grands programmes", giving up the central mode of state intervention, to a growing involvement of regional public actors (Brette & Chappoz, 2007), leading to the emergence of technopoles. French technopoles are characterized by the coexistence, on a given space, of small and large high-tech firms, a large multisectoral range of economic activities including both manufacturing and services, academic or private research labs and a strong metropolitan character (Antonelli, 2000, in Berthinier-Poncet, 2013).

"Competitiveness clusters" result from a new ambitious policy of innovation and research launched in 2002 and embodied three years later in a call for projects that led to the creation of 71 clusters all over the French territory. A competitiveness cluster is defined as a combination of companies, higher education hubs and public or private research units, engaged in a partnership so as to create synergies in the frame of innovative projects, on a regional (sometimes interregional) scale (Brette & Chappoz, 2007, in Berthinier-Poncet, 2013).

Rhône-Alpes region is one of the 27 regions of France. Its capital, Lyon, is the second-largest metropolitan area in France after Paris. Rhône-Alpes is the first French industrial region and 5th European region for its technological and scientific potential. Such region is also particularly interesting for its high concentration of clusters, 2nd rank after Paris region (Berthinier-Poncet, 2013; Muller, Héraud & Zenker, 2009).

Monterrey context

NL government put efforts towards the regeneration of "the sources or productivity in science and technology through new forms of cooperative relations" (Etzkowitz, 2008, p. 73). Such effort was reflected in the NL 2004-2009 State Development Plan 9 (Plan Estatal de Desarrollo 2004-2009), which established the relevance of the interaction among government, industry and academia for economic development through initiatives that involve those three actors. These initiatives seek to stimulate these interactions primarily through: 1) establishing the institutional settings for knowledge transfer, 2) creating the environment for attracting industry, and 3) strengthening and developing clusters in the state.

In 2003 the State Congress approved the Law for the Promotion of Knowledge-based Development. This led to the creation of the I2T2 - Institute for Innovation and Technology Transfer - a public decentralized body responsible for orienting University-Industry-Government collaborations with the aim of increasing the competitiveness of the state at a national and international level. The creation of strategic clusters in specific technological knowledge areas was one of the strategies implemented by the I2T2 for promoting economic development.

Monterrey metropolitan area is located in Nuevo León, which is one of the 32 states of Mexico. It is considered the second largest metropolitan area in Mexico, after Mexico City. Monterrey concentrates 8.2% of large enterprises in Mexico and occupies the first positions for each of the factors that comprise a competitive environment (i.e. Economic Performance, Government Efficiency, Business Efficiency, and Infrastructure) according to the Competitiveness Index of Mexican States for 2010 (Campos & Naranjo, 2010). Some of the main strengths of Monterrey IT cluster are[2]:

- Geographical proximity to the world's largest consumer market.
- Cultural business affinity with the United States.
- Highly specialized talent generated in a consolidated ICT industry and well-established university systems.
- Research & Innovation Technology Park (PIIT) built by the State, specifically to accommodate new R&D centers and software development companies.

4.2 Analysis

Several sources were consulted for both cases of the present study. First, websites related to the innovation and science public policies in both countries, France and Mexico (i.e. pôle de compétitivité" and Programa Nacional de Innovación – SIICYT) were consulted. Due to the different government levels (i.e. national, regional and local) and the characteristics of public policies scopes, the innovation clusters were selected as the level of analysis. Because comparable size, focus and regional context was desirable, several information sources (i.e. reports, documents, news, and websites) were studied to identify the specific clusters under analysis, IMAGINOVA and Monterrey IT cluster. An exhaustive content analysis was

1 Secondary data: it is understand as an empirical exercise carried out on data that has already been gathered or compiled in some ways (Dale, Arber & Procter, 1988).

2 Retrieved from csoftmty website http://www.itbook.mx/en/industry/monterrey)

performed in order to identify the relevant aspects to compare between both cases.

5. RESULTS

Dedicated to the creation, production and distribution of IT content, IMAGINOVE'S actions[3] are driven by an analysis of the major trends in the entertainment industry: Videogame on line, mobile telephones, multimedia players, and use-generated contents. The Rhone-Alpes IMAGINOVE cluster supports videogames, cinema, audiovisual and multimedia activities. The region represents 650 companies, 23 research laboratories, 28 image-related training courses, plus international events such as the Game Connection.

Monterrey IT cluster is mainly focused on software development, IT management, software engineering, and website design & internet. The IT industry in Monterrey has more than 25 years of international experience and groups more than 350 software companies[4]. The headquarters of the largest information technology and communications companies in Latin America are located in such region.

A comparison of relevant aspects between the IMAGINOVA cluster in Rhône-Alpes and the Monterrey IT cluster is presented in Table 3.

In terms of social/relational capital, both clusters showed a moderate to high degree of associativity, with IMAGINOVA showing higher bonding social capital due to its connections and relationships among members who are actively involved in the activities and who know each other well. On the other hand, Monterrey IT cluster showed higher bridging capital, developing social linkages between and among actors in the city who do not know each other very well. This kind of bridging capital in the associativity context refers to the relationships among those members who are quite inactive and take part in association activities only occasionally (Garcia, 2006a). This, in terms of network operations, facilitates the creation of well-knitted "social fabric" in the case of IMAGINOVA, but less outsider (and thus innovative) contatcs, while Monterrey IT Cluster shows less "social fabric" in its knowledge-based infrastructure, but shows a lot more possibilities for links with the outside world (in and out of the city) that can bring new ideas and potential innovation.

Table 3. Comparison between Rhône-Alpes and Monterrey contexts

Aspect	**IMAGINOVA Rhône-Alpes**	**Monterrey IT Cluster**
Initiative/origin	Stem from top-down national and regional politics – Call for projects	Stem from top-down regional politics – assigned projects
Objective	Fostering innovation	Fostering innovation and collaborative work among the triple-helix actors.
Governance focus	Autonomous structure in charge of managing the network	Public decentralized body "Council for the Development of Software Industry of Nuevo Leon (csoftmty)"
Innovation approach	Collaborative innovative project-based	Collaborative innovative project-based
Territorial perimeter	Broad perception of geographical proximity	Narrow perception of geographical proximity
Source of funds	Central government	Central and regional government. "Mixed Fund CONACYT-Nuevo Leon"
Structural characteristics	128 firms, 11 research centers, 23 education institutions. 99.5% SME (65% < 10 employees).	Created in 2004. 40 firms, 1 education institution, 1 public research center, 2 government entities.
Industries	4 main industries: 1) videogames, 2) cinema, 3) audiovisual and 4) multimedia activities.	7 IT solutions: 1) Computer hardware; 2) IT management; 3) Multimedia & Graphics; 4) Network and Telecom; 5) Software development; 6) Web Design & Internet; 7) Social Media Marketing.
Location	Majority of actors located in Lyon + Grenoble, Annecy et Valence.	Majority of actors located in PIIT + a few in Monterrey metropolitan area.

3 Retrieved from IMAGINOVA website http://www.imaginove.eu/

4 Retrieved from CSOFTMonterrey website http://www.itbook.mx/en

Governance structure	Strategic governance: a board of 10 people in 5 colleges; industrials 6/10 seats; Scientific committee 10 people. The board is divided in 5 categories (i.e. Cinema / Audiovisual, Video Games, Multimedia, Schools and Research Laboratory; Pôle d'Excellence). Operational governance: 6 people + director	Strategic governance: a board of 24 people at csoftmty (5 universities; 13 industrials; 2 associations; 3 government entities; + director). The board is divided in 6 committees (e.g. human capital, entrepreneurship, funds, innovation, markets, and image and communication). Operational governance: 10 people + director.

Sources: Berthinier-Poncet (2013), Campos (2011), Chavez (2013), IMAGINOVA & CsoftMty websites.

6. CONCLUSION

It could be observed that for both UISs' learning and interaction appear to be intense, thus putting both IMAGINOVA and the Monterrey IT Cluster in a position closer to the "Innovation Milieux" (innovative environments) typology and further from the ones mentioned earlier: Innovation Districts, Technical and Technopoles. On the other hand, weaker interactions were observed in terms of cluster-cluster relationships, putting the knowledge-based social fabric that sustains the scaffolding for present and future innovation networks at stake.

In other words, these two clusters characterised as potential UISs, showed knowledge-intensive capabilities based on performance of individual entities within their clustering formations. Therefore, neither external economies of agglomeration, nor the innovative atmosphere breathed in certain areas, would be enough to explain clusters' performances. As we have seen, the innovative partnerships - with their knowledge spillovers – are not confined within local or even regional boundaries. This does not mean that the territorial location is irrelevant, but that its influence is mediated by the behavior and strategies of individual firms. It depends on firms' (and other social forms within clusters)'s abilities to absorb and exploit the resources of the context (learning and knowledge-sharing, that is), using them also to create long-range networks, spanning "structural holes" that separate them from non-redundant sources of information.

Although one limitation of this paper is the use of a lot secondary data analysis, an important part of the scope was the result of learning interactions between team members of the bi-national research team. As a result, a broader perspective of networks and clustering formations were portrayed. Another limitation is that only two case studies were addressed. As future research, one line of inquiry is to complement the present findings with a more intense primary data collection, that could include more in-depth interviews. Such method will allow a better understanding of both cases, and consequently, new elements of comparison could be identified.

In the meantime, it was observed that transforming governance of techno- ecosystems toward sustainability could require a rich understanding of the complex interactions of people and nature at different scales, and of the drivers and feedbacks that affects these interactions. With new challenges in a rapidly evolving world, we need to nurture the broad range of sources of knowledge and learning to be able to deal with the demands of open source systems coupled with the knowledge-intensive environments that surround the highly specialized cluster structures in innovation settings.

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KNOWLEDGE CITY AS MECHANISM TO SOLVE THE PROBLEM OF URBAN INFLATION-- CASE STUDY (GRATER CAIRO)

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ABSTRACT

The idea of the research is based on the possibility of using the university as a nucleus for the establishment of a new knowledge community with capacity for self-development. Not only this, but will have the ability to attract Population from Metropolis cities and alleviate the problems caused by it, as is the case in Greater Cairo where the core concept of the research proposes moving four governmental universities from Greater Cairo to a "Knowledge City". The research aims to Form a perfect urban society that adapts to global change. Shaping a nucleus of science and knowledge, And also research aims to Alleviate the urban and population concentration in Cairo by possibilities for new development away from the centralized capital.

The research methodology is based on all of the experimental method and deductive, where some tests are studied for Knowledge Cities to identify the most important components, as well as deductive approach where the link between objects and ills is and this is what will be studied in universities and their impact in driving growth in new areas.

It should be noted that the most important results show that Global Competitiveness requires that there will be a supporting pole for a well renowned historic city such as Cairo, and moving universities to the proposed Knowledge City helps to achieve an integrated and attractive urban environment. The most important recommendations of the research crystallized in the necessity of Transfer public universities that are existing in Cairo to the outside and the establishment of other international universities with competitive capabilities that contribute to raising the levels of performance of those universities.

KEYWORDS

Knowledge City, urban development based on knowledge-, specialized knowledge communities_

1. INTRODUCTION

One of the leading results of urbanization is the expansion of cities and its growth horizontally and vertically, which became a phenomenon for many cities, especially the capitals of Third World Cities. Also one of the of the prominent results of urbanization is the major development in the education system as a result of the emergence of the information revolution, which led to minimizing the interval between acquiring knowledge and different aspects of science and the application on the community. With the emergence of the concept of globalization and its social and economic ideas, the world started to have common interests, making it a real (small village). In order to cope with the social and economic changes in the world, specialized educational institutions spread across the countries and established its philosophy based on three important props: (knowledge - society – human beings).

Thus, the role of universities became the lighthouse for science, civilization and culture that leads the movement for change, modernization and development. This is in addition to working on developing the areas where they are located through scientific research that meets the economic, social and urban requirements for development and investing the local resources in the best way.

1.1. Research problem:

Studies show the possibility that the population in Cairo will have reached 38 million person by the year 2050, and this undoubtedly means that there will be a problem in all aspects of life and these problems can be shown in the following:

Random urban inflation for Cairo and its growth horizontally and vertically with the inefficiency and inadequacy of infrastructure, which is the base of urbanization in any society.

Decrease of vehicular traffic speed and the relevant negative impact on the economy of the city.

2. KNOWLEDGE CITIES - CONCEPTS AND CHARACTERISTICS

The concept of Knowledge City can be considered an inclusive concept that can accommodate all aspects of social, economic and cultural life of any urban community. Knowledge cities have been defined as adopting the standards of knowledge economy, or existing knowledge based development, that maximizes urban and intellectual assets, which is considered the main motto of the third industrial revolution that depends on the intensive use of information, after centuries of

dependence on the machine, steam energy, then human beings and their energy.

It has also been defined as those communities capable of making use of the available information and existing technologies to improve the standard of living of human beings, their welfare and progress in the physical and spiritual fields [1]. It has also been said that it is used as a possible solution to face the challenges of sustainability of the modern city and raise the standard of living of citizens[2].

2.1. Areas of urban and knowledge development

Those are the components and spatial relationships that characterize the community entity which is represented in the following areas:

Social: It is responsible for each of the following: the standard of living - social and human development - intellectual capital.

Economic: depends on: Competitiveness - Innovation - regeneration –based on knowledge.

Environment: It achieves: Sustainable Urban Development - multiplied sustainability - a unique or outstanding identity [3].

3. KNOWLEDGE CITIES AND UNIVERSITIES

Universities are described as the nucleus of knowledge, powerful engine for change, factories for humans with intellect and knowledge, centre of business network and industrial communities of knowledge economy.

It is worth mentioning that the university has become the main nucleus in the urban network and new civilization due to its long history and its organized tendency for cooperation and scientific communication. University plays a key role in the developing economy, which is expected to be stuffed annually with consumer commodities[4]. international experience has shown that the developed countries in the economic and technical fields have achieved progress by taking care of education and applying development strategies that provided it with a base of highly qualified trained work force. This human wealth is the real capital of the scientific and industrial renaissance in major industrial countries today.

In terms of Urban yield , the role of universities in some new cities has accelerated its growth steadily like the city of Boston, which is considered the oldest centers of industry in New England. This city is considered the most important area of scientific engineering research in the world, represented in Harvard University and the Massachusetts Institute of Technology, as well as industrial research laboratories, as there is a road in this city that has about 225 industries including electronics industry and other industries characterized by being linked to the scientific aspects. The establishment of scientific research institutes in this region is considered the only factor in the flourishment of economy of new England years ago. This is a result of the concentration of scientific research on some areas that attracted many industrial activities, and the best example is the scientific triangle of research in the south part of the United States and is supported by three major universities, these are (3) Duke University and the University of North Carolina and Carolina State University. These universities have a great impact on creating a dynamic industrial region and thus attracting large numbers of industrial research laboratories and various industrial process.[5]

4. KNOWLEDGE CITIES EXPERIENCES

4.1 Knowledge city in Medina

We are providing the example of economic knowledge city as pioneer experience in Saudi Arabia and it deals with the most important objectives of establishing the Economic Knowledge City, which lies 5 km away from the Prophet's Mosque and 7 km away from the airport and started to take shape within the urban fabric of the city of Medina and seeks to contribute actively towards achieving the vision of Medina in the transformation to an integrated city of knowledge.

4.2. Objectives of establishing City of Knowledge

- Create a development pole that reduces the overpopulation where the population of Medina have lately exceeded one million inhabitants.
- Make Knowledge Economic City a cultural landmark and make it international monument for economic development based on knowledge-based industries
- Considering Knowledge City as one of the pillars of economic diversification strategy of the Kingdom that aims at

1 Javier, Francisco,(2006) -Knowledge Cities: Approaches, experiences, and perspectives-UK

2 Dvir , Ron (2005) "Knowledge City, seen as a Collage of Human Knowledge Moments 1

3 Khaled Salah, (2012), an initial model for the knowledge region system, expanded regional seminar and the achievement of sustainable development - opportunities and challenges, Morocco

4 Mumford, Lewis (1964), the city throughout the ages - Part II, the Anglo-Egyptian library, Cairo, (p. 792-793) (2) Ghallab, Mohamed El Sayed (1979), geographic world, the Anglo-Egyptian library, Cairo, edition), (p. 158)

5 Saif, Dr mohmoud of Muhammad (1986), industrial sites, Dar university knowledge, Alexandria, pp. (246 – 247)

the advancement of the rank of the city

4.3. City plan characteristics

- It is the first project that is fully planned as a vital area for housing, employment, education and entertainment.
- Resettlement of an Academic entity and its basic reference is knowledge.
- Educational facilities at various levels are centralized in the city.[6]

Figure 1 The city of knowledge city in Medina

Plan components: those components can be divided into two basic groups:

- *knowledge Entity Group*: as follows:
  Knowledge entity: specialized in embracing the activities and events of forums and conferences in the economic, cultural and training field.
  The educational sector: the educational region includes international technical college, model schools and an international university.
  Urban Center and museums: consists of several museums centered on different fields, including the Biography of the Prophet and a Center for Science and Technology.
- *Range of Residential and Services Facilities*: is as follows:
  Residential villas: The total area of the project is 140-acre, that includes 900 villas.
  Residential buildings: semi-closed compounds that offer its residents comfort and contain apartments.
  Housing Visitors compounds: contains more than ten thousand hotel rooms.
  Commercial and hotel towers: consists of 20 floor containing offices, a hotel and some shops
  Markets compounds: connected to the cultural center and has museums and a mosque.
  From the above it becomes clear that:
  - Knowledge City currently implemented in Saudi Arabia depends mainly on the financial resources of the state where the Government of the Kingdom of Saudi Arabia has special interest in supporting the economic growth of the region and therefore it is an initiative that is not triggered by the problems in Medina.
  - In terms of the components of the city, we note that it lacks the presence of important and vital uses related to the practical side such as research centers and the practical side, such as technological manufacturing units.
  - The city has different levels of housing and services which promotes the idea of quick stability.

4.4 Models of global knowledge communities

In addition to the foregoing, the main features of some communities that are considered as knowledge-based clusters can be illustrated as shown in Table 1

Table 1. Features of international and regional knowledge clusters

City	name	Main components of the city	Ways of achieving the knowledge activity	Results

6 http://www.madinahkec.com/sites/default/files/images/KEC%20Investor%20Catalog.pdf

Singapore	global economy	Multinational companies Technological industries Regional – Foreign companies in the innovative sector	Technology transfer service oriented to support multinational companies and foreign investment Include Singapore into the international economy in order to benefit from international experience, knowledge and technology. Providing an appropriate environment for innovation in order to generate non-traditional business and invest intensively in infrastructure Workforce development and provide incentives that support the development of industries	second position in the Global Competitiveness International Institute for Sustainable Development _ The second most globalized 2004 Aty Keartey report
Grand Phoenix (1)	the capital of knowledge	educational institutions at the level of university, College community and technical school - vital technological companies - Cultural organizations. - Regional and international air and land transport network	focusing on laying out the technological foundation for knowledge projects.	Phoenix began a process that leads to become the capital of knowledge. - The city has taken strategic steps to the introduction of new technology sectors
Manches-ter	Cities of universities	Victoria college in Manchester University of UMIST	Merging the two biggest universities in the area (Victoria –UMIST)it is known as union project to facilitate the process of transition to the development of knowledge cities Make the university an international class organization - Provide intelligent management and development of infrastructure. -- The development of smart networks	Emergence of a new type of associations called by scientists "institutional League" aims to raise the reputation of the university and its competitiveness.
Holon	City for children	- Children's Museum uses modern technology that offers an interactive experience for children and their parents. - Digital Arts Center uses advanced technology in order to enrich the culture and intellectual skills of children	- a focus on children's activities, that enables children to expose to facts and ideas in various fields and learn from them. - Improving the learning environment and infrastructure in the city. - The development of knowledge networks between the community and the ministry of education. - The development of knowledge network with academic institutions	- raising the education budget to 28.7% and cultural 7.7%. - City guardian which began issuing intellectual capital reports and use that to assess and visualize the overall capacity for the management of education, culture and the relevant potentials.

Knowledge City in Medina	Technological industry	- Center for Medical Sciences and Biotechnology - High-tech center for knowledge-based industries. - Research centers and scientific development-ministry Institute of Technology Education	Establishment of multinational companies. Provide information technology incubators. Providing a competitive environment for young Saudis small business owners who are looking for their business development.	- Create 20,000 new job opportunity - expected population to be attracted is 150,000. – Accommodate thousands of visitors in world class accommodation - Provide an area the retailers
Science parks in China	Silicon valley	International companies -human capital - Technical Beijing Economic Zone and the Beijing Tian Zhu for export processing. - Central Business District - Street Money and industrial development zones	- To encourage direct foreign investment. - The State encourages External Relations with China from the industrial and economic aspects and with Hong Kong, Taiwan and Korea - Exempt new companies from taxes for two years and eliminate taxes on the import of materials and parts used in the production of exported goods.	The high growth rate of exports - The presence of high-precision technology companies that is related to universities and business

5. GREATER CAIRO - ISSUES AND PROBLEMS

Greater Cairo's most important issues and problems can be identified as follows:

- Centralization, which is centralizing the main activities and administrative authority, all in one point of the state, only in Cairo.
- It was a national investment bias in favor of the territory of the capital, the main reason for being number one in the processes of growth and it is enough to say that it has 55% of universities of and 40% of governmental investments.
- Migration from rural to urban is a negative social phenomenon in Cairo region in particular. Where migrants move from rural to urban areas looking for better living, Cairo is considered the largest center of attraction for Migration (IOM) at the level of the Republic. The Governorates of Monofiyah - Assiut – and sharkia are considered the largest sources of immigration as the share of each is about 9% of the total estimated number. About 1.5 million immigrants migrated to the region in 1996, or about 13% of the total population of the region. Statistics indicate that the region's population is growing every year as a result of the rate of natural increase and migration rate by 4.6% of the population of the region.[1]
- The problem of transportation in Cairo is part of a wider urban problem of urban growth and urban management. Cairo has seen a steady increase in population density. This huge increase in population causes deficiencies in services and facilities within the region, housing shortages and problems in transportation and traffic, where transport services in the region face many problems, including:
  - Great increase in the number of vehicles about 2 million vehicles in 2007.[2]
  - The internal road networks are not used in the best way, but they are used as parking areas which increased the pressure on the main networks.
  - The average trip time in the territory of Cairo takes more than 75 minutes by the public transportation and about 60 minutes by private car, which requires moving urban growth outside the existing residential block.

According to what was mentioned above, we can address one of the main axes, which is considered as an essential part in the problems of Cairo centralization which is in the field university education and scientific research as follows

6. CAIRO AND THE CENTRALIZATION OF HIGHER EDUCATION AND RESEARCH CENTERS

There is a package of different jobs in Cairo and we noticed that the educational jobs have a special role, if not a unique one, and that its audience of students exceed 4 million students.

1 Dr/Ali Abdullah Bili, Factors that influence the direction of urban growth ,Ph.D, alaazhar university , 2002

2 Report of the Cairo 2050 plan, the Ministry of Housing, Utilities and Urban Development, 2011

Higher education is the only one that shows crucial geographic concentration and it is shown in the existence of Cairo University in Giza, Ain Shams University in the Abbasia, Helwan University in Helwan area and Al-Azhar University in Nasr City and darasa.[1]

The number of students studying in these universities is about three-quarters of a million student, a number that cannot be overlooked, especially that all those students cause great disruption in traffic by their trips in any city, not Cairo only, especially in peak times in addition to the number of workers and staff members and teaching assistants to those universities.

The table number (2) shows the number of faculty members, their assistants, staff and students in the year 2011.

Table 2. The Number of Faculty |Members, their Assistants, Staff and Students in the Year 2011.[2]

University	Number of staff member and their assistant	Number of students	Number of employees	total
Cairo	11656	293425	10000	315081
Azhar (in cairo)	6000	165111	5500	176611
Ain-shams	9036	185041	9000	203077
Helwan	4337	91898	6149	102384
Total	**31029**	**735475**	**30649**	**797153**

The above table shows that there are approximately one million individual dealing with the four universities mentioned above, a figure that negatively affects the life form in Cairo, whether urban ,social or economic. Figure (2) shows the location of the four public universities in Cairo.

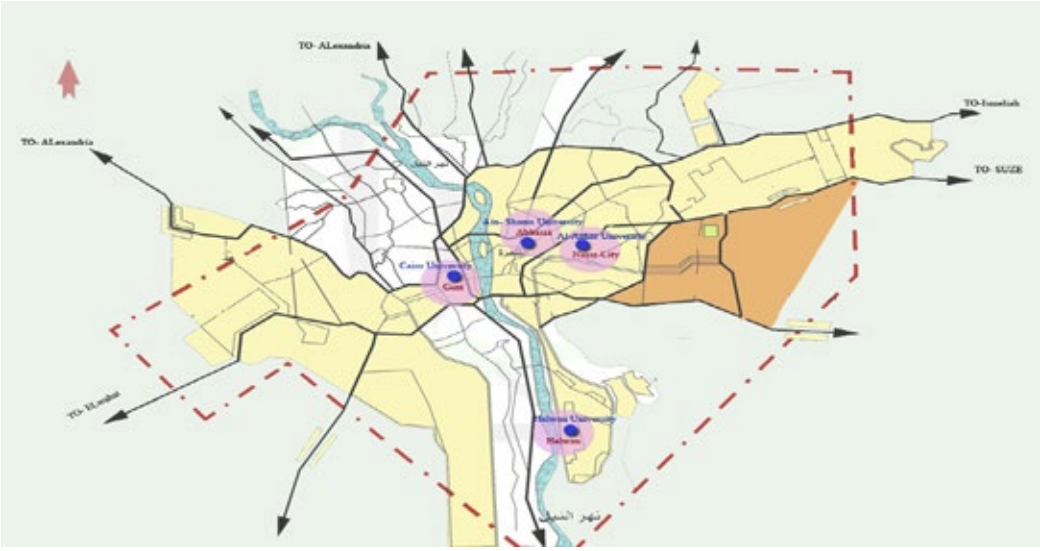

Figure 2. The location of the four public universities in Cairo

From the previous figure we can summarize the most important impacts of those universities as follows:

- Influential range of the student movement and traffic varies in each university ,where the influential range is concentrated where the students' accommodation is located, especially with the presence of expatriates and also the rising traffic density due to higher daily trips of students, teachers and administrators that is directly moving to the university. There is also a less influential range, where students are less and then the traffic density related to the trips of the university becomes lower.
- Al-Azhar University is considered one of the most visible universities in the students concentration around its campus in its direct and indirect range where the presence of students extends from sixth district of Nasr City till the seventh and eighth district and even the tenth and that as a result of increase of the percentage of expatriate students in the university.

In addition to the above, some of the existing universities schemes show poor distribution of its use and poor urban structure that is not suitable for requirements of the current age.

1 Hamdan, Gamal (2012), Cairo, Dar Al-Hilal, Cairo, (p. 37-38)

2 The Ministry of Higher Education, the international information network-) Al-Azhar University, Department of Information

As for the research centers it is noted that many research centers is concentrated in Cairo and the scope of the study will not cover them or list its most important characteristics, and it employs thousands of workers and researchers, and of course generate many daily trips for them and for their relatives.

7. TRANSFER OF PUBLIC UNIVERSITIES FROM CAIRO AND THE EXPECTED POSITIVE IMPLICATIONS

Through previous readings which were represented in theoretical writing and applied experiments it was proposed to transfer the four universities (Cairo - Al-Azhar - Ain Shams - Helwan) as well as research centers. It is important to select a convenient location for the settlement of such activities and make it as a nucleus to create a new urban community.

Accordingly, expected positive consequences will be addressed as follows:

7.1 Reduce the rate of university trips:

Rate of current trips for faculty members and their assistants: about 60% of faculty members and their assistants own private cars and the estimated number of their trips is around 18620 trip per day and the rest, which account for 40% use various public transport types such as microbuses and public buses and the rate of their trips 6250 trip daily Total trips are (24825).

The current average trips for students: about 60% of university students in Cairo (Cairo, Ain Shams and Helwan) uses public transportation and subway train and 35% of students take microbuses and buses and thus the estimated rate of trips is (17160) trip daily The rest of the students, which represents 5% own a private car or take a taxi) and their estimated the number of trips is (18386) trip daily.

The current average trips for employees: As in the case of students, 60% of employees use public transport, especially the metro and 35% of administrators take microbuses and buses thus the rate of trips is estimated at (715) trip daily, and the rest, which their estimated rate is about 5%, own a private car or take a taxi of trips (1530) daily trip.

The total trips generated by all categories of about (62 661) daily trip and this means that the size of the traffic problems that occur now and which is expected to escalate in the coming years, especially that the population growth rates in Cairo indicate an increase that never happened in the past few decades.

According to international rates, it shows that the expected number of trips for current students in the four universities reaches more than one million trips and this of course will be a tremendous number on Cairo city, which is considered one of the most important problems of traffic congestion.

7.2Lowering the rates of immigration and population growth

Through the proposed resettlement of universities and research centers there will be a possibility to provide housing units for workers which will have a positive effect on their stability as well as the existence of the proposed urban temptations that contribute to attract them to the settle in the new location.

1 - For universities, the expected number people who will resettle is as follows:

Number of members of the faculty (x) = 31029 Member

Employees and administration (w) =30649

Assuming the average family size = 5 members

Number of the academics and administrators =(x+w)*5 = (31029 + 30649) * 5 = 308 390 inhabitants

The number of workers in the expected services of academics and administrators population = population * person rate in the service activity = 308390 * 0.2 = (61678) individual

Number of population in service jobs= (61 678) * 5 = (308 390) people

And the total number of expected population = number of academics and administrators population + service population = 308390 + (308390)

This is in addition to the expected numbers of the population through ensuring job opportunities of work upon the resettlement of some basic activities such as industrial and agricultural activity as they are directly related to the academic and practical domain. Such activities generate employment opportunities during which a family component will be created on those numbers.

According to the above, there is a real opportunity to reduce the growth rates expected as a result of academics, administrative staff and researchers in universities and research centers in Cairo. This in addition to providing other job opportunities that attract job seekers from neighboring provinces and Upper Egypt province and then reduce the rates of immigration, which will be dramatically absorbed by these cities.

8. PROPOSED MECHANISMS FOR THE ACCOMPLISHMENT AND SUCCESS OF THE IDEA

Necessity of choosing a suitable site:

With the increase in urban growth in Cairo, the general outline of the territory for the year 2000 indicated several sites

for urban growth, including the east region on the desert lands to establish new settlements so as it would be separated from the existing urban mass and with specifications and costs that suits all classes of people.

In order to choose the site, it must be taken into account all the social ,physical, natural and economic aspects as much as possible and then it has been suggested that the location of the city will be on the Oasis Road about 100 km away from the 6th of October City, it was selected for the following reasons:

- Make use of the current proposal of establishing a high speed railway line which links Cairo to Alexandrai from the west; parallel to the desert road.
- Support the developmental ideas to establish a development hub in the West and this city acts as a nuclei for the required development.
- To implement the idea of continuing the urban development of the communities in the pivotal road extension after the 6th of October City and then there will be a positive impact in accelerating the process of settlement of population in the 6th of October City and leaving the residency in Greater Cairo as Sixth of October City lies in the center between the proposed project and Cairo.
- The presence of development support represented in the province of Fayoum which will be close to the site

Figure 3 The proposed site

Using the financial return of land held by universities:

Using the price of the current land where the universities are located, such as Al-Azhar University, which has an area of 350 acres and is located in special location in Cairo, Ain Shams University, which has an area (150) located in the Abbasia and the University of Helwan, which has an area (350) acres located in Helwan.

As regards Cairo University and because of its historic location, it cannot be sold but can be economically used by renting some of the buildings for making international conferences and arranging open museums.

Establish a railway with the BOT system:

In order to guarantee quick and full achievement of the idea, there should be an economic, communal and fast way of transportation and this is represented in the establishment of a railway of an electric train with a speed 200 km/h. This could be achieved through its implementation by a major company and the cost of construction will be in return for operation and keeping the profits for a specific period of time like the first phase of Cairo's Metro. This railway should be established near an existing land route such as the east new road of Koreamat or the oasis on the west and it will have a positive impact on the speed of implementation.

Activation of Cairo Vision 2050 (the establishment of international universities):

The most important projects of Cairo Vision 2050 are represented in the establishment of three international universities in the existing new cities. These projects can be implemented in the city that is proposed for the transfer of the four universities and then it can be a driving force to speed the development of the city.

Land Reclamation:

Open the way for land reclamation, which are backed mainly from agriculture faculties of the four universities and the agricultural research centers proposed to be located in the city. This is also in addition to introducing reclamation projects on large investors and the younger generations who are interested in this matter. The land reclamation efforts could be made quickly, as it does not take a lot of time and depends on preparing the land and digging water wells for irrigation and then choosing the proposed site in the land that is ready for reclamation.

9. THE FEATURES OF PLANNING THE PROPOSED KNOWLEDGE CITY

9.1. Conceptual design of the proposed Knowledge City

The idea of transferring universities and research centers from Cairo to outside is the main focus of the establishment of Knowledge City, where the idea is based on making those universities one of the most important main components and even the central nucleus within the clusters of knowledge that will be used to accelerate the process of development of the new site as shown in Figure (4)

Figure 4 Uses distribution and its relationship to the proposed interactive in knowledge city

The previous figure can be analyzed as follows:

- Universities settlement and make it a central nucleus of the proposed knowledge communities where the presence of these universities has a direct impact on the existence of residential and service activities through the creation of nuclei for each one for the faculty and staff members at universities.
- Specialization of knowledge is considered one of the main pillars of the research centers, which in turn supports the development of all the proposed activities such as land reclamation and cultivation and using its products for the development of industrial activity also these research centers directly support the development of industrial activity through the practical applications of engineering and electronics fields.
- Universities directly contribute to supporting the development of agricultural activity through the applications of agricultural colleges and the practical and scientific practice of its functions also contribute to the development of industrial activity through the applications of engineering colleges.
- Both agricultural and industrial activity contribute to the residential development activity through providing job opportunities, attracting population and relocating them next to the headquarters of their business.
- There is a reciprocal relationship between agricultural and industrial activity where the first provides the latest with the products for the agricultural industrialization and the other provides it with the tools and modern agricultural machinery.

So according to what was previously mentioned, we notice that the presence of universities is considered the common denominator in the development of all the proposed activities.

It is noteworthy that the quality of colleges created within any university is subject to local and regional factors so limiting the size of the university to a specific area cannot be achieved as the size may vary from one place to another according to the components available therein.[1]

9.2 The main components of the proposed Knowledge City

We can summarize the main components as follows:

Knowledge Society: It consists of a set of integrated and interrelated knowledge activities and they are outlined in graph no. 11 and as follows:

- Specialized and knowledge-oriented university to be the nucleus of the society.
- Research centers, these are the centers that exist in the city of Cairo.

1 baiche ,Boumaha and William, Nicholas(2000) -Neufert architects data – third edition – (oxford)-p (314)

- The knowledge transfer centers and they achieve three main functions, knowledge generation knowledge, transfer to the sites of implementation, and the transfer of knowledge to others through education and training.
- Centers of innovation and creativity.
- Training institutes and Cultural centers.
- Specialized institutions and Practical technological institutions.
- Various commercial markets and hotels

Economic activities: they are considered as practical elements to the proposed knowledge society as industrial activities related to high-technology products and land reclamation activities, which is an important link between the knowledge society and the manufacturing community.

Service activities: is represented in all public services whether (security and fire services - licensing unit - mobilization and recruitment....) and administrative (civil registry - the courts -....) and social services (medical centers - schools - clubs - gardens....).

Residential activities: It consists of:

- Private housing for the knowledge society with all its components and it is considered priority one projects.
- Housing for workers in all other activities which are created according to specific executive phases.

Insulating Activities: It is in the green areas which are considered a main element for the separation between different components within the city, even there were no pollutant elements of the urban environment, but the separation between knowledge community and some activities is essential.

9.3 Distributing knowledge communities in the proposed Knowledge City

According to the above, the proposed Knowledge City consists of four main communities of knowledge as follows:

1-Medical knowledge society: It is proposed that Cairo University be the core of this cluster in addition to some research centers and important institutions such as:

- Center for endemic diseases and liver
- Research Center for diseases of tropical areas... Etc.)
- Hospitals with global specializations

It is worth mentioning that Cairo University was chosen because it is the forerunner in the medicine field, regionally and locally.

2 - Manufacturing technological knowledge society: the University of Ain Shams is the nucleus which the proposed cluster is based upon and the following research centers and institutions are attached to it:

- Technology and innovation centers
- Academy of Scientific Research and Technology.
- National Institute of Telecommunications.
- Egyptian Organization for Standardization and quality production
- Egyptian General Authority for Geological Survey and Mining Projects
- Tebin Institute - Central Laboratory for farming systems.
- Petroleum Research institute - Practical institutes for science and technology.

3-Agricultural knowledge society: the University of Helwan and a group of important institutions is the nucleus of knowledge clusters, namely:

- Desert Research Center – agriculture research centre - multinational companies.

4-Knowledge, cultural and historical society: due to what Al-Azhar University enjoys of scientific religious rank all over the world, it is proposed to be the nucleus of this knowledge cluster, especially because it is considered a source of radiation of science for all Muslims, Arabs and non-Arabs. We propose that it should to be supported by several centers such as:

- Center for Documentation of Cultural and Natural Heritage
- A variety of cultural centers (visual - Readable)
- Research Center of Literature of Oriental Languages
- The National Centre for Social Research.

10. RESEARCH RESULTS

- Global competitiveness requires that there should a pole of knowledge that supports a capital of historic and cultural weight like Cairo.
- The economic gains and positive aspects or locating higher education in certain areas include the economic and investment activities that emerge in the infrastructure of university and higher education. This is in addition to the geographic expansion of this infrastructure so that it includes the economic and social impact in all parts of the country. In addition, the economic and social development projects that are currently implemented are diverse and this continuous growth need human capital that leads the development process.

- Many of the previous conferences concluded that the city of knowledge must embrace at least one university of high quality, as well as many technical training institutes and training schools.
- Knowledge-based society is characterized by its products that are not raw materials or manufactured goods, but of non-physical knowledge, associated with new technologies that go beyond the barriers of time and space whereknowledge is transformed to be one of the most important components of capital in the current era, and the progress of any society is linked mainly to its ability to use them.
- Communities that relied on the knowledge based development, solved a lot of existing problems, such as poor distribution of economic resources, and thus solving many of the social problems caused by the sense of injustice and inequality in society, which in turn was one of the major obstacles to development.
- One of the most common features of knowledge societies is that knowledge is free of charge and should remain to be so for the benefit of the society and for achieving more development for such knowledge.
- Although some Arab initiatives were trying to imitate the Knowledge Cities models - as in the Knowledge Economic City in Medina, and the Knowledge Village in Emirates Dubai, but they remain to be incomplete interpretations, and do not represent a general policy with overall dimensions, as in the rest of the civilized world.
- There is a real opportunity to reduce the expected growth rates produced by the presence of academics, administrative staff and researchers in Cairo by providing a residential environment suitable for their professional nature in addition to providing other job opportunities that attract job seekers from neighboring provinces and the provinces of Upper Egypt. This will help reduce the rates of immigration, which will be dramatically absorbed.
- Transfer of universities outside Cairo leads to reducing the average number of educational trips as the total trips generated by all categories are nearly 100 thousand trips a day from the activity of university education. This is expected to escalate in the coming years, especially as population growth rates in Cairo indicate an increase that never happened in the last few decades.

11. RECOMMENDATIONS

- Transfer public universities that are existing in Cairo to the outside and the establishment of other international universities with competitive capabilities that contribute to raising the levels of performance of those universities.
- Creating a variety of knowledge societies of different approaches (medical - technology - ..... etc.) in the framework of the proposed knowledge city outside Cairo and its nucleus would be specialized public universities.
- Transfer research centers located in Cairo and make it a major supporter to the transferred universities in order to support the knowledge community.
- Provide the infrastructure of the proposed city to carry the model of knowledge cities. Infrastructure here will not limited to the traditional concept of electricity networks, clean water and communications, but it exceeds that to other dimensions such as providing a network of libraries, museums, institutes, cultural institutions and application institutions of technological sciences.
- The work mechanism of the knowledge city must be based on the integration of variety of proposed knowledge communities that cover all areas of human knowledge to induce a state of comprehensive development based primarily on the industry of knowledge and exchanging them through means of technological communication.
- In order to stress the importance of the three basic pillars which are knowledge, society and humans, the appropriate supporting educational climate should be made available and should be stressed in the good urban design and the site coordination. Paying attention to high-technology industries, and the great attention to scientific research centers and cultural and civilization centers, such as museums, research centers, information centers and major bookstores.
- In order to link the elements of the project effectively, the university must be in the middle of the site and all other uses should be spread at varying distances in circular module shape where the university would be at its centre and to make the influential direct relations the linking factor between them.

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CROSS-BORDER TWIN-CITY, TERRITORIAL OR RELATIONAL? DOUBLE ACT OF GLOBALISATION AND EU INTEGRATION IN PURSUIT OF KNOWLEDGE-BASED URBAN DEVELOPMENT

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ABSTRACT
Purpose: The aim of this paper is to explore the evolution of strategic spatial planning in Estonian-Finnish context for emerging twin-city region in its pursuit for knowledge-based development and cross-border added-value.
Scope: The paper explores the knowledge-based urban development potential of the Helsinki-Tallinn twin –city region in the context of territoriality and functional tiers.
Method: The paper provides a theoretical framework of strategic planning for the knowledge-based cross-border metropolitan region. The europeanization of Estonian spatial planning via Finnish know-how, mobility patterns and socioeconomic asymmetries serves as the empirical case.
Results: The paper presents the experiences, challenges and outcomes of the Europeanization of Estonian spatial development policies in the context of the pursuit towards knowledge based urban development and the Helsinki-Tallinn twin-city region development as one of the implications of that pursuit, driven by market forces, both formal and informal relations, seeking complementarities of governance and eroding socioeconomic disparities.
Recommendations: The paper provides recommendations for introducing joint strategic planning in the context of a twin-city region and in the framework of the knowledge based development discourse.
Conclusions: The paper evidences the asymmetric tiers and domains of the Helsinki-Tallinn twin-city region and stresses the importance of joint strategic planning for knowledge-based urban development

KEYWORDS
Knowledge-based urban development, strategic planning, europeanization; twin-city region

1. INTRODUCTION
Knowledge has become one of the main driving forces of socio-economic as well regional development in the era of information society and globalisation. The knowledge economy is based on the generation and adoption of new knowledge made available by technological advancements and scientific research, creativity and innovation. Unlike physical goods that are consumed as they are used, providing decreasing returns over time, knowledge provides increasing returns as it is used. The more it is used, the more valuable it becomes, creating a self-reinforcing cycle (Clarke, 2001). It is widely recognized that knowledge is a central element of not only economic development but also socio-spatial development (Yigitcanlar & Velbeyoglu, 2008; Yigitcanlar *et al*., 2008a). Globalization has been the trigger for the need to increase creativity and innovation, at the same time calling for local level differentiation and hence competitive strategies for improvement of generating and sustaining knowledge (Porter, 1998). The competitiveness and performance of the cities and regions also increasingly depends on the institutional and human capital, the innovation environment and the capacity of strategic planning for urban development, which allows creation and fostering new knowledge. Knowledge-based urban development has increasingly been seen during the last two decades as a management tool for knowledge cities and regions.

As a management tool, knowledge-based urban development (KBUD) has broadly three principle purposes:

1) codifying technical, market, financial and human knowledge within an economic model;
2) indicates the intention to increase the skills and knowledge of residents as a means for human and social development;
3) builds a strong spatial relationship among urban development clusters to augment the knowledge spill-over effect that contributes significantly to the engineering of creative urban regions.

The present article focuses on the evolution and key features of spatial planning of the KBUD. The article firstly intends to identify and contextualize the specific domains of Europeanization in the spatial development policy of Estonia and the emergence of strategic spatial planning in the 2000s. Secondly, it relates the Estonian development to the planning system of Finland, primarily the transfer and exchange of knowledge with Estonia and its implications on Estonian spatial planning. Networking and know-how transfer has always been intense between Estonia and Finland. The proximity plays a key role here as it "that helps generate and transfer knowledge more effectively" (Yigitcanlar, 2010). Finally, cross-

national Estonian-Finnish strategic spatial planning in the context of the massive functionalities and intensive tiers of a Helsinki-Tallinn cross-border region is discussed. Cross-border cooperation is conceived of as a response to the challenges posed by globalization, and especially by the crisis of the nation state, which role weakens steadily (Shen, 2004). Also, the peripheral location in Europe plays an important role in cooperation for global competitiveness. The existence of this type of cooperation is placed, in this sense, within the global processes of multilevel governance (Hooghe and Marks, 2003), which has led some authors to use the term 'cross-border governance' (Kramsch and Hooper, 2004; Lissandrello, 2006) and emerging 'cross-border regionalism' (Scott, 1999, 2002a).

The article concludes with some recommendations for strategic planning in the context of the knowledge based urban development of a twin-city region.

2. THEORETICAL FRAMEWORK

The paper provides a theoretical framework of strategic planning for the knowledge-based urban development. The europeanization of Estonian spatial planning via Finland serves as the empirical case. Lenschow (2006) defines three types of Europeanization: top-down (EU–nation state), horizontal (state–state) and round-about (state–EU–state). Since the EU harmonisation throughout the 2000s, the top-down approach has dominated strongly. The longer Estonia is integrated into Europe, the more the 'top-down' has been balanced with the 'bottom-up'.

Followed by the initial construction, Europeanization consists of the processes of diffusion and institutionalization of formal and informal rules, procedures, policy paradigms and "ways of doing things". Another merit is developing shared values and norms within the EU policy process which are then filtered, consolidated and incorporated into the logic of national discourse and institutions. (Böhme and Waterhout 2008).

Olsen (2002) identified five distinct meanings of Europeanization. Without repeating all of them in detail, two categories are relevant for the purposes here. The first is an understanding of Europeanization as adapting "national and subnational systems of governance to a European political centre and European-wide norms." The second meaning of Europeanization is as "a political unification project," which refers to the process of constructing Europe as a more unified and stronger political entity. The category is related to all the other forms of Europeanization such as territoriality, center building, domestic adaptation, and as a "European effect" to systems of governance (Olsen 2002: 924).

In addition to Europeanization processes, the paper addresses current regionalization and region-building processes which progress at various spatial scales, including informal networking, concrete plans, and policy-making. The Baltic Sea exemplifies regionalization processes across the state borders (Metzger and Schmitt, 2012). Scholars have been seeking a for a balance between the relational and territorial approaches (Paasi, 2012). In the literature of cross-border studies, two opposing models – cooperative and competitive – are discussed. Scott's (2002a,b) *cooperative* approach builds upon the political geography and spatial planning approaches to cross-border regionalism. The focus is on the collaborative development of policy innovation and cross-border networks. The cooperative model relying heavily on the role played by the European Union and its territorial cooperative programmes as a framework and catalyst for co-operation. Formal and informal contacts between subnational and supranational tiers of governance developed out of decentralisation at both European and national levels. As national level was weakening, a strong meso-level emerged out of the Europeanisation process, based on regional actors which look to further their influence on cross-border policy-making through strengthening cross-border ties with either subnational or national governments. The competitive model by Kramsch (2001) focuses on the *competitive* development of regions within the wider context of international networks, including macroregional and Europe-wide and taking advantage of cross-border opportunities.

When it comes to assessing the KBUD of a cross-border region, we can look at the following key determinants: knowledge infrastructure, business, relational, socio-institutional and governance dimension (Trippl, 2009). Common broad KBUD policies include: developing financial, social and human capital systems, distributing instrumental capital, developing and adopting the state of art technologies, providing hard and soft infrastructures, and providing quality life and place (Carrillo, 2004; Yigitcanlar *et al.*, 2008a). The role of decentralisation in promoting transnational networks must also take into account economic competition between subnational actors at a European level linked to the larger process of globalisation.

The empirical findings regarding the Helsinki-Tallinn twin-city region's case result from the recent territorial programme funded project "Helsinki-Tallinn Transport and Planning scenarios" (HT Transplan) carried out in 2011-2013. The empirical findings on the KBUD and cross-border strategic planning come from the OECD cross-border regional innovation policy background report compiled in 2013. From the viewpoint of KBUD, both countries can be called knowledge economies.

3. RESULTS

3.1. Europeanization as a framework for strategic spatial planning in Estonia

As in other "new" European countries, spatial planning has undergone a substantial transformation in Estonia (Adams 2006, Adams *et al* 2014). After the societal transition, mismanagement, failures, and learning-by-doing in public administration, and the convergence of land use spatial planning on the national and local levels, strategic spatial planning has now

grown into certain maturity. Estonia exemplifies the "new" European countries that phased out centralised spatial planning systems and have been steadily introducing new integrated national-local two-tier system with high degrees of complexity, mimicking societal dynamics and the change of legal and economic systems and governance (Adams *et al* 2014).

EU newcomers are increasingly influenced by European policies and it is seen as territorial cohesion for balanced development, competitiveness, sustainability and good territorial governance (Böhme and Waterhout 2008, Bachtler *et al* 2014). Barca (2009) stresses the need to harmonise policy discourses: national as well as local authorities should share the values of the Commission and EU-level policies despite different governance modes, tools and practices. However, administrative systems have a path-dependency, such as the persistence of institutions and cultures (Nadin and Stead 2008).

The tension arises around two different notions of planning: planning as a physically oriented search for ideal territorial forms versus planning as a more process-oriented and governance-based discipline. Europeanization becomes the battlefield between the two. In Newman and Thornley's (1996) five-class European planning system, the Estonian system was categorised as Eastern-central European. Apparently, the Estonian system has been moving towards the Scandinavian family and transferring gradually to the Nordic model and planning practices.

In terms of the current spatial development and planning issues in Estonia, neo-liberal discourse determines economic as well as public policies in the framework of increasing globalization, macro-regional functional relations, metropolization and of widening the regional divides and internal peripherization. In general, spatial development follows an ad hoc approach (Roose and Kull 2012).

In relation with the KBUD context, three main problems can be brought out in terms of Estonian spatial planning: 1) the shortage of human capital (qualified planners); 2) the institutional settings of spatial planning in terms of planning levels are loosely integrated or not integrated at all; 3) Estonian spatial development policy is closely related to regional policy which is directly linked to EU policies. In theory, key documents explicitly refer to the convergence with EU regulations and approaches. In practice, Estonian politicians and officials have sought a selective application of European spatial policy (Raagmaa *et al* 2014). Nevertheless, planning follows permanent change and learning, reflecting complexities, values and attitudes, practices, institutional and legal frameworks that originate from Europe in essence.

The landmark achievement of strategic spatial planning is the national spatial plan Estonia 2030+ adopted by the Estonian government in 30 August 2012. Promoting sparse city concept, low-density urbanised space which integrates compact cities, suburbs and traditional villages is the most controversial and challenging principle of the national spatial vision. On the path of strategic spatial planning, collaboration between municipalities is a key to strengthen and consolidate the implementation of county plans. A vertically organised and fragmented financial and political system as well as eclectically designed legislation does not support cooperation and joint action between neighbouring and, in many cases, rather small municipalities. In broader context, the political process is related to amalgamation of local authorities. On the local level, the major issue is empowering municipalities to implement their comprehensive plans as the majority of municipalities are dependent on subsidies from the national government. In some suburban municipalities, comprehensive plans are still missing or already outdated. Also, the majority of land is privatized and there is not much space, literally and figuratively, for local public initiatives. The majority of plans were implemented in the framework of project-based business planning with an emphasis on short-term financial return. Private interest often overruns public interests, disturbing procedures of public planning. Strong neo-liberalism has enforced the urban space as an arena for market-oriented economic growth and elite consumption practices. However, as an aftermath of the real estate bubble and economic crises in 2008, the speed and volume of planning has decreased substantially, leading to the improvement of quality of planning and streamlining the process.

Although strategies and development documents on the national, county and local levels have been drafted, these documents have often remained quite ineffective in terms of strategic decision-making.

3.2. The impact of Finland on Estonian spatial planning

Estonian planning law and planning system are adapted from the Nordic countries, particularly from Finland. An integrated system of planning tiers, awareness and communication follows the best practices of planning system in Finland. The system was seen as a legal superiority, a mere regeneration of bureaucratic routines and introduction of formal schemes, in summary centralization tendencies. Planning is still largely the ownership of architecture, specifically in urban environments. As Estonia has moved from the new right or laissez faire non-planning of the 1990s towards a neoclassical discourse during the Europeanization of the 2000s, physical and formal "site and speed" planning dominate in Estonia, leaving the Nordic ingredients such as communication, participation and collaboration in the shadow. In the 2000s, spatial planning has taken a rather pragmatic approach.

The question is the size and strength of professional community. Adams *et al* (2014) admit that territorial knowledge communities are not at all strong in Estonia (nor in other Baltic States). As spatial policy goals and concepts are interpreted differently across Europe, it may affect the choice of policy instruments used to address these goals and concepts. Jauhiainen (2014) states that spatial patterns and territorial-administrative structures in Europe change slowly, being influenced by path-dependent legacies and the recently emerging uncertainties in the EU, thus, turning the Europeanization of spatial planning into a cyclical rather than a top-down process.

Assessing policy processes, before the accession to the EU, politicians and policy-makers were attentive to European agendas; they were keen to learn from Western and Nordic counterparts (Jauhiainen 2014). After the accession since 2004, the main focus was on exploiting the strategy of absorbing EU grants in a formalised sophistication. Other studies on Europeanization of Estonian policies (e.g. education policy) suggest that Finland played a catalysing role in the Europeanisation of Estonian policy only in a limited period. Shortly before and after Estonia became a member of the EU, Finnish experience was used to legitimise Brussels' vision and to implement relevant policy change in practice (Toots, 2009). A similar double standard thinking, administrative hypocrisy and ambivalent rhetoric originating partly from the Socialist period can be witnessed here.

The EU's territorial cooperation programme as a stimulus for Europeanization facilitates cooperation between regions and actors, and has acted in support of the emergence of transnational spatial planning practices, the diffusion of certain spatial ideas across European countries and changes in the domestic patterns of spatial planning and regional policies, both in terms of approaches and institutional capacity (Janin Rivolin and Faludi 2005).

During the years 2000-2003 the co-operation was carried out in Southern Finland Coastal Zone Interreg IIIA programme and when Estonia joined the EU in 2004 the programme evolved to Interreg IIIA Southern Finland – Estonia programme. As such the programme was mainly focusing on learning processes and joint programme management in the fields of networks, employment and competitiveness as well as environmental questions. During last years the macro-regional strategy for the Baltic Sea Region provides new arenas for European, national and sub-national actors to shape policy and action having territorial impacts. However, this does not necessarily imply that these new arenas have had a significant impact on domestic policy process to date.

3.3. Strategic planning in Helsinki-Tallinn capital region

Cross-border metropolitan region of Helsinki-Tallinn will be analysed as the empirical case of the europeanization of Estonian spatial planning via Finnish know-how, mobility patterns and socioeconomic asymmetries.

Table 1. Key indicators of Tallinn and Helsinki metropolitan regions

	Tallinn metropolitan region Harjumaa	Helsinki metropolitan region Uusimaa
Territory	4333 km^2	9097 km^2
Population	572 103	1 566 800
GDP per capita (EUR, PPS)	21 599	48 682
Employed in tertiary sector	73%	82%
Tertiary degree	33%	43%

The cooperation between the capitals is intense and according to the survey results more than seven million trips are made between Tallinn and Helsinki every year (Fig. 1). The biggest growth in connection of Helsinki and Tallinn has been passenger cars, multiplied by seven times during last ten years.

Figure 1. Passenger travel between Helsinki and Tallinn (Data: Finnish Transport Agency 2012)

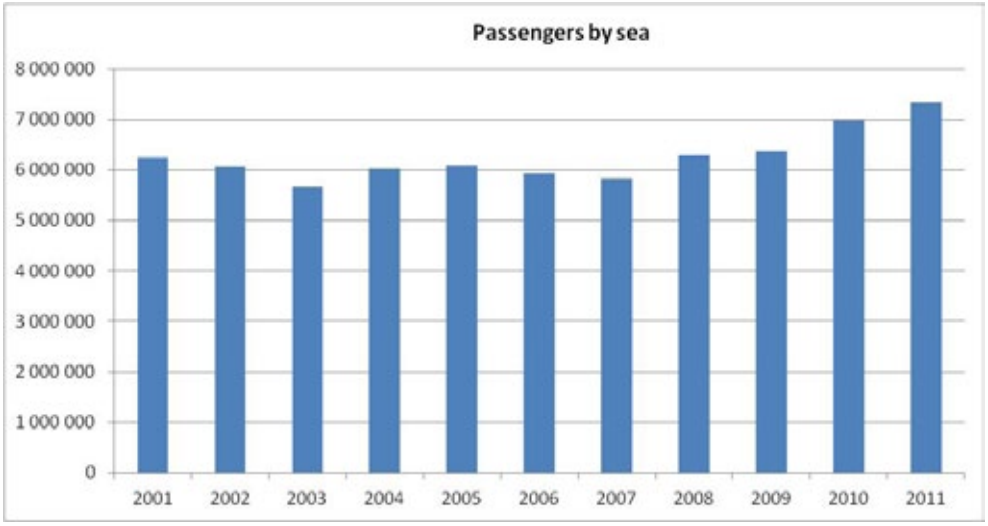
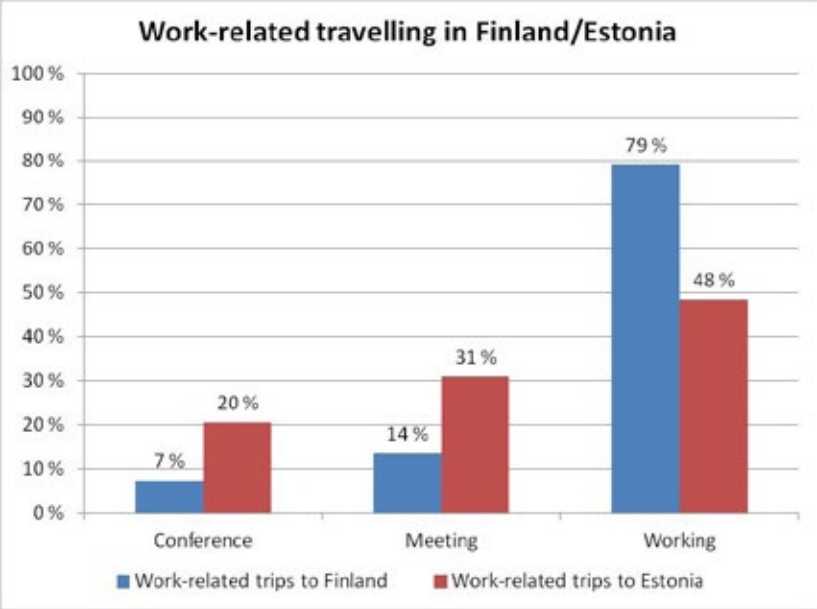


Figure 2. Work-related travel between Helsinki and Tallinn. (Data: Innolink, 2012)

Figure 2. Work-related travel between Helsinki and Tallinn. (Data: Innolink, 2012)



An average of 15 224 Finns are in Estonia on working days and 19 570 on weekends. The respective numbers for Tallinn are 4 418 on workdays and 7 701 on weekends. During the working days, there are on the average 14 622 Estonians in Finland, compared to the 11 547 on Saturday and 1 213 on Sunday (Silm and Ahas 2012).

In terms of knowledge infrastructure, several universities and polytechnics (University of Helsinki, Aalto University, Hanken), governmental agencies (TEKES, FINNVERA, Sitra) and expertise centers (Culminatum, Nordregio, VTT and other technology centers) are located in Uusimaa. Except for Tartu University, the main research and development institutions are located in Tallinn and Harju County (Tallinn University, Tallinn University of Technology (TUT), Tehnopol, Technopolis Ülemiste).

Although both countries have knowledge economies and there is cooperation between the academies of Finland and Estonia, research institutions, TEKES and Enterprise Estonia, the cooperation tends to rather multinational than bilateral in nature. The asymmetry is evident since the knowledge infrastructures tend to be not used jointly and the lower salaries and price levels attract the Finns more than knowledge-based skills and services.

Table 2. National knowledge indicators

Indicator	Estonia	Finland
R&D, % x GDP (2010)	1,62	3,87
R%D, real growth 2005-2010, %	74,4	17,5
Business R&D, % x GDP (2010)	0,81	2,69
Non-R&D innovation expenditure, % of turnover (2008)	1,77	0,57
Population (30-34) tertiary educated, % (2010)	40,0	45,7
High-tech products, % of exports (2011)	14,9	8,0

Regarding the business dimension, the main drivers for intense cooperation in the past two decades have been:

- Cost difference: until the end of the 1990s, production and cost of living in Estonia was very inexpensive; price differences still exist, but are less favorable nowadays;
- Cost of labor was 10 times cheaper in Estonia in 1990s, today 2-3 times;
- Cultural and political co-operation, particularly on the highest political level (presidents, prime ministers).

The development of business and industrial cooperation has been favorable from the early 2000s. At the beginning of 2012, there were 4673 Finnish owned companies in Estonia, and of them 3260 were 100% Finnish owned (in 2009, approx. 2800; in 2005, approx. 1700). There were about 440 Finnish subsidiaries in Estonia with total personnel of 27 000 and turnover of 3 900 million € in 2010. The number of personnel of Finnish firms represents about 5 % of total employment in Estonia. Significant asymmetries can be seen because the Finnish companies take advantage of Estonian dynamic business climate, lower salary rates, income tax and corporate taxes.

The estimated total effect of the Finnish tourists' expenditure on the value added of Tallinn-Harju is EUR 240 million

and that the contribution of Finnish tourism to the employment in Tallinn-Harju is a considerable 2,5–4 % of total employment. The total effect of Estonian tourists on Helsinki-Uusimaa is EUR 54 million (2011). The number of Estonians participating the Helsinki-Uusimaa labour markets was 17 500 – 18 500 in 2011 which causes a net increase of 200 – 300 million € to the value added in Estonia via direct and indirect effects. There are great asymmetries in the monetary flow of tourism, which is several times larger from Helsinki-Uusimaa to Tallinn-Harju than to other direction but Estonians have started to travel more to the other direction because of the relatives working and living there since the labour market is skewed in favour of Finland (Laakso *et al* 2012).

Regarding the socio-institutional dimension, a number of barriers can be mentioned hampering the KBUD of the cross-border region. There are societal differences, Finland being a welfare consensus-based society with strong trade-unions and Estonia market-oriented with flexible employment rules. The responsibilities of the public sector and attitudes towards it differ. There are disparities in services (well developed and innovative ICT sector, but cheap labor force and services in Estonia versus inflexible systems and expensive labor force in Finland). Different working cultures characterize the countries: rigid, well-planned, long-term decision-making in Finland versus hectic, fast and irregular plans and their implementation in Estonia. The Finnish are known for deliberateness and planning versus the Estonian readiness to take chances and to experiment.

Allmendinger and Haughton (2009) discuss the new generation of "soft spaces" and "fuzzy boundaries" that characterize emerging political objectives within new state relations, all of which are causing a changed agenda for planners and others charged with formulating territorial-based strategies. Soft planning is seen as a form of neo-liberalism for optimising otherwise formal, legal and bureaucratic spatial 'plannings' (Haughton *et al*. 2009). Relational planning as defined by Hooghe and Marks (2003) converts decision-making more flexible in functionally defined decision spaces. While soft spaces offer a more functional approach to planning, they pose significant problems setting territorial governance schemes (Faludi, 2012). The evidence of the abovementioned principles of "soft" planning can be reflected based on the recent territorial programme funded project "Helsinki-Tallinn Transport and Planning scenarios" (HTTransplan).

On both sides of the Gulf it has been in political terms an outspoken strategy since 2000s that closer cooperation across the Gulf is needed and mutually beneficial. Despite vision documents, in actual spatial planning in the region collaboration has not been happening. Regarding the governance structures, cross-border activities inside the twin-region have been led by a non-profit organisation Helsinki-Tallinn Euregio since 1999. The organisation has introduced and implemented triple-helix (Leydesdorff 2006) principle (cooperation between private and public sectors and academia) in practice (Lepik and Krigul 2009). This type of cooperation is difficult even within one country, but when compounded by the cross-border element and socio-economic as well as cultural differences, the setting becomes even more difficult (Lepik 2010).

In the framework the HTTransplan project, twin-region as one entity was explored with spatial planning techniques and insights for spatial development. The data and analysis for regional and local planners was produced through joint work and co-learning in transport and urban planning for the Helsinki-Tallinn twin-city region. It became evident that despite frequent interaction between horizontal societal groups, there is little knowledge of the programmes, activities and actors of the other side of the Gulf which can be explained by the lack of appropriate governance models apart from Euregio. The similar lack of acknowledgement of interdependency was evident in policies and strategic documents of both countries, which have similarities but there is no clear sign of any attempt to enhance cross-border cooperation purposefully in the twin-region area. Although internationalization is a key word for advancement of competitiveness of both regions, it does not inevitably include the cross-border actors, transport nor infrastructure. Despite obstructions the focus groups of the project representing city and regional planning and development departments, harbours, ferry operators, and universities succeeded in formulation of 4 regional scenarios which considered 3 dimensions: willingness and administrative capability of Helsinki-Tallinn for strategic partnership, global economic development and level of EU integration. Transportation scenario relies on increased cargo transport, especially related to the construction of the Rail Baltic. In Twin-city scenario, it is expected further socioeconomic integration using territorial governance at the top level of city's administration as well on national governments.

4. CONCLUSION

The aim of this paper was to investigate the evolution and practices of spatial planning in Estonian-Finnish context, exploring the case of strategic spatial planning in particular with the purpose of better management of a twin-city region in its pursuit for knowledge-based urban development.

The Europeanisation of spatial planning has contributed progressively to the emergence of new discourse, concepts and insights of territorial cohesion in Estonia to smoothen land use planning. It has increased complexity with Estonian territorial governance in multiple dimensions, in particular strategic planning tools, practices, and funding.

Helsinki-Tallinn twin-city region's case demonstrates cumulative outcomes of cross-border strategic spatial planning taking into account multiple contextual angles: contrasting backgrounds, different planning system, 'culture' of strategic decision-making, structural change in Estonia/Tallinn and Finland/Helsinki. There is increasing cross-regional economic interaction between Tallinn and Helsinki regions in terms of trade of goods and services, cross-border activities of enterprises, transport, tourism and cross-region work. As a result there is no doubt that the growth of the flows during the last 10 years has benefitted both regions though the functional tiers are increasingly asymmetric. Despite deepening functional and

socioeconomic tiers between Tallinn and Helsinki, territorial governance of cross-border remains on project level.

This paper confirms the statement made by Böhme and Waterhout (2008) that spatial planning in Europe does not converge or harmonize, but rather translates into various processes and formats "as a consequence of deeply embedded differences between European nations in terms of political, professional and administrative cultures and structures" (Stead and Cotella 2011).

Helsinki-Tallinn twin-city regions with its spatial policy case shows that knowledge based urban development approach in the cross—border setting can be taken when devoting more efforts to joint strategic planning and policy intelligence. There is still plenty of room for mainstreaming cross-border policies in the strategies and action plans of national, regional and local actors. Collaboration of knowledge networks can be further intensified by supporting entrepreneurship and including universities, R&D institutions, venture capitalists and public agencies from both sides of the Gulf. By focusing more on strategic joint planning,

the Helsinki-Tallinn cross-border region could evolve from a price-driven asymmetric model towards a knowledge-driven cooperation one.

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PARALLEL SESSION 2: CREATIVITY, TECHNOLOGY AND LEARNING COMMUNITIES

DO CULTURAL AND CREATIVE INDUSTRIES (CCI) MATTER FOR INNOVATION AND VALUE CREATION IN KNOWLEDGE-BASED BUSINESS? AIMS, FORMS AND PRACTICES OF COLLABORATION IN ITALY

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ABSTRACT

Purpose: This paper provides the first results of a scoping study exploring in detail how Cultural and Creative Industries (CCI) can represent a source and resource of critical and creative thinking as well as a set of processes to be deployed in order to foster and support innovation.

Scope: Focusing on a sample of Italian companies, the aims, the forms and the specific practices of collaborations between CCI and knowledge-based and traditional businesses are identified and discussed.

Method: In order to derive and test theories, trace causal pathways, explore hypotheses, researchers have designed and implemented qualitative research methods and conducted investigation mainly based on web-available data, archives and interview-based information.

Results: The case examples of relevant Italian companies effectively provide evidences of the impact and modalities of adopting initiatives to develop innovation capacity.

Recommendations and conclusions: The investigation of a sample of Italian companies suggests that most of the attention is focused on collaborations aimed to reinforce company image and reputation, to develop corporate social responsibility and to improve brand recognition.

KEYWORDS

Cultural and Creative Industries; Knowledge-Based and Traditional Business; Innovation Capacity; Management Models; Italy.

1. INTRODUCTION

In the new business age, companies need to be more and more flexible, agile, intuitive, imaginative, resilient, and creative in order to face the increasing complexity, turbulence, and pace of change of the competitive environment (Schiuma, 2011). These dynamics are connected with the increasing organizations' needs to do business in different ways. In fact, nowadays, the traditional rational- and efficient-based way of managing business is no longer sufficient to guarantee profits and sustainable competitive advantages: it is more and more important to consider the ability to use creativity for supporting innovation capacity and performance improvements as well as the capacity of catching and anticipating emerging needs in the society. In this prospect, in order to get access to creative processes business organisations can build relationships of various natures with Cultural and Creative Industries (CCI). Specifically, although CCI can be considered as part of the business economy, they are distinguished from traditional business sector by the products and services they offer. In order to foster innovation capacity and performance improvements, change and transformation, businesses can collaborate and learn from CCI. For this reason, this paper presents the results of a scoping study exploring the feasibility of fostering innovation capacity through collaboration between CCI and traditional businesses. This involves the understanding of the potential benefits and impacts that could be generated from such collaborations as well as a practical exploration of projects, practices, and initiatives aimed to improve organizational innovation capacity by deploying creativity and culture. The focus of the explorative fieldwork is the Italian business context.

2. BUSINESS AND CREATIVITY-BASED INNOVATION

The twenty-first century business landscape appears more and more scattered with ambiguities, uncertainties, dynamism, and unpredictability: this calls for a new interpretative perspective of the organisation and management systems (for an in-depth understanding of the conceptual pillars of this paper see "The Value of the Arts for Business" by G. Schiuma Cambridge University Press). For this reason some researchers and practitioners have argued about the role of *creativity-based innovation* as a driver for innovation and performance improvements, highlighting the potential impacts of the adoption and integration of creativity-based processes in the competitive strategies of businesses. For the scope of this paper we see cultural- and creative-based processes related to CCI as a potential catalyst and leverage or driver to enhance organisational innovation capacity. In other words, they can be seen as an instrument for improving organisational business performance. In this view, we approach cultural- and creativity-based processes as devises for cross-innovation, i.e. as

mechanisms that using the creative and cultural contents and practices can inspire and support managers to develop management innovation, frame new organisational and business models, and draw on new approaches and instruments to tackle emergent business challenges.

The power of the cross-innovation devises can be analysed through their twofold role. On one hand, they represent vectors to shape and influence organizations' dimensions. On the other hand cross-innovation devices can be used as managerial vectors to transform business dimensions and properties, in particular, influencing and transforming tangible and intangible organisational infrastructures and products. This calls for the understanding of the forms and contents of collaborations and partnerships between CCI and traditional business sectors as a new fruitful strategy to develop organisational innovation processes.

3. A SECTOR ANALYSIS

The term "creative industries" has relatively recent origin. While there are obvious connections to and continuities with cultural industries, the designation marks a historical shift in approach to potential commercial activities that until recently were regarded purely or predominantly in non-economic terms (Andersen *et al.*, 2000; Smagina and Lindemanis, 2012). The concept emerged in Australia in the early 1990s, but was much wider exposure by policy makers in the United Kingdom (UK) in the late 1990s, when the Department for Culture, Media and Sport (DCMS) set up its Creative Industries Unit and Task Force. In the process, the DCMS moved the understanding of the concept of creativity a long way from its common association with activities having a strong artistic component, to any activity producing symbolic products with a heavy reliance on intellectual property (UNCTAD, 2004). Defining "creative industries" is a matter of considerable inconsistency and disagreement in the academic literature and policy circles as well as among practitioners, especially in relation to the parallel concept of culture and cultural industries. Sometimes, a distinction is made between the creative and the cultural industries; sometimes the two terms are used interchangeably. Despite some criticism concerning definition of the creative industries, the most widely accepted are the ones set by UK DCMS and UNCTAD. UK DCMS in its "Creative Industries Mapping Document" (1998, revised 2001) define creative industries as *"those industries which have their origin in individual creativity, skill and talent and which have a potential for wealth and job creation through the generation and exploitation of economic property"*. In the "Creative Economy Report", UNCTAD (2008) defines creative industries as *"the cycle of creation, production and distribution of goods and services that use creativity and intellectual capital as primary inputs. They comprise a set of knowledge-based activities that produce tangible goods and intangible intellectual or artistic services with creative content, economic value and market objectives"*. The specific interest of this scoping study is the notion of cross-innovation, i.e. how culture-based and creative-based processes can contribute and foster the development of an organisation innovation capacity particularly in the context of traditional business sectors. Our basic proposition is that the intersection of culture and creativity with traditional businesses can trigger and support the development of new innovation processes. Thus, we envisage the collaboration and integration of culture and creativity into organisational life and the exploration, identification and definition of new approaches, frameworks and tools that can drive the deployment of culture and creativity as instruments for enriching the value creation capacity of an organisation. Then, we are interested to understand the possible relationships between the CCI and traditional business sectors. Our fundamental assumption is that traditional businesses can potentially collaborate with CCI with the scope of deploying what we see as the 4Ps of culture and creativity for innovation capacity: 'people', 'practices', 'principles' and 'products'. Traditional businesses can enhance their innovation capacity by deploying the 4Ps and exploiting them as catalysts and drivers for change and transformation. The 4Ps provide mechanisms to support such mechanisms. In particular, people coming from the CCI can bring into organisations and share with employees their skills and knowledge in order to support the refinement and development of the organisational soft competences. This equals to consider the people as vector of new knowledge tapped from the culture- and creative-based domains. Practices denote all those methods and processes that are typical of the cultural and creative world and that can be useful for traditional businesses in order to do 'things' in a different way in comparison to what they normally do. Principles are related to the human-centric view that usually distinguishes CCI as a driver for sustainable value creation focusing in particular on experiential and emotive-base economic features. Finally, products denote the use of the outputs of the CCI as a way to increase the value added of traditional businesses as well as a way to shape working environments as symbols and vectors of meanings.

4. THE EMPIRICAL RESEARCH

4.1 Data and methods

This section presents a series of concrete business results and elements of innovation and competitive advantages focused on the collaboration between cultural and creative industries and traditional business sectors. The attention is paid on the Italian business context with the scope to extract some relevant insights from the Italian state of the art of the use of culture and creativity in the organisational business models in order to support innovation capacity and value creation. In particular, the empirical research has been carried out with the aim to identify some possible trends of Italian companies in terms of adoption and/or integration of culture and creativity in the organisations' value creation chain. The key

investigated question is: *How do Italian firms operating mainly in traditional businesses engage with culture and creativity in order to enhance innovation processes and get competitive advantages?*

This is a scoping study with the aim of identifying the benefits related to the adoption and integration of creative- and cultural-based processes in traditional businesses. In order to derive and test concepts, trace causal pathways and define new hypotheses, we have designed and implemented a qualitative investigation combining semi-structured interviews enriched with the collection of available secondary data. Specifically, we solicited more than thirty Italian companies and sent emails to these companies describing the research project and inviting senior managers to participate in the explorative study. Out of the population, 24 companies have been included in the sample that we have analysed. In Table 1 the list of the investigated companies building the sample are listed together with the indication of the sectors that they overall represent.

Table 1. Italian companies included in the investigated sample.

Companies building the investigated sample Benetton Group; Brem; Brunello Cucinelli – Fondazione Cucinelli; Cartiere del Garda; Ceretto Vini; Diesel; Elica; ENI; Favero-Milan Ingegneria; Ferrero – Fondazione Ferrero; Furla – Fondazione Furla; Gobbetto Resine Speciali; Gruppo Euromobil; Gruppo Industriale; Tosoni; Illy; Italcementi Group; Ridea – Heating Design; Santa Sofia Vini; Telecom Italia; Teseco – Fondazione Teseco per l'arte; Trussardi – Fondazione Trussardi; Unicredit Group; Zegna – Fondazione Zegna
Sector of activities of selected companies
Construction/ Materials for the construction – n. 3
Engineering – n. 2
Food – n. 4
Furniture – n. 2
Paper production - n. 1
Services/Commodities & Waste Management – n. 1
Textile/Dressing/ /Shoes/Fashion – n. 7 Services/Banking – n. 1
Utilities (oil&gas, telecom) – n.2

The empirical research has investigated some relevant issues with the aim to collect information about the kind of relationships Italian companies are engaging with the CCI. In particular, below the main investigated matters are outlined.

- The existence of collaborations with the companies and organizations operating in the cultural and creative sectors;
- The sentiment/feelings of Italian companies about these collaborations;
- The strategic objectives that the companies wish to achieve through the collaboration with organizations operating in CCI;
- The main projects and specific initiatives that have been developed in the last few years;
- The business areas, departments and processes more interested and involved in shaping collaborations with cultural and creative organisations;
- The main obtained or expected results and/or impacts derived from such collaborations;
- The main enabling and hampering factors and obstacles for the development and the effectiveness of such collaborations.

4.2 Insights

The fieldwork investigation has revealed different and interesting insights about the collaborations between traditional businesses and CCI. The first evidence shows a limited but increasing awareness of the relevance to develop collaborations with the creative industries as well as of adopting cultural-based and creativity-based processes for improving innovation dynamics and competitiveness in the traditional businesses. However, Italian companies have not structured connections with creative organizations. Most of the relationships tend to be stand-alone and not structured but rather emergent in nature. There is a general interest and feeling of the role and relevance that culture and creativity can play for company competitiveness. In other words executives have the intuition that organisations could benefit and tap into CCI as a way to enhance innovation capacity and deliver better value to stakeholders. Nevertheless, they lack of frameworks and clear understanding of how this can be achieved and governed in practice. In addition, the actual economic recession, which is strongly affecting the economic performance of Italian firms puts managers in the difficult position of experimenting new approaches and tools that could turn into failures without generating return on investments. In this prospect a structured investments in the relationships with culture and creativity is seen highly risky and not capable of producing clear benefits for firms' bottom line results. The main declared objectives to be reached through the collaboration with CCI

are mostly related to reinforce company image, brand and reputation and to develop corporate social responsibility. Further dimensions of benefits are: product differentiation; the contribution to add intangible value to traditional products and services; the capacity of driving product innovation mechanisms. While, little attention is associated to the role that culture and creativity can play as drivers for organizational development and particularly as managerial approaches to support human resource development and engagement. From the empirical investigation has emerged that Italian companies establish relationship with CCI in order to respond to three fundamental purposes as listed below.

- Corporate social responsibility (CSR);
- Marketing, branding and communication;
- New value for products and services.

Many Italian organisations are developing relationships with CCI as part of their CSR strategy. The focus is on delivering value propositions for stakeholders and particularly to create value for communities, society at large and indirectly for environment by deploying cultural-based and/or creative-based activities and projects. The fundamental mechanism through which organisations operate to build a relationship with CCI and deliver their CSR initiatives is the sponsorship. Actually, sponsorship is the traditional and quite common approach of interaction between culture/the arts and business. Through sponsorship the companies assume the role of patron to an artist, an artwork and/or an artistic process and even art and cultural institutions such as museums and galleries. This is done for multiple reasons, including ethical and cultural motivations, getting the attention of institutions, strengthening ties with the local community, creating an opinion and an identity of the organisation both internally and externally, and for increasing brand awareness and enhancing reputation. Cultural sponsorship and co-sponsorship can take different formats. Usually, organisations sponsoring cultural and arts productions and events get marketing benefits, such as credit on television and print advertising as well as credit on all cultural event related materials including banners, posters, performance programmes, and ticketing options. Corporate social responsibility, marketing, branding and communication involve all the delivering of a company's "message" to its customers and stakeholders in a renewed way. *Unicredit* represents a good example of Italian company that have shaped its relationship with CCI as a CSR initiative. Unicredit is an international banking group which is successfully exploiting sponsorship as a way to create and deliver socio-cultural value to stakeholders. The basic idea moving *Unicredit* sponsorship is to support talents to emerge and to have success through the reinforcement of the relationships among artists, arts lovers, galleries, critics and specialized magazines. Specifically, *Unicredit* has established relationships with: "Castello di Rivoli" a contemporary art museum, the MACRO - contemporary art museum based in Rome, the MAMbo - contemporary art museum based in Bologna, the MART - contemporary art museum based in Trento and Rovereto, the Museum der Moderne of Salzburg. In addition, *Unicredit* is greatly involved in sponsoring music and opera. It actively promotes, through the support of orchestras, the attention and the promotion of the classic music engaging audience at large. It is partner of the "Teatro alla Scala" of Milan, the "Arena di Verona", the "Filarmonica '900" of the "Teatro Regio" of Turin, the "Teatro Massimo" in Palermo, the "Teatro dell'Opera" of Rome. At international level, through its controlled banks such as Bank Austria and HypoVereinsbank (HVB), *Unicredit* also supports respectively the Filarmonical of Wien in Austria, and the Opera of the Bayern in Germany as well as it promotes relevant regional events in Bayern such as the Rheingau Music Festival, the Mozart Festival at Würzburg the Richard Strauss Festival at Garmisch-Partenkirchen., the Opera Academy at Gut Immling and its programme "Jugend Kulturell". A further case example of Italian company pursuing CSR through the development of relationships with CCI is *Telecom Italia:* a company operating in the telecommunication sector. They are supporting culture as part of their CSR strategy by partnering with "Galleria Borghese" based in Rome, the "Accademia Nazionale di Santa Cecilia" of Rome as well as sponsoring the "Mostra Internazionale di Architettura" of Venice and the MAXXI Museum of Rome. In addition, they are partner of the "Salone Internazionale del Libro" of Turin, and of the RomaEuropa WebFactory - the web community dedicated to multimedia artists. Along the same approach stands *ENI*, one of the major Italian oil and gas corporations. ENI supports actively the cultural life of the territories in which operates, particularly through the support of artistic initiatives and by sponsoring renovation projects of heritage assets.

It is worth to point out that the main way of establishing and managing the relationships with CCI is performed by means Foundations. Indeed, the analysis of the relationship developed by the Italian companies with CCI has revealed that most of the organisations have created a Foundation, see for example, Fondazione *Ermenegildo Zegna, Fondazione Nicola Trussardi, Fondazione Cucinelli* and *Fondazione Ferrero*. It is important to note that the attention to establish relationships with CCI for CSR purposes is not a prerogative of Italian multinationals, but it characterises also SMEs. In particular, *Favero-Milan Ingegneria*, operating in the engineering field, and *Cartiere del Garda,* operating in the paper production, support cultural initiatives in region of Trentino and collaborate effectively with cultural associations, institutions and foundations.

Marketing, branding and communication denote the second fundamental strand of collaboration between Italian businesses and CCI. In this case, the fundamental purpose of establishing a relationship with CCI is aimed at creating, communicating and protecting company's identity, brand and reputation. The scope of this kind of relationship is mainly to impact on customers and intermediaries, but also more generally affect the perception of a company from the point of view of its different stakeholders. One of the key example of Italian company that has traditionally used creativity and culture as a way to build its brand and reputation is *Benetton*. Among others, it is worth to mentions the initiative named

"Fabrica". Fabrica - founded in 1994 - is the Benetton Group's communication research centre in which a group of creative young people of various nationalities work together with the aim of developing ideas and potential inspirational creative-based projects that can be valuable for promoting and marketing the company worldwide. Other examples of Italian companies that are deploying and exploiting the relationships with CCI for marketing and branding purposes are: *Gruppo Euromobil* (home furniture), *Teseco* (facilities and waste management), *Diesel* (fashion), *RossiModa* (textile), *Gobbetto Resine* (materials for the construction sector), *Gruppo Tosoni* (engineering) and *Santa Sofia Vini* (wine production).

The attempt to provide new value for products and services is the third strand of collaboration between Italian traditional businesses and CCI. The basic idea grounding this approach is that creative partners can contribute to the idea and development of new products. Product and/or service experience can be strengthened by working with its sensuous qualities, aesthetics and design, or by involving the consumer in the development process. Accordingly, design, culture, arts represent important 'value added vectors' to increase the value incorporated into products and services. From a business perspective, the idea is to infuse the artful energy into products and services. The attention is focused on increasing the economic value of a product by incorporating aesthetic dimensions. At practical level, creative collaborations can contribute to product and service innovations in various ways. In this perspective Italian companies have been traditionally particularly effective in differentiating themselves and their products in the market by embodying cultural and creative features into products and services with the result of creating embedded intangible value. For example, *Ridea* and *Brem*, two Italian leader companies in the design and production of heating products have linked their market success to the ability to offer heating systems and solutions that incorporates aesthetic and design features. The focus is on finding a continuous advanced balance between functionality and elegance, utility and aesthetic, high technology and environmental sustainability. The value proposition is to deliver to the market not only an object that heats but also real furnishings objects that can be integrated perfectly in the home atmosphere contributing to create a living house. *Furla* represents a further example. Giovanna Furlanetto, owner of Furla, has stated: *"The arts have delivered to the world a very different perception of my company"*. Furla is an interesting case example since it experiments on its core-products (i.e. the female bags) the work of young creative people sponsored by the Furla Foundation as well as it exploits the talents of young filmmakers to reinvent communication through new "stories" in which the bag becomes input, fetish object to be transformed and even destroyed and desecrated. For example, the project "*#candycool"* has been an open laboratory in which creatives have been invited to re-interpret the Candybag playing with fantasy and unusual components such as chains, textiles pieces and even biscuits. More recently, on 2007, this approach has been institutionalized through the so-called Furla Talent Hub, a centre for the promotion of the new young talents of the fashion design that offers to them the chance to design a complete collection. A further Italian case example of a company that is using the relationship with CCI as a way to create intangible value embedded into products is *Italcementi Group*. This company represent one of the major actors in the cement industry at international level. Nowadays, the cement offers high performance very difficult even to think till some years ago and this determines the great relevance of the deep collaborations that *Italcementi* develops with customers, designers, architects and building community. Among these dimensions great attention is paid to the architecture as a means to impact on the sustainable transformation of territories. This feeds collaborations with architects in order to develop relevant projects able to be symbols of innovative and sustainable use of cement. This view is resulted in the development of projects with famous architects such as Nervi, Ponti, Meier, Perrault, and Cucinella. In order to make this kind of collaboration more stable and structured, *Italcementi Group* has launched since the end of '90s an inititive named "Incontri Millenium" which is aimed at developing conversations with Italian faculties of architecture through workshops and events. An Italian company that has been able to leverage on cultural and creative dimensions to transform a commodity such as coffee into a product with high value-added is *Illy Caffè*. Among the different initiatives put in place by *Illy*, one of the most significant is the so-called "Illy Art Collection": it is a series of 70 little cups for coffee limited in number, designed by famous artists, such as Michelangelo Pistoletto**,** Marina Abramović**,** Sandro Chia**,** Julian Schnabel**,** Robert Rauschenberg**,** Jeff Koons**,** Kiki Smith, Joseph Kosuth**,** James Rosenquist and a lot of young emergent talents**.** This was one of the very first examples of collaborations with the CCI launched by the company. As result of this project the little cups for coffee became real porcelain sets through which the arts and the aesthetic dimensions were linked to the sensorial pleasure of the coffee, promoting at the same time brand management and enriching customers' experiences. Since 2006 Illy largely adopted the idea of using art as a means to enrich the value incorporated into products with the vision of making art accessible and applied to common objects. In this perspective, a further example of application of creativity and culture is the creation of another iconic Illy's product: the "250g" box of the coffee named "Barattoli d'Autore" (authored coffee boxes). According to a number of famous contemporary artists, such as James Rosenquist**,** Michael Lin**,** Michelangelo Pistoletto**,** Tobias Rehberger**,** and Sebastião Salgado, the box provides a new symbolic message interpreting the surface of a box and transforming it in a circular and infinite picture. To underline the relevance and the exclusivity of the artistic boxes, they are limited in number and available only twice in a year. The above are examples of how culture and creativity can be deployed to increase the value added of products and differentiate them in the market. Apart the use of culture and creativity as a way to enrich the value incorporated into products another important use of the relationship with CCI as a way to generate intangible value is represented by the deployment of CCI as an instrument for shaping better workplace. Among others companies, this is the vision that has inspired *Ceretto Vini* which has established a collaboration with the creative industries with the aim to 'beautify' the work environments. They see the workplace design as one of the major factors affecting the performance of workers and of the overall organisation. Their

fundamental assumption is that the physical setting and the workplace environment have measurable effects on building relational capital, social life and organisational context, which in turn influence work. Workers are more productive when working within a positive, stimulating and enjoyable environment. Accordingly, arts are used as an instrumental means to create a space and an intangible aura within and around the organisation, with a positive impact on people, by stimulating a constructive emotional and energetic state. They have designed and built facilities in a such a way that they embed symbolic meanings so that they positively shape and affect the workplace.

5. CONLUSION

The empirical scoping study about a sample of Italian companies has pointed out that there is an interest on developing collaborations with the creative industries and understand how to better integrate culture and creativity into business models; however there is still a lack of strategic understanding about how this can be carried out. The existing collaborations with creative industries do not respond to a structured strategy and are mainly the result of emergent relationships generally driven by the personal interest of the entrepreneur and its family or in other cases of the top management. From a practical point of view, the collaborations tend to be developed with single professionals/artists and consultants (for example curators) rather than to be based on structured relationships or partnerships with cultural and/or creative organisations. It is also worth to mention that there is a lack of attention on the assessment of the impacts/benefits produced by the relationships with the cultural and creative sectors. We call for more in-depth and extensive research investigations that could shed light both on the empirical practices and on the conceptual frameworks of how cultural- and creative-based processes can generate cross-innovation and benefit organizational value creation capacity.

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BUSINESS MODEL DEVELOPING CIRCLES: FROM OPEN INNOVATION TO CREATIVE BUSINESS MODEL

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ABSTRACT

Purpose: The purpose of this paper is to answer the question,
"How does one make a new business model in a knowledge-based economy?"
Design/Methodology/Approach: We built a research framework based on literature reviews.
In addition, we performed social experiments in DGIST during 2011–2014 to build a new business model.
Findings/Results: There are four different active businesses model building processes among which three are active.
First is Customer Entrepreneurship.
Second is User Entrepreneurship.
Third is Social Entrepreneurship.
Fourth is Engineer Entrepreneurship
Research Limitations/Implications
We need to confirm these business model approaches from the business model patents database.
Fourth approach, engineer entrepreneurship should be deeply analyzed to find out which aspects drive success and which drive failure.
Practical and social implications: Having a new start-up or changing start-up from the development of a business model based on customer entrepreneurship, user entrepreneurship, social entrepreneurship, and engineer entrepreneurship should be motivated for the future creative economy.

KEYWORDS

Business model; Open innovation; Convergence; Entrepreneurship; Open innovation; Service innovation

1. RESEARCH QUESTION, SCOPE, AND METHOD

1.1 Why business models?

Traditionally, business administration that deals with a firm's management fails to pay attention to business models. With this, recent innovation theories that focused on the growth and development of firms' technological innovation based after the advent of the knowledge-based society did not pay attention to firms' business models either. If this is the case, then why should we give our attention to business models? The answer to this is because many subjects whom we meet in markets pay more attention to business models than to anything else. Most firms, prep entrepreneurs who newly prepare for business start-up and researchers who wish to connect their study results directly to business start-up, pay more attention to the development of business models or innovation than to anything else.

In addition, because of the acceleration of the second IT revolution and the deepening of the knowledge-based economy, the characteristics of the connected economy that can be linked to markets and technologies in the world are intensified. That is, the necessity of new business models for access to new markets and new business models created by the combination of technologies and markets is being intensified more than ever.

Thus, the purpose of this paper is to answer the question, "How does one make a new business model in a knowledge-based economy?"

1.2 Research Scope and Method

The research framework used for this paper is based on literature reviews.

The concept of business models, which has not yet been established, will be formed through analysis of previous studies and other methods. In addition, through review of diverse results of previous studies on existing business model elements, core components of business models, which will serve as the foundation of this study, will be arranged. Furthermore, through a review of previous studies on existing business model development methodologies and interviews with firms that have experience in business model development, new business model development methodologies will be established.

Lastly, the business model development methodologies developed as such will be applied to develop new business models. As a way to implement concrete substances of business model development, this study takes the application of

business model patents to the Korean Intellectual Property Office (KIPO). Under the IPC patent classification, G06Q is explicitly classified into business model patents. By combining the progress of social experiments-termed business model development with business model patent applications, the outcomes, the social experiments, and whether they are successful can be primarily measured and verified through institutional devices-termed patent application and registration (Bailey, 2008; Berg & Lune, 2004). By revising and supplementing business model development methodologies through these social experiments, the reliability and validity of relevant business model development methodologies will be enhanced. If some methodologies do not pass the conditions for patent application, the validity of the relevant development methodologies will be verified through interviews (DiCicco-Bloom & Crabtree, 2006; Schoenberger, 1991; Yin, 2009).

This study systematically analyzes the entire process in which the lead author developed actual business model development methodologies in the DGIST IT fusion research department from January 2010 to June 2014, business model patents based on the same methodologies were applied and registered, and the validity of the developed business model development methodologies was enhanced through the application of the relevant methodologies to the development of some external business models through interviews.

2. LITERATURE REVIEW AND RESEARCH FRAMEWORK

2.1 The Value of Business Model and Relationship with Open Innovation

Despite the fact that business models play very important roles in the sustainable existence and development of firms in reality, diverse definitions exist on one hand and it has not been completely established scientifically as with the concepts of strategies, among others, on the other hand (Osterwalder, 2004; Teece, 2010; Zott, & Amit, , 2010). It can be pointed out that business models act as various forms of models: to provide a means to describe and classify businesses; to operate as sites for scientific investigation; and to act as recipes for creative managers (Baden-Fuller & Morgan, 2010). That is, the definitions of business models may vary depending on the usage of business models.

In fact, highly emphasized in entrepreneurial practice, business models have received limited attention from researchers (Morris, Schindehutte, & Allen, 2005). However, innovation in business models are increasing to a critical level for building sustainable advantage in a marketplace defined by unrelenting change, escalating customer expectations, and intense competition (Sorescu, Frambach, Singh, Rangaswamy, & Bridges, 2011). With the growth of business models, novel implications are to be expected (Gambardella & McGahan, 2010).

In concept with its partners, a firm's business model as a system of interdependent activities enables them to create value and to appropriate a share of that value (Zott & Amit, 2010). Among others, value creation and sharing are core components of business models (Amit & Zott, 2001; Chesbrough & Rosenbloom, 2002; Johnson, Christensen, & Kagermann, 2008; Zott & Amit, 2010). Business models play roles as a mediating construct between technology and economic value (Chesbrough, 2007; Chesbrough & Rosenbloom, 2002).

In line with this, if business models are combinations of or connections between technologies and markets, it can be seen that open innovation, which means open relationships between technologies and markets in which the main agents of technologies and that of the market are not necessarily identical, is a concrete precondition of a business model (Brem & Tidd, 2012, p. 257; Chesbrough, 2006, 2007, 2010a; Chesbrough, 2012; Yun & Mohan, 2012). The innovation of the business model designed for licensing such technologies will have unpredictable, but inevitable, consequences for industry structure and organizational capabilities, as well as for the content and context for upstream science talks in which technologies are a novel alternative to applied, specialized, commercially mature technologies, featuring business model innovation and the evolution of technology markets. Because of the deepening of the knowledge-based economy, the utilization of technologies developed by a certain industry or firm in other firms and industries and the move toward technologies of general applicability are becoming representative characteristics of open innovation paradigms. Living Labs, which can be understood as user-centric environments for open innovation, are examples between business model and open innovation or the open innovation as the theoretical background of business model development.

Therefore, new value creations in diverse relationships between technologies and markets; that is, in four types comprising the relationships between existing technologies and existing markets, between existing technologies and new markets, between new technologies and existing markets, and between new technologies and new markets, as shown in Figure 1, can be defined as business models.

- New technology - Existing market	- New technology - New market
- Existing technology - Existing market	- Existing technology - New market

Figure 1. 4 Type of business model according to the relationship between technology and market

However, because conceptual definitions of business models are diverse and embracing comprehensive contents is limited, describing core contents will be more helpful in understanding the concepts.

2.2 Core components of a business model

Centering on not only the top 10 papers in the degrees of quotation among those that discuss the components of business models, but also on recent papers that attract attention with their new themes or contents, core components of business models were derived as shown in Figure 2.

First, value proposition is directly presented as a core component of a business model in almost all papers (Chesbrough, 2010a; Desyllas & Sako, 2013; Dubosson-Torbay, Osterwalder, & Pigneur, 2002; Huarng, 2013; Johnson *et al*., 2008; Osterwalder, 2004; Teece, 2010; Van der Borgh, Cloodt, & Romme, 2012).

Second, a technology system that creates value and distributes to customers is also quoted as a major component of business models. However, the technology system is indicated as a core component through diverse expressions rather than being directly quoted (Camponovo & Pigneur, 2003; Chesbrough, 2007, 2010a; Desyllas & Sako, 2013; Huarng, 2013; Johnson *et al*., 2008; Osterwalder, 2004; Osterwalder & Pigneur, 2002, 2010; Schubert & Hampe, 2005; Teece, 2010).

Third, the customer segmentation means concrete consumers of business models. Although some previous studies expressed this component within another business model component, major papers specified customer segmentation as an independent core component of business models (Camponovo & Pigneur, 2003; Chesbrough, 2007; Huarng, 2013; Osterwalder, 2004; Osterwalder & Pigneur, 2010).

Fourth, costs and revenues mean firms' concrete costs in the process of realization of the relevant business models along with gains to be obtained by the relevant firms through the realization of the relevant business models. As criteria for judgment of the value of business models and as a ground for the innovation and development of business models and the development of new business models, costs and revenues are unavoidable core components of business models (Camponovo & Pigneur, 2003; Chesbrough, 2007, 2010a; Desyllas & Sako, 2013; Huarng, 2013; Johnson *et al*., 2008; Morris *et al*., 2005; Osterwalder, 2004; Osterwalder & Pigneur, 2010).

Fifth, to deliver the value created by business models to customers, connection with customers is presented as another major component (Chesbrough, 2007, 2010a; Desyllas & Sako, 2013; Osterwalder, 2004; Osterwalder & Pigneur, 2002, 2010). Connection with customers is characterized by being expressed in diverse ways, such as strategies in many previous studies. In addition, although this is indicated to be within other business model components, such as costs and revenues in some previous studies, it is presented as an independent core business model component in major previous studies.

2.3. Diverse discussions on business development in existing studies

Discussions on business development in existing studies are divided into three types— maps of business model approaches, process of business model approaches, and business model innovation strategies or cases. Maps of business model approaches include business model-mapping approach (Osterwalder, 2004), business model canvas (Osterwalder & Pigneur, 2010), and IBM's component business modeling (Chesbrough, 2010a). Process of business model approaches present processes, such as experimentation, discovery-driven planning, effectuation, and leading change in the organization (Chesbrough, 2010a).

Business model innoation strategies or cases focus on presenting diverse strategic factors of business model innovation. For example, business models can be designed from an activity system perspective, which includes design elements, such as content, structure, and governance, and design theme, such as novelty, lock-in, complementarities, and efficiency (Zott & Amit, 2010). Another representative case is when one profits from a business model innovation, such as the Pay-As-You-Drive (PAYD) in auto insurance (Desyllas & Sako, 2013).

Business model innovation in two groups of design theme, such as one group that includes operational efficiency, operational effectiveness, and customer lock-in in value appropriation, and another group that includes customer efficiency, customer effectiveness, and customer engagement in value creation is also proposed (Sorescu *et al*., 2011). Accelerating business model renewal through three core metacapabilities to make an organization more agile, such as strategic sensitivity, leadership unity, and resource fluidity, are proposed (Doz & Kosonen, 2010). In fact, as environmental conditions change, business models may require adaptation or wholesale change. These are the evolutions of business models, or internal and external "fit", where the former is concerned with a coherent configuration of key activities within the firm and the latter addresses the appropriateness of the configuration given the external environmental conditions (Morris *et al*., 2005). As a strategic development of business models, four factors, which are social networking, interaction orientation, user-added value, and customization or personalization, are proposed for Web 2.0 in creating value on the Internet (Wirtz, Schilke, & Ullrich, 2010). An emerging dynamic perspective, such as business model innovation through trial-and-error learning, sees business model development as an initial experiment followed by constant revision, adaptation, and fine-tuning based on trial-and-error learning (Sosna, Trevinyo-Rodríguez, & Velamuri, 2010).

Value proposition	Value proposition by Osterwalder & Pigneur (2002)	Value proposition by Osterwalder (2004)	Value proposition by Teece (2010)	Value proposition by Chesbrough (2007)	Customer value proposition by Johnson, Christensen, & Kagermann (2008)	Value proposition by Chesbrough (2010) and Demil & Lecocq (2010)	Value proposition by Osterwalder & Pigneur (2010)	Mechanism to capture value by Teece (2010)	Value proposition by Van der Borgh, Cloodt, & Romme (2012)	Value (why) by Huarng (2013)	Customer value proposition by Desyllas & Sako (2013)
Technology system (that creates value and distribute to customer)	Infrastructure management with resource or assets by Osterwalder & Pigneur (2002)	Value configuration by Osterwalder (2004)	Value network and ecosystem by Chesbrough (2007)	Key process and resource by Johnson, Christensen & Kagermann (2008)	Key activity, Key partners, key resources by Osterwalder & Pigneur (2010)	Revenue generation mechanism by Chesbrough (2010)	The concept model with innovation by Huarng (2013)	Value, positioning in the value network by Desyllas & Sako (2013)	Technology by Teece (2010) and Camponovo & Pigneur (2003)	Value architecture by Schubert & Hampe (2005)	Internal capability factors by Morris *et al.*, (2005)
Customer segmentation	User by Camponovo & Pigneur (2003)	Target Customer by Osterwalder (2004)	Target market by Chesbrough (2007)	Customer segments by Osterwalder & Pigneur (2010)	Margent segment by Chesbrough (2010)	Market (who) by Huarng (2013)					
Cost and revenue	Regulation context by Camponova & Pigneur (2003)	economic factor by Morris *et al.* (2005)	Cost structure and revenue model by Osterwalder (2004)	Revenue mechanism by Chesbrough (2007)	Profit formula by Johnson, Christensen, & Kagermann (2008)	Cost structure and revenue streams by Osterwalder & Pigneur (2010)	Cost structure and profit potential by Chesbrough (2010)	Revenue, profit, and cost by Huarng (2013)	Revenue and cost by Desyllas & Sako (2013)		
Connection with customer	Customer relationship by Osterwalder & Pigneur (2002)	Distribution channel by Osterwalder (2004)	Value network and ecosystem, strategy by Chesbrough (2007)	Customer relationships by Osterwalder & Pigneur (2010)	The structure of value chain, Strategy by Chesbrough (2010)	Value chain, competitive strategy by Desyllas & Sako (2013)					

Figure 2. Core components of business models that are found from literature reviews

For the purposes of this study, the researchers explored the business model portfolios of four European biotechnology companies. The distinctive nature of business models are taken into consideration and their business model portfolios are defined as the range of different ways they deliver value to their customers to ensure both their medium-term viability and future development (Sabatier, Mangematin, & Rousselle, 2010). A study on an individual business model in the making analyzes the process of innovation and development of the business model in the process of a chief's quest for creative freedom (Svejenova, Planellas, & Vives, 2010). Studies that analyze the business model reconfiguration from technological development are also part of case studies (Calia, Guerrini, & Moura, 2007).

Table 1. Diverse researches on business model development

Division		Literature review
Map of business model		Osterwalder (2004), Osterwalder & Pigneur (2010) IBM's component business modeling (Chesbrough, 2010)
Process of business model		Chesbrough (2010)
Business model innovation	Strategy	Zott & Amit (2010) Desyllas & Sako (2013) Sorescu et al. (2011) Doz & Kosonen (2010) Morris (2005) Wirtz et al. (2010) Sosna et al. (2010)
	Case	Calia, Guerrini, & Moura (2007) Sabatier, Mangematin, & Rousselle (2010)

As shown in Table 1, among existing discussions on business model development, only several discussions on business model mapping are closely similar to discussions on development. Instead, most discussions focus on the innovation strategies of existing business models. Map discussions focus on mapping existing business models and derive only some ideas for innovation of business models in the mapping process. On the other hand, discussions on processes focus on the process of business model innovation.

Thus, these imply that existing discussions on business model development tend to focus on studies of business model innovation rather than on business model development.

2.4 Framework of analysis

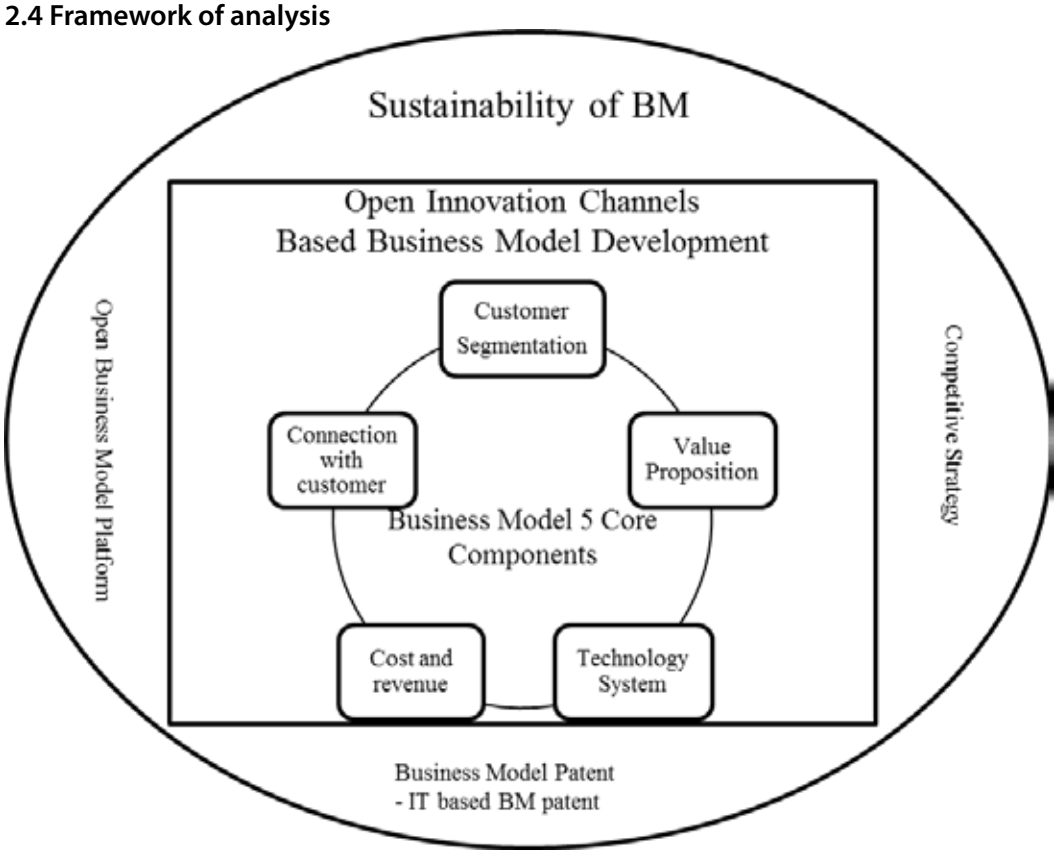

Figure 3. Framework of business model development

This study will steer away from approaches to business model innovation or mapping used in existing studies and will instead develop business model development methods. That is, as shown in Figure 3, business models that contain the five core components of business models will be developed. The approach to new business model development in this study begins from diverse channels of open innovation. When firms look for new business models or innovation sources, they rely in their innovative activities upon external search breadth, which is defined as the number of external sources or search channels (Laursen & Salter, 2006). Open innovation assumes that internal ideas can also be taken to the market through external channels outside the current business of the firm to generate additional value (Chesbrough, 2003b, p. 43). Open innovation can be defined as systematically encouraging and exploring a wide range of internal and external sources for innovation opportunities, consciously with firm capabilities and resources, and broadly exploiting those opportunities through multiple channels (West & Gallagher, 2006). Even if a firm specialized in marketing and has critical information about market needs, has well-developed distribution channels, and is in a collaboration with a manufacturing firm, it can be another type of open innovation at the commercialization step (Lee, Park, Yoon, & Park, 2010). Beyond the borders of existing firms, new business models will be developed by creative combinations of open innovation-based technologies and markets. The process of business model development will begin from diverse channels of open innovation and follow the process of new open combinations of technologies and markets; provided that, the process will include the five major core components of business models.

In line with this, it is thus also essential for the sustainable growth and development of firms that relevant business models be prevented from being easily imitated or caught up by other firms (Kim, 1997; Lee & Lim, 2001, p. 255). There are diverse ways to secure the sustainability of business models, such as combining business models with competitive strategies, constructing open business model platforms to open business models per se, and defending business models by securing business model patents.

First, the coupling strategy and business model analysis is needed to protect the competitive advantage that results from a new business model sign because a business model is more generic than a business strategy (Teece, 2010). As a business model is a reflection of a firm's realized strategy, the substantive difference arises when the firm's contingent strategy calls for business model modifications (Casadesus-Masanell & Ricart, 2010). According to Teece (2010), a competitively sustainable business model requires a strategic analysis filter to figure out and implement "isolating mechanisms" to hinder or block imitation by competitors and disintermediation by customers and supplier. Securing the dynamics of a business model through changes in the relationships among core components is also a way to secure a business models' sustainable survival and development through competitive strategies (Casadesus-Masanell & Ricart, 2010; Demil & Lecocq, 2010).

Second, going beyond its position as a source of business models, open innovation is indispensable for business

models' sustainable development (Chesbrough, 2013, p. 110; Morris *et al*., 2005). An adaptive business model in an open innovation platform can identify new business models (Chesbrough, 2013, p. 111). External technology partnerships allow open business models to accomplish even more (Chesbrough & Schwartz, 2007). The case of Adobe Co., which promoted groundbreaking development of business models based on platforms, should be also noted (Chesbrough, 2003a). On the other hand, the fact that, although Apple Co. opens SW business models, e-book business models, music business models, among others, through Appstore, Ibook, iTunes, Newsboard, and so on, they keep sources and core capacities internally, which proves the fact that among R & D capabilities, core capabilities should be stored internally (Chesbrough & Schwartz, 2007; Jobs, 2007). First of all, we need to establish a continuing business model innovation process in firms through open innovation of the business model itself (Mitchell & Coles, 2004; Smith, Binns, & Tushman, 2010). Open business models can be used by companies to create and capture value by systematically collaborating with outside partners (Osterwalder & Pigneur, 2010, p. 109). The next frontier of using outside technologies to develop products and licensing intellectual property to external parties is to open the business model itself (Chesbrough, 2012).

Third, Entrepreneurs and e-business companies who seek to patent e-business processes and even entire aspects of their business model are currently increasing (Osterwalder, 2004; Ovans, 2000). A firm cannot manage what you cannot measure and the importance of converting intangible assets into tangible outcomes, such as business model patents (Kaplan & Norton, 2004; Wu, 2005). The U.S. Court of Appeals for the Federal Circuit vacated a preliminary injunction imposed on Barnes and Noble.com (B&N) for allegedly infringing U.S. Patent No. 5,960,411 (the "411 patent") assigned to Amazon.com (Amazon) for a "one-click" ordering system for electronic commerce (e-commerce) transactions (Lesavich, 2001). A typical business model patent is an e-commerce patent. E-commerce patents, including normal business model patents, have two distinguishing attributes: "(1) it describes an essentially commercial (as opposed to technological) activity, normally some way to make or save money; and (2) the high level of generality that they are for all practical purposes nominal (Meurer, 2002)." Modern business model patents are a subset of computer programs (Tousi & Albrecht, 2009). Business model patents are subclasses of electrical systems, which are in turn subclasses of all utility patents. Therefore, because the information technologizing of all industries is in progress throughout the world following the second IT revolution, the number of targets of business model patents is expected to increase explosively. Internet business method patents appear to have been no worse than the average patent and possibly even better than most patents (Allison & Tiller, 2003). As with general patents, business model patents should be applied to Korean Intellectual Property Office and registered for core elements of business models based on IT when the business models have innovation, progress, and usefulness for the business models to have patent rights (Allison & Tiller, 2003).

3. LOGIC OF BUSINESS MODEL DEVELOPMENT

3.1. Finding channels for developing new business models

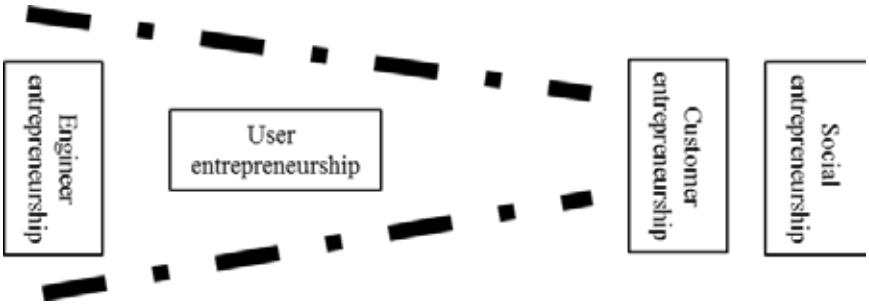

Figure 4. 4 Channels for developing BM in open innovation knowledge funnel

From the viewpoint of the knowledge funnel, we can identify four channels like in Figure 4. First, at the starting point of the knowledge funnel, there is an engineer who connects between the technology and the market, and takes the connection business model to the market by himself from the engineer perspective. Second, in the middle of the knowledge funnel, there is a user who connects between the technology and the market, and takes the connection business model to the market by himself from the user's perspective. In this, the user refers to the business entrepreneur who is already in his own firm's knowledge funnel. Third, at the end of the knowledge funnel, there is a customer who connects between the technology and the market, and takes the connection of the business model to the market by himself from the customer's perspective. Fourth, at the next of the knowledge funnel market, there is a customer who connects between the technology and the market, and takes the connection of the business model to the market by himself from the social welfare or the market failure perspective.

These four channels are all based on the convergence between the technology and the market, which are two different sectors as seen in Figure 1 (Kodama, 1986). At times of convergence, the differences among several of the characteristic differences between industries begin to blur from the four channels for developing a BM in an open innovation knowledge

funnel (Bröring, Martin Cloutier, & Leker, 2006). The development of open innovation business models, in which existing technologies and markets and new technologies and markets are newly combined, has already been making active appearance, eventually leading to the phenomenon of industrial convergence and resulting in the emergence of diverse services and products that pass the boundaries of existing industries (Hacklin, 2007; Hacklin, Raurich, & Marxt, 2004).

3.2. Customer entrepreneurship-based business model development

Figure 5. Customer entrepreneurship based business model development cycle

According to Bettencourt (Bettencourt, 2010, p. 14), a business can begin from customer needs and proceed to breakthrough services. The method for a successful service strategy development has four steps:

Step 1. Select the innovation focus.

Step 2. Detect the customer needs.

Step 3. Prioritize the customer needs.

Step 4. Develop a services strategy. (Bettencourt, 2010, p. 15).

The open service innovation concept map, which is developed to escape the commodity trap, also has four steps:

Step 1. Think of your business as a service business.

Step 2. Cocreation

Step 3. Open Innovation

Step 4. Transforming business models (Chesbrough, 2010b).

As these methods reveal, an outcome-driven innovation to create breakthrough products and services also has to first capture the customer's inputs (Ulwick, 2005, p. 15). Existing studies that began from the consumers' demands and expectations are the catalyst of a firms' innovation. However, because entrepreneurs are everywhere (Ries, 2011, p. 8), following the cycle shown in Figure 5, which begins from concrete and intensive consuming activities, consumers can actually develop new business models by themselves (Franke & Piller, 2004).

First, developing particularly addictive consumption areas of interest is the starting point of a consumers' business model development. Because the consumption group is identified by consumers with a critical mind, it thus becomes the target of business models. This corresponds to the customer segmentation step.

Second, consumers grasp problems related to certain products or services more introspectively in areas on which they focus. This corresponds to value proposition proposed by the business model.

Third, consumers propose creative solutions for any problems they have found. In business model development, this step corresponds to the technology systems step in which consumers come to propose systems to create value for consumers and deliver the value to other consumers.

Fourth, in the product development step, consumers present concrete cost and revenue for coming true solutions for conquering problems. This also corresponds to a similar step in business model development, wherein manageable costs and relevant revenues are proposed.

Fifth, in the firm building and marketing step, consumers at firms' state deliver products that were developed and proposed, based on their critical mind, to other consumers. This step thus corresponds to the connection with a customer step in business model development steps.

For those business models that have been developed based on customer entrepreneurship, as mentioned above to be sustainable, they should be combined with competitive strategies, open innovation business model platforms, or business model patent development. In particular, to apply for patents for the business models, the aforementioned five steps should

be combined with IT so that they can be developed in more creative forms with innovation, progress, and usefulness.

3.3. User entrepreneurship-based new business model development

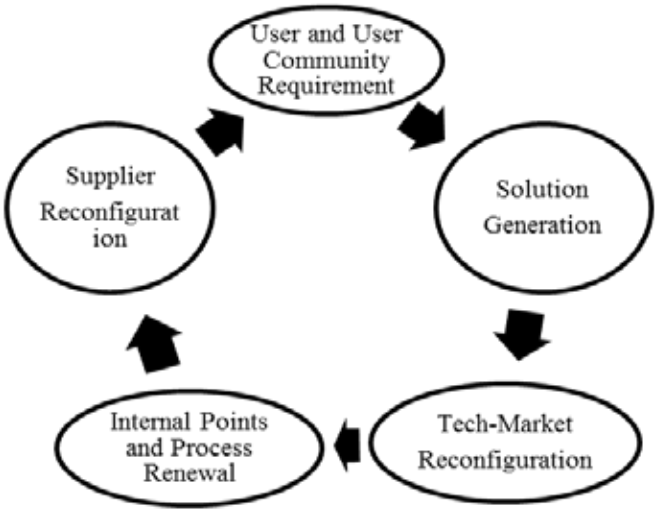

Figure 6. User entrepreneurship-based business model development cycle

It is known that end users of products and services sometimes innovate and that these innovations developed by users occasionally become the basis for important new commercial products and services (Morrison, Roberts, & Von Hippel, 2000). In particular, the main agents of user innovation in the areas of technology-based capital goods industries, such as medical devices, tools, and cutting-edge equipment, are mostly small- or medium-sized enterprises (SMEs) rather than individuals. However, the word "user" in user innovation considerably overlaps with the word "customer", when used scientifically (Von Hippel, 2005). Therefore, in this study, the main agents of user entrepreneurship based new business model development are limited to the main agents of user innovation of capital goods or cutting-edge technology products. In other words, end user does not belongs to this category. This is in order to clearly differentiate the former from customer entrepreneurship (Yun, Nadhiroh, & Jung, 2013). Almost 30 years ago, innovation by user was generally regarded as a minor oddity. However, today it is clear that user-centered innovation is a very powerful and common phenomenon (Von Hippel, 2009). This is due to the following facts.

First, concrete demands from the current user or user community of a firm's products are easily understood (Von Hippel, 2009). Understanding the users' new demands corresponds to the discovery of new customer segmentations. The user community has been an important external source of a firm's product or service innovation (Hau & Kim, 2011).

Second, in the solution generation step, the countermeasures against the demands or expectations raised by users are clarified. This step corresponds to the value proposition step of the business model development steps. The solution of the concrete demands presented by the users corresponds to the value that should be created by new business models.

Third, to realize the solutions, ways to recombine technologies and markets between the technologies and markets already owned by the firm and those that are not owned by the firm are realized. In this step, the value propositions, which were newly proposed based on the users' new demands, are concretely realized. This step corresponds to the business model development's technology system step.

Fourth, in the internal points and process renewal step, the core capabilities that must be improved or revised among the core capabilities internal to the firm are clarified. This step corresponds to the business model development's cost and revenue clarification step. In this step, the necessary costs to realize the new value propositions and related profits are clarified.

Fifth, matters that must be improved, replaced, implemented firsthand, and be entrusted to suppliers among matters implemented by suppliers on the value chain of the firm, are newly determined. This step creates concrete connections with customers anew.

The aforementioned user entrepreneurship-based business model developing is suitable as a new business model development process for existing firms' switching start-ups. If this business model is implemented based on IT with more systematic innovation, progress, and usefulness, a patent for the business model may be applied.

3.4. Social entrepreneurship-based new business model development

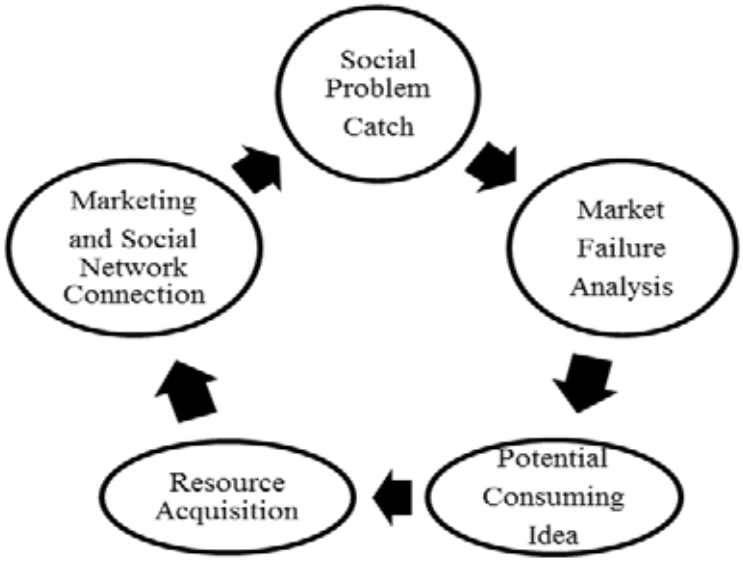

Figure 7. Social entrepreneurship-based business model development cycle

Social entrepreneurship combines the passion of a social mission with an image of business-like discipline, innovation, and determination commonly associated with, for instance, the high-tech pioneers of Silicon Valley (Dees, 1998; Martin & Osberg, 2007; Yun, Park, & Avvari, 2011). The process of social entrepreneurship involves five steps:

Step 1. Opportunity recognition, including social problems, and unmet needs.

Step 2. Concept development, including the identification of social rewards.

Step 3. Resource determination and acquisition, including financial resources.

Step 4. Launch and venture growth, including expansion and change.

Step 5. Goal attainment, including attainment of a stable service equilibrium (Brooks, 2008).

In the first step, social problems are understood through diverse channels, including media, such as the newspaper and broadcasting news, site visits, and individual experience. This step corresponds to the customer segmentation step among business model development steps; recognizing concrete social problems is the starting point.

In the second step, which is the market failure analysis step, concrete causes of the social problems are perceived. In particular, values that do not act in markets but are socially necessary are perceived and understood in this step. This step corresponds to the business model development's value proposition (Austin, Stevenson, & Wei-Skillern, 2006; Zahra, Gedajlovic, Neubaum, & Shulman, 2009).

Third, in the potential consuming idea step, systems that will concretely solve social problems are developed. This step corresponds to the business model development's technology system. In this step, importance is given to systematically realizing the blended value, while simultaneously considering the enterprise value and social purpose (Brooks, 2008, p. 71).

Fourth, in the resource acquisition step, the social capitals that are the grounds for the existence of social enterprise among others are secured and social welfare is clarified (Adler & Kwon, 2002; Portes, 2000). This step corresponds to business model development's cost and revenue clarification. In this step, the peculiarity of costs and revenues should be noted.

Fifth, in the marketing and social networking step, social networks through which social value is distributed are clarified to create connections with customers.

The social entrepreneurship-based business model development cycle approach is a way to create business models that create sustainable social value for second-class citizens, such as the elderly, the youth, the minorities, and the unemployed (Hirshleifer, 1971). Business models for the creation of social value should also acquire competitive strategies, open innovation business model platforms, or business model patents for sustainable growth and development. The way to secure business model patents through the creative implementation of the five components based on IT is a new, sustainable strategy of social entrepreneurship.

3.5. Engineer entrepreneurship based new business model development

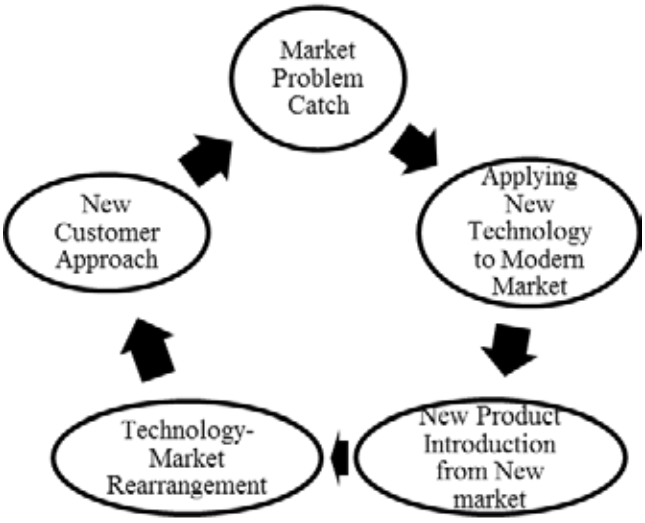

Figure 8. Engineer entrepreneurship-based business model development cycle

Engineer entrepreneurship refers to engineering specialists who have expanded their understanding of markets, established business on their own based on their engineering expertise or technologies held by them, developed related products, and are selling those products in markets (Nichols & Armstrong, 2003). The University of Texas in Austin opened an engineering entrepreneurship course to provide opportunities for the commercialization of specific technologies to students. In addition, diverse engineering entrepreneurship programs have been studied to promote business start-ups for students who major in engineering, through market or economy education (Creed, Suuberg, & Crawford, 2002; Dabbagh & Menascé, 2006; Refaat, 2009). In addition, a few studies have also been conducted on technology ventures that began from technologies. These studies discussed steps on how to establish new firms (Dorf & Byers, 2005, p. 133; Li & Atuahene-Gima, 2001). However, the discussions on engineer entrepreneurship-based business model development that began from the viewpoint of engineers, have not yet reached a sufficient establishment of their development as a concrete business model.

First, in the market problem catch step, which corresponds to the customer segmentation step, engineers perceive the tentative consumer demands from the standpoint of the most refined consumers based on their technological expertise (Young & Simon, 2006, p. 210).

Second, in the value proposition step, engineers apply their technological expertise to create solutions perceived from the standpoint of the most refined consumers (Isaacson, 2011, p. 71).

Third, in the technology system step, new products suitable for the anticipated markets are introduced (Brandt, 2009, p. 89). In this step, the systematic combination of new markets and new technologies is clarified.

Fourth, in the technology-market rearrangement step, the costs and revenues related to the introduction of new markets and new technologies are clearly presented. In this step, engineers should clarify costs and revenues from the viewpoint of their new products' users and contributors, in particular (Goldman & Gabriel, 2005, p. 229).

Fifth, in the new customer approach step, customers are newly defined, connection channels are identified, and all marketing plans for the relevant customers are renewed because the engineers are approaching new markets with new technologies. This step corresponds to the business model development's connection with a customer step.

The engineer entrepreneurship-based business model development cycle is attracting attention as a new alternative for a new business model development, based on the valuable technologies in the economic reality where both economically valuable technologies and patents increase because of the acceleration of the knowledge-based economy. Therefore, it is essential that in the development of business models, the engineers are willing to go beyond their role as researchers, and expand their role into those of entrepreneurs. Although there are considerable limitations in additionally acquiring business model patents for these business models because they are based on source technologies, these business models act as a very important element for the firms' sustainability, along with competitive strategies and other similar factors.

4. VALIDATING THE FOUR BUSINESS MODEL DEVELOPMENT CYCLES THROUGH SOCIAL EXPERIMENTS

Table 2. Summary of the social experiments for the four business model development cycles

Division	Kind	Content
Social Entrepreneurship	BM Patent Apply: 2 Register: 2 Reject: 0	Smart weekend farm system Apply: 2011.11.17, Issue:2013.07.01 Smart social library service system Apply: 2012.02.01, Issue:2013.11.27
Customer Entrepreneurship	BM Patent Apply: 9 Register: 3 Reject: 6	Online photographing linkage system Apply: 2010.05.11, Rejected Method and system for mediating Internet transactions using a transaction map Apply: 2011.08.09, Rejected Online clothing design and trade system Apply: 2011.01.21, Rejected Smart real-time concert system Apply: 2011.11.17, Register:2013.05.30 Real estate development information intermediate method and system Apply: 2012.02.08, Register: 2014.04.18 Method and system for offering the ranking of a law specialist Apply: 2012.02.28, Rejected Smart medical service matching method Apply: 2012.02.1, Rejected Real-time social commerce providing server, and method thereof Apply: 2012.02.15, Rejected Time and location based survey marketing service providing server and method Apply: 2012.01.31, Register: 2013.09.23
User Entrepreneurship	BM Patent Apply: 6 Register: 1 Process: 5	Apparatus and method for a postcorrection on a mobile terminal, thereof Apply: 2013.04.04, Issue: 2014.04.18 How to make circulating public relations servers and home pages Apply: 2013.06.18 Bank item service device and method Apply: 2013.07.12 Essay editing service device and method Apply: 2013.07.12 Open business platform service method and device Apply: 2013.11.12, Bed system for detecting sleeping conditions and sleeping condition detecting method Apply:2013.11.25,
Engineer Entrepreneurship	Engineer Interview Entrepreneur Interview 3 firm founders who have engineering background	HyungWoo Lee: MIDAS IT Ltd. Founder and president Interview: 2014.04.24 MinHwa Lee: Ex-president of Medison Ltd. (now Samsung Medison) Interview: 2014.04.24 YoungDal Kim: IDIS Holdings President and Founder of IDIS Ltd. Interview: 2014.05.23

First, in the case of social entrepreneurship, the research team held self-seminars, developed business models according to the cycle shown in Figure 7, and applied patents for the business models. Among others, as the lack of stable revenues in farm villages in Korea and fear of unhygienic food in cities came to the forefront as major problems in the Korean society between July and November 2011, a "smart weekend farm system" business model was developed. This model follows the cycle that begins from an in-depth analysis of social problems. Later, a patent for the business model was applied. In addition, between December 2011 and January 2012, issues regarding jobs for elderly persons and modern-city dwellers

who do not read books came to the forefront in the Korean society. With this, the in-house research team again intensely concentrated its efforts on the same problems to develop a "smart social library" business model, again following the cycle show in Figure 7. Patents for the business model were again applied. Both patents were registered and plans to transfer the relevant business model patents to public enterprises, the government, and related private firms and to implement business models are being currently promoted. In the case of social entrepreneurship-based business model development cycles, accurately segmenting the customers through social problem catches, among others, will enable balance security between the enterprise value and the social value, as well as secure the necessary driving force for a sustainable development of firms.

Second, in the case of customer entrepreneurship, voluntary applicants who wanted to establish businesses were recruited. The business models were developed by following the customer entrepreneurship-based business model development cycle shown in Figure 5, which begins from the applicants' personal costuming behaviors. The nine business model patents were then applied, resulting in the registration of three patents. Among others, because individual applicants clarified their consumption addictions, target customer segmentations and value propositions directed on them could be concretized. When the individual participants began from their consumption behaviors to develop business models, the cycle shown in Figure 5 acted as a useful toolkit. Among the applied business model patents, the four that have not been registered, online photographing linkage system, method and system for mediating Internet transactions using a transaction map, online clothing design and trade system, and method and system for offering the ranking of a law specialist, led to firsthand business start-ups by the relevant applicants for business model development. As for the three business models that have been successful in registering their patents, smart real-time concert system, real estate development information intermediate method and system, and time- and location-based survey marketing service providing server and method, both the business model developers and the existing firms interested in the relevant business models are concretely preparing for new business start-ups or business model expansion using the aforementioned models. In addition, both the smart medical service matching method and the real-time social commerce providing server and method thereof were used in business start-ups by the participants in the development, joint business start-ups, or expansion of business models for existing businesses. However, these two business models failed to register patents, and thus failed to lead their models to concrete business start-ups.

Third, in the case of the user entrepreneurship, voluntary participants, who wanted to develop new business models, were recruited from among those who had already established a business and were running a firm. On the other hand, those who were participating in the management and business model development made attempts beginning from their demands. Beginning from the participants' user requirements regarding products currently in production, concrete business models were developed using the cycle shown in Figure 6 as a toolkit. Currently, six business model patents have been applied; one of them has already been registered, while the remaining five are still under the examination for patents as they wait for disclosure in the KIPO's database. However, regardless of whether or not their patents have been registered, four of them, the apparatus and method for postcorrection on a mobile terminal, thereof; how to make circulating public relations servers and home pages; open business platform service method and device; and bed system for detecting sleeping conditions and sleeping condition detecting method, were already adopted by the voluntary applicants who participated in the patent applications. These were then added to their existing firms' new business models for running their business. The remaining two business models, the bank item service device and method, and the essay editing service device and method were not yet included the relevant firms that participated in the development as new business models. Currently, these last two are still for internal review.

Fourth, in the case of engineer entrepreneurship, the engineer entrepreneurship-based business model development cycle shown in Figure 8 was set as a toolkit, so that the development of new business models can begin from detecting the market problems, based on the engineers' deep technological expertise. In the development step, the said cycle was applied to the experiences of Steve Jobs, the cofounder of Apple, and Larry and Sergey, cofounders of Google, in business model development and business start-ups to secure the validity in advance. Because the validity of this business model development toolkit was secured through in-depth interviews with their representative founders in Korea, who began as excellent engineers and later succeeded in business start-ups in their respective expertise, social experiments different from those conducted with the other three cycles were conducted with this toolkit. Medison is currently Samsung–Medison, which is a cutting-edge medical device manufacturer that represents Korea. The business model development methodology could be verified, revised, and supplemented through its founder's, MinWha Lee, experience in business start-ups. Lee graduated from Seoul National University's College of Engineering, one of the best colleges of engineering in Korea. An interview with him regarding business start-ups was conducted for this study.

HyungWoo Lee, the founder of MIDAS, was going toward a new technology market rearrangement through the existing market problem catches, based on his expertise in vessel development SW solutions. His company, MIDAS, is a world-class solution development firm for the development of SW for large structures, such as construction and ships.

YoungDal Kim, the founder of IDIS, which is a world-class security solution firm, carefully caught problems in the existing markets based on typical technological expertise, and step by step, went toward new technology applying to modern markets based on the results. In particular, the engineer entrepreneurship based business model development cycle is indispensable in cases of business start-ups by engineers. The said model, under the current education system, is actually rare. Within the current education system, the division and differences among social science, engineering, and natural

science are vast, both for high school and university. However, if engineers succeed in business start-ups, they will bring about great social success. The reason behind the fact that excellent engineers, who received Ph.D. degrees, are mainly academics, rather than business start-ups, is the fact that it is not easy for them to understand markets and learn successful new business model development methods. This is the reality in Korea. Figure 8 was developed to respond to such demand and was then applied to cases of engineer entrepreneurs who have already succeeded with their business start-ups to secure its validity ex post facto, and improve the toolkit to accommodate the current conditions of the society.

5. DISCUSSION AND CONCLUSION

5.1. Discussion

First, this study identified that the source of new business models is convergence. The fact that convergence between customers and producers, between users and suppliers, between social requirements and market requirements, and between technologies and markets is the source of a new business model development was identified through this study.

Second, this study proved that open innovation is the starting point of a new business model development. Both inward open innovation, in which firms actively utilize external technologies, and outward open innovation, in which a firms' internal technologies are not utilized, are commercialized outside the firms. These are based on the open relationship between technologies and markets. Also, since creative connections or bridges between technologies and markets are part of business models, developing creative business models without open innovation is impossible.

Third, to develop business models utilizing the four business model development cycles and move toward business start-up, the business model developer should accumulate diverse kinds of creative energy in everyday life through several ways. According to interviews four following efforts are good ways to accumulate creative energies. The following efforts are: (1) frequent travel to domestic or overseas cities, (2) meditation and contemplation while taking a walk for at least one hour one time, and (3), efforts to intentionally make time for enjoying the arts such as music, painting, and movie *et al*.

Fourth, making efforts to actively develop business models and apply patents for business models is a way to overcome the arrow information paradox, as well as the chasm and Death Valley perceived due to the existence of great gaps between technologies and markets. In a knowledge based economy, instances wherein technologies are not naturally and directly connected to markets still remains the same Among the 17 business models developed in the process of this study, four led to new business start-ups, and six led to switching and expanding business start-ups. The remaining seven business models have been actively taken by diverse entities for new or switching business start-ups.

5.2. Conclusion

In this study, first, based on previous studies on business models and open innovation as theoretical foundations, the four business model cycles, customer entrepreneurship-based business model development cycle, social entrepreneurship-based business model development cycle, user entrepreneurship-based business model development cycle, and engineer entrepreneurship-based model development cycle were developed. The validity of these business models was enhanced through applications for and registrations of business model patents, application of the business models to new or switching business start-ups, and ex post facto verifications through interviews with engineers who have greatly succeeded in business start-ups.

An implication of this study is the fact that the four types of business model development toolkits, which can be utilized by individuals and firms on their current positions, were developed. Because the individual business model development cycles were developed from the four viewpoints on the knowledge funnel and were verified and supplied by applying them to actual social experiments, they can be seen as both suitable and applicable for the individuals' current positions

However, more people should develop business models that utilize these business model development cycles and actually establish businesses. Success of the development and establishment of business models that successfully create profits in markets is important in accumulating cases for such. By applying these models to the entire processes of business value chains, these models should be further refined and more detailed processes suitable for more situations should also be developed. Also, experiments that would actually utilize the engineer entrepreneurship-based business model development cycle to develop actual business models, apply for and register patents, and lead to business start-ups are necessary.

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UTILIZING DESIGN IN FACILITATING INNOVATIONS AT TURKISH FIRMS

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ABSTRACT
In response to the call of the European Commission (2010) this research aims to understand the extent to which leading Turkish firms utilize design thinking in facilitating innovations. A theoretical framework of design management is built based on literature review, and multiple case study methodology is applied in which 20 Turkish companies from a variety sectors are studied through on-site observations and interviews with their managers using the developed framework. Eight models of design capacity were identified based on the empirical study, and results show that firms differ in their use of design management practices in facilitating innovations. This research contributes to the emerging field of design management, building on the works of Kootstra (2009), Heskett & Liu (2012) and Storvang *et al*. (2013).

KEYWORDS
Design management; innovation; Turkey

1. INTRODUCTION
As the lifeblood of entrepreneurial activity, innovations have been recognized for long as a major source of creating competitive advantage and generating economic growth (Schumpeter, 1934), but a better understanding of what makes a successful innovation and innovation process is needed (Becheikh *et al*., 2006). Innovations are defined broadly as the development and use of new ideas and behaviors in organizations and narrowly as technologically new products and processes or significant technological improvements in products and processes (Damanpour and Wischnevsky, 2006). They can be classified as technical innovations or administrative innovations, product innovations or process innovations, closed innovations or open innovations, and radical innovations or incremental innovations. The innovation process can be conceptualized as one of problem finding, problem selecting, solution finding, and solution selecting, and this coincides well with design thinking as a problem-solving process of combining theory and practice (Owen, 2007; Beckman and Barry, 2007).

Traditionally designers have been utilized to improve the look and functionality of products. However, it has been observed that many such innovations have failed due to not taking into account customers' needs. As a result, the design thinking, representing a user-centered approach and utilizing multi-disciplinary teams has emerged as a new discipline (Buchanan, 1992). It aims to use a designer's methods to match people's needs (desirability) with what is technologically feasible (feasibility) and what a viable business strategy can convert into customer value and market opportunity (viability) (Brown, 2008). Human-centered design is at the core of innovation activities that go beyond aesthetics, i.e. innovation is driven by a thorough understanding and observation of what users want and need in their lives. As such, design has been identified as a strategic tool for firms to drive value creation and bring competitive advantage through differentiation (Kotler and Rath, 1984; Martin, 2009).

For design-intensive firms, design plays a key role in their innovation strategies, and these firms are found to be more innovative than others (Verganti, 2008). On the other hand, although design has a direct contribution to creativity and innovativeness, its impacts on firm performance are not immediate; they are to be achieved in the long-run (Wattanasupachoke, 2012). Chiva and Alegre (2009) suggest that it is not pure investment in design but the effective management of design processes that leads to improved business performance.

The European Commission has also acknowledged design management as a key competence related to innovation management (Kootstra, 2009). It included design as one of ten priorities in European Union's innovation policy stating in its vision statement for 2020 that design should be a well-integrated element of innovation policy across Europe (European Commission, 2010). However, the cross-disciplinary field of design management is still in a state of emergence seeking to establish itself in its own right (Erichsen and Christensen, 2013), and there is still not enough understanding on design capacities of firms which enable design-driven innovations (Storvang *et al*., 2013). There is a lack of knowledge on the manner and extent to which European businesses integrate design into their management structures (Kootstra, 2009).

This research aims to contribute to this gap by studying design management capacities of selected leading firms from Turkey, a candidate for membership to the European Union. The research questions are the following.

What is the situation of design management among leading Turkish firms?

How can Turkish firms further develop their design management capacities?

The rest of the paper is organized as follows. Relevant literature is reviewed, and the theoretical framework is presented

in section 2. Methodology is described in section 3, and results are shared in section 4. Finally, the paper ends with a discussion in section 5.

2. THEORETICAL FRAMEWORK

Design thinking is a process of continuously redesigning a business based on insights from users addressing product, process and business model innovation (Martin, 2010). Divergent thinking involving a diverse group of people is the route to innovation in design projects which go through the stages of inspiration, ideation and implementation (Brown, 2008). The inspiration stage starts with a problem that motivates the search for solutions. At the ideation stage potential ideas to solve the problem are generated, developed and tested. Trying early and often is key to face failure before it gets costly. The pay-offs are high when the firm builds a "test and learn" capability (Davenport, 2009). The selected idea will be productized and marketed at the implementation stage.

The design staircase model developed by the Danish Design Centre has identified four levels in which design is utilized at firms (Ramlau and Melander, 2004), and the DME staircase model developed by Design Management Europe (DME) has added a second dimension of design management to the model developed by the Danish Design Centre (see Kootstra, 2009). At the lowest level, there is no systematic use of design (i.e. no design management). If any use, it will be on an ad-hoc basis with limited targets and management. Importance of differentiation is not recognized by firms at this level. At the second level, design is understood and used as final finishing and styling of products. As such, it is an aesthetic add-on function and designers are involved at later stages of the innovation process (i.e. design management as project). Design is used more as a marketing activity and not for innovating new products. At the second level, coordination of design activities is low, and responsibilities are concentrated in the hands of few persons in the firm. At the third level, design is an integrated but not controlling part of innovation processes at firms (i.e. design management as function). Importance of design on innovation and differentiation is well-understood by firms at this level and as a result, the use of design is not limited to products and spans to innovation processes. At such firms there will be dedicated people or a department for management of design activities, and design is used proactively in product development and innovations. Finally at the fourth level, design is seen as a central strategic element guiding innovation activities (i.e. design management as culture). Firms at this level aim to be market leaders through design innovation. All employees, including senior management and different functions, are involved in applying design thinking in innovating, and design is a deeply integrated part of corporate culture in these firms.

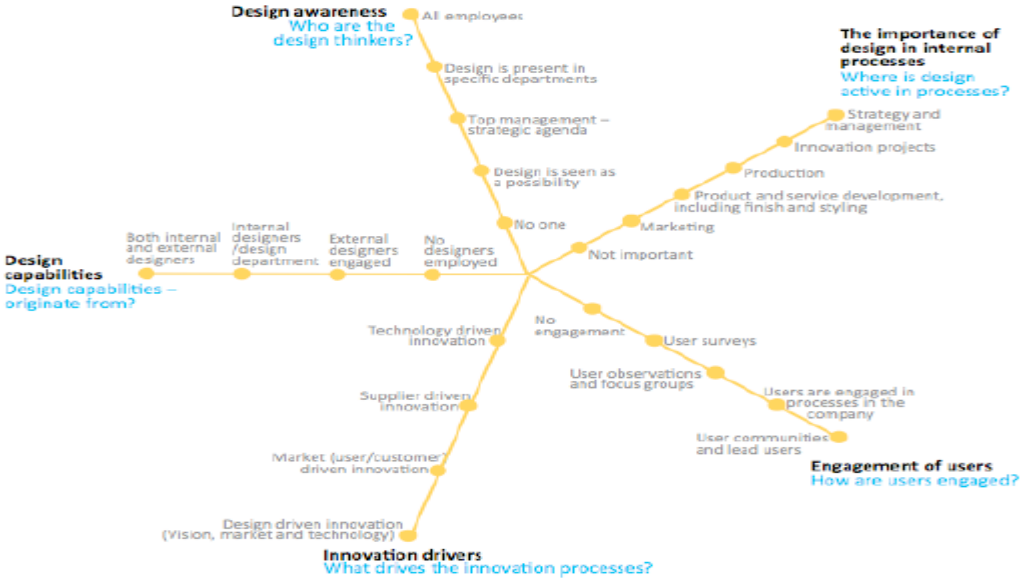
The dimension of design management is described by five factors in the DME staircase model. These are awareness, process, planning, expertise, and resources. The awareness factor is the extent that a firm knows about the potential value of design management. Lack of awareness by senior management is a significant barrier to its use. The process factor measures the existence of formally established, effective design management processes embedded in core business practices. The planning factor reflects the development of a strategy for design which is documented in business plans with clear design objectives and principles, and communicated throughout the firm. The expertise factor addresses the quality of the staff, tools and methods involved and applied in design processes. Expertise can be both from inside or outside of the firm. Finally, the resources factor shows the total amount of investment (including budgets and number of staff) in design projects. Firms at different levels may score differently in each of these factors.

Heskett and Liu (2012) have differentiated design management at three levels: strategy, function, and operation. The strategic level addresses recognition of design's importance by senior management and its role in firms. The functional level refers to how the design function should be organized in firms, and the operational level covers use of design in projects. Their framework, which was developed in Chinese context to study design capacities of firms, is based on six criteria. These are firm size (small, medium, or large), design awareness (by top management or whole firm), design and competitiveness (whether design is identified as a competitiveness factor or not), internal design (whether there is an established design team in the firm or not), design work assigned to (no designer, internal design, external design, internal and external design), and design process (flexible or standardized). There is room for improvement regarding some of the criteria in this framework. First of all, firm size is a demographic variable which cannot be attributed directly to design capacity. As such, in our opinions, it can be omitted and not be included as a criterion in the framework. Secondly, the criteria of internal design and design works assigned to are not independent criteria. This is because internal design checks whether there is an internal design team or not while design works assigned to does a similar job in checking the source of design capabilities (internal or external or both). Similarly, there is also inherent correlation between the criteria of design awareness and design and competitiveness. The higher is the degree of awareness, the higher would be the probability that design is identified as a competitiveness factor. Thirdly, some of the categories under the criteria can be further fine-tuned in order to assess the design capacity more sensitively. Instead of having either or categories use of Liikert-scale measures to assess the criteria may be recommended. For example, the criterion of design and competitiveness could be measured as the degree to which design is identified as a competitiveness factor. Similarly, design process criterion could be measured from as the degree to which design processes are standardized or flexible.

Inspired by the work of Heskett and Liu (2012), Storvang *et al.* (2013) have introduced a similar framework for design capacity in Danish context which builds on the following five dimensions: design awareness, the importance of design in internal processes, engagement of users, innovation drivers, and design capabilities, and each dimension is divided

into categories for measurement purposes (see Figure 1). Design awareness dimension addresses the question of who the design thinkers are while the importance of design in internal processes dimension aims to answer where design is active in processes. The engagement of users dimension tries to understand how users are engaged, and the innovation drivers dimension looks at what drives the innovation processes. Finally, the design capabilities dimension analyzes where design capabilities originate from. The framework by Storvang *et al.* (2013) is more comprehensive than that of Heskett and Liu (2012), but there are issues in some of its dimensions in terms of measuring design capacity. Design capacity is defined as the firm's ability to implement design practice on strategic, functional and operative levels (Heskett and Liu, 2012) and used in order to measure how equipped the firm is to bring design into play to support innovation processes (Storvang *et al.*, 2013).

Figure 1. The framework for design capacity by Storvang et al. (2013)



Let's analyze in the light of this definition how the framework performs and how it can be improved. Categories in the dimensions of design awareness, engagement of users, and innovation drivers are logical measures for design capacity. Design capacity is higher if more people in the firm are aware of design (and its benefits), if users are engaged proactively in innovation processes, and if innovations are driven by design or users than by technology or suppliers. However, it is not easy to trace similar logical increase in design capacity in the categories of the remaining two dimensions. In the dimension of the importance of design in internal processes, design can be active in production but not in marketing, but this does not suggest that the firm has a higher design capacity than another firm where design is active in marketing but not in production. Similarly, in the dimension of design capabilities, it may be a strategic decision of the firm to outsource design to external designers. Thus, it should not be whether design is carried out internally or externally that measures design capacity but the number and quality of the designers involved in the process as well as the investment made by the firm in the area.

Visualizing design management as a facilitator of innovations and inspired by the works of Kootstra (2009), Heskett and Liu (2012), and Storvang *et al.* (2013), the following framework in Table 1 is proposed for assessing design management capacity of firms. The first dimension is awareness of benefits and principles of design management. This dimension tests the extent to which benefits and principles of design management are known inside the firm. The second dimension is about drivers of the innovation process. This dimension aims to identify the source of the innovation process. The third dimension is about the extent to which users are engaged in innovation process, and the fourth dimension is about existence of established management processes and plans for applying design thinking. Finally, the fifth dimension measures expertise and resources utilized in design management. See Table 1 for the detailed framework.

Table 1. A framework for design management capacity

Dimension	Measures of the dimension
Awareness of benefits and principles of design management (DM)	1: no DM – nobody is aware 2: DM as project – top management awareness 3: DM as function – awareness by designers at design department 4: DM as culture – everybody is aware
Drivers of the innovation process	1: Technology driven innovation 2: Supplier driven innovation 3: Market (user/customer) driven innovation 4: Design driven innovation
Engagement of users in the innovation process	1: No engagement 2: Engagement via surveys 3: Engagement via observations and focus groups 4: Engagement of user communities and lead users
Process and plan of DM	1: No established DM processes or plans 2: Established DM processes in some functions, no strategy of design documented in business plans 3: Established DM processes in all functions, but no strategy of design documented in business plans 4: Established DM processes in all functions and strategy of design documented in business plans
Expertise and resources utilized in DM	1: No designers involved and no investment in design projects 2: External designers are involved occasionally in design projects with limited investments 3: There is an internal design team or an assigned team of external designers in design projects with medium investments 4: All employees have design expertise, and they are involved (together with external designers if needed) in design projects with high investments

3. METHODOLOGY

The research approach was inductive, and multiple case study was selected as the research strategy. Inductive approach was selected since there is need to understand design management capacities in Turkish context, and multiple case study was selected as the optimal strategy because it enables deep exploration of relatively new phenomena and identification of patterns among cases in response to how and why questions (Yin 2003). Multiple case study suits well to the field of design management which is an emerging field, and it was also applied by Heskett and Liu (2012) and Storvang *et al.* (2013).

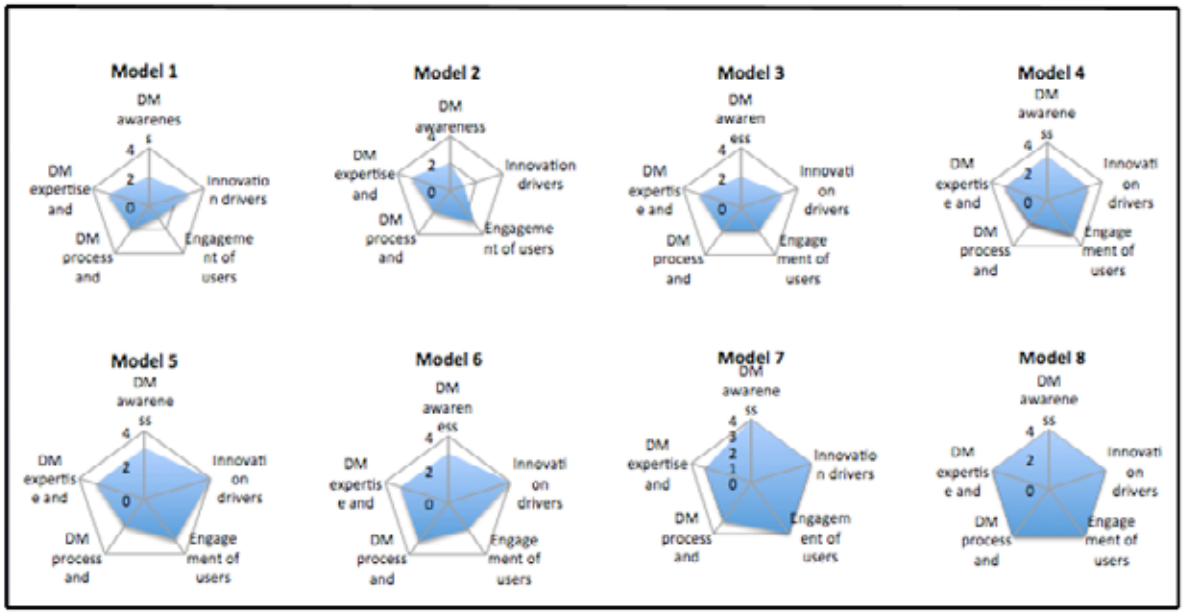
A detailed qualitative survey was developed and interviews were conducted with managers holding different positions in the firms. Information given by the interviewees was triangulated with on-site observations and secondary research. 20 firms were selected among those present in both domestic and international markets or are targeting to internationalize their operations in the near future. They were members of a program called Turquality where their marketing and internationalization efforts are supported and incentivized by the Turkish Government. The sizes of the firms in the research are medium to large. There are three medium firms with 50 to 250 employees. Other firms are large, nine with 251 to 1000 employees and eight with more than 1000 employees. According to Eurostat's NACE Rev.2 classifications, 19 firms are manufacturers from a variety of sectors including manufacture of chemical products, electric domestic appliances, wearing apparel, furniture, food products, construction chemicals, hair and skin supplements, electric lighting equipment, basic pharmaceuticals, textiles, machinery and equipment, motor vehicles and military fighting vehicles, ceramic products and jewelry. Among these 20 firms, 10 are running their own exclusive retail shops, four are only operating on a B2B basis, seven are only operating on a B2C basis, and nine are serving both customers and businesses.

Selected firms were analyzed using the developed framework. Based on collected data from various sources, design capacities of firms were measures in terms of levels of 1 to 4 in each of the five dimensions (see Table 1 for the measures in each dimension), and patterns were identified to classify the firms in terms of their design capacities.

4. RESULTS

The following 8 models of design capacity were identified among Turkish firms.

Figure 2. 8 models of design capacity among Turkish firms.



Model 1 - Firms with low user engagement:

Firms belonging to this category see design mostly as an aesthetic issue related to the finishing and packaging of the products. Although - they use both internal and external resources for design, the awareness is limited to the top management and both research and development and new product development functions work directly with the general manager to develop new products. Since all employees are not expected to contribute to design, processes related to design management are defined only for a limited number of functions and a design strategy is not documented in the business plans of the firm. The innovations are market and customer driven, and competitors' products are closely monitored in order to develop and offer similar products to the market.

Model 2 - Firms with limited innovation drivers:

Firms in this category use technology as an innovation driver rather than suppliers, market / customers or design. Although they use both internal and external resources for design and hold monthly meetings to generate new ideas, the overall design awareness is limited to the top management. They engage the users in the design process through observations and focus groups together with the feedback received from their sales force and distributors when developing new products. Similar to Model 1, processes related to design management are defined only in a limited number of functions, and a design strategy is not documented in the business plans of the firm.

Model 3 - Market-driven firms with product extension innovations:

The main attribute of firms in this model is their market driven innovation and their design efforts being mostly concentrated on product extensions. They do it either by monitoring their sales figures to find out the best selling items or get inspired by new designs introduced to the market. They use both internal and external designers, and most of the time they target a cheaper version of a good selling product. Design management awareness, design management process and planning along with user engagement are again limited in these firms. They consider design management as a project handled by the top management. Processes related to design management are defined only in a limited number of functions, and they engage the customers and users through surveys.

Model 4 - Firms on the way to improve their design capacity:

This is the category with the highest number of firms (9 out of 20) in the research. These firms see design as a function, and their design awareness is extended to the designers along with the top management of the company. Their designs are market / customer driven, and they engage their users in the design process through observations and focus groups. In most of the cases their sales representatives are also involved with the design process through their customer feedbacks. These firms employ both internal and external designers and from time to time conduct joint projects with their suppliers or users to develop new products. Although they have established design management processes in some of the functions, they do not have a documented design strategy in their business plans.

Model 5 - Firms engaged in design driven innovation without a documented design strategy:
In this category, the designers are aware of design management along with the top management, and firms are involved with design driven innovation, utilizing both internal and external design teams. Some firms have even allocated innovation teams or new idea platforms incorporating employees from various departments. However, this is not reflected in the documentation of the companies as the design processes are only defined for some processes, and there is not a documented design strategy. Users are involved in the design process through observations and focus groups. Firms in this category follow a design driven innovation methodology and have become more involved with design and innovative products especially within the recent years and introduced innovative products to the market.

Model 6 - Firms engaged in design driven innovation with limited user involvement:
This category has several points in common with Model 5, including the awareness of the designers of the company along with the top management, the utilization of both internal and external design teams and design driven innovation practices. However, these firms have limited engagement of the users as they only rely on customer surveys when developing new products. Periodic meetings are held with design, production and marketing departments, and all those functions have design processes included in their key performance indicators although a documented design strategy does not exist.

Model 7 - Firms with high design awareness:
Firms in this category have a high degree of internationalization, and most of their revenues and profits come from their international operations. They have a high degree of design awareness, as all employees are aware of design, but design strategy is not documented in their business plans. They set yearly targets for new and innovative products and have been receiving awards in recent years. These firms engage their users in the design process through user communities and lead users and follow a design driven innovation methodology. They have an internal design team along with an external one.

Model 8 - Firms with design culture:
Firms belonging to this category use design methodology in all of their processes, and their design awareness is very high due to the fact that design has become the company culture. All of the employees have design expertise and are involved with design projects. They mostly rely on their internal design team and own employees rather than external designers and use their accumulated design knowledge and expertise. Some of those firms identify themselves as design houses, and they design their products separately for each customer group. They pursue a design driven innovation process and have a distinct design strategy documented in their business plans.

5. DISCUSSION AND CONCLUSION

This research aimed to find out the situation of design management among Turkish firms and suggest paths for them to develop their design capacities. To achieve this purpose a framework was developed based on earlier studies by Kootstra (2009), Heskett and Liu (2012), and Storvang *et al.* (2013). The developed framework enables managers to identify their firms' design capacities and development areas for establishing a design culture, and thus it is a contribution to the growing literature on design management. The framework has five dimensions: awareness of benefits and principles of design management, drivers of the innovation process, engagement of users in the innovation process, process and plan of design management, and expertise and resources utilized in design management. The classification of firms along each of these dimensions was conducted on a scale of 1 to 4 using insights from the works of Kootstra (2009) and Storvang *et al.* (2013). As it was mentioned in the literature review, the developed framework provides a clearer progression in design capacity in each of the dimensions compared to above mentioned earlier models.

The research also makes a significant contribution in response to the European Commission's call (European Commission, 2010) by presenting the current situation of design management among leading firms in Turkey, a candidate country to the EU. Eight models of design capacities were observed among selected 20 Turkish firms. The eight models show different levels of development in the five dimensions of design capacity, and they are more fine-tuned and progressive compared to the six models identified by Heskett and Liu (2012).

The research reveals that Turkish firms differ in the dimensions of the design management framework from being firms with low user engagement (Model 1) to being firms with design culture (Model 8). A high number of Turkish firms (9 out of 20) were classified to be firms on the way to improve their design capacity (Model 4). In order to develop their design capacities, it may be beneficial for managers of these firms to spread awareness of design to all employees and engage them in design projects, engage user communities and lead users in design-oriented innovation projects, and document design into strategy and business plans and integrate it to all innovation processes. Managers can compile their recommendations based on which model their firms are categorized into.

The research has certain limitations. First, findings are about Turkish manufacturing firms. They can't be generalized to service sectors or other geographies. Second, there are limitations in generalizability and further exploration of findings due to the low numbers of cases classified into some of the eight models. For future research, it is recommended to extend the research to other firms in Turkey (including those from service sectors) and also compare the results with results from other

studies conducted in other countries. Increase in the number of firms in the models will also enable further exploration on whether certain firm characteristics (e.g., firm size, industry, or type of operations – B2B or B2C), are correlated with design capacity. Another avenue for future research could be to correlate different models of design capacity with firms' innovation performances. This kind of research could help understand in what ways design capacity contributes to innovation performances. A further avenue for research would be to conduct longitudinal case studies. Such studies could help understand how design capacity evolves in time along the five dimensions.

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KNOWLEDGE CREATION IN SMEs: COMPARING GERMANY AND ICELAND

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ABSTRACT

Purpose: The comparative paper presents initial insights into how small businesses in Germany and Iceland identify the need for new knowledge and how they create new knowledge.
Method: The studies involved are of an exploratory (qualitative) research nature. Data was collected through semi-structured interviews with managing directors of twenty small firms (ten in each country).
Findings: The findings indicate that the need for new knowledge is primarily initiated by problems and bottlenecks, so it is an outcome of a reactive behaviour rather than a proactive one. Once this need for knowledge is identified the managing directors of both countries emphasise creating this new knowledge, consequently this process can be characterized as an active one.
Originality/value: The study´s findings add to the limited information on knowledge creation in SMEs as found in different parts of the world.
Practical implications: The outcomes presented in the paper may help managing directors of smaller firms to make the knowledge creation process more effective, and in that way enhance the firms´ innovation potential as well.

KEYWORDS

Knowledge creation, small and medium-sized enterprises (SMEs), knowledge management, knowledge

1. INTRODUCTION

SMEs play a vital role in most advanced economies in the world. In the European Union, for instance, SMEs represent 99% of all enterprises, provide around 65 million jobs, and are a major source of innovation (European Commission, 2005). In the United States, small enterprises are estimated to constitute 95% of all American businesses and account for approximately two thirds of all newly-created jobs. Small firms have also been crucial for the flourishing of high technology industries in the USA (Rutherford, McMullen & Oswald, 2001). In a global business environment, creation of new knowledge is vital for the survival of firms. Knowledge creation provides value to organizations, and can support them in forming competitive advantage. This might be shown by new product development or patents (Mitchell and Boyle, 2010). While knowledge is considered the most important source of a firm´s competitive advantage, the study of knowledge creation in general is lacking, particularly with regard to definitions and measures (Mitchell and Boyle, 2010). This refers to all organizations, regardless of size. If one addresses the study of knowledge creation in small and medium-sized enterprises (SMEs), however, there is a particular shortage of research. Bearing this in mind, the paper presents initial insights into how managers of small businesses identify the need for new knowledge and how they create new knowledge. Another focus point is whether SMEs face the same issues independent of country of origin, or whether certain societal factors affect the knowledge creation process. In this paper studies on knowledge creation in German and Icelandic SMEs will be presented.

2. THEORETICAL BACKGROUND

Here, we are particularly interested in knowledge creation in SMEs. The concept refers to ways which focus on the construction of new knowledge. The most influential theory of knowledge creation is that of Nonaka and associates (Nonaka, Toyama and Konno, 2002), who argue that the interaction between tacit and explicit knowledge via socialization, externalization, combination and internalization (summarized under the term SECI), leads to the creation of new knowledge. A shared place is also considered important for knowledge creation. Ba provides a platform for advancing individual and/or collective knowledge. Knowledge resides in Ba and is intangible.

The knowledge management process can be divided into capturing or documenting knowledge; packing (cleaning, formatting and indexing) knowledge for reuse; distributing knowledge; and reusing knowledge (Markus, 2001). In all of these steps, new knowledge and opportunities may emerge when individuals and groups sense problems in the process.

Knowledge creations have been measured as a process, output and outcome (Michell and Boyle, 2009). The process perspective assesses the steps or activities undertaken to create new knowledge, such as the uses of metaphors to externalise knowledge. As an output, knowledge creation is measured in terms of an immediate product of the knowledge creation process, usually reflecting a significant enrichment of existing knowledge, such as a representation of a spoken idea. Knowledge creation as an outcome is measured in terms of a value-adding object, for instance, new service, changed routine or product prototype. Here, the link with innovation is quite prevalent.

Former research has shown that new knowledge can emerge by accident (e.g. the discovery of penicillin) or by deliberate

discovery by following a gap in the literature (Allard, 2003). New knowledge can, further, generally emerge from new ideas or by emergent internal or external needs. Often, new ideas are transferred to the organizations via suppliers, professional bodies, consultants or research literature (external influences) or they stem from internal creativity and inventions. New knowledge also originates from needs and pressures from customers, competition, legislation and so on (external forces), or they originate from perceived problems and opportunities noted by the staff and managers of organisations (Daft, 2007; Sparrow, 2005; Hughes, O´Reagan and Sims, 2009).

Knowledge management tools can assist knowledge discovery and creation. For example, knowledge discovery by means of databases (data mining) can provide the basis for improving companies' competitive advantage in the market. According to Jasahapara (2011), knowledge discovery consists of data cleaning, data analysis, model interpretation and integration of results. Such processes are expected to provide deeper insights into e.g. customer demand and quality problems, compared to those obtained from reports, queries, executive information systems and so forth. Similarly, knowledge maps can provide common context regarding ideas, concepts and mental models for employees in an explicit visual model (Eppler, 2003). They can help individuals and groups transfer knowledge into a new context, connect it with previous experiences, and enable an organisation-wide learning process. Regarding innovation, the use of KM 2.0 tools (e.g. blogging, wikis, video casting) can help firms improve. In this case we may talk about "outside innovation", where customers and the "crowd" take on a substantive role in the innovation process by testing ideas and giving feedback on the developmental stage (Ribiere and Tuggle, 2010).

Knowledge creation is closely linked to learning. Learning in organisations, for example, could happen through error detection. This would comprise a proper diagnosis of the error´s cause, and its correction so that organisations can learn from experience and implement suitable actions that are intended to avoid a repetition of these errors (Argyris, 1999). "Often this leads to identifying a need that requires new knowledge to be created to answer the need" (Allard, 2003, p. 375). A shared place is considered important for knowledge creation as well. According to Nonaka, Toyama and Konno (2002), *Ba* provides a platform for advancing individual and/or collective knowledge. Knowledge resides in Ba and is intangible. The interaction between tacit and explicit knowledge via socialization, externalization, combination and internalization, leads to the creation of new knowledge. Finally, organizational culture can facilitate or strain knowledge creation. Hence, a culture characterised by a high degree of change and flexibility will have more positive effects on knowledge creation than cultures marked by stability and formalization (Kayworth and Leidner, 2003).

3. RESEARCH METHODOLOGY

This paper combines two qualitative studies on knowledge creation. The first one was conducted with small German companies (Durst, Edvardsson, and Bruns, 2013). The second one is based on a study of knowledge creation in Icelandic SMEs from different industries (Gudmundsdottir, 2013).

The German study represents firms operating in the building and construction industry. They were identified through convenience sampling. That is, the firms were recruited through the researchers' informal and formal contacts. Data was collected through a series of semi-structured interviews with the managing directors of the firms. Ten firms were involved, which employed at that time between 1 and 210 employees. The interview guide used in the study focused upon general facts concerning the business and managing director and issues related to knowledge creation. The interviews were conducted over the telephone in January 2013.

The Icelandic companies selected for studies came from different industries, such as a manufacturing company, food company, high-tech company and service company. Ten firms were involved which hired from three to 50 employees. The firms were selected according to purposeful sampling, and they were contacted via email or phone. An interview guide supported the interview process, focusing upon general facts concerning the business and managing director and issues related to knowledge identification and creation. The interviews were conducted from December 2012 to March 2013 and took place face to face. The interviews lasted anywhere from 40 minutes to one and a half hour, were recorded and later transcribed (Gudmundsdottir, 2013).

In order to compare the findings of the two studies, the authors of the present paper brought together the interview transcripts of both studies with the objective of identifying specific patterns regarding knowledge creation.

4. PRESENTATION OF FINDINGS

4.1 Identification of the need for knowledge

According to Table 1, the need for new knowledge is identified in various ways in the two countries. The Icelandic managers mentioned foreign influences, such as by going abroad for education, gaining information on new products, machines and raw material, going to trade fairs, and recruiting highly educated employees (in high-tech companies). Educational institutions are also important in new knowledge identification. This is both in order to get talented students to work on projects, and also by asking professors to work with the companies on specialised projects. Foreign students can also test new products as a first step in international marketing. In Iceland suppliers are very important in knowledge identification. Most of the SMEs have suppliers from many countries, but the domestic ones are vital for sharing information on new

products and raw materials that in some cases have led to product innovation. In one case a firm began cooperating with a competing firm with considerable success, in order to achieve more rapid growth and market expansion. Managers are very active in identifying new possibilities, and employees also contribute to the process. In some firms this is done in a systematic way by regular teamwork, while in others the process is more informal. Finally, customers bring with them feedback and comments on products and services that can be used for improvements.

Also in the German firms different sources or incidents represent starting points for the need for new knowledge. This may happen, for example, during personal discussions with different stakeholders such as architects, suppliers and customers. Journals, association releases and trade shows were mentioned as triggers as well. One of the German interviewees, for instance, saw the need for new knowledge in the context of the introduction of new processes. Additionally, the need for knowledge is discovered at construction sites when tasks can no longer be solved using the existing knowledge base. Furthermore, all types of problems can justify knowledge demand. Several other interviewees mentioned sickness and labour turnover as reminders of need for knowledge. One interviewee mentioned changes in standards. This interviewee also stated that the need for knowledge is discovered through "consistent double-checking". Moreover, further training courses or "a feeling of being out of date" are occasions in which the need for new knowledge becomes apparent. News from the trade guild can initiate the need for new knowledge as well.

Table 1. Knowledge identification in German and Icelandic SMEs

	Germany	**Iceland**
Foreign education and influences		X
Educational institutions		X
Suppliers	X	X
Competing firms		X
Employees	X	X
Managers	X	X
Customers	X	X
Architects	X	
Trade shows	X	
Journals	X	
Releases from Associations	X	
Problems at work	X	X
Inefficient processes	X	

4.2 Knowledge creation processes

Table 2. Knowledge creation processes in German and Icelandic SMEs

	Germany	**Iceland**
Brainstorming		X
Informal meetings/gatherings	X	X
Customer surveys		X
Customer feedbacks		X
Mind maps		X
Workshops	X	X
Discussions	X	X

Since knowledge is regarded as crucial resource of organizational development, knowledge creation activities are continuously carried out. It is of great importance to know by which means SMEs develop new knowledge. As can be seen in Table 2 brainstorming is widely used in the developmental stage, where managers, employees and even customers reflect on products. Feedbacks and reflections are used to further improve the products and services. Regular staff meetings and training courses can also serve as a forum for reflection and experimentation. One Icelandic manager mentioned actual sales (of clothes) as an opportunity to learn and develop products. If sales are below expectations, the managers try to explain the reasons and action is taken for the next year. Some firms organise workshops, while others use mind maps in their developmental process. The smallest ones have informal meetings to discuss new ideas. Finally, three firms in Iceland used customer surveys in order to get feedback on their products from customers.

The German firms regularly conduct exchanges of experience, which contribute to knowledge creation. These meetings occur internally and follow different objective paths. For example, in one German firm, the entire workforce meets in regularly held "social rounds" (every six weeks) in order to jointly discuss "problems of a human nature" in an "enjoyable environment". The trainees are the only members of the workforce who do not take part in these rounds. These

meetings are meant to improve the employee network and increase the exchange of information and knowledge. On the other hand, irregular meetings of project groups deal more directly with professional problems. Additionally, a coming together before the start of every work day to discuss the project of the day is typical in the German firms.

Regardless of the type of meeting, each employee is expected to actively participate in the discussion. According to the statements from the German interviewees, this tactic seems to work. The responsible employees later record these suggestions and compare them with the performance contents. The result of this process may lead either to savings in time or quality improvements. One interviewee mentioned the development of new calculation software as an example of an internal knowledge generation project. All employees helped create a central control instrument for the capacity - and time planning - developed from the standard software.

A „conventional way" of knowledge creation in one German company is to conduct workshops. The workshops should profit from the exchange of internal and external participants. The remaining German interviewees would not, or only rarely, conduct workshops. Instead, these remaining companies found informal gatherings to be of better use for knowledge creation. One German interviewee claimed to have at least two employees available for all company functions. This was originally introduced in order to prevent shortages, but also led to the result that the employees could have direct exchanges of knowledge with their colleagues concerning various work processes. This also represented the typical approach for the generation of knowledge for this company.

5. CONCLUSION

The paper presents initial insights into how small businesses in Germany and Iceland proceed regarding knowledge creation. More precisely, information about the identification of the need for new knowledge and the process of knowledge creation is presented. Given the importance of knowledge creation in innovation, on the one hand, and the lack of studies on knowledge creation, on the other, our understanding of the topic would benefit from more research. The present study's intention was to make a small contribution to it.

The findings indicate that knowledge identification and knowledge creation are complicated processes, and that many actors are involved, even among SMEs. This result both underlines that the companies in question are good networkers and that they have realized the benefits of networking activities. In the knowledge identification process, suppliers, customers, educational institutions, employees and managers are all involved and contribute with feedback and suggestions on potential improvements of products and services. One main difference between the two countries appears to be that the Icelandic companies are more outward oriented regarding this issue, whereas the German companies take a closer look at internal processes and operations as a starting point for new knowledge.

Regarding knowledge creation, most firms utilise brainstorming, meetings, customer feedbacks and workshops as the main instruments to generate new knowledge. To a great extent the processes are very similar between the two countries in the study, but two differences are worth mentioning. First, more international influences were noted in knowledge identification among Icelandic SMEs which most likely relates to the small domestic market. Second, the Icelandic SMEs seemed to use more systematic methods in the knowledge creation process than the German ones, for example workshops and customer surveys. The explanation probably lies in the old craft traditions of the construction industry in Germany, whereas the Icelandic firms were more varied in nature, some even classified as high-tech with a tradition of systematic innovation processes. On the other hand, the German companies seem to place a stronger emphasis on internal knowledge creation, which was not found in the Icelandic companies.

The insights generated and presented in this research might be useful to the study of knowledge creation in SMEs as they shed light on how managing directors proceed regarding knowledge creation. The research also outlines some differences and similarities regarding this topic from two different countries. From a practical point of view, those findings may help managing directors of smaller firms to better cope with knowledge creation.

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THE DIFFERENCES IN OPEN INNOVATION BEFORE AND AFTER IPO ACCORDING TO MATURATION OF KNOWLEDGE-BASED SOCIETY: FINDINGS FROM SEOUL DIGITAL COMPLEX COMPANIES

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ABSTRACT
This study attempts to measure the changes of open innovation before and after corporate IPO. It introduces a new concept to measure open innovation using patent information to enhance the ideas of the "width" and "depth" dimensions of open innovation. Based on a review of related literature, three open innovation measures are used: ratio of open innovation (ROI), intensity of open innovation (IOI), and total level of open innovation (TOI). These measures are applied to compare open innovation levels among companies in the Seoul Digital Complex (SDC) in Korea and to analyse the effects of open innovation on company performance.

KEYWORDS
Open innovation; knowledge based economy; cluster; IPO

1. INTRODUCTION
This study is based on a literature study on open innovation and patents. (Nelson and Winter, 1982) We made quantitative analyses through statistics and T-analysis, and made qualitative analysis through in-depth interview.

Open innovation is gradually being established as an innovation paradigm that represents the era of the knowledge-based economy. Open innovation assumes that companies can and should use external and internal ideas as well as internal and external paths to markets as companies look forward to advance their technology (Chesbrough, 2003). The knowledge-based economy, which is the volume of knowledge and technology outside companies, has increased so much that even enterprises with the greatest R&D investment can obtain more ideas for products and services through innovation from the outside (Bianchi *et al.*, 2010; Di Benedetto *et al.*, 2008; Hughes and Wareham, 2010; Yun *et al.*, 2008; Yun *et al.*, 2011; Yun and Mohan, 2012b; Yun and Ryu, 2012). Open innovation is emerging as an important subject in more areas of business and in other socioeconomic activities, such as car assembly, publishing, media, governmental activities, education, and measures for natural disasters. The provision of new products and public services based on knowledge and technologies from the outside as well as the external utilisation of internal knowledge and technologies, which were not previously provided and utilised, is occurring in diverse areas (Sloane *et al.*, 2011; Tapscott and Williams, 2009). On the other hand, several studies have investigated levels of open innovation, but they have been either qualitative or heavily dependent on survey data. This study proposes new measures for open innovation to gauge the level of open innovation in companies using patent data (Chiaroni *et al.*, 2010; Gassmann *et al.*, 2010).

Because open innovation is emerging as a subject of new innovation and new product development in almost all economic areas, it is becoming more important to measure the level of open innovation of companies more accurately and to estimate its implications and effects more specifically. Consulting companies that want to cope with demands of customers for the promotion of open innovation, enterprises that develop open innovation software, and companies that promote open innovation for their own use all require objective means to measure open innovation levels and status.

Above all, the rapidly increasing number of open innovation business models of companies, open innovation platforms, open innovation strategies, and the open innovation levels of companies should be first measured objectively in this era of the open innovation paradigm. Several studies on open innovation have been carried out worldwide since Laursen and Salter (2006) examined the level of open innovation of companies through a questionnaire survey. However, little progress has been made since their study, which evaluated the means to compare the open innovation levels of companies objectively, with the exception of studies based on survey methods or individual case studies (Yun *et al.*, 2010).

This study investigated the methods to measure levels of open innovation. Moreover, the researchers investigated whether they could be usefully applied to the companies before and after IPO.

In this study, the width and depth of open innovation are measured through the analysis of patents applied for by companies. This study also examined the applicability of the method through the comparative analysis of open innovation patents among industries and companies and through the analysis of the relationship between patent-based open innovation

of company and company performance.

Companies included in this study were those in the SDC that applied for patents. As such, KOSDAQ companies in the SDC represent the Korea Industry Complex. (Vrande *et al.*, 2009) This study was conducted based on the Korea Institute of Science and Technology Information (KISTI) patent database. Table 1 shows Company Status of the Seoul Digital Complex (SDC) in Korea.

Table 1. Company Status of Seoul Digital Complex (SDC) in Korea

	Total	IT	*Electronics*	*Machinery*	*Clothing*	*Others*	*Service*
Total Number of Companies	11,191	3,791	2,548	659	655	866	3,392
Percentage	100%	31.8%	21.4%	5.5%	5.5%	7.3%	28.5%
Number of IPO Companies	***61***	***32***	***7***	***9***	***1***	***7***	***5***
Percentage	100%	52.5%	11.5%	14.8%	1.6%	11.5%	8.2%

We selected 61 IPO companies in the SDC area where 11,911 companies are located. We categorised them into five sectors, IT, Electronics, Machineries, Clothing, Other Production, and Services. There are 3,791 (31.8%) companies in the IT sector and 655 (5.5%) companies in the traditional clothing sector. Among KOSDAQ companies, there are 32 (52.5%) companies in the IT sector and 1 (1.6%) companies in the traditional clothing sector. This reflects that KOSDAQ companies are more focused in new industry areas than in traditional areas.

In addition, this study identified patents from January 1984 to January 2014 as objects of analysis, and after 2013, patent application results of companies were not registered in the KISTI DB in the same form to allow comparison. The financial statements of the KOSDAQ companies of 2013, however, were included in the temporal scope of our analysis.

Table 2 shows the patent status of KOSDAQ companies. A total of 11,911 companies applied for 20,955 patents in the SDC area for an average of 2 patent applications per company. KOSDAQ 61 (0.51%) companies have 3,300 (15.72%) patent applications, and thus, on average, 54 patents were applied for per KOSDAQ company.

Table 2. Patent Status of KOSDAQ Companies

	Number of Companies	*Average Founded Year*	*Average IPO Year*	*Number of Patents*
Total Number of Companies	11,911	-	-	20,955
Number of KOSDAQ Companies	61	1993	2005	3,300
Percentage	0.51%	-	-	15.72%

Given the above discussion, this study analysed the level of open innovation using patent data and compared the differences among industries as well as the differences among companies in terms of open innovation patents. In addition, this study examined the effects of open innovation on company performance while controlling the age and size of companies in terms of open innovation patents.

2. LITERATURE REVIEW

When the concept of open innovation was proposed by Chesbrough (2003), it was not conceptualised in a measurable form but was based on various forms of case studies. He also considered companies with trade patents as open innovation companies and conducted an in-depth analysis of these companies. In the process of analysing various open innovation business models, Chesbrough (2006) specifically extended the concept of open innovation of companies to a business model concept beyond open innovation strategies.

Laursen and Salter (2006) first suggested the concept of comparable measurement of open innovation of companies beyond the level of case analysis. For measurement of the open innovation levels of companies, Laursen and Salter (2006) developed the concepts of "width" and "depth" in open innovation and attempted to measure them for the first time. They analysed the relationship between open innovation and company performance by studying manufacturing enterprises in the U.K. Their analysis was based on the data collected through a technical innovation survey of companies considered to be advanced enterprises, and it was based on concepts from the Oslo Manual. They measured the width of open innovation based on the answers of companies that had open innovation levels of more than two points on a five-point scale. They measured "depth of open innovation" based on the answers of companies that had open innovation levels of more than three on a five-point scale. Although these measures developed by Laursen and Salter (2006) provide a foundation for the measurement of the open innovation levels of companies, they have limitations. They measured open innovation levels based on a survey in which the responses were obtained from the companies themselves. Thus, the results were not based

on objective data. The correlation between the width and depth of open innovation showed a very high level of 0.417. As a result, there might be mixed use of different concepts of open innovation width and open innovation depth.

As mentioned before, many studies on open innovation have been conducted using case study methods and interviews, while others have adopted survey-based research methods following the framework introduced by Laursen and Salter (2006) as shown in Table 2. (Li, 2010a; Li *et al.*, 2010b) In other papers, financial data have been utilised to measure company performance (Yun *et al.*, 2009). However, because objective open innovation measuring instruments have not been sufficiently developed or suggested, quantitative data-based research, such as a comparison of open innovation levels among companies and at the nation level, has not been sufficient.

Table 3. Open Innovation Patent Analysis Framework—Dimensions

Analysis Item	*Contents*
Ratio of open innovation based on collaborative patents (ROI)	The ratio of open innovation patents jointly applied for with external agencies to the total number of patent applications by companies through which the breadth of open innovation of a company can be measured.
Intensity of open innovation based on collaborative patents (IOI)	It is the average number of applicants at a specific company through which the depth of open innovation of a company can be measured.
Total level of open innovation based on collaborative patents (TOI)	The result of multiplying the standardised ROI by the standardised IOI. The combination of ROI and IOI can yield the total effect of open innovation. TOI means the combined effect of ROI and IOI.

un and Mohan (2012a) slightly improved the open innovation measuring method of Laursen and Salter (2006). First, they conceptualised open innovation levels on a single measurement basis by multiplying the open innovation's "width" and "depth". In addition, they improved upon the concept of open innovation depth to provide a more logical definition by arithmetically calculating the mean value of five-scale answers obtained from companies in surveys on open innovation levels. However, this approach does not overcome the fundamental problem of the subjectivity of survey-based results and the fact that it depends on the questions developed from the Oslo Manual.

Yun *et al.* (2011) conducted a patent-based analysis for the development of more objective indices to measure the open innovation levels of companies. When companies independently apply for patents, it is most likely the result of closed innovation because the relevant technologies are the result of independent R&D. On the other hand, when companies apply for patents acquired through partnerships with external companies, universities, research institutes, or individuals rather than independently, the same patent ideas can be considered to have been created as a result of open innovation outside of the company rather than within the company. Accordingly, they defined the patents jointly applied for with external institutions or individuals as open innovation patents, and they defined the ratio of open innovation patents to the total number of patent applications as the open innovation level of a company. Through this research, they demonstrated that the open innovation level of Hyundai Motors (approx. 9%) was far lower than that of Toyota Motors (approx. 30%), and the open innovation level of Samsung (approx. 13%) was also much lower than that of Nokia (approx. 65%). However, this study was not able to explain the levels of open innovation dimensionally in the process of patent application of companies. For example, as a patent application by companies filed jointly with external agencies is considered an open innovation patent, measurement of the level of open innovation activity according to the number of external agencies making a joint patent application, i.e., measurement of the intensity of open innovation, was not considered.

In summary, the concept of open innovation has been concretely established through case studies and surveys. The challenge has been to develop objective measures. Survey-based studies have been carried out despite the limitations inherent in such methods. A study by one of the authors has attempted to define open innovation patents and to use this concept to measure open innovation levels more objectively. There are, however, limitations in these newer approaches, i.e., measuring the intensity of open innovation. This study addresses all of these issues.

3. PATENT ANALYSIS

3.1. Research Framework

Patent output is related to the composition of a company's alliance portfolio, including the diversity, depth, and scope of technologies, extent of alliance partner co-specialisation, entry stage of technology development, and extent of prior alliance partner experience (McGill and Santoro, 2009).

This study attempts to measure the difference in open innovation before and after a company IPO. For this end, two key dimensions are defined as shown in Table 3. This study is focused on 61 companies in the Seoul Digital Complex (SDC) of Korea from 1984 to 2014 as shown in Table 4.

Table 4. Scope of This Study

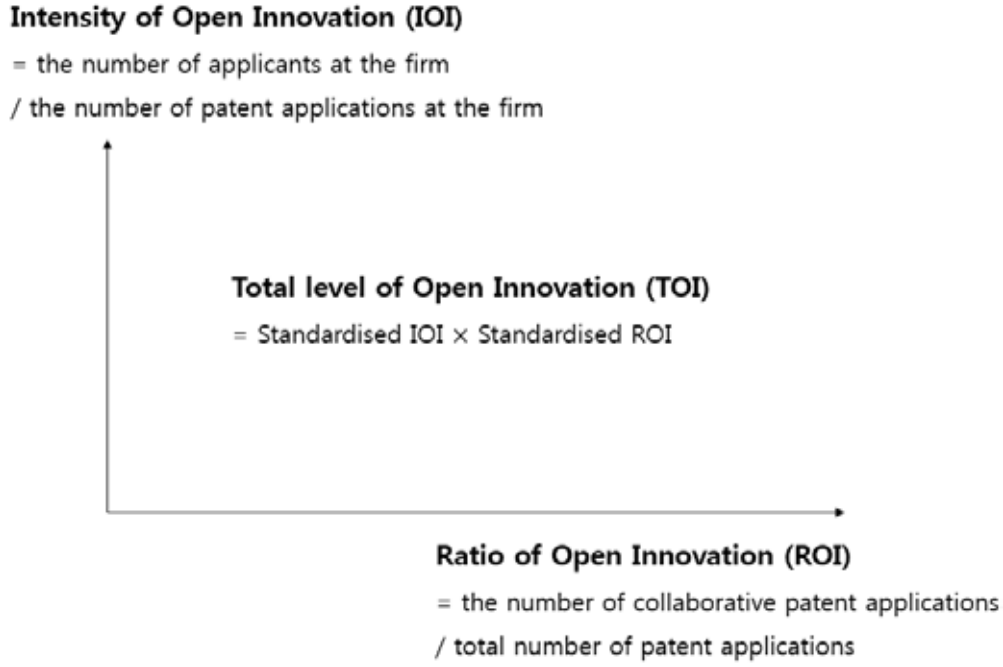
Scope	*Contents*
Year	1984~2014
IT	32
Machinery	9
Electronics	7
Other manufacturing	7
Services	5
Clothing	1
IPO company	61

The patent analysis framework should make it possible to measure and analyse the open innovation levels of companies objectively. Second, the framework should establish an analysis concept that considers both the width and depth of open innovation of companies. Third, these measurement concepts should be able to measure other aspects of the open innovation of companies in such a way that does not allow the existence of a high correlation between the width and the depth of open innovation.

3.2. Re-visit to ROI, IOI, and TOI

As major rudimentary indices that measure degrees of open innovation, the ratio of open innovation (ROI) and the intensity of Open Innovation (IOI), respectively, refer to the ratio of open innovation patents collaboratively applied for with external agencies over the total number of patent applications, and the average number of applicants for the total patents in a specific company. (Yun *et al.*, 2014) Meanwhile, the total level of open innovation (TOI), as in Fig. 1, is measured by multiplying the standardised IOI by the standardised ROI.

Figure 1. The relationship among ROI, IOI, and TOI (Yun *et al.*, 2014)



Unlike IOI that measures the whole depth of open innovation and shows the number of external agencies with which a company performs innovative activities(Serenko *et al.*, 2010), ROI is meant to assess the width of open innovation of specific companies by measuring the proportion of a company's innovation activities that are carried out in open innovation with external agencies. The patents that were collaboratively applied for and registered are fundamentally the consequences of a wide range of innovation activities. (Jeong *et al.*, 2014; Yang and Anderson, 2011; Yoo *et al.*, 2013). For this reason, the earlier study had defined the patents issued by more than two individuals, corporations, or institution applicants as open innovation patents. (Yun *et al.*, 2014)

4. APPLICATION TO THE KOREA SDC

4.1. Patent Application Status

In this section, we start with KOSDAQ company patents in the Korea SDC area, which is regarded as a representative Korean company sector. The patents are analysed to view the differences in open innovation among nations followed by an analysis of differences among companies in the sector.

Table 4 shows the Annual Trend of Patent Application and IPO from 1984 to 2014. Before 2004 a total of 60 companies were established, but after 2005, only one company was established. Before 2004 a total of 29 companies held IPOs, and after 2005 a total of 32 companies held IPOs. A total of 841 applications were made before 2004 per IPO on average, but a total of 2,459 patents applications were made after 2005. That is, an average of 46.7 patent applications per year was made before IPO, but an average of 245.9 patent applications per year was made or 5.6 times more than the pre-IPO level were made after IPO. As a result, before 2014, most companies were established, but innovation was accomplished after IPO.

Table 5. Annual Trend of Patent Application and IPO

Before IPO					*After IPO*		
Year	*Foundation Number*	*IPO Number*	*Patent Number*	*Year*	*Foundation Number*	*IPO Number*	*Patent Number*
1984–1995	25*	1	31	2005	1	3	207
1996	2	0	30	2006	0	2	276
1997	5	1	31	2007	0	5	311
1998	7	1	66	2008	0	4	379
1999	6	3	58	2009	0	4	299
2000	8	7	89	2010	0	6	292
2001	1	5	80	2011	0	5	345
2002	4	9	121	2012	0	2	275
2003	1	2	147	2013	0	1	71
2004	1	0	188	2014	0	0	4
Subtotal	60	29	841	Subtotal	1	32	2,459
Subaverage	2.9	2.9	46.7	Subaverage	0.1	3.2	245.9
Total					2.0	3.1	3,300

*25 can be normalised as 2.1 for 12 years.

Figure 2 shows the Annual Trend of Patent Application and IPO on KOSDAQ from 1984 to 2014. Patent application comprises two stages, the first stage is from 1995 to 2003, and the second stage is from 2005 to 2013. We can predict that the KOSDAQ companies will require new innovation motivation in the third stage. We find that most KOSDAQ companies were established around 2000 when Korean ventures were booming. The number of patent applications continuously increased until 2007 and was saturated thereafter. The Korean government provided incentives for creative economy growth by companies and drove a second venture boom.

Table 6 and Figure 3 show the Patent Application Trend before and after IPO. We divided the total time frame into four periods of three years each. We find that patent applications remarkably increased after IPO and especially rose during the three years before and after IPO.

Figure 2. Annual Trend of Patent Application and IPO

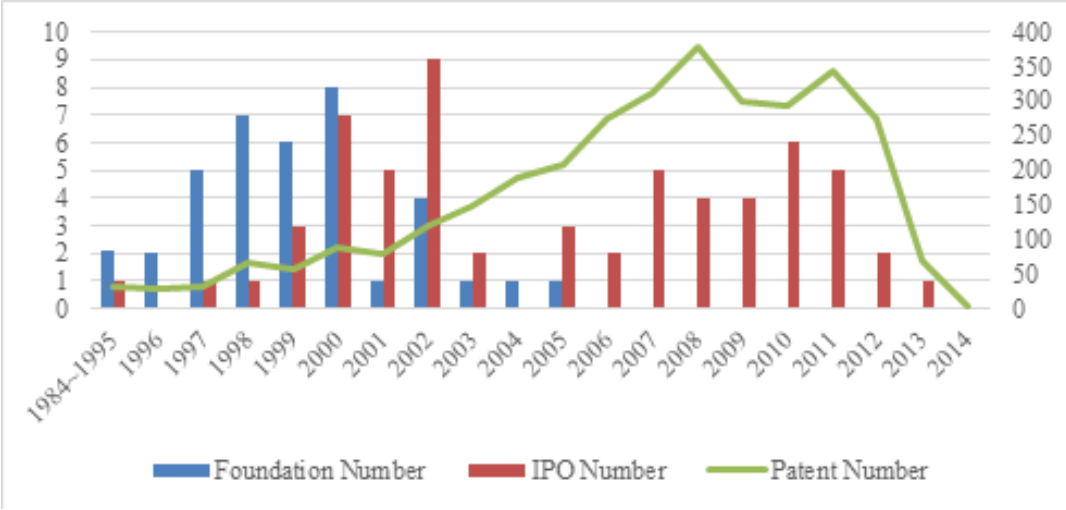
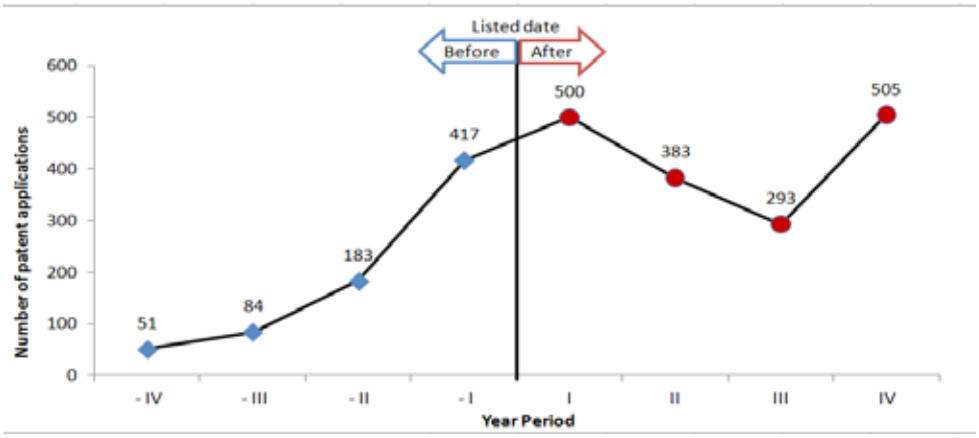


Table 6. Patent Application Trend Before and After IPO

Year	*1*	*2*	*3*	*4*	*5*	*6*	*7*	*8*	*9*	*10*
Before IPO	167	134	116	65	77	41	28	16	40	51
After IPO	164	167	169	126	143	114	91	132	70	505
Year Period	I			II			III			IV

Figure 3. Patent Application Trend Before and after IPO



4.2. Differences in Open Innovation Levels among Companies

In this section, we start with KOSDAQ patents in the SDC area, which are regarded as a representative Korean industry sector. Patents are analysed to assess the differences in open innovation among companies in the SDC area.

Table 7 shows the Ratio and Intensity of Open Innovation Patents of 61 Companies from 1984 to 2014. As shown in Table 6, the number of average patent application per company is comparably high at 56.9, and the number of innovation patents is 4.6. The average patent number is comparably high at 62.4 per company. The Ratio of Open Innovation (ROI) is comparably high at 8.6%. In contrast, the difference in ROI among companies is large. The Intensity of Open Innovation (IOI) is comparably high at 1.13%.

Table 7. Ratio and Intensity of Open Innovation Patents of 61 Companies

Applicant Name	*Total Patents (A)*	*OI Patents (B)*	*Total Applicants (C)*	*IOI (=C/A)*	*ROI (B/A)%*
Kohyoung	172	37	209	1.22	21.5
Nanoentek	43	5	48	1.12	11.6
Neofidelity	17	4	29	1.71	23.5
Green Cross Cell	60	4	64	1.07	6.7
Daesung Eltec	43	0	43	1.00	0.0
DongYang P&F	3	0	3	1.00	0.0
Diotek	34	1	35	1.03	2.9
Ringnet	0	0	0	0	0
Macrogen	63	28	103	1.63	44.4
SaraminHR	1	0	1	1.00	0.0
3S Korea	21	2	23	1.10	9.5
Samji Electronics	56	4	61	1.09	7.1
Seoul Semiconductor	1,086	22	1,114	1.03	2.0
Seoul Credit Rating & Information	18	0	18	1.00	0.0
Seohwa	33	4	37	1.12	12.1
Sungho Electronics	12	1	13	1.08	8.3
Sejin Electron	105	13	120	1.14	12.4
Cellumed	30	5	35	1.17	16.7
Sonokong	29	3	32	1.10	10.3
Solacia	57	1	58	1.02	1.8
Soulbrain Eng	242	50	297	1.23	20.7
Secuve	19	2	21	1.11	10.5
CNB Technology	20	1	21	1.05	5.0
Anapass	30	0	30	1.00	0.0
Anam Information Tech	0	0	0	0	0
Aromasoft	0	0	0	0	0
ITX Security	31	3	34	1.10	9.7
Energy Solution	0	0	0	0	0
SG&G	4	1	5	1.25	25.0
ST cube	3	0	3	1.00	0.0
Able C&C	7	2	9	1.29	28.6
EXA E&C	51	3	55	1.08	5.9
Mgame	5	0	5	1.00	0.0
Mcnex	36	0	36	1.00	0.0
YoungIn Frontier	45	2	47	1.04	4.4
Orbitech	54	11	65	1.20	20.4
Osstem Implant	160	4	164	1.03	2.5
Ommitel	32	2	34	1.06	6.3
Welcron	30	2	33	1.10	6.7
Ubivelox	5	0	5	1.00	0.0
UBcare	54	3	58	1.07	5.6
Yujin Robot	98	1	99	1.01	1.0
Initeck	35	1	36	1.03	2.9
Esang Networks	4	0	4	1.00	0.0

Emnet	4	0	4	1.00	0.0
Ezwelfare	10	0	10	1.00	0.0
Ecredible	2	0	2	1.00	0.0
Infinitt Healthcare	47	1	48	1.02	2.1
Zalman Tech	99	9	108	1.09	9.1
JNK Heaters	7	4	23	3.29	57.1
Com2us	11	0	11	1.00	0.0
KT Music	32	1	33	1.03	3.1
Core Cross	22	1	23	1.05	4.5
Cubes	9	3	13	1.44	33.3
Texcell Netcom	3	0	3	1.00	0.0
TVLogic	21	2	23	1.10	9.5
Puloon Tech	63	11	74	1.17	17.5
KCP	29	2	32	1.10	6.9
Hanbit Soft	5	0	5	1.00	0.0
Hanil Networks	2	0	2	1.00	0.0
Hanjin P&C	85	8	96	1.13	9.4
Average	54.1	4.3	59.3	1.06	8.2

Table 8 shows the Ratio and Intensity of Open Innovation Patents of 61 Companies before and after 2004. As shown in Table 8, the average number of patent applications per company is comparably high at 13.8, and the number of innovation patents is comparably low at 1.7. The average patent number is comparably low at 15.8 per company. The Ratio of Open Innovation (ROI) is comparably high at 9.1%. In contrast, the difference of ROI is large among companies. The Intensity of Open Innovation (IOI) is comparably low at 0.86%. After 2005, the number of average patent applications per company is comparably high at 40.3, and the number of innovation patents is 2.6. The average patent number is comparably high at 43.5 per company. The Ratio of Open Innovation (ROI) is comparably low at 7.6%. In contrast, the difference of ROI is large among companies.

After IPO, the number of average patent application per company remarkably increased by as much as 26.51, the number of average innovation patents slightly increased by 0.95, and the number of average total patents remarkably increased by as much as 27.75. In contrast, the Ratio of Open Innovation (ROI) slightly increased by as much as 0.12, and the Intensity of Open Innovation (IOI) slightly decreased by -1.6. These results demonstrate that open innovation remarkably increased directly before and after IPO, and the innovation status was maintained after the IPO, although a small fluctuation exists.

Table 8. IOI &ROI before and after IPO of 61 Companies

Applicant Name	*Before IPO*					*After IPO*					*Difference*	
Applicant Name	*Total Patents*	*OI Patents*	*Total Patents*	*IOI*	*ROI*	*Total Patents*	*OI Patents*	*Total Patents*	*IOI*	*ROI*	*IOI*	*ROI*
Kohyoung	9	0	9	1.00	0.0	163	37	200	1.23	22.7	0.23	22.7
Nanoentek	13	3	16	1.23	23.1	30	2	32	1.07	6.7	-0.16	-16.4
Neofidelity	4	4	16	4.00	100.0	13	0	13	1.00	0.0	-3.00	-100
Green Cross Cell	60	4	64	1.07	6.7	0	0	0	0	0	-1.07	-6.7
Daesung Eltec	4	0	4	1.00	0.0	39	0	39	1.00	0.0	0.00	0.0
DongYang P&F	0	0	0	0	0	3	0	3	1.00	0.0	1.00	0.0
Diotek	9	1	10	1.11	11.1	25	0	25	1.00	0.0	-0.11	-11.1
Ringnet	0	0	0	0	0	0	0	0	0	0	0.00	0.0
Macrogen	14	5	19	1.36	35.7	49	23	84	1.71	46.9	0.35	11.2
SaraminHR	0	0	0	0	0	1	0	1	1.00	0.0	1.00	0.0
3S Korea	7	1	8	1.14	14.3	14	1	15	1.07	7.1	-0.07	-7.2
Samji Electronics	16	1	17	1.06	6.3	40	3	44	1.10	7.5	0.04	1.2
Seoul Semiconductor	145	12	159	1.10	8.3	941	10	955	1.01	1.1	-0.09	-7.2

Applicant Name	*Before IPO*					*After IPO*					*Difference*	
Applicant Name	*Total Patents*	*OI Patents*	*Total Patents*	*IOI*	*ROI*	*Total Patents*	*OI Patents*	*Total Patents*	*IOI*	*ROI*	*IOI*	*ROI*
Seoul Credit Rating & Information	5	0	5	1.00	0.0	13	0	13	1.00	0.0	0.00	0.00
Seohwa	16	3	19	1.19	18.8	17	1	18	1.06	5.9	-0.13	-12.9
Sungho Electronics	0	0	0	0	0	12	1	13	1.08	8.3	1.08	8.3
Sejin Electron	70	7	77	1.10	0.0	35	6	43	1.23	17.1	0.13	17.1
Cellumed	10	0	10	1.00	10.0	20	5	25	1.25	25.0	0.25	15.0
Sonokong	23	2	25	1.09	8.7	6	1	7	1.17	16.7	0.08	8.0
Solacia	6	1	7	1.17	16.7	51	0	51	1.00	0.0	-0.17	-16.7
Soulbrain Eng	80	38	123	1.54	47.5	162	12	174	1.07	7.4	-0.47	-40.1
Secuve	6	0	6	1.00	0.0	13	2	15	1.15	15.4	0.15	15.4
CNB Technology	6	0	6	1.00	0.0	14	1	15	1.07	7.1	0.07	7.1
Anapass	0	0	0	0	0	30	0	30	1.00	0.0	1.00	0.00
Anam Information Tech	0	0	0	0	0	0	0	0	0	0	0.00	0.00
Aromasoft	0	0	0	0	0	0	0	0	0	0	0.00	0.00
ITX Security	7	3	10	1.43	42.9	24	0	24	1.00	0.0	-0.43	-42.9
Energy Solution	0	0	0	0	0	0	0	0	0	0	0.00	0.00
SG&G	2	1	3	1.50	50.0	2	0	2	1.00	0.0	-0.50	-50.0
ST cube	0	0	0	0	0	3	0	3	1.00	0.0	1.00	0.00
Able C&C	3	0	3	1.00	0.0	4	2	6	1.50	50.0	0.50	50.0
EXA E&C	9	0	9	1.00	0.0	42	3	46	1.10	7.1	0.10	7.1
Mgame	0	0	0	0	0	5	0	5	1.00	0.0	1.00	0.00
Mcnex	0	0	0	0	0	36	0	36	1.00	0.0	1.00	0.00
YoungIn Frontier	41	2	43	1.05	4.9	4	0	4	1.00	0.0	-0/05	-4.9
Orbitech	10	1	11	1.10	10.0	44	10	54	1.23	22.7	0.13	12.7
Osstem Implant	29	0	29	1.00	0.0	131	4	135	1.03	3.1	0.03	3.1
Ommitel	15	1	16	1.07	6.7	17	1	18	1.06	5.9	-0.01	-0.8
Welcron	12	0	12	1.00	0.0	18	2	21	1.17	11.1	0.17	11.1
Ubivelox	0	0	0	0	0	5	0	5	1.00	0.0	1.00	0.0
UBcare	16	0	16	1.00	0.0	38	3	42	1.11	7.9	0.11	7.9
Yujin Robot	5	1	6	1.20	20.0	93	0	93	1.00	0.0	-0.20	-20.0
Initeck	7	1	8	1.14	14.3	28	0	28	1.00	0.0	-0.14	-14.3
Esang Networks	2	0	2	1.00	0.0	2	0	2	1.00	0.0	0.00	0.00
Emnet	0	0	0	0	0	4	0	4	1.00	0.0	1.00	0.00
Ezwelfare	0	0	0	0	0	10	0	10	1.00	0.0	1.00	0.00
Ecredible	2	0	2	1.00	0.0	0	0	0	0	0	-1.00	0.00
Infinitt Healthcare	10	0	10	1.00	0.0	37	1	38	1.03	2.7	0.03	2.7
Zalman Tech	35	1	36	1.03	2.9	64	8	72	1.13	12.5	0.10	9.6
JNK Heaters	0	0	0	0	0	7	4	23	3.29	57.1	3.29	57.1
Com2us	3	0	3	1.00	0.0	8	0	8	1.00	0.0	0.00	0.00
KT Music	23	1	24	1.04	4.3	9	0	9	1.00	0.0	-0.04	-4.3
Core Cross	19	1	20	1.05	5.3	3	0	3	1.00	0.0	-0.05	-5.3
Cubes	4	1	5	1.25	25.0	5	2	8	1.60	40.0	0.35	15.0
Texcell Netcom	3	0	3	1.00	0.0	0	0	0	0	0	-1.00	0.0
TVLogic	2	1	3	1.50	50.0	19	1	20	1.05	5.3	-0.45	-44.7
Puloon Tech	24	1	25	1.04	4.2	39	10	49	1.26	25.6	0.22	21.4

Applicant Name	*Before IPO*					*After IPO*					*Difference*	
Applicant Name	*Total Patents*	*OI Patents*	*Total Patents*	*IOI*	*ROI*	*Total Patents*	*OI Patents*	*Total Patents*	*IOI*	*ROI*	*IOI*	*ROI*
KCP	0	0	0	0	0	29	2	32	1.10	6.9	1.10	6.9
Hanbit Soft	1	0	1	1.00	0.0	4	0	4	1.00	0.0	0.00	0.00
Hanil Networks	2	0	2	1.00	0.0	0	0	0	0	0	-1.00	0.0
Hanjin P&C	52	5	60	1.15	9.6	33	3	36	1.09	9.1	-0.06	-0.5
Average	13.8	1.7	15.8	0.86	9.1	40.3	2.6	43.5	0.98	7.6	0.12	-1.6

4.3. Open Innovation Effects in Companies

4.3.1. Descriptive statistics and research hypothesis

Table 9 shows descriptive statistics of open innovation. As shown in Table 9, there was an apparent difference between ROI and TOI, and the total volume of patents among KOSDAQ companies in SDC. Accordingly, the method of analysing ROI and IOI will be a very useful tool for analysing the differences between companies. In this section, we verify the value of TOI through which the effect of open innovation on KOSDAQ companies will be examined via regression. In general, we followed the process of Laursen and Salter (2006) to examine the effect of a company's open innovation on its performance.

For the subjects for this research, 61 companies were selected for which age and sales (2013) as well as patent data have been published, and they were chosen from among SDC companies. The two dimensions defined for the patent analysis of open innovation, ROI and IOI, were used for this purpose.

This study analysed the effect of open innovation patents (IOI, ROI, and IOI*ROI) from 1994 to 2014 on the mean sales figures of companies in 2013. Table 8 shows major descriptive statistics.

In detail, the innovation after IPO remarkably increased compared to that before IPO. This means that the IPO companies cooperate with external partners in technology development and patent application activities to improve the reality of the technology and market accessibility. On the other hand, ROI remarkably increased in three years after IPO compared to the three years before IPO. This means that after the IPO companies are more conservative in finding suitable partners with the company's growth and development. In conclusion, after the IPO companies strive to improve the technological and market accessibility through cooperation with external partners in technology development and patent application activities, other companies more carefully select suitable partners on the other hand.

Table 9. Descriptive Statistics

Indices	*Mean*	*SD*	*Variance*	*Minimum*	*Maximum*
Age	19	6	37	9	35
Sales Mean (KRW million)	106,100	18,820	354,149,600	5,800	1,032,000
Employee	198	193	37,108	34	1,146
IOI (before)	1.06	0.42	0.18	0.00	3.29
IOI (after)	0.86	0.65	0.42	0.00	4.00
IOI (total)	0.98	0.50	0.25	0.00	3.29
ROI (before)	8.17	11.35	128.72	0.00	57.10
ROI (after)	9.14	17.64	311.09	0.00	100.00
ROI (total)	7.57	13.00	169.10	0.00	57.10
IOI*ROI (before)	8.66	4.77	22.85	0.00	187.86
IOI*ROI (after)	7.89	11.46	131.36	0.00	400.00
IOI*ROI (total)	7.45	6.46	41.76	0.00	187.86

4.3.2. Analysis of open innovation effects on performance

As an index to better understand the open innovation status of companies through patent data, the TOI value, which is obtained by multiplying the breadth by the depth of open innovation, was used as the open innovation level. The standardised IOI*ROI value, that is, the correlation between IOI and ROI, is identified by multiplying the standardised IOI by ROI from 1994 to 2014 and the mean sales for 2013. The standardised IOI slightly increased from 0.86 to 0.98.

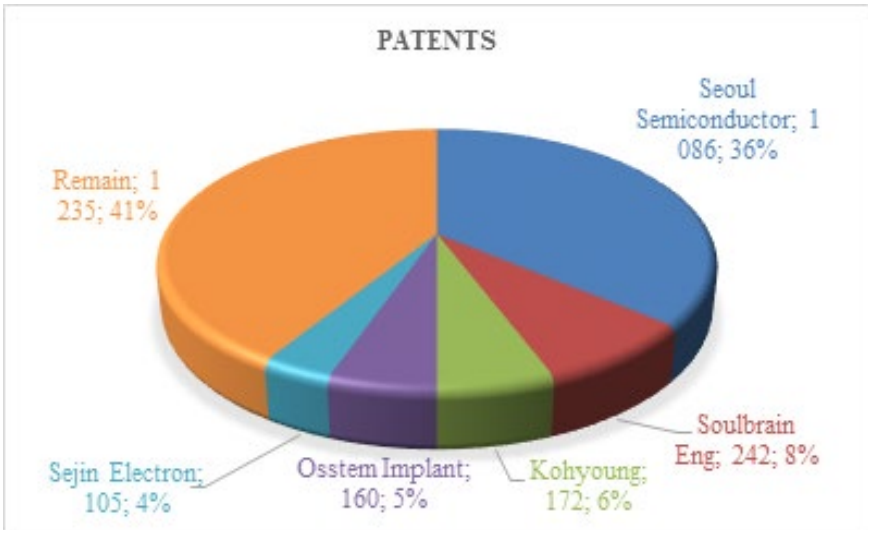
The standardised ROI decreased dramatically from 9.13 to 7.57. As a result, the standardised TOI slightly decreased from 7.89 to 7.45. This means that Korea KOSDAQ companies have little motivation for innovation. The reasons for this are assumed to be as follows: they are strongly interconnected with large companies, they are sandwiched internationally between developed and developing countries and their entrepreneurship is diminishing as time passes.

Although age was found to be irrelevant in this study, it was listed as a controlling variable in the previous study of Laursen and Salter (2006). In this study we developed the following hypothesis to extend the research results of Laursen and Salter (2006).

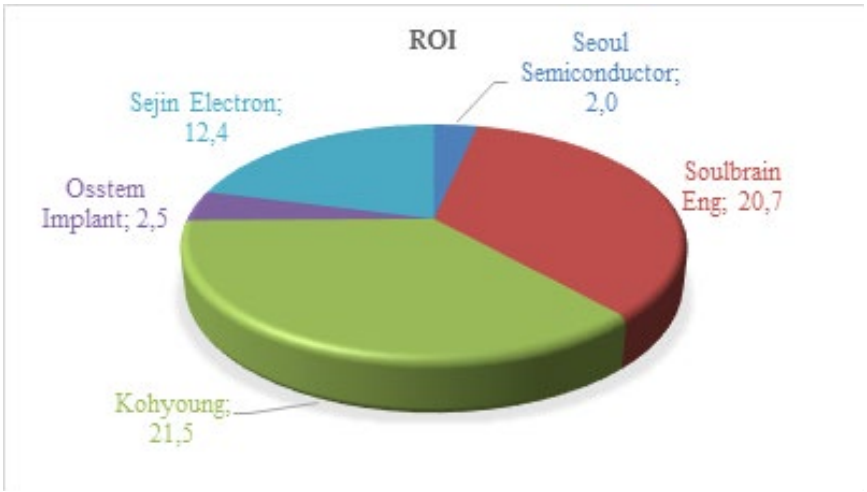
Hypothesis: if the total level of open innovation based on the collaborative patents of a company is high, the company will also achieve a high level of performance.

This study specified the operational definition for measurement as "If companies have a high mean value when multiplying IOI by ROI from 1994 to 2014, the mean sales of companies from 1994 to 2014 will increase". This analysis also considered a time lag effect because open innovation level is measured based on patent data.

Figure 4. Total Patents and Open Innovation Patents of the Top Five Companies



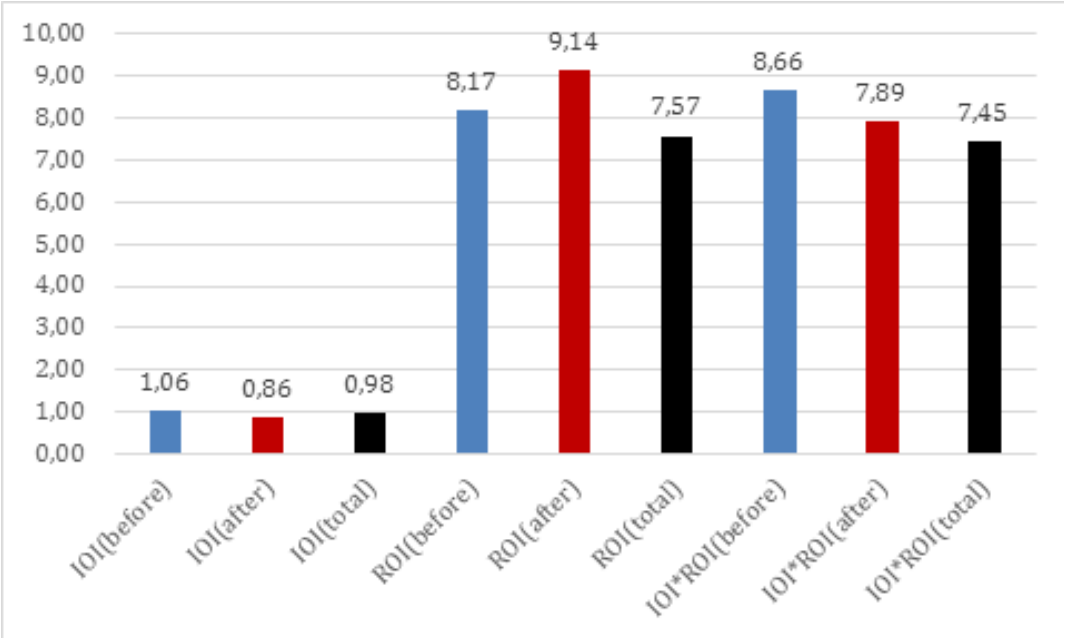
Ratio of Patent Applications of top 5



Ratio of OI Patent Applications of Top 5

Figure 4 shows the total patents and open innovation patents of the top five companies. As shown in Figure 4, when ROI is high, the number of patent application is high. But Seoul Semiconductor and Osstem Implant are exceptions, because they are in traditional and monopolistic industries. Seoul Semiconductor is in the lighting industry, which has been controlled by a few major players such as GE, Osram, and Nichia. Osstem is in the dental industry, which also has been controlled by a few major players, such as Osstem, Dio, and Neobiotech. As a result, when the total level of open innovation based on the collaborative patents of a company is high, the companies also achieve a high level of performance and have more patents. Figure 5 shows the innovation trend before and after IPO. As shown in Figure 5, ROI increased, but IOI decreased after IPO over the long terms. This indicates that IPO companies need motivation for new innovation at this time.

Figure 5. Innovation Trend Before and After IPO



5. CONCLUSION

5.1. Summary

In this study, the concepts of IOI, ROI and TOI are verified by analysing patents among KOSDAQ companies in the SDC. We find that patent applications remarkably increased after IPO, especially during the three years before and after IPO. The standardised IOI slightly increased from 0.86 to 0.98. The standardised ROI decreased substantially from 9.13 to 7.57. As a result, the standardised TOI slightly decreased from 7.89 to 7.45. This means that Korea KOSDAQ companies have little motivation for innovation. The reasons are assumed to be as follows: they are strongly interconnected with large companies, they are sandwiched internationally between developed and developing countries, and their entrepreneurship is diminishing as time passes. When ROI is high, the number of patent applications is high. But Seoul Semiconductor and Osstem Implant are exceptions, because they are in traditional and monopolistic industries. When the total level of open innovation based on the collaborative patents of a company is high, the companies also achieve a high level of performance and have more patents.

Open innovation remarkably increased directly before and after IPO and maintained the innovation status after IPO, although some fluctuation exists. In a detailed review of company innovation, the innovation after IPO remarkably increased relative to that before IPO. This means that after the IPO, companies cooperate with external partners in technology development and patent application activities to improve the technological and market accessibility. On the other hand, ROI remarkably increased in three years after IPO compared to three years before IPO. This means that after the IPO companies are more conservative in finding suitable partners as the company grows. In conclusion, after the IPO companies strive to improve technological and market accessibility through cooperation with external partners in technology development and patent application activities on the one hand, other companies more carefully select suitable partners on the other hand.

5.2. Implications

In this study, we considered the strategic value of technology, especially patents in the knowledge-based economy in relation to corporate IPO. The accumulation of technologies through patent applications by IPO companies is a key success factor.

IPO companies require joint development of patents with various external partners for success. For companies in the IPO stage, joint development efforts for patents is the best way to overcome the limitations of their capabilities and to secure a variety of new technologies and patents.

Soon after the IPO, companies should cooperate with more various partners to develop a variety of creative technologies under the company and in an academic cooperation system to ensure sustainable corporate growth.

This is the first study to investigate differences in open innovation before and after a company's IPO through an objective patent analysis. In addition, we present a case study from a representative cluster, SDC. This is the oldest and largest cluster in Korea, and it has rapidly changed from traditional production based area to a digital knowledge based sector. This is the first study of the differences and characteristics of open innovation through a representative case analysis

before and after IPO.

5.3. Limitations and Additional Research Goals

This study performed a diverse quantitative analysis of patent applications, and open innovation before and after corporate IPO, and a qualitative analysis was not addressed. In this study, the IPO is regarded as a performance variable or dependent variable, and the open innovation impact on the company performance was examined quantitatively. That is, the company's actual performance variables such as sales and profit margins were not considered, and instead the authors focused on an IPO-based metadata analysis. Accordingly, through in-depth interviews with major companies, supplementary studies are needed to evaluate the differences in qualitative characteristics of open innovation and performance before and after IPO.

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CLUSTERING AND MOVEMENT OF KNOWLEDGE WORKERS IN/BETWEEN AUSTRALIAN GLOBAL CITIES: A COMPARATIVE STUDY OF SYDNEY, MELBOURNE AND BRISBANE

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ABSTRACT

Purpose: This study compares the global capacity of three Australian global cities – Sydney, Melbourne and Brisbane – through the lens of knowledge workers for those knowledge-based services.

Scope: A global city is defined by its global capacity of providing advanced producer services, which are essentially knowledge-based services.

Method: It measures not only the clustering of knowledge workers in the cities, but also the movement of knowledge workers between them.

Results: The results reveal the cities' shifting clustering of knowledge workers, and attraction and retention of knowledge workers.

Recommendations: The results reveal the cities' shifting clustering of knowledge workers, and attraction and retention of knowledge workers, to suggest recommendations for urban management and policy.

Conclusions: This study provides a new approach to global cities from the perspective of clustering and movement of knowledge workers, and sheds new lights on the changing global capacities of knowledge-based services among Australian global cities.

KEYWORDS

Knowledge-based services; Knowledge workers; Global cities.

1. INTRODUCTION

This study investigates the knowledge-based services and their dynamics in and between Australian global cities Sydney, Melbourne and Brisbane. Situated within the global city discourse, this study aims to contribute an Australian version to the global city analysis and employ an innovative approach of the clustering and movement of knowledge workers. The global city discourse has emerged to respond to the impacts of contemporary globalisation on cities – a group of global cities that function as the centres or nodal points of the global economy (Friedmann, 1986; Friedmann & Wolff, 1982; Hall, 1998; Knox & Taylor, 1995; Sassen, 1995a, 2001; P. Taylor, 2004). The increasingly integrated global economy has been generating simultaneous processes of dispersion and concentration – the dispersion of production and retailing activities across the world and the concentration of specialised services and command within a few global cities (Sassen, 2001). The key argument is that increasing importance of transnational corporations (TNCs) as actors of an integrated global economy, accelerated global competition, and the macro transition towards a post-Fordist economy, have led to greater complexity of managing, controlling and coordinating global activities and organisations. This has required greater use of advanced producer services, including finance, banking, accounting, law, advertising, and marketing and management consultancy (Sassen, 1995b, 2001; P. J. Taylor, 2004). Global cities are defined as command and control centres of the global economy and key locations of the advanced producer services (Sassen, 2001). Empirically, global cities have been measured and compared through their capacities of advanced producer services, which are essentially knowledge-based services.

Sydney and Melbourne are internationally recognised global cities in Australia (Beaverstock, Taylor, & Smith, 1999; P. J. Taylor, 2004; Taylor *et al.*, 2011). Locally, there has been great enthusiasm for shaping global Sydney and global Melbourne from both public and private (City of Melbourne, 2008; City of Sydney, 2008; Committee for Sydney, 2007, 2009; Commonwealth of Australia, 2010; OECD, 2003; State of New South Wales, 2005; State of Victoria, 2003; Sydney Business Chamber, 2010; Sydney Chamber of Commerce, 2008). They were recently joined by the aspiration for 'Brisbane Australia's new world city' (Acuto & Steele, 2013; Jensen, 2011). Not in the same level as Sydney or Melbourne, Brisbane also appeared in international rankings, after Sydney and Melbourne only in Australia (Mould, 2011). Empirically, the studies on Australian global cities have predominantly focused on Sydney and its growing global services capacity (Baum, 1997; Daly & Pritchard, 2000; Hu, 2012, 2014c; McGuirk, 2004; Searle, 1996), and there was a study comparing global Sydney and global Melbourne only (Hu, Blakely, & Zhou, 2013).

This study is a new effort to compare the three Australian cities Sydney, Melbourne and Brisbane as global cities. It borrows the criteria of advanced producer services, the defining capacities of global cities, to evaluate the knowledge-

based services. This is made through the lens of knowledge workers. It measures not only the clustering of knowledge workers in the cities, but also the movement of knowledge workers between them. The results reveal the cities' shifting clustering of knowledge workers, and attraction and retention of knowledge workers. By doing so, this study provides a new approach to global cities from the perspective of clustering and movement of knowledge workers, and sheds new lights on the changing global capacities of knowledge-based services among Australian global cities. This article is organised as follows. This introduction is followed by a literature review on theorising why knowledge workers cluster and move. Then it offers methods and results of the empirical study. The article concludes with a discussion on new findings, and scholarly contribution to the knowledge and approach of global cities and knowledge-based services.

2. WHY KNOWLEDGE WORKERS CLUSTER AND MOVE?

2.1. Why Knowledge Workers Cluster?

The clustering of knowledge workers has been linked with the rise with the rise of a 'knowledge-based economy', a full genealogy of which could trace back to the 1960-1970s when buzzwords like 'knowledge society' or 'information economy' were invented (Godin, 2006, p. 18). Its resurgence in the 1990s was a result of the advancement of new information and communication technology (ICT) and its popularity was largely attributed to the dissemination of the Organization for Economic Co-operation and Development (OECD). In 1996, the OECD stated that 'knowledge is now recognized as the driver of productivity and economic growth', and defined the knowledge-based economies as 'economies which are directly based on the production, distribution and use of knowledge and information' (OECD, 1996, p. 3). A shift to knowledge-based growth has been characterized by falling costs and rising efficiency in the transmission, retrieval, and analysis of information. According to the OECD (1996), the most distinguishing feature of a knowledge-based economy is the pervasive presence of knowledge as an input and an output throughout the economy. Thus, in a knowledge-based economy, the ability to create wealth is increasingly dependent on the effective management of knowledge, that is, 'the organizational capability to create, acquire, accumulate, disseminate, and exploit information and knowledge' (Gera & Mang, 1998, p. 150). The industries which fit the definition of the knowledge-based economy include: high- to medium-tech manufacturing; high-tech services; business services; financial services; health and education services; cultural and recreational services and international transport services (Brinkley, 2008).

The knowledge-based economies indicate more tendencies towards geographical clustering than traditional less or low knowledge-based economies, suggesting enhanced association between agglomeration and productivity performance (Gabe & Abel, 2011; Sonn & Park, 2011). There have been numerous scholarly literatures on the geographical concentration of business activities and industry production. However, not many offer explanations specifically in relation to the context of the knowledge-based economies, especially to the concentrations of such industries as advanced producer services occurring in particular regions and in particular parts of cities, like the central cities. The basic clustering theories of the localization externalities, including a large pool of specialized labour, a large number of specialized local providers of intermediate inputs and services, and the positive technological spill-over (Krugman, 1991; Marshall, 1927), help explain the new knowledge-based economies too. The advantages of geographical proximity, such as traditional external economies of scale out of shared physical infrastructure and reduced transaction costs, and enhanced circulation of knowledge as well as inter-firm collaboration and networking (Porter, 1998), makes no differentiation of applicability between traditional manufacturing industries and new knowledge-based industries. However, they are far from sufficient to explain the concentration of the knowledge-based economy with the fullest plausibility.

The knowledge-based economy has witnessed significant cost reduction and efficiency improvement in transmitting and transacting knowledge and knowledge-related products and services through the mediation of the ICT. Nonetheless, the predicted 'death of distance' or 'death of cities' did not occur in a digital age, and has not indicated any sign of occurring in the foreseeable future either. Conversely, agglomeration of the knowledge-based economy persists and is becoming even denser. Two strands of theories specific to the context of the knowledge-based economy have been proposed to explain this seemingly counter-intuitive phenomenon. Both strands of theories are centred on the characteristics and behaviours of the knowledge workers, the actors of the knowledge-based economy, to justify the non market-based externalities of the agglomeration of the knowledge-based economy.

One strand of theories is related to the indispensability of the face-to-face contact in today's knowledge production process. Storper and Vehables (2004) suggest that the face-to-face contact is an important mechanism for co-ordinating economic activities, particularly those embedded in tacit knowledge and creativity in which people learn by doing and being around others. This important role of the face-to-face contact in the knowledge-based economy is attributed to the unique behavioural and communicational properties which give the face-to-face contact specific advantages as a technology of communication, coordination, and motivation. The major properties of the face-to-face contact include: it is an efficient communication technology; it allows actors to align commitments and thereby reduces incentive problems; it allows screening of agents; and it motivates effort (Storper & Venables, 2004, pp. 353-357). This kind of human capital externalities differs by particular types of workers. The knowledge acquisition required to drive innovation nowadays implies ever more frequent interactions between agents in order to share knowledge (McCann, 2007). In contrast to

the knowledge-based activities which often require direct and instant contact to solve unforeseeable uncertainties, the knowledge spill-over facilitated by the face-to-face contact is of less importance to low-skilled labourers and personal service providers (Gabe & Abel, 2011).

The other strand of theories is related to the diversity and the necessary density to generate diversity, which contribute to the productivity of the knowledge workers, or creative talents. Diversity in cultures and expertises leads to a high degree of knowledge production and diffusion, and diversity promotes tolerance to new ideas (Florida, 2002; Jacobs, 1969). Urban areas with density offer higher degree of diversity of specializations, and more favourable environments of innovation and knowledge production. An expert can easily contact people with similar or different specialties to exchange ideas and generate knowledge in large cities, especially the central city areas. Workers of the knowledge-based economy, who are mostly college educated and have particular creative talents, tend to congregate to capitalise from the benefits of agglomeration (Florida, 2002, 2008).

2.1. Why Knowledge Workers Move?

The drivers and motivations of highly skilled, talented and mobile workers are complex and diverse (Mahroum, 2000). Globally mobile talents are not one single entity; groups within this broad classification each have their own sets of motives. Each group of mobile talents are either pushed or lured, by a number of different circumstances and provisions. Many studies have attempted to further understand the generic and case specific drivers of geographical mobility amongst the highly skilled (see(Beaverstock, 2005; Beaverstock & Boardwell, 2000; Beaverstock, 2002; Beaverstock & Hall, 2012; Cobb-Clark & Connolly, 1997; Malecki & Ewers, 2007; Miguélez & Moreno, 2014; OECD, 1997). Jonathan Beaverstock is a leading theorist in the study of highly skilled internal labour migration, conducting case studies of the drivers of transnational elites (particularly British expatriates) in a number of global cities (including New York, Singapore and London). Beaverstock argues from a labour demand perspective that globally mobile talents are pushed and pulled by transnational corporations (TNC) to cities around the world. Others such as Mahroum contest that whilst TNCs play a significant role in driving global talents, there are a number of motivations specific to individual groups within the broad title of 'global talent'(Mahroum, 1999, 2000). Mahroum's (2000) study on highly skilled globetrotters identifies four different types of globally mobile talents and theorises their individual motivations.

The first group of globally mobile talents were managers and executives. A study by Salt and Clarke (2001) found that managers and executives tend to be "accidental tourists", that is the driver of their global mobility comes often from a new merger or company expansion, leaving their movement often unplanned and unexpected. The second group were referred to as the "economy-class passengers", who tended to be engineers and technicians who had less control of their mobility. It was found that these globally mobile talents were the motivated by external economic factors and/or immigration policies (Salt & Clarke, 2001). The third group of globally mobile talents was largely made up of the academics and scientists. Mahroum's (2000) study referred to them as 'pilgrims' because they were driven by bottom-up developments in the academic field, meaning that due to the nature of the work and the need to spread knowledge often physical migration is a requirement for academics and scientists alike. The fourth and final group identified by the study were entrepreneurs. The study found that this group of global talents were driven by 'exploration', meaning they move to environments which would allow their venture to thrive.

Florida identified (2003) creative people are key factor in regional economic growth. His creative capital theory argues that economic and lifestyles, mix of both factors influences mobility of creative people. He also added that highly educated people are attracted towards innovative, diverse and inclusive places and wants to move a place where they can take root, flourish and validate their identities as a creative people. 'Technology, talent and tolerance', cities which can offer the mix of these 3Ts are the winner of creative age (Florida, 2003). Hospers and Van Dalm (2005) has supported the theoretical concept of Florida.

There are several studies (Bennett, 2010; Boschma & Fritsch, 2009; Clifton, 2008; Hansen & Niedomysl, 2009; Houston, Findlay, Harrison, & Mason, 2008; Lorenzen & Andersen, 2009; Martin-Brelot, Grossetti, Eckert, Gritsai, & Kovacs, 2010; Mellander & Florida, 2006; Murphy & Redmond, 2009; Scott, 2006) to examine the creative class movement and mostly testing Florida's hypothesise in European context. Mellander and Florida (2006) used a series of path analysis to examine independent effects of human capital, different types of creative classes and technology on regional development in Sweden and found that universities, amenities, diversity, openness and tolerance certainly attract talents in any region. In contrast, Hansen and Niedomysl (2009) did an empirical study in Sweden and states that the creative class migrates marginally more than the other migrant groups and the primary driver of creative class migration is employment closely followed by social reasons. The authors (Hansen & Niedomysl, 2009) have claimed that the theoretical argument by Florida is wrong in the European context and lack of empirical research. However, positive correlation between mobility and tolerance and openness has been identified by Boschma and Fritsch (2009) in European cities.

Martin-Brelot, Grossetti *et al.* (2010) also tested Florida's hypothesis on of creative class mobility and soft factors on 11 European cities. The have argued that European creative class is not as mobile as Florida suggested. In addition, they (Martin-Brelot *et al.*, 2010) said soft factors have lesser roles in attracting creative class, but have more in retaining them in a city. Murphy and Redmond (2009) has done a case study in Dublin to test the effects of 'hard and soft factors' on to attract creative knowledge workers and have found that 'employment availability, family and birth place'- are mostly valued.

However, they found that, creative knowledge workers in Dublin are highly mobile and validated Florida's hypothesis and some of the reasons identified for this mobility were – 'to find better pay', the expiration of current contract', 'leaving the country' and 'to find a more interesting job'.

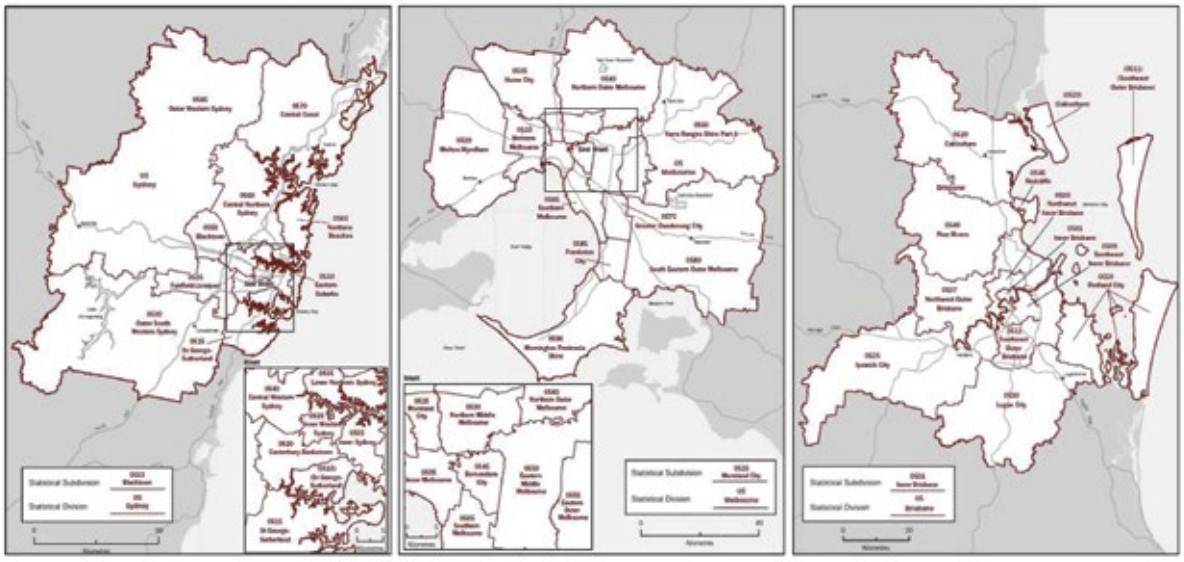
The creative class migration in small cities and rural areas is different than the big metropolis. Verdich (2010) studied the creative classes in Tasmania, Australia. Verdich asked the creative community of Launceston's what motivate them to move and stay there. She found it is not the amenity, lifestyle or diversity; it is about close to environment, downshifting, time with family, outdoor amenities that move the creative class out of the metropolis to rural qualities. Bennett (2010) studied the artists in Western Australia (WA), recognized that creative class in WA faced difficulties due it's widespread spatial distribution. Artist in WA moves to where there are more opportunities to create work or presence of more established community or to find bigger population base. Another distinctive reason of moving is to move away from social network to further their artistic practice (Bennett, 2010).

This study empirically measures the clustering and movement of knowledge workers in/between three Australian cities. It associates the debates on knowledge workers with the global city discourse, which provides a new approach to understanding the capacities of knowledge-based services in contemporary global cities. Apart from understanding the status quo and time-series changes of knowledge workers in these cities, it also examines their competitive relations in terms of attracting retaining knowledge workers. In the Australian context, this study enriches the literature on internal migration by injecting inter-city knowledge workers competition into inter-state human capital competition (Blakely, Bista, & Khan, 2007).

3. METHODS

Geographically, the three cities of Sydney, Melbourne and Brisbane refer to their greater regions that are defined by the Statistical Divisions in the Australian Standard Geographical Classification (ASGC) (see Figure 1). Basic information of the three cities is provided in Table 1. The knowledge workers are defined by people employed in the knowledge-intensive industries, including Financial and Insurance Services; Information Media and Telecommunications; Professional, Scientific and Technical Services; and Rental, Hiring and Real Estate Services, as classified in the Australian and New Zealand Standard Industrial Classification (ANZSIC) 2006. These industry sectors are used to capture the advanced producer services that are reflective of a global city's capacity of providing knowledge-based services (Hu, 2014b).

Figure 1. Geographical Classifications of Sydney, Melbourne and Brisbane.



Source: Australian Bureau of Statistics, reworked by the author.

Table 1. Basic Information of the Studied Cities.

	Population (2011)	Employment (2011)	Land Area
Sydney	4,391,672	1,851,756	12,137 km²
Melbourne	3,999,980	1,736,177	7,694 km²
Brisbane	2,065,998	916,076	5,950 km²

Data source: Australian Bureau of Statistics

This study uses data from the Australian Census 2006 and 2011 to investigate the knowledge workers in the three cities

and their time-series changes. The Location Quotient (LQ) technique, which compares the cities' share in a particular variable to the national share in the same variable, is used to measure the clustering of knowledge workers. The LQ analysis is widely used 'to identify the concentration of an industrial sector in a local economy relative to a larger reference economy' (E. Blakely & Bradshaw, 2002, p. 122). Employment is the most frequently used variable in the LQ analysis that defines a ratio of employment shares: the local industry's share of total local employment compared with the industry's employment share in a wider reference region (regional, national, or even international) (Klosterman, 1990). An LQ more than 1 indicates a higher than average degree of specialisation in that sector locally compared with the reference region, and it is interpreted as an indicator of concentration and competitive advantage (Spencer, Vinodrai, Gertler, & Wolfe, 2010). Built upon a study for economic drivers of Australian sea change communities (Hu & Blakely, 2013), plotting charts of three variables – employment share in 2001, LQ in 2011, and LQ change in 2006-2011 – are used to present a comprehensive understanding of the clustering of knowledge workers and its strengthening or weakening trend. The employment data for clustering of knowledge workers is based on Place of Work in the Australian Census.

This study uses the Five Years Usual Residence Indicators in the Australian Census 2011 to measure the movement of knowledge workers between the three cities from 2006 to 2011. It measures the total movement of knowledge workers; it further measures the movement of knowledge workers in each of the knowledge-intensive industries. They combine to provide a comprehensive and detailed understanding of the newest dynamics in the movement of knowledge workers between the three cities. The population data for movement of knowledge workers is based on Place of Residence in the Australian Census.

4. RESULTS

4.1. Clustering of Knowledge Workers

Figures 2-5 illustrate the clustering of knowledge workers in Sydney, Melbourne and Brisbane respectively, showing their capacities of knowledge-based services (detailed data in Appendix). The three cities have different levels and trends of the clustering of knowledge workers, viewed by individual knowledge-intensive industry sectors. Sydney is dominating the Australian urban landscape in terms of clustering of knowledge workers. This is reflected by the very high LQ values of its knowledge-intensive industries compared to the other two cities. Sydney has the highest level of clustering of Financial and Insurance Services, which is in line with its status as a financial centre of global importance. A new dynamic in its capacity of knowledge-based services is the high clustering of Information Media and Telecommunications. Furthermore, the clustering of Information Media and Telecommunication was the most strengthened as measured by LQ change in 2006-2011 of all industry sectors in Sydney. On the contrary, despite its large employment base in Sydney's economy, the clustering of Professional, Scientific and Technical Services, demonstrated a declining trend.

Overall Melbourne's clustering of knowledge workers is much lower than Sydney. Like Sydney, Melbourne also demonstrated a growing trend in the clustering of Information Media and Telecommunications, and a declining trend in the clustering of Professional, Scientific and Technical Services. The difference is that the degree of either Melbourne's growing trend or its declining trend is less than that of Sydney. Like Sydney, Melbourne's has the highest level of clustering of Financial and Insurance Services of all industry sectors. The new dynamic is that Melbourne had a robust growth in the clustering of Financial and Insurance Services as measured by LQ change in 2006-2011, while Sydney had now growth.

Brisbane has the lowest level of clustering of know ledge workers of the three cities. It does not indicate a clustering in two knowledge-based services: Financial and Insurance Services; and Information Media and Telecommunications. Compared with Sydney and Melbourne, the new dynamic in Brisbane's capacity of knowledge-based services is that it had a robust growth in the clustering of Professional, Scientific and Technical Services as measured by LQ change in 2006-2011. Of all industry sectors, Brisbane has the highest level of clustering of Professional, Scientific and Technical Services.

Figure 2. Clustering of Knowledge Workers in Sydney.

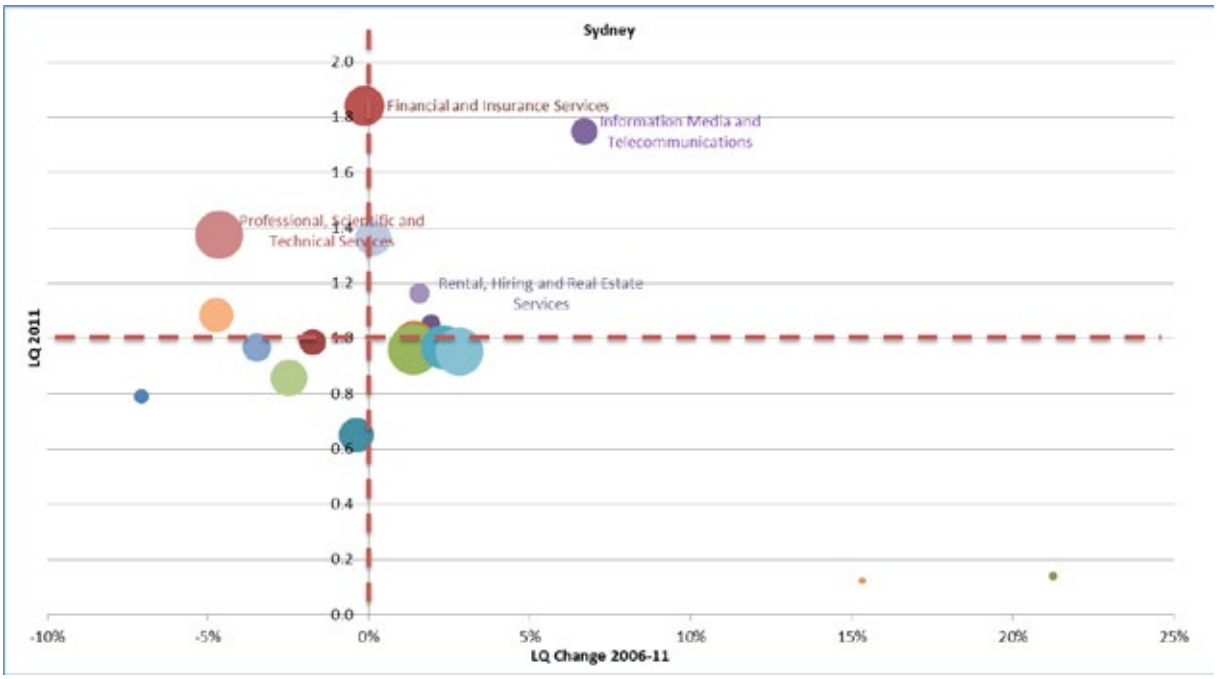


Figure 3. Clustering of Knowledge Workers in Melbourne.

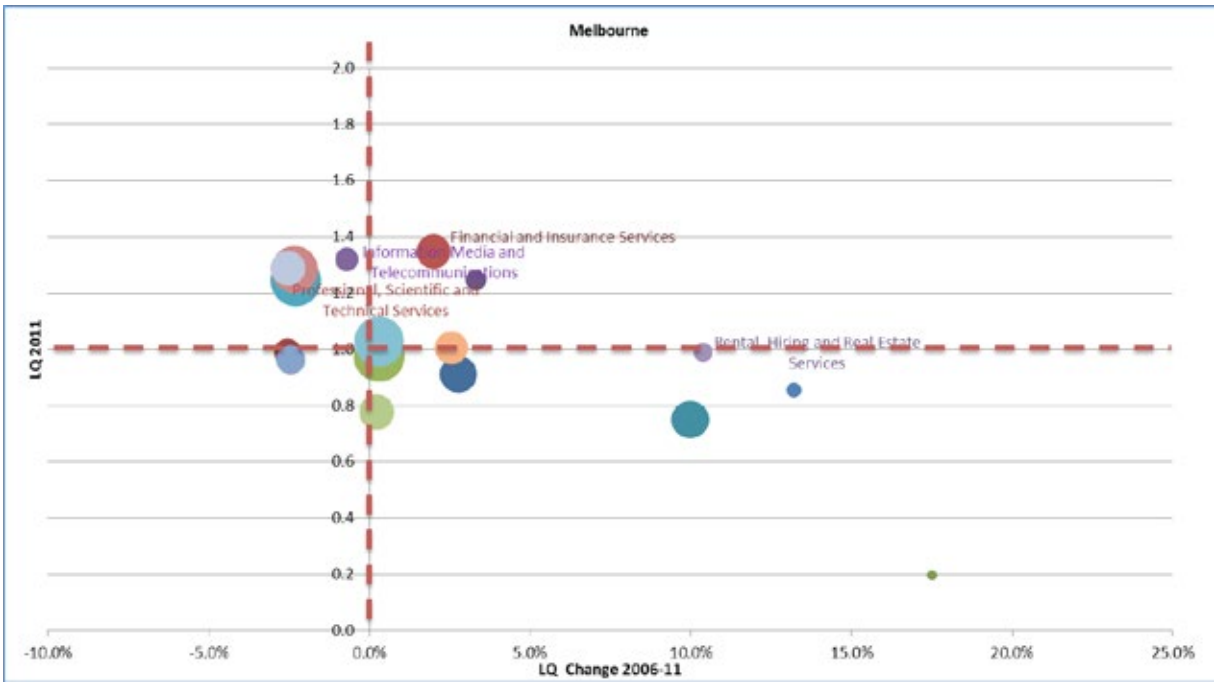
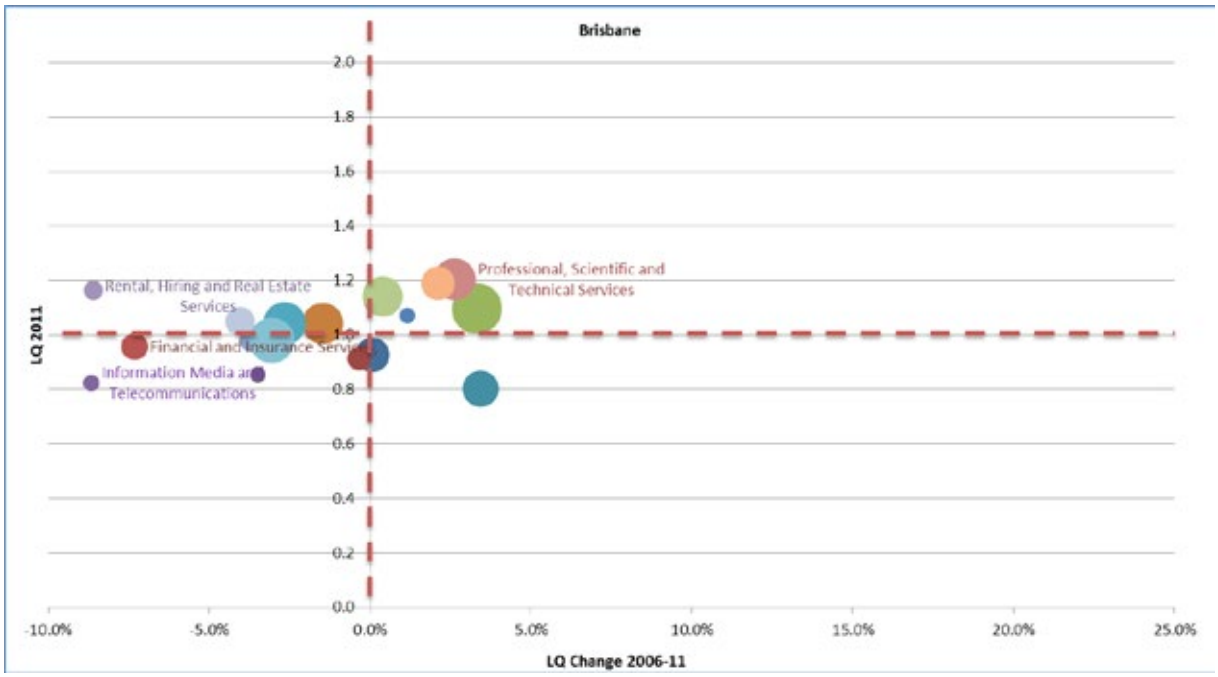


Figure 4. Clustering of Knowledge Workers in Brisbane.

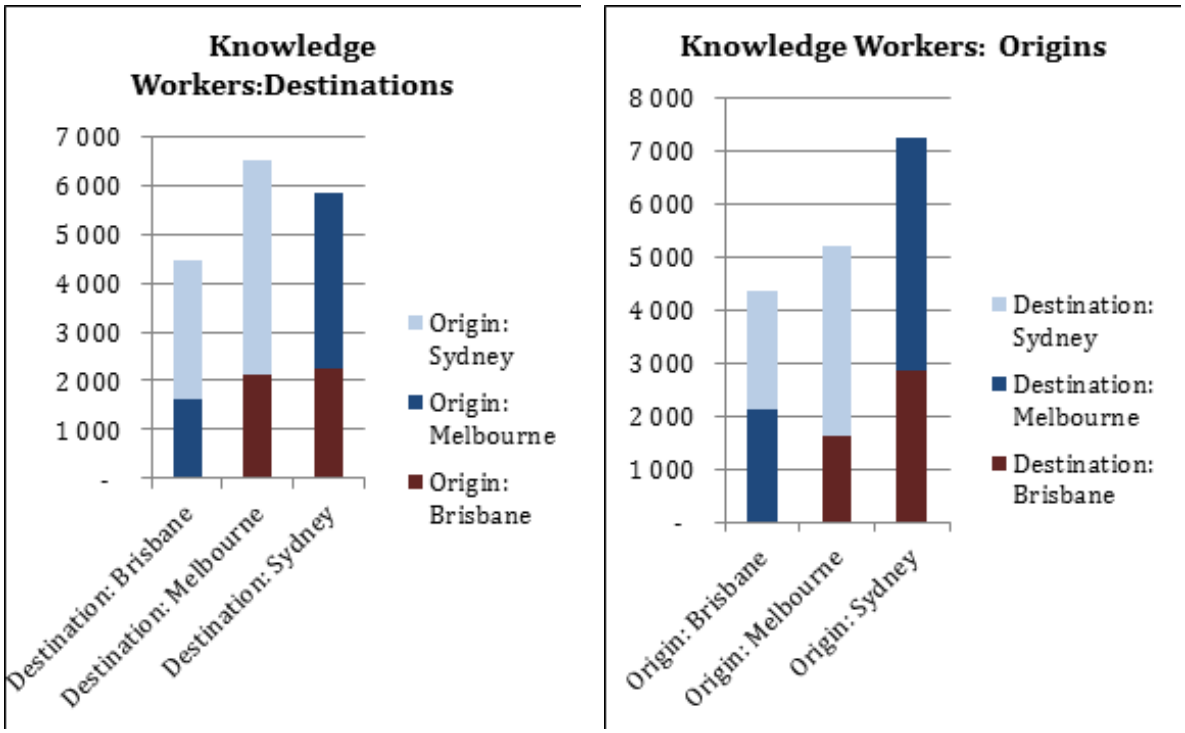


4.2. Movement of Knowledge Workers

Australian national urban policy identified 18 major cities with a population of more than 100,000 (Australian Government, 2011). The three cities of this study experienced the most dynamic inter-city people movement. In 2006-2011, Brisbane (101,597) attracted the most people from the other 17 major cities, followed by Melbourne (87,379) and Sydney (75,933). In the same period, Sydney (124,919) lost the most people to the other 17 major cities, followed by Brisbane (89,811) and Melbourne (76,843). These include the movement of knowledge workers between the three cities (see Figures 5). In terms of the movement of knowledge workers between the three cities in 2006-2011, Melbourne was the largest winner, and Sydney was the largest loser.

Figure 5. Total Movement of Knowledge Workers.

Figure 6. Movement of Knowledge Workers by Destination and Origin.



The movement of knowledge workers between the three cities demonstrate different patterns by knowledge-intensive industries and by cities. In 2006-2011, Professional, Scientific and Technical Services had the largest scale of people movement between the three cities, followed in sequence by Financial and Insurance Services; Information Media and Telecommunications; and Rental, Hiring and Real Estate Services (see Figure 7). There are winners and losers in movement of knowledge workers by industries in 2006-2011 (see Figure 8). It turns out that each city's net movement of knowledge workers is partially in line with its clustering of knowledge workers demonstrated in Figures 2-4. Sydney had net loss of workers in all of the four knowledge-intensive industries to the other two cities. The largest loss occurred to Professional, Scientific and Technical Services, which is in accordance with its declining clustering as identified above. On the contrary, Melbourne had net gain of workers in all of the four knowledge-intensive industries from the other two cities. The largest gain was in Professional, Scientific and Technical Services; and Financial and Insurance Services. The latter gain is supposed to contribute to its growing clustering in Melbourne in 2006-2011. Brisbane enjoyed considerable gain of workers of Professional, Scientific and Technical Services and a very modest gain of Rental, Hiring and Real Estate Services from the other two cities, and lost people in the remaining two knowledge-intensive industries. Brisbane's net movement of knowledge workers generally fit with its clustering patterns of knowledge workers, in particular its growing clustering of knowledge workers of Professional, Scientific and Technical Services.

Figure 7. Movement of Knowledge Workers by Knowledge-based Industries.

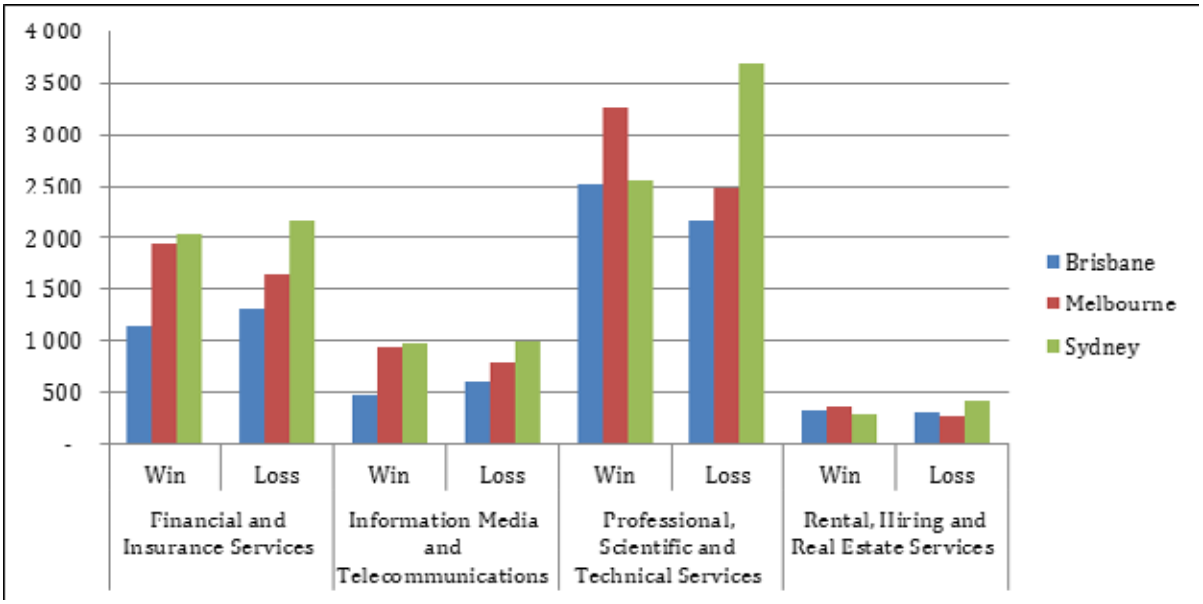
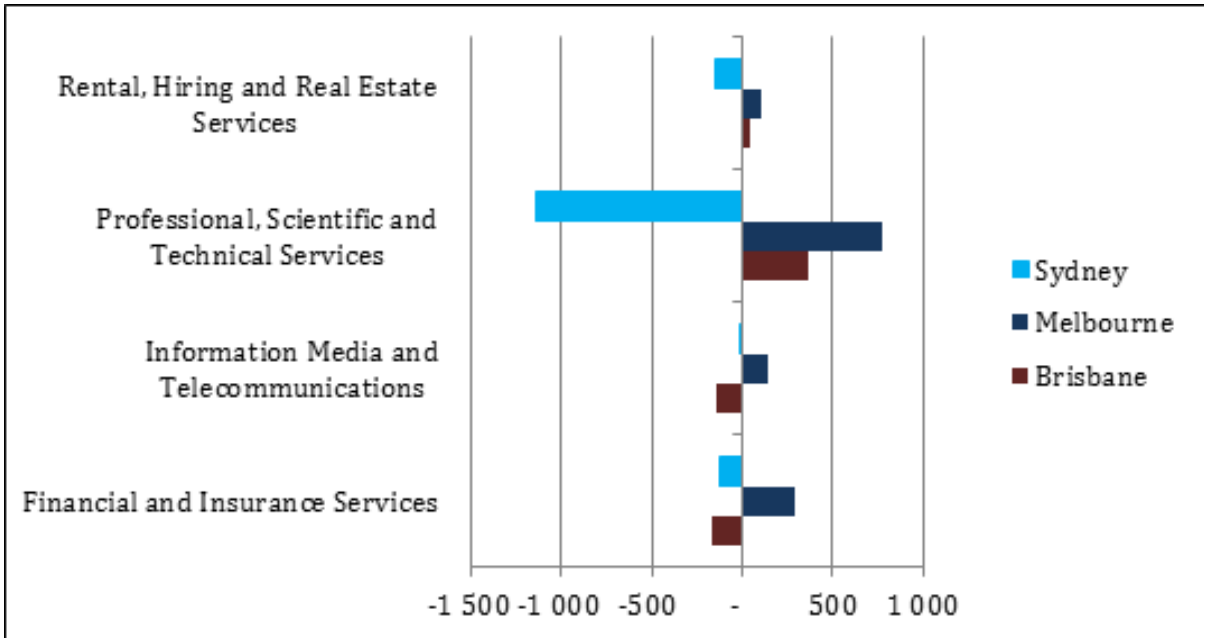


Figure 8. Net Movement of Knowledge Workers by Knowledge-based Industries.



5. CONCLUSION

This study provides new insights into the clustering and movement of knowledge workers in/between the three Australian global cities Sydney, Melbourne and Brisbane. In terms of clustering of knowledge workers, Sydney is dominating the other two cities, which well reflects Sydney's capacity of advanced producer services and its status as Australia's leading global city. However, Sydney's dominance in the knowledge-based services is facing challenges from the other two cities in different ways. The challenges include Melbourne's growing capacity in Financial and Insurance Services, and Brisbane's growing capacity in Professional, Scientific and Technical Services. For Sydney, its growing capacity in Information Media and Telecommunications adds new elements of the creative economy to its established economic base of a global financial centre.

The movement of knowledge workers provides another lens to examine the competitive relationship between the three cities. In this regard, Sydney is even more challenged by the other two cities. In terms of general people movement between Australian major cities, Sydney lost the most people while Brisbane gained the most people followed by Melbourne in Australia. In terms of the movement of knowledge workers between the three cities, Melbourne gained the most while Sydney lost the most. In each of the four knowledge-intensive industries measured in this study, Melbourne gained

knowledge workers from the other two cities to various degrees, and Sydney lost knowledge workers to the other two cities to various degrees. Brisbane experienced both gains and losses of knowledge workers in the four knowledge-intensive industries.

There is a mixed relationship between the clustering of knowledge workers in the three cities and the movement of knowledge workers between the three cities. Sydney's declining capacity in Professional, Scientific and Technical Services is accompanied by its largest loss of knowledge workers in this industry sector. At the same time, Brisbane's growing capacity in Professional, Scientific and Technical Services is accompanied by its largest gain of knowledge workers in this industry sector. Melbourne's growing capacity in Financial and Insurance Services is accompanied by its gain of knowledge workers in this industry sector. However, there are also contradictions. Despite its declining capacity in Professional, Scientific and Technical Services, Melbourne gained the most knowledge workers in this industry sector from the other two cities. Despite its growing capacity in Information Media and Telecommunications, Sydney suffered a modest loss of knowledge workers in this industry sector to the other two cities. The correlations and contradictions reflect the complexity in the relationship between the clustering of knowledge workers and the movement of knowledge workers. The formation of one economic cluster within a city is a function of different factors, including the movement of workers from other cities. This justifies the partiality of linking the clustering of knowledge workers in them with the movement of knowledge workers between them. However, the three cities are the largest cities and play a predominant role altogether in the Australian context. The relationship between the clustering of knowledge workers in the three cities and the movement of knowledge workers between the three cities should be more important than cities in other contexts.

This study provides new knowledge to inform the debates on Australian global cities. The debates include the argument that Melbourne has closed the gap on Sydney since 2000 by becoming more competitive globally and nationally (Searle & O'Connor, 2013), and the campaign for Brisbane's rise as Australia's new world city (Jensen, 2011; Acuto & Steele, 2013). Both Melbourne and Brisbane have indicated stronger growth, of population and employment in particular, than Sydney in the national context (Hu, 2014a). This study further compares their shifting capacities of the knowledge-based services and points out the challenges to Sydney presented by Melbourne and Brisbane. But they should not be simply translated into an understanding that Sydney's is going to lose its Australia's leading global city status to either Melbourne or Brisbane: 'Sydney is challenged' does not mean that 'Sydney is going to be surpassed'. This is argued based on two evidences from this study. One is that there is considerable gap between Sydney's capacity of knowledge-based services and that of the other two cities; the other is that there has been a robust growth of creative economy in Sydney which the other cities do not enjoy. This finding helps strengthen, rather than refute, the differentiated competitiveness of Sydney and Melbourne in the global context in a previous study (Hu *et al.*, 2013). On the other hand, the findings of this study help inform the directions of the pursuit of global Melbourne and global Brisbane. A global Melbourne is underpinned by its growing capacity of Financial and Insurance Services. A global Brisbane is underpinned by its growing capacity of Professional, Scientific and technical Services. Compared with Sydney and Melbourne, Brisbane's relatively weak capacities in Financial and Insurance Services; and Information Media and Telecommunications present a challenge to its campaign for Brisbane as Australia's new world city.

This study contributes to the scholarship on global cities along two directions. For one direction, comparing global cities in the national context presents a different approach to the studies of global cities, which have been mostly conducted in the global context. One challenge to the studies of global cities in the global context is comparability. Differences in social, economic, and political configurations, and data unavailability and inconsistency have heavily impacted the validity of such studies. On the other hand, comparing cities in the same nation using the criteria of global cities, that is, its capacity of providing advance producer services or knowledge-based services, offers new insights into cities. This approach integrates the understanding of contemporary cities in both national and global contexts. For the second direction, this study advances the strand of scholarship on migrant knowledge workers in global cities. This study sheds light on the issue of inter-city movement of knowledge workers and its association with a city's capacity of knowledge-based services. This adds an important dimension to the understanding of migrant knowledge workers within a global city (Hu, 2014b).

To sum up, this study uses inter-censual data to provide the newest and the most comprehensive understanding of the clustering and movement of knowledge workers in and between the three Australian global cities Sydney, Melbourne and Brisbane. The results reflect their capacities of providing knowledge-based services and their time-series shifts, and their attraction and retention of knowledge workers. The results also ascertain their global city status, and point out their directions of pursuit for global city status. They help inform the debates on Australian global cities. The scholarly contribution of this study lies in its knowledge obtained from studying contemporary cities in both national and global contexts, and in its advancement of approach to global cities from the lens of migrant knowledge workers.

APPENDIX

Details of Clustering of Knowledge Workers in Sydney, Melbourne and Brisbane

	Sydney			Melbourne			Brisbane		
Industries	LQ 2011	LQ change 2006-2011	Employ-ment share 2011	LQ 2011	LQ change 2006-2011	Employ-ment share 2011	LQ 2011	LQ change 2006-2011	Employ-ment share 2011
Accommodation and Food Services	1.0	2.3%	6.3%	0.9	2.8%	6.0%	0.9	0.1%	6.1%
Administrative and Support Services	1.0	-1.7%	3.2%	1.0	-2.5%	3.3%	0.9	-0.3%	3.0%
Agriculture, Forestry and Fishing	0.1	21.2%	0.4%	0.2	17.5%	0.5%	0.3	42.5%	0.7%
Arts and Recreation Services	1.1	1.9%	1.6%	1.2	3.3%	1.9%	0.9	-3.5%	1.3%
Construction	0.7	-0.4%	5.4%	0.8	10.0%	6.2%	0.8	3.4%	6.7%
Education and Training	1.0	1.4%	8.1%	1.0	0.3%	8.5%	1.0	-1.5%	8.6%
Electricity, Gas, Water and Waste Services	0.8	-7.1%	0.9%	0.9	13.2%	1.0%	1.1	1.2%	1.3%
Financial and Insur-ance Services	**1.8**	**-0.1%**	**7.1%**	**1.3**	**2.0%**	**5.2%**	**1.0**	**-7.3%**	**3.7%**
Health Care and Social Assistance	1.0	1.4%	11.4%	1.0	0.3%	11.6%	1.1	3.3%	13.0%
Information Media and Telecommunica-tions	**1.7**	**6.7%**	**3.2%**	**1.3**	**-0.7%**	**2.4%**	**0.8**	**-8.7%**	**1.5%**
Manufacturing	1.0	2.3%	8.9%	1.2	-2.3%	11.4%	1.0	-2.7%	9.5%
Mining	0.1	15.3%	0.2%	0.1	-16.7%	0.2%	0.6	34.0%	1.1%
Other Services	1.0	-3.5%	3.7%	1.0	-2.4%	3.7%	1.0	-3.6%	3.8%
Professional, Scientific and Technical Services	**1.4**	**-4.6%**	**10.3%**	**1.3**	**-2.3%**	**9.6%**	**1.2**	**2.6%**	**9.0%**
Public Administration and Safety	0.9	-2.5%	6.1%	0.8	0.2%	5.5%	1.1	0.4%	8.1%
Rental, Hiring and Real Estate Services	**1.2**	**1.6%**	**1.9%**	**1.0**	**10.4%**	**1.6%**	**1.2**	**-8.6%**	**1.9%**
Retail Trade	1.0	2.8%	10.3%	1.0	0.3%	11.1%	1.0	-3.1%	10.6%
Transport, Postal and Warehousing	1.1	-4.8%	5.3%	1.0	2.5%	4.9%	1.2	2.1%	5.8%
Wholesale Trade	1.4	0%	5.6%	1.3	-2.5%	5.3%	1.1	-4.0%	4.3%

Note: Knowledge-intensive industries are highlighted in bold.

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PARALLEL SESSION 3: KNOWLEDGE-BASED ECONOMY

THE COMPETITIVENESS OF THE MSMEs, IN THE CONSTRUCTION OF A KNOWLEDGE REGION; A STUDY ABOUT HOTEL INDUSTRY IN THE STATE OF TABASCO

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ABSTRACT
Nowadays has been observed that in international level countries become more competitive, this macroeconomic competitiveness is determined based on a variety of factors that affect the rankings of each one of them. In addition, at a microeconomic level, MSMEs play a decisive role in the development and economic growth of a country.

Evidence from research conducted to date have proven that the factors which influence the competitiveness of enterprises are: quality, technological position, financial capability, organizational structure, innovation, human resources, commercial resources, management and IT & communication skills (Kester & Luehrman, 1989) (Porter M. , 1990 p145) (Camisón, 1997) (Rubio & Aragon, 2008) and (Kraaijenbrink, Spender, & Groen, 2010) according to the economic focus of the company (Schumpeter, 1944), the model of the new industrial economy (Porter M. , 1990 p145) and organizational strategic typology (Miles & Snow, 1978 p65)

The study is supported by the methodology established by the Foundation for Strategic Analysis and Development of Small and Medium enterprises. The applied surveys resulted in the acceptance of the hypothesis: the competitiveness of the hotel industry in Tabasco is weak and deficient. This diagnose is the pacesetter to establish development strategies for this sector that should be considered priority in Tabasco, due to its multiple tourist attractions and the need of a competitive boost to become a knowledge region in Mexico.

KEYWORDS
Competitiveness, MSMEs, knowledge region, hotel industry, Tabasco

1. INTRODUCTION
The overall level of competitiveness in Mexico has deteriorated. According to the Global Competitiveness Index (GCI) of the International Institute for Management Development (IIMD) between 1999 and 2002 (INEGI, 1999, p 85), Mexico went from place 35th to 41st , while , according to The Global Competitiveness Index (GCI) of the World Economic Forum (WEF) , the drop was 14 points ; from position 31st in 1999 to 45th three years later (Mexican Institute for Competitiveness, 2008).

The political momentum and investment promotion towards the achievement of the competitiveness have failed to induce MSMEs, particularly the tertiary sector (Hospitality industry) to a higher level of development even though there is great potential for expansion, in this industry, that can help to consolidate the state economy.

Tabasco has a number of productive sectors within their different enterprises and industries. Its geographical location makes it the gateway to the southeast of the country, as it has abundant labor, because most of the population is young and on natural resources is a state that is surrounded by a vast variety of flora and fauna (Chablé Sangeado, Tesis Doctoral, 2006 p58).

Hence the need for a deeper study, serious and the degree of competitiveness of MSMEs Evolution of Economic, sector Hotels of Tabasco from 2007 to 2012.

2. MSMEs IN THE CONSTRUCTION OF A REGION OF KNOWLEDGE IN TABASCO

2.1 MSMEs in Tabasco
Enterprises in Tabasco are classified by size according to the number of jobs generated: Micro up to 10 employees, small 11-50 employees and Medium 51-250 Employees (Diario Oficial de la Federación, 2002 p20) as sampling frame took the 2004 economic census directory erected by the INEGI, 402 companies that were taken over four employees that served as reference to choose 171 hotels, located throughout the state (Neme Calacich, Estrada Calix, & Baena Paz, 2013).

Census directory 2004 (INEGI, 2004) and not the 2009 was made for two reasons; the first that given the high mortality of companies in their first 4 years, it was preferred to select those who have already passed the test of that age threshold and have more structural consistency and the second were not available census data directory 2009 to start lifting research surveys.

In the business sector Tabasco sum , according to the 2009 Economic Census , a total of 52,861 businesses, where micro (up to 10 employees) make up 94.44 % , followed in importance by the small (11-50 employees) with 4.44 % of total representation , less than .95 % of medium-sized (51 to 250 employees) and .17% large companies (Neme Calacich, University, Business and Government at the Competitiveness of SMEs in Tabasco Case of Corn Tortilla, as part of the Knowledge Society, 2012).

At national level, according to the 2009 Economic Census, commerce sector is having a greater impact in the economy of our country as it has a greater number of economic unit, as shown in the table, however the non-financial services are generating more jobs.

Table 1. Number of economic units
Number of economic units and persons employed by activity, 2008

Economic activity	Economic Units	%	Personnel Employed	%
National Total	3,735,347	100	20,254,726	100
Manufactures	435,436	11.66	4,522,799	22.33
Commerce	1,869,120	50.04	6,183,596	30.53
Non-Financial Services *	1,351,477	36.18	6,957,249	34.35
Rest of the Sectors**	79,314	2.12	2,591,082	12.79

Source: Data from the 2009 Economic Census INEGI. (INEGI, 2009)

* In general, the non-financial services include all services, both the Private Sector and the Public Sector, ranked in the following sectors of services according to the NAICS.

** The sectors that are in the residual group are: 2, Mining ; 22 Electricity, gas and water supply pipeline to the end consumer ; 23 , Construction ; 48-49 Transportation and Warehousing ; and 52 financial and insurance services . In this group are also included fishing (code 1141) and animal aquaculture (1125).

Although Tabasco MSMEs constitute 99.82 % of corporate production plant, suffer, as happens at the national level, a number of limitations and problems

- Technological backwardness, machinery taking second or third hand.
- Disadvantages of access to markets for inputs and final products.
- Low use of modern management techniques: using often ideas for designing your company copying what they see and often obsolete models.
- Deficient levels of quality.
- Difficulties in access to institutional credit and economic information. (Chablé Sangeado, 2004 par. 50).

Taking into consideration the economic branch Hotels is important in the state of Tabasco, since in this branch is where a significant number of employed persons, together with the Trade captures represent 15.4 % of the state GDP, we can assume that would be a wise state government to promote a policy which produces the necessary for the business of these micro economic sectors become in more competitive conditions (Aragón Sánchez & Rubio Bañón, 2005a).

The permanence , stability and growth of MSMEs enhance the capacity to generate productive jobs in the economy to help to absorb 1´300,000 young people on average each year are incorporated in the national workforce and in Tabasco estimates are about 20,000 youth annually entering this group (Chablé Sangeado, Información Económica del estado de Tabasco, 2004 par. 50).

Table 2. Sector of Economic Activity

Sector of Economic Activity	Percentage of contribution to state GDP (2009)
Primary Activities	1.36
Agriculture, forestry, fishing and hunting	1.36
Secondary activities	70.27
Mining	60.64
Construction Electricity, gas and water	6.46
Manufacturing Industries	3.17
Tertiary activities	28.37
Commerce, restaurants and hotels (Commerce, Temporary lodging and food and beverage preparation)	8.56
Transport and Information media (Transportation, post office, and storage)	3.75
Financial and real estate services (Financial and insurance services , Real Estate, Rental and Leasing assets)	6.16
Educational and medical services (Educational Services, Health Care and Social Assistance)	4.99
Government Operations	2.72
Other services * (Professional, scientific and technical enterprises Management of companies and services, business support and waste management and remediation services , leisure and cultural services Sports and Recreation , Other Services and Government)	2.19
Total	100

Source: INEGI. System of National Accounts of Mexico. Gross Domestic Product by State, 2005-2009 (INEGI, 2009).

To strengthen MSMEs would have to resort to different ways such as training, innovation, access to credit, microfinance and entrepreneurship support legal, regulatory and supervisory.

The hotel business is essential for the development of tourism in the state and is important because of the direct impact on job creation, as well as resuscitation productive and competitive advantages. That is why this sector is paramount in Tabasco economy and is meant as a strengthening of the state economy.

Figure 1 Map of Mexico (Diaz Rodríguez, 2012)

2.2 Knowledge Region

The study of territorial competitiveness requires different methodologies regarding the analysis of business competitiveness, not for different purposes and tools of competitive strategy, but also by the possible impact of the economic performance of a country in the welfare of its people and functions assumed by the central and local governments in the promotion and economic advancement. (Sobrino, 2005)

It is in these Knowledge Regions or Knowledge Cities, where knowledge has become an intangible asset that is a capital for the development of regional economies (Carrillo, 2005) and whose field of study and development has become a specialized discipline, consisting of : specialized publications, and virtual forums, professional associations, R & D (research and development) , substantial repositories (Yigitcanlar, Metaxiotis, & Carrillo, 2012).

The field of study of Knowledge Cities is a branch of Knowledge Based Development. The Knowledge Based Development has resulted from the confluence of the Theory of Economic Development and Knowledge Management. Discipline of Knowledge Cities in particular, is a confluence of Urban Studies and Planning (EPU) and Knowledge Management. The field of knowledge cities is then that part of the Knowledge Based Development dedicated to the understanding, design and planning of cities whose development is deliberately based on knowledge (Carrillo, 2005)

Then the result of previous research shows, where we determine the features of the Knowledge Region (Baena Paz G. L., 2012)

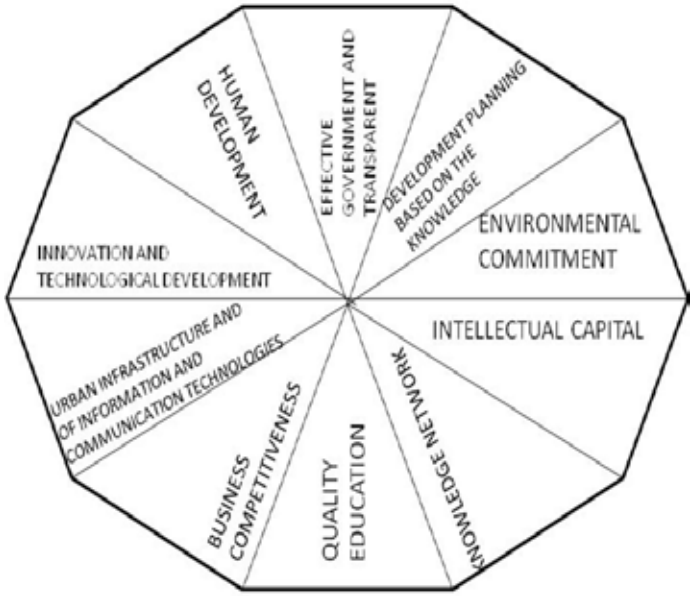
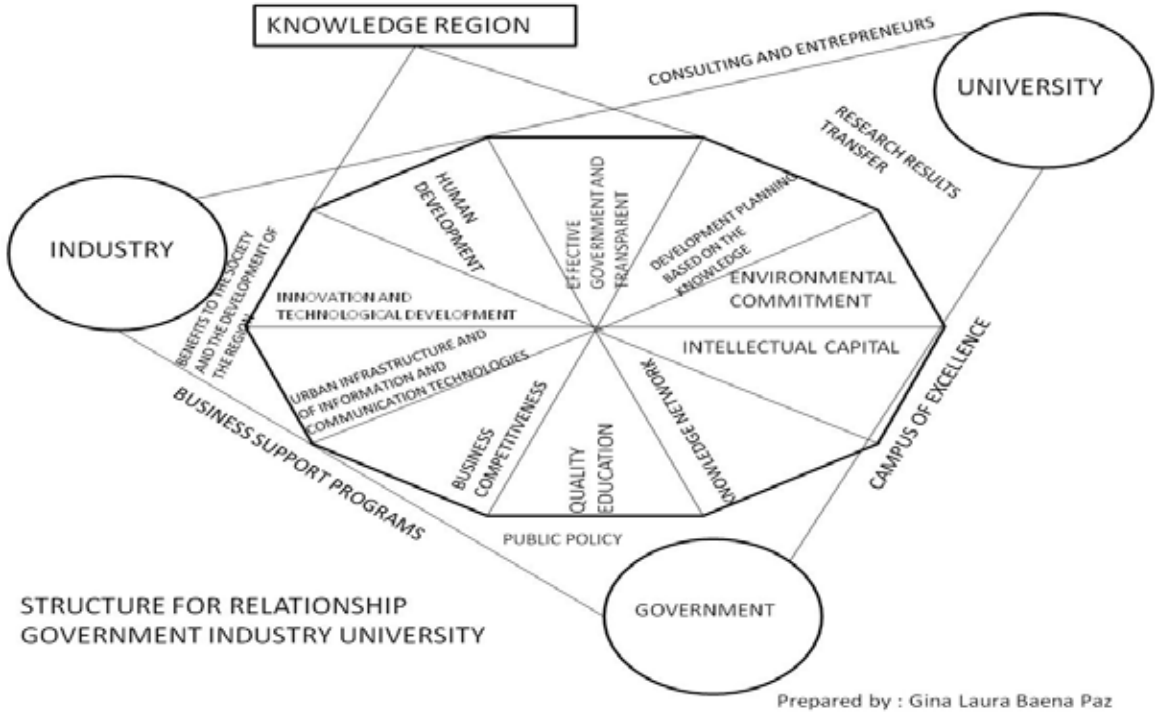


Figure 2 Characteristics of Knowledge Region (Baena Paz G. L., 2013)

To set the operation of the Model Knowledge Region Linking the following model according to the Triple Helix Model (Baena Paz G. L., 2013)



(Baena Paz & Neme Calacich, The relationship University, Business and Government in the construction of a Knowledge Region in Tabasco, Mexico, 2013)

Figure 3. Model Knowledge Region, Linking

2.3 Methodology

The research is based on economic approach to entrepreneurship, innovation and competitiveness of Joseph A. Schumpeter, (Rodríguez, 2005 p 67) his theory of business cycles is based on innovation, the role of the entrepreneur in the appearance mass of entrepreneurs, products and industries (Salvatore, 1991 p76). Consider business cycles as the "heartbeat" of the economic system because for him they are the essential part of capitalism (Montes & Sabater, 2002).

Theory of competitive advantage in business according to the conceptual framework proposed by Michael E. Porter (Porter M. E., 1991 p76), the competitiveness of a company or group thereof, is determined by six critical dimensions; these attributes and their interaction explain why innovate and remains competitive companies located in certain regions (Inman & Segura, 1998 p77)

Classification strategies Miles and Snow (Miles & Snow, 1978 p65) is based on four types: exploratory, analyzer , defensive and reactive , the first three can be considered successful strategies, while the latter is doomed to failure because not respond to a planned strategic pattern and in this sense, can be considered even as a "no strategy."

The information was obtained after the application of the survey beginning with the characterization of the respondent company , strategy, structure, human resources , quality, innovation , information technologies and communication, accounting and financial aspects; will also discuss its results in comparison with its competitors, its main success factors , difficulties in their development and general proposals for action, and the job will end with the fourth chapter containing the conclusions and recommendations for further development and strengthening MSMEs in Tabasco

3. CONCLUSION

The results obtained through the methodological process lead us to the following table, where the statistics tests are summarized, research hypotheses that address the research questions posed and the objectives set:

Table 3. statistical tests

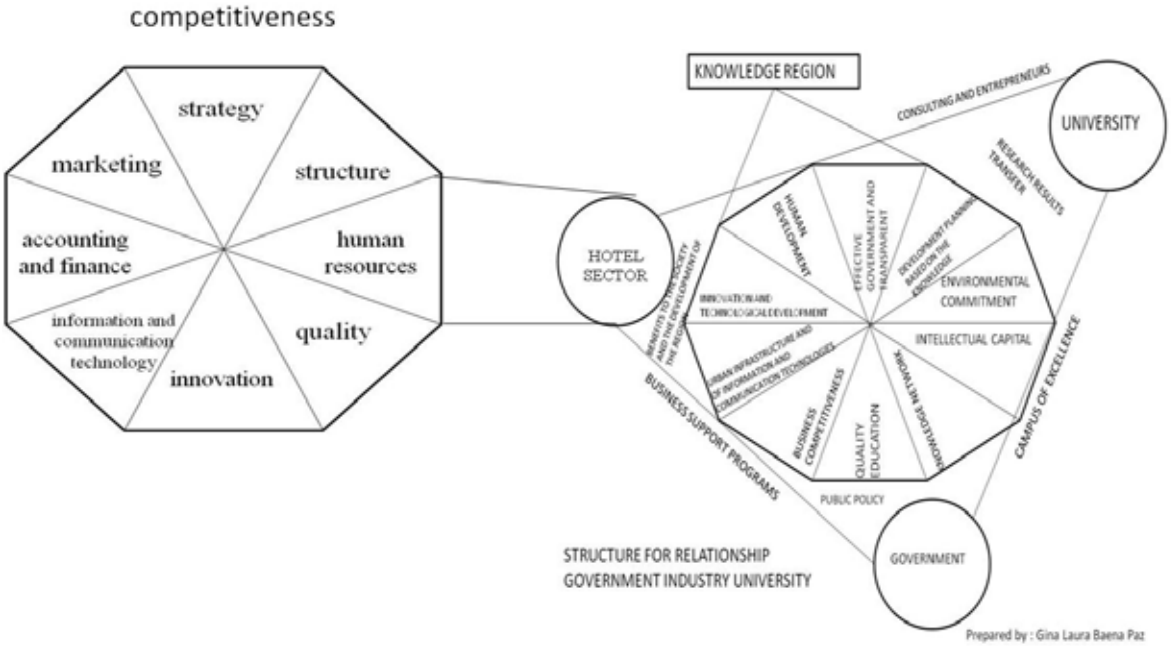
Summary of statistical tests of the research hypotheses		
NullHypothesis	**Conclusion**	**Remarks**

1. Level of education of the director or manager of the development of MSMEs in the state of Tabasco hotels branch 2007-2012, is equivalent to that of other states in Mexico.	Ho is rejected and Ha is accepted	Therefore the educational level of director or manager of the development of MSMEs in the state of Tabasco branch hotels 2007 - 2012, is low compared to other states taken as reference.
2. Strategic planning for the development of MSMEs in the hotel industry in the state of Tabasco 2007 - . 2012, is similar to that of other states	Ho is rejected and accept Ha	Therefore strategic planning of developments of MSMEs in the state of Tabasco branch hotels 2007 - 2012 , is poor compared to other states taken as reference.
3. Processes of human resource management (recruitment and selection, performance appraisal, staff training, staff development and incentive programs) of the evolution of MSMEs branch of Tabasco hotels 2007-2012 are similar to other states	Ho is rejected and accept Ha	Therefore human resources (recruitment and selection, performance appraisal, staff training, and incentive programs) of the evolution of MSMEs branch of Tabasco hotels 2007- 2012, are poor compared to other states taken as reference.
4. Position of the technological evolution of MSMEs in the hotel industry in the state of Tabasco 2007 - 2012, is similar to that of other states.	Reject Ho and accept Ha	Therefore Technological developments position MSME branch of hotels State of Tabasco 2007 - 2012, is weak compared to other states taken as reference.
5. The quality standards of the evolution of MSMEs in the hotel industry in the state of Tabasco 2007 - . 2012 , are similar to other states	Reject Ho and accept Ha	Therefore the quality standards of the development of MSMEs in the state of Tabasco branch of Hotels 2007 - 2012, are low compared to other states taken as reference.
6. Using of modern information and communication technologies to the development of MSMEs in the state of Tabasco hotels branch 2007 - 2012, are similar to that of other states	Ho is rejected and accepts Ha	Therefore Using modern information and communication developments MSMEs branch of Tabasco hotels 2007 - 2012, is low compared to other states taken reference

Source: Based on data obtained from the basis of the research project "Comparative analysis of the competitiveness of the business sector Tabasco branch of economic activity" FOMIX -CONACYT - State Government. 2012 (Estrada Calix, 2013)

According to these results, the model Competitiveness of MSMEs for the Construction of Knowledge Region was developed.

Figure 4. Model MSMEs Competitiveness for the Construction of Knowledge Region



With the above we can say that to the extent of making more competitive MSMEs in Tabasco succeed in reducing the gaps to build a region of knowledge, analyzing in this investigation, the hotel sector in the State of Tabasco, considered a high Region tourism its vegetation and archeology; but recognized for its high production Oil.

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FUTURE OF ISTANBUL IN THE KNOWLEDGE BASED GLOBAL ECONOMY: A FOCUS ON ISTANBUL FILM INDUSTRY CLUSTER AND ITS MODEL OF GLOBAL INTEGRATION

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ABSTRACT

Purpose: The main objective of this paper is to explore cluster dynamics and external linkages of Istanbul film industry through questionnaire study made with film producers.

Scope: In the context of this study, the film industry is used as a paradigmatic example demonstrating the degree of global integration for Istanbul. It mainly questions whether the cluster dynamics of the Istanbul film industry can create economic success in global market.

Method: Clustering and local-global interactions are the main points of analysis contributing the integration of film clusters into global film markets.

Results: The findings show that Istanbul film industry cluster is in the tendency of disintegration in spatial sense and has weak external linkages.

Recommendations: For sustainable development and being resilient against the crises, local-global interactions and external linkages should be integrated into the existing cluster dynamics.

Conclusions: Consequently, it can be said for Istanbul through film industry that it is on the periphery of global economic system and its position and degree of global integration can be increased through creative industries.

KEYWORDS

Global Economy; Creative Industries; Film Industry; Clustering; Local-Global Integration

1. INTRODUCTION

After the end of the favorable conditions of mass production and state interventionism in the economic system within the economic crisis of 1970s, capitalist development has entered a phase in restructuring of the global economy. The creative or cultural economy has been emerged as a new direction of many countries' economic policy after the end of industrial period. A striking characteristic of the new period is the increasing importance of sectors which produce goods and services whose subjective meaning to the consumer is high in comparison with their utilitarian purposes. The sectors, which are named as cultural industries, represent modern cultural economy, and are regarded as newly growing sectors which able to solve many of the problems of de-industrialization and unemployment.

However, providing sustainable development in these sectors is really an exhausting and dynamic process as especially observed in the film sector; the most visible, pervasive and biggest commercial sector in cultural industries. It is an industry exposed to an increased interest with its biggest economic and cultural impact especially in the last decade.

In this process, not only film industry but also the all cultural industries have taken a central position in cities' economic policies. Major cities all over the world are now trying to be integrated into the world city networks with their cultural product industries due to their acceptance as the drivers of local economic development (Scott, 2004). As it is stated by Scott, industrial profile of many countries has changed in the direction of cultural economy over the last decade as the source of expansion for output and employment.

Main concerns of this study are about the economic development of Istanbul in global economy through film industry as one of the most important cultural industries with its direct contribution to the urban economy (by triggering multitude of other sectors such as accommodation, catering and transportation) and its impacts on the promotion of cities and countries (by presenting local culture, creating images, and increasing city's potentials to attract tourists). In this context, cluster dynamics and external linkages of Istanbul film industry are explored through questionnaire study made with film producers. Istanbul is chosen as the case study area for being the only film cluster of Turkey. It is questioned that whether the cluster dynamics of the Istanbul film industry can create economic success in global market. In this regard, at first stage clustering dynamics and different global integration models are explained with the aim of understanding the general structure of film industry; secondly historical analysis of Turkish film industry are made by referencing to the cluster dynamics and integration models. In the third part, database and the survey process are explored and in the fourth part, cluster analysis and the findings are explained. Finally, the findings are summarized and discussed for the Istanbul film cluster and some policy changes are suggested.

2. CLUSTERING AND LOCAL-GLOBAL INTEGRATION

In the first stage, I will focus on the question that how can we explain the success of cultural industry clusters? Dual theoretical structure used by Vang and Chaminade (2007) for the clusters will provide a conceptual framework for the explanation of this success. However, there is a lack of research about the cluster dynamics of the cultural industries which have intensive external linkages and global relations. While the cluster literature named as Marshallian and Jacob clustering provide a good framework for the investigation of the cultural industries' globally intensive relationship based structure, it includes important deficiencies for the evaluation of external linkages.

2.1. Marshallian Clustering

According to the Marshallian approach, the positive effects of clusters on success are related to the human and social capital. Competitiveness, which is generated by the interactive learning, emerges as the function of human and social capital in clusters. These two types of capital are most important factors determining the interactions of the firms and mutual learning process among them. While the human capital refers to the skills, education, health and training of individuals underpinning the absorptive capacity of clustered firms, social capital refers to institutions, relationships and norms forming the quality and quantity of social interaction. Human capital is more related to the labor market and shows their ability to access, interpret, transform and commercialize localized knowledge spillovers in the sector whereas the social capital might facilitate transactions characterized by a high degree of uncertainty. In this approach, both human and social capitals are crucial for the economic success of clusters (Vang & Chaminade, 2007).

Ignorance of the local global relationships and the analysis made just related to the foreign direct investment are the points of criticism for the Marshallian clustering. They decrease the explanatory power of this approach because the cultural industries are the specific sectors developing project based relationships and intense external linkages. Local global interaction analyses made on cultural industries and especially on film industry investigate the production strategies of clusters focused on the utilization from foreign countries' cheap labor, infrastructure, natural beauties and financial supports. There is no investigation in this cluster category concentrating on the questions of how and to what extent global relations or external linkages affect the success and internal organization of cultural industry clusters (ibid).

2.2. Jacobs Clustering

The studies made on cultural industry clusters are generally developed with Jacobs approach (Jacobs, 1969). These studies made for the explanation of the reason of the tendency of concentration in metropolitan areas and clustering are focused on the factors such as diversified labor markets, openness, tolerance and buzz. In order to increase the competitive capacity of cultural industries, access to unique, valuable and diversified knowledge and re-combinations of the diverse type of knowledge become the crucial points. Fast re-combinations, knowledge sharing and the continuous reproduction of knowledge are the essential features of cultural industries organized in the form of cluster. Cultural industries are project based where each project must be different from the previous one and hence they have to organize fast, produce innovations and practice them. This type of organization may solely be in the metropolitan areas accommodating diversity of human capital. The high level of diversity is related to the openness and tolerance of the society. Globalization process and local-global linkages are again the shortcomings of this clustering approach (Vang & Chaminade, 2007).

In brief, when these two approaches are evaluated, it is seen that clustering is the concept must be emphasized for the success of cultural industries. In this process, different dynamics of the clustering become important for the success and competitiveness. These dynamics can be analyzed under the five different headings by adding external linkages and globalization process (Bathelt, 2004). Horizontal dimension based on the competitiveness and diversity, vertical dimension based on the interactive learning, institutional dimension encouraging inter-firm cooperation and collaboration projects, external dimension based on the connections to markets and knowledge pools in different regional and national settings, and finally power dimension including adaptation processes to changing regulations and markets are the prominent issues in cluster analysis. Another important point is the trade-offs should be established among the different dimensions of clustering. Otherwise, situations such as lock-in, path dependency, blind confidence and over-embeddedness may emerge in the cluster and prevent economic successes.

Film industry as the basis of this study inherently produce clusters due to its project based organizational structure. Connections with all related actors for each different film projects require being together. Furthermore, as it is emphasized in the cluster literature as the reason of proximity, possibility of socialization, learning, face to face interaction, creativity and motivation encourage firms to be located in together. As all the cluster examples around the world show, clusters positively affect the creativity, productivity and therefore the development of firms. Additionally, they make positive contributions to the economy of city and region in which they located by enabling the emergence of new firms, new jobs, innovativeness and competitiveness (Jacobs, 1969). Although the positive relationship between the success and geographical agglomeration is emphasized in the cluster literature, reverse examples can be observed in practice. For the cultural industries, problems in the core or central areas and attractiveness of the sub-centers have produced a tendency of shift as it can be observed in Istanbul film industry cluster.

2.3. Restructuring Process in Film Industry

Before the detailed analysis of Istanbul film cluster, the changing dynamics and contexts of the film industry in the world market should be understood within the perspective of globalization. The film industry has been undergoing strong structural changes named as globalization in the last decade encompassing not only the production process itself but also distribution, exhibition and financing processes. Lorenzen (2009) evaluates globalization as the integration of different nations, firms and organizations into global economic, cultural and some extent political systems. Dicken claims globalization as "the functional integration of internationally dispersed activities" into broader social, cultural, politic and economic realities (Dicken, 1998, p. 5). Globalization is a process entails interconnectedness between a multitude of countries, leading to their integration into global networks of economy, culture, policy, etc (Lorenzen, 2007; Lorenzen, 2009).

In the film industry, there are four aspects of globalization exposed by Lorenzen (2007, 2008); that are globalization of (1) involvement in filmmaking, (2) film consumption, (3) film production, and (4) organization of filmmaking. The first aspect is related to the increasing film producers in the countries outside the USA. Globalization's second aspect is mainly related with the changing consumption patterns evolving through global consumer taste and global consumption together with newly introduced niches. 'Film projects crossing national borders' is the third aspect of globalization; that is globalization of film production. The fourth aspect, that is global forms of organizations, is best demonstrated by global corporations. In this process, cultural production companies integrated both horizontally and vertically in order to be competitive in many industrial areas (such as publishing, music, TV, cinema, etc.) and reach wider global markets.

As it can be seen from the different aspects above, globalization process in film industry deserves particular attention. Local film industry examples from different parts of the world are now becoming integrated to the global film markets. There is a globalization process under which local and global players adapting new conditions and developing new meanings. The organization of the film industry is undergoing a transformation in this process. Different activities of different film countries are coming together and functionally integrated to each other through the transnationalization of audiences, labor pools, distribution networks, and production capital. In this process, not only the organizational elements are integrated ("material integration") but also the product specific elements such as star persons, visual styles and storytelling mode ("stylistic integration") are integrated (Klein, 2004).

The literature about the production organization of different film industry examples in globalization process indicates that integration to global film market is a necessity to provide sustainable growth and competitiveness in the global market. The integration of local or national film industry into the global markets in the new cultural economic structure shows different trajectories for different localities. In this changing and transforming network relationship of film industry, different film countries from different parts of the world come to the fore with their own production organization, labor process, and arrangement mechanisms. In the light of the above mentioned concepts and discussions, I have specified six different types of integration models to the global market in film industry. These models emerge with the different combinations of industrial organizations (production, distribution and marketing system), size of home market, labor market conditions, regulatory mechanisms, and contents of the films. First strategy is the integration into the global film market with command functions, as in the Hollywood examples. Organizational heterogeneity, internationally appeal film making, powerful distribution and marketing networks give them superiority on global film markets. Second one is related to the use of runaway productions as a strategy for one side to integrate world film market and for the other side to benefit from local financial and creative sources. Co-production with foreign film companies is the third most preferred strategy for integration, increasingly used by nations based on arrangements performed by governments such as tax incentives-reductions, some procedural advantages, and cheap labor force. Fourth strategy is based on the integration into global market with adjusting and cloning of Hollywood's industrial organization and film making styles which are tried to be applied by countries such as Korea and France. Users of this strategy are all criticized by the cinema critics as imitators of the Hollywood. Fifth one is based on the use of geo-cultural markets with diasporic films. Cultural similarities are the starting point for this model. The last strategy niche markets base on the use of different methods of film making such as dogma strategies of Denmark, technological superiority of postproduction firms of German, Italian strategy of film making with well-known directors, and animation films of Japan. Art-house film making is the preferred way of this integration. In this strategy, integration is based on non-commercial use of films.

Different film clusters do not need to use just one model, they may use range of models at the same time. At first glance, it is seemed that Turkish film industry is the practitioner of the three global integration strategies. Co-productions with European countries, exporting films to geo-cultural markets consisting of the Middle East, Balkan States, and Turkic countries, and marketing and distribution of Turkish films to Europe for the diasporas are the ways exporting Turkish films to foreign countries. Although there are some positive developments in Turkish film industry towards global integration in the last ten year, it has still small portion of export growth and limited revenue from foreign markets. When it is compared with Hollywood and other film clusters such as UK, France and Japan, it still remains very small scale industry. In order to represent the position of Turkish film industry comparatively to other film countries in global film market, some statistical indicators are collected and showed that Turkish film industry can be categorized with the small scale film countries such as Ireland and Denmark according to the number of films, home market size, admissions, market shares, number of screens, and gross box-office revenues.

3. TURKISH FILM INDUSTRY

The growth of Turkish film industry has displayed fluctuated characteristics over the years due to the social, economic, and political factors. After a weak start, it showed a big development within the domestic market after 1950. Although it has reached a big production capacity in the '50s and '60s, it could not sustain its development in the '80s. Beginning with 1970s, it nearly came to a standstill in parallel with the problems in economic, social, and political structure of Turkey. However, after 1980s, Turkish film industry has entered a restructuring process. The recovering period for Turkish film industry started after those years in parallel with the globalization process. In all of these historical processes, external relations of Turkish film industry are generally based on the one-way flow as the import of films from foreign countries and distribution and exhibition of them in domestic market. Although it has strong clustering dynamics and weak relationships with foreign markets since the beginning of cinema in Turkey, decentralization process and new ways of integration into global or foreign markets have emerged in the last two decades.

4. ANALYSIS

In the light of the above mentioned concepts, databases needed for the analyses of production organization of film industry are created. In order to analyze the industrial geography of film industry within the perspective of global integration, a questionnaire is designed for the production companies. Due to the lack of statistical data about the agents and films in Turkish film industry, a survey is designed to collect information. It is prepared for the producers due to their prevailing structure in the film sector with the aim of understanding production organization and the external linkages of Turkish film industry.

4.1. Collection of Database for Questionnaire Study

To begin with, a list of producers in Istanbul tried to be acquired. However, exact information about the numbers of film producer could not be obtained from the related institutions and organizations. Inconsistency was the other problem area emerging after the collection of limited information from these sources. And also, the content of the databases gathered from these institutions and organizations (such as State Institute of Statistics and professional organizations) did not match each other. Therefore, in order to analyze production networks of film industry at local and global level, the data was collected through the field survey.

The research on creating a producers list for Turkish film industry was started by getting in contact with film producer associations. Four producer associations –SESAM (Professional Union of Film Producers, Importers, Cinema-owners), SEYAP (Film Producers Professional Association), TESİYAP (Proffesional Association of Television and Cinema Film Producers), FİYAB (Film Producers' Professional Association) - were confirmed in the film industry field from the website of "The Ministry of Culture and Tourism: Directorate General of Copyrights and Cinema". In order to build a production company database, member lists of these associations are analyzed and integrated. At the end of these processes, lists of these associations were combined and totally 182 film companies were determined. In order to understand the structure of Turkish film industry and reliability of survey questionnaire, a pilot study was made with eight producers to test and finalize the survey form in Istanbul. At the end, final form of questionnaire was determined.

At the end, only 75 company owners were achieved to get in contact with. While 58 of the 75 contacted companies were accepted to participate in survey. However, eleven firms had not arranged any time for questionnaire in the following six months. Two answered questionnaire were invalidated due to their partially completed condition. At the end only 45 film companies accepted and answered all of the questions in the survey form. The share of the completed questionnaires was twenty-five percent (25%) if the total number of cinema film producers were accepted as 182 from the combined data. When we calculated this ratio with the contacted companies (75), the result was 60 percent sample size.

15 of the 45 surveyed companies were one-man firms which had no institutional record about previous projects. Company owners generally had an agenda or notebook including all valuable information about their previous projects such as budgets and expenses. These agendas also contained the list of mobile phone numbers of film producers in Istanbul. Unprofessional structure of these companies was one of the important points complicating the survey process. The other 30 film companies were more organized and institutionalized. They were making film projects every year, employing more people, and achieving better score at box-office. They were generally doing business in different segments of audiovisual industry. However, the problem of the absence of systematic record and archive of the past projects was appeared for these companies, too. Due to this problem, questionnaire sheets had to be answered by company owners who were the masters and decision makers of all film making processes.

4.2. Questionnaire

The survey questionnaire was prepared with the aim of revealing the structure of film companies, production organizations, and sectoral relationships. The questionnaire sheet filled by the producers is composed of three main parts as general information about the company, production organization of film industry, and other relations including financial, labor, institutional, and sectoral relations.

In the first part, multi-sectoral structure, experiences, past and present dynamics of companies, national and international

co-productions, and way to establish partnerships were questioned. In the second part, three sub-categories were defined in order to understand the relationship networks, external linkages, and partnerships. Under the relationship networks, companies' relations with other firms and institutions both nationally and internationally were questioned for all stages of film production over their last film projects. Finance, pre-production, production, post-production, and distribution are the five main stages of film production examined in this section. Under the heading of production organization; density, frequency, and satisfaction were questioned for the companies' networking relationships. Moreover, the terms coming from local economic development literature about the industrial organizations as competitiveness, creativity, clustering, and knowledge flow were interrogated for Turkish film industry with the help of producers in the production organization section of the questionnaire sheet. In the parts of partnerships and external linkages; the reasons and ways of producers going into partnerships for national and international co-productions -the important tendencies in film industry after 1990s- were analyzed for Turkish film industry. Release in foreign markets, integration into global film market, film export, and strategies to reach foreign markets are the issues questioned in the context of this survey.

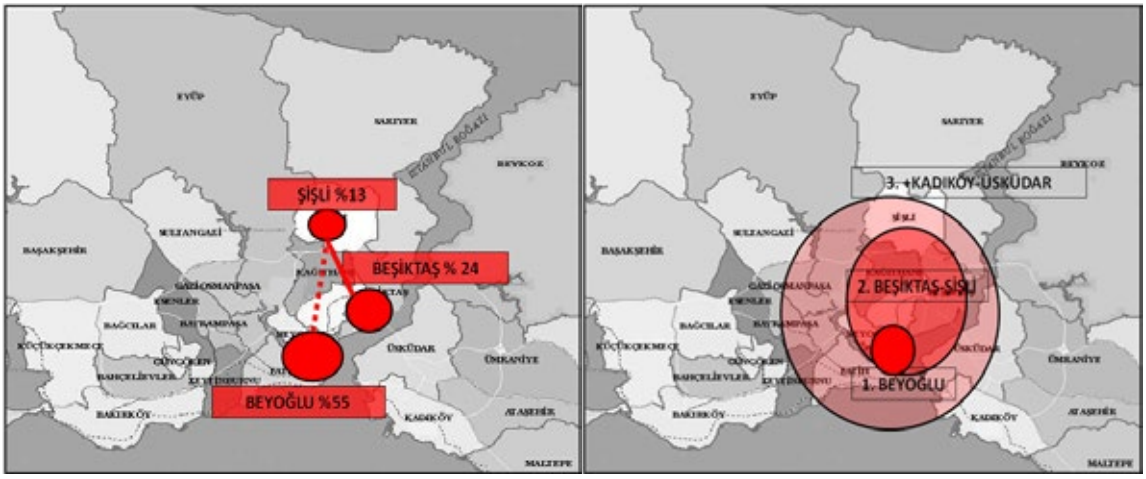
And finally, in the third part, financial resources, spending items, labor processes, institutional relationships, and other supportive sectors were examined over the last film projects of companies with the aim of deepening the research on the industrial organization. The survey included dichotomous, open-ended, multiple choice, and five point likert-scale questions.

5. CLUSTER ANALYSIS

Beyoğlu is the only center of Turkish cinema which developed of its own accord. The interviews revealed that the 42 of the firms within the 45 of active firms in the sector are located in the districts of Beyoğlu, Beşiktaş and Şişli. Beyoğlu is still an important center for film production. Beşiktaş has the share of 24% with 11 firms within the interviewed firms, while Şişli has the share of 13% with only 6 production firms (Figure 1). As we could not reach any precise data on the actively working firms in the sector, it was impossible to make a geographic concentration analysis including all the firms in the sector. This situation is also evident on the other works on Turkish films in the literature. Durmaz (et.al., 2009) accepted the number of producers as 147 using the data on IMDB (internet movie database) and of Film Producers Association in his comparative work on English and Turkish film industries. But, IMP (2006) used the data of SESAM for the report of research group on cultural industries and reached the number of 162 firms. On the other hand, Özkan (2009) used the data on 46 production firms he interviewed with in her PhD thesis on film industry and its potential on producing urban regeneration.

In the context of this study, I made an additional research using the first 200 successful films due to box office numbers, in order to resolve the uncertainty on the number of production firms. These 200 films were produced by a total of 118 firms. The address of only 76 of them could be reached and it came up that 66 firms were located at Beyoğlu, Beşiktaş and Şişli. This result is compatible with the data reached through the interviews made with 45 firms. In addition; Beyoğlu, Beşiktaş and Şişli come to the fore as the first three nodes in European Side due to another review made on the address data on the member lists of SESAM and FİYAP. There were only 13 firms at Anatolian Side, located at Kadıköy, Beykoz and Üsküdar.

Figure 1. Film production companies in Istanbul (45 producer)



Source: Survey Results, 2008

Table 2 shows the spatial preferences of the interviewed firms and the reasons behind their preferences. It is asked the producers to make an evaluation using a rating scale between 1 and 5 (likert scale) where 1 represents the least important factor and 5 represents the most important one. The analysis put forward that the most important determinants on

geographic location preferences are accessibility, socio-cultural environment and the quality of physical space. The frequency distribution given on tables 2-3 and 4 shows a verification percentage of 60%. However affinity to the public services, related institutions and the firms worked together are other factors effecting the spatial preferences of sector, which are important due to the general numbers but not given so much importance by the firms. The intensity of services and cultural facilities in the region is not shown as an important factor on preferences; but a group of firms constituting a share between 25% and 30% answered these questions as very important.

Table 2. Frequency Distribution of the Reasons for Spatial preferences

Rate of Importance	Accessibility		Affinity to the Cultural Industries (Media and Music Firms)		Quality of Physical Environment	
	Firms (#)	Perc.(%)	Firms (#)	Perc.(%)	Firms(#)	Perc.(%)
1	7	15.6	14	31.1	13	28.9
2	0	0	3	6.7	2	4.4
3	2	4.4	3	6.7	5	11.1
4	10	22.2	7	15.6	6	13.3
5	26	57.8	18	40.0	19	42.2
TOTAL	45	100.0	45	100.0	45	100.0

Source: Survey Results, 2008

Table 3. Frequency Distribution of the Reasons for Spatial Preferences Regarding Affinities

Rate of Importance	Related Professional Institutions		Other Firms Worked With		Subcontractor Firms Worked With	
	Firms (#)	Perc. (%)	Firms (#)	Perc. (%)	Firms (#)	Perc. (%)
1	15	33.3	16	35.6	17	37.8
2	1	2.2	2	4.4	2	4.4
3	9	20.0	7	15.6	6	13.3
4	5	11.1	5	11.1	7	15.6
5	15	33.3	15	33.3	13	28.9
TOTAL	45	100.0	45	100.0	45	100.0

Source: Survey Results, 2008

Table 4. Frequency Distribution of the Reasons for Spatial Preferences

Rate of Importance	Density of Cultural Activities		Density of Services		Adequateness of Public Services	
	Firms (#)	Perc. (%)	Firms (#)	Perc. (%)	Firms (#)	Perc. (%)
1	15	33.3	16	35.6	16	35.6
2	5	11.1	0	0	5	11.1
3	7	15.6	10	22.2	4	8.9
4	6	13.3	5	11.1	8	17.8
5	12	26.7	14	31.1	12	26.7
TOTAL	45	100.0	45	100.0	45	100.0

Source: Survey Results, 2008

An important majority of the firms located in triangle due to the reasons mentioned above. Representatives of the sector indicated their reasons to stay together with other firms as the important opportunities such as the chance of developing

face to face relations, ease of working together, working on similar conditions and trust environment (Table 5). Besides the survey, we know that Beyoğlu, Beşiktaş and Şişli are all localities hosting rich cultural activities, colorful night life and so much commercial and cultural centers. However, the interviews made with representatives of the firms located on Beyoğlu put forward that the region has lots of problems such as transportation and parking, narrow sites, security problems at night and high rates of both real estate and shooting licenses. The tendency to move from Beyoğlu to more prestigious places has been realized depending on these reasons. The firms preferred to stay at Beyoğlu aim to develop relations with other firms more easily by staying inside the city. Some of the firms emphasize the historical and cultural identity of the region. Especially the location of the firms acting on the supportive sub-sectors at Beyoğlu reveals that the processes of pre-production and production are occurring in this region.

The tendency of the production companies to move is another issue reviewed through the survey analysis of the Turkish film sector. The firms are asked for their districts of foundation and whether they were ever moved and the reasons for those moves. Accordingly, 26 of 45 firms were established at Beyoğlu while 13 firms were established Beşiktaş and Şişli. The number of firms moved in spatial terms is 24 in 45 (%53). Apart from the moves in the same districts, a tendency to move through the route of Ortaköy-Levent and Şişli is seen. The evaluation of the reasons for these movements showed that being in the central place, accessilibility, affinity to prestigious places and sources of finance are the most important reasons. However, rants, accessibility and spatial sizes gain importance for the moves within the same districts.

I have also made a geographic concentration analysis for montage studios, firms working on equipment leasing, film studios, modeling and casting agencies, distribution firms and professional organizations apart from the questionnaires made with film production companies. The data on related firms and institutions are gathered from the book published by Film Producers Association; "Temel Verileri ile Türk Sineması:1996-2006" (Sayman & Kar, 2010).

Table 5. Clustering Dynamics

Rate of Importance	Ease of Working Together		Chance for Developing Face to Face Relation		Working on Similar Conditions		Trust Environment	
	Firms (#)	Perc. (%)	Firms (#)	Perc. (%)	Firms (#)	Perc. (%)	Firms (#)	Perc. (%)
1	11	24.4	6	13.3	6	13.3	8	17.8
2	2	4.4	2	4.4	5	11.1	4	8.9
3	3	6.7	4	8.9	6	13.3	4	8.9
4	5	11.1	9	20.0	6	13.3	7	15.6
5	24	53.3	24	53.3	22	48.9	22	48.9
TOTAL	45	100.0	45	100.0	45	100.0	45	100.0

Source: Survey Results, 2008

This analysis showed that there are 18 montage studios, 12 equipment leasing firms, 4 film studios, 19 modeling and casting agencies, 23 distribution firms and 20 professional organizations and Foundations. The evaluative on their location preferences demonstrates that they are concentrated at the same districts with the film producers (Table 6)

Table 6. Spatial Analysis of Sub-sectors (number of the firms)

District	Montage Studio	Equipment Leasing	Film Studio	Modeling and Casting Agency	Professional Organizations and Foundations	Distribution Firms
Beyoğlu	4	3	1	9	18	10
Beşiktaş	7	1	1	5	1	8
Şişli	3	6	1	3	-	3
Sultanahmet	2	-	-	-	-	-
Beykoz	1	-	-	-	-	1
Mahmutbey	-	1	1	-	-	-
Fatih	-	1	-	-	-	1
Sarıyer	1	-	-	-	-	-

District	Montage Studio	Equipment Leasing	Film Studio	Modeling and Casting Agency	Professional Organizations and Foundations	Distribution Firms
Kadıköy	-	-	-	1	-	-
Üsküdar	-	-	-	-	1	-
Caddebostan	-	-	-	1	-	-

Source: Basic database of the Turkish cinema: 1996-2006, 2008

It is mentioned above that clustering literature is insufficient to explain local-global linkages especially for the cultural industries. However, in the film industry which shows an intense process of globalization, everyday a different country tries the co-production strategy (with foreign firms) in order to have its place in the world market or in order to increase its share (Canada, Izland, Ireland, Australia, China and some European Countries like France, England and Germany). In relation with this, the tendency of working with foreign firms in the Turkish Film Industry is also questioned within the survey. It is seen that 19 firms of 45 (42,2%) are produced coproduction films with foreign companies. Thus, the tendency for co-production becomes prominent in Turkish film industry as an important situation to analyze. Additionally, it is seen that cinema council of European Union has promoted co-production projects using the supports given within the scope of Eurimages. Turkish cinema industry has taken the advantage of these supports every year since 1990.

The way how these foreign partnerships are established is another issue examined through the survey (Table 7). The result shows the facilitator effect of international festivals on these partnerships. The atmosphere in the festivals easing the communication provides the representatives of the firms the chance to meet each other and see their productions. The network relation established here motivates the future co-productions. Eurimages and international festivals come to the fore as the most important exogenous factors for Turkish film industry. Taking the developments within the world film industry into account, we see that, different countries come together with the worldwide powerful actors (producer, director, cast, etc.) through co-production projects and provide important competition advantages. In this process state support and the sectors own efforts gain importance. However, this is a very recent development for Turkish film industry. It is seen on the last decade that, some new associations such as Film Industry Development Association, Turk Film Council and Platform for Cinema are begun to be established. They are comprised of representatives of the sector which follow the developments of world film industry and aim to integrate. As a result, it can be said that Turkish film industry cluster is weak on external linkages and has a system working on certain means.

Until this point, different dimensions of clusters through film industry are examined. Finally, I will evaluate five dimensions of clustering, which Bathelt (2004) suggested, through İstanbul film industry cluster. The dimension of horizontal relations represents the relations between the firms actively working in the same branch of the industry. To remain together with the rival firms and the resulting interaction with them offers new competitive advantages through production differentiation and innovation.

Table 7. Ways to get into a Foreign Partnership

	Firms (#)	Perc.(%)
With firms we met on festivals	6	13.3
With mediation of another firm (local/ foreigner)	1	2.2
With self-application to the partner firm	1	2.2
With application of the partner firm.	5	11.1
Acquaintance	2	4.4
Correspondences	1	2.2
Personal application	1	2.2
Recognition of the director / Quality of the project	1	2.2
Eurimages	1	2.2
No partnerships	26	57.8
Total	45	100.0

Source: Survey Analysis, 2008

The survey results demonstrate the conception that co-production with local and foreign producers provides competitive advantages and led them to gain superiority over others with 70% score. However, the real practice does not show such

a tendency. The context of vertical relations refers to the commercial and noncommercial dependencies. The analysis on Turkish film industry put forward the relations aiming to provide finance and produce big budgeted projects. The relations with the firms in the supportive sectors points out the tendency to work with the firms located in the same region. The examination of the role of noncommercial factors like interchange of know-how and learning on building partnerships and cooperation showed that the importance of such kind of dependencies stay on 50% in Turkish film industry. The dimension of externality is examined through the relations developed by Eurimages and festivals. There is still no international organization conducted through the networks made on account of the big firms own relations. The process of coherence and adaptation puts forward whether the sector can keep up with the developments of the world film sector. Internationalization and globalization tendencies of the film sector occur through co-productions, outsourcing depending on productions using external sources gain via taxes and direct financial supports and runaway productions which refers to the realization of different phases of film production in different foreign countries. Bearing these in mind, Turkish film industry lags behind the world film market. Finally, the examination of the institutional dimension indicates the complaints of representatives of the sector from the lack of states' interest. However, in contrast with that, the statements in the media demonstrate that the big firms do not prefer the state intervention on the sector. Thus, the consideration on existing politics and implementations puts forward the insufficiency of the institutional dimension.

6. CONCLUSION

Istanbul is definitely the heart of Turkish film industry which is in the process of flourishing especially after 2000. When we consider the other related sectors such as TV series and advertising industry, important economy for both the city and country is emerged. It is very obvious that clustering has made big contributions to the acceleration process of film industry. Existence of creative and technical labor and their density, recreation and cultural activities and prestigious places are the reasons facilitating the agglomeration of firms in specific places. The analyses made in the context of this study has displayed that film industry with all actors in the production system shows the characteristics of cluster in Istanbul and they are located in the triangle of Beyoglu, Besiktas and Sisli. When the spatial dynamics of the Istanbul film industry is questioned in historical process, it is seen that the industry is experiencing a shift from the one unique centre Beyoglu to Besiktas and Sisli. Decentralization process and multi-centered structure are the new characteristics of Istanbul film industry.

Beyoglu is still the important center of film industry but spatial difficulties (small size of buildings), narrow streets and high rental fees are the problems for film shooting. Film companies changing their location have the aim of being in prestigious places and being near with the financial environments. Besides, connection with the other related actors can easily be made with the help of new technologies. It is observed in the interview process producer or director can instantly organize the film crew in specific film project by making a mobile phone call. It can be considered that clustering started to lose its significance but the representatives of the sector has emphasized the importance of face to face interaction in the clusters.

Istanbul film industry cluster has high geographic concentration. When the possibility of face to face interaction, capability of fast organization and the environment of trust are considered, cluster seems successful with this structure. However, the process of internationalization and globalization in film industry has required the investigation of Istanbul film cluster with the perspectives of local-global linkages. The analyses show that there are some problems about the awareness and implementation of external linkages and partnerships. Eurimages and artistically successful movies are the way of connections to the foreign markets. On the other hand, mainstream filmmaking occupying the big part of sector is in a weak position in terms of the global relations and co-productions. Cluster which can be evaluated as the source of success in the sense of internal relations has embodied big deficiencies for the local-global relationships. As it can be seen in the historical process, successes of Yesilcam period's film cluster have ended with the crises and new developments. It could not produce a new way of development in that period. Clusters which are accepted as the source of creativity and innovation in the literature cannot produce a success stories if there is weak or no connection with external markets. Therefore, for the sustainability of the cluster and economic development, local-global relations and external linkages have big importance. Turkish film industry has dominated the domestic market since 2000 but it should make a connection with foreign partners and should be integrated into the global film market in order to the overcome new possible crises. When the development process is considered, awareness of this situation can be observed.

As the global integration models of Turkish film industry, co-productions with European partners, exhibition in the foreign markets where Turkish people mostly live (diaspora), art-house films for the niche markets and film distribution and exhibition in culturally similar markets (geo-cultural marketing) are observed. However, the integration models and the successes in the domestic market emerged after 2000 are still very small when it is compared to global scale. The analyses showed that Turkish film industry is partially integrated into the global film market and it is still on the periphery of this system. However, it is in the process of movement for being more integrated into the global market by using geo-cultural marketing and co-productions. The industry should follow and develop these global integration models in order to avoid the problems encountered in the history.

In this study, film industry is evaluated as a paradigmatic example showing the place and position of Istanbul in global network economy. As it is in the film industry, Istanbul can be evaluated as on the periphery of new global economy.

Economic policies are still determined with the strategies developed for the traditional industries. Knowledge, creativity and technology based cultural industries are only considered with the perspectives of urban renewal. For the sustainable economic growth and integration into the global economy, it should be focused more on cultural or creative industries and the social, cultural and physical environment in which these industries develop. However, economic and cultural policies suggested at national, regional and urban levels still ignore these industries. Yet, it should be concentrated on doing cities attractive for the creative class in the world and by this way the support of cultural industries. Thus, it will be easy to take position in global economy as the controller of flows and sustainable growth can be ensured. Otherwise, the successes achieved in the domestic market do not produce the same level of success in global markets.

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KNOWLEDGE-BASED DEVELOPMENT AS ECONOMIC CULTURE

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ABSTRACT

Purpose: To synthesize the axiological, epistemological and instrumental grounds sustaining the emergence of knowledge cultures.

Method: Represented experience is introduced to characterize knowledge-based value, exemplifying its singular economic dynamics.

Results: The 'knowledge' attribute of knowledge city-regions relies on the capacity to balance all societal values into an equitable and sustainable dynamic equilibrium.

Recommendations: The values, concepts and tools of (radical) KBD may enable human communities to identify and negotiate their net future value base, operationalize it into workable decision-making and social-accountability tools and hence become the basis of progressive KBD policies.

Conclusions: A first attempt to lay the foundations for KBD as a new economic culture.

KEYWORDS

Economic culture, knowledge-based development, capital systems, represented reality.

1. INTRODUCTION: URBAN ROOTS OF KNOWLEDGE CULTURES

Our behavior as economic agents, i.e., the way we all to some extent produce, finance, distribute, buy, consume and dispose of goods and services pervades most other aspects of human life. The way we make sense of it and the underlying value system constitute the foundations of urban cultures.

Nowadays, a transition is going on between a received cultural paradigm and a new emerging one: from the industrial to the knowledge economy. The fabrics of everyday life and consequently the shape and dynamics of cities is largely determined by this transition. All living generations are witness to the dawn of knowledge-based culture and its main expression: the knowledge city. This conceptual paper is a summary report on several years of work into the cultural foundations of industrial cities and their current transition.

The association of the terms *knowledge* and *city* (as in *knowledge city*) conveys, for most people today, the intensification of economic productivity in urban spaces through the aggregation of science, technology, innovation, academy and culture. University campuses, technological districts, cultural precincts, creative neighborhoods, science parks or innovation hubs are regarded as knowledge-intensive areas catalyzing urban and regional competitiveness. A number of authors (Landry, 2000; Komninos, 2002; O'Mara, 2005; Meusburger, Funke & Wunder, 2009; Mandanipour, 2011; McCann, 2013) have studied the spatial dimensions of technology and innovation-intensive urban sectors for some years. These knowledge-intensive production spaces are well exemplified by California's Silicon Valley, London's East End, New York's Roosevelt Island, Barcelona's @22, North Carolina's Research Triangle, Moscow's outskirts Solkovo and Paris' outer circle development.

The European Institute of Innovation and Technology *Knowledge Triangle* model illustrates the idea that science, education and innovation intensity can contribute significantly to a city's knowledge-based profile (EU, 2013). Nevertheless, knowledge-based development (KBD) also includes other intangible assets such as urban *cohesion* (Buck, Gordon, Harding & Turok, 2005), urban *identity* (Pusic, 2004), urban *resilience* (Leichenko, 2011). Even non-urban communities such as *Indigenous Cultures* (Indigenous Peoples' Restoration Network, 2012), *Aboriginal Communities* (Northern Territory of Australia, 2003) or *Indian Villages* (Batra, Payal & Carrillo, 2013) are distinctively covered by KBD. Obviously, a wider concept than cutting-edge technology-intensity is required to encompass all these urban dimensions. The multidimensionality of urban knowledge seems to be better expressed by current trends such as social entrepreneurship and innovation, open dealing, green growth, happiness economics, crowd dealing, frugality and voluntary simplicity, sharing economies, peer-to-peer dealing, collaborative consumption, etc. Certainly, knowledge and the city conjugate today in far richer formulas than knowledge triangles.

Knowledge cities are also often characterized as relatively high concentration of educated and highly productive people in areas such as industry, politics and arts. The concept of *creative class* (Florida, 2004), emphazises individuals making a difference to the global competitiveness of a city. Nevertheless, that idea of a privileged urban elite is inconsistent with the above non-high-tech and often more cohesive and sustainable communities. Whereas consolidating colonies of highly creative individuals might be another way to promote knowledge cities, this concept is too limited to convey the potential of KBD. Knowledge cities have more to do with the democratization of knowledge, creativity and innovation than with a privileged class. *Mass Fluorishing*, the recent book by Nobel in Economics Edmund Phelps (2013) provides a fresh account of knowledge and innovation in modern economic history closely resonating with this work's perspective. Not surprisingly,

international awards such as *Most Walkable City*, *Sustainable City* or urban attributes such as *livability* or *quality of urban life* imply a comprehensive development framework for all citizens.

Intensive information and communication technology (ICT) infrastructure is another element with which knowledge and the city are often associated. *Digital territories* and *smart cities* are variations relying on big data analysis and extensive digital grid management, contributing to improve aspects of public service management such as transit, public transportation and security. Indeed, digital grids are enhancing urban analysis, planning, design, management and assessment, by enabling fast and effective response though distributed, real-time systems. Furthermore, the Internet has contributed to reduce information asymmetries as well as to empower individuals and groups to mobilize their ideas and initiatives. Hence, the digital leveraging of social processes is an ingredient of knowledge cities. However, an advanced digital infrastructure may facilitate to but does not define a knowledge-based society. KBD involves a process of multidimensional transformation aiming at collective value balance.

For all of the previous ideas often applied to knowledge cities, there is no need for a new term. Existing concepts such as regional innovation systems, technology clusters, smarts cities an human capital are clearly sufficient. Yet, the most distinctive feature of knowledge cities includes but is not restricted to prime educational, scientific and innovation spaces. It also includes but cannot be reduced reduced to spots of highly creative people. It may be leveraged, but it is conceivable without, high-tech digital infrastructure.

A first clarification that should be made is that the 'knowledge' component of KBD is not characterized here in terms of either *objects* or *flows* as in 1st and 2nd KBD generations. This clarification stems from identifying three necessary and sufficient conditions for *knowledge events*: knowledge *object* (that which is known), knowledge *agent* (her/him who knows) and knowledge *context* (axiological and semiotic references providing value and meaning) (Carrillo, 1998).

A 1st generation, object-centered approach involves object attributes, such as content molarity (e.g., data, information, knowledge) and medium nature (e.g., stone, paper, magnetic recording, digital image). A 2nd generation deals with agent attributes, such as structure (e.g., roles and hierarchy) and relevant competencies (e.g., code or language proficiency). These have been extensively discussed in the literature from a variety of angles and certainly have an impact on KBD. For instance, knowledge object molarity, determines differential KBD analyses at the level of data (e.g., energy grid analytics for smart cities), information (e.g., traffic support systems for intelligent cities) or knowledge (e.g., e-citizenship facilitation for knowledge cities). A substantial amount of attention is being paid to knowledge agent structure through social network analysis research in domains such as technology clusters and regional innovation.

Knowledge object and knowledge agent dimensions, being necessary conditions for KBD, are given due consideration throughout this work insofar these relate to specific aspects of urban life. Otherwise, two contributions are suscribed in this work: Arrow's (1994) identification of the social base underlying information and knowledge value generation, and Morroni's (2006) insight that data, information and knowledge share distinctive value dynamics regarding to transmittability and tradability.

At this stage is critical is to emphasize the often neglected knowledge *context* dimension. This dimension that provides KBD of economic relevance and cultural significance. A 3rd KBD generation, by focusing on value and meaning, gives prominence to the convergence of traditional capital (physical + monetary) and intellectual capital (other relevant dimensions). All forms of distinctive outputs and services in knowledge societies, not only to knowledge-intensive goods, become involved (De Long & Froomkin, 2000; Carlino, 2001). Hence, KBD portrays and develops urban life from an integrated social value perspective, one where all aspects relevant to equitable and sustainable living are considered. This approach has also been identified as *integrated* or *radical* KBD (Carrillo, 1998, 2006c, d; Malone & Yohe, 2002; Allee, 2002; von Mutius, 2005).

Hence, KBD no doubt deals with objects and agents in knowledge-intensive transactions. But it also and more distinctively deals with value dimensions so far neglected in traditional economics and institutions (Commons, 1931, 1936). The human potential for development and cultural evolution is the point where knowledge and the city redefine each other. It aims at correcting major environmental, social, and gender unbalances (Beneria, Berik & Floro, 2003). The distinctive leverage of the knowledge city and the resulting new culture lies in a transformation of the social contract based on a human behavior upgrade (Carrillo, 2006b; Hodgson, 2013).

The notion of KBD conveyed by this work aims at a dynamic identification, measurement and balance of all major value elements shared by an urban community. The convergence space between knowledge and city, knowledge and economy and knowledge and society is this expanded (e.g., Jacobs, 1970; Machlup, 1972; Soddy, 1983; Sakaiya, 1991; Stehr, 1994; Mokyr, 2002; Liang, 2003; Allee, 2003; Bounfour & Edvinsson, 2005; Duke, Doyle & Wilson, 2006; Alperovitz & Daly, 2009; Menkhoff, Evers, Yue & Eng, 2011; Mandanipour, 2011; Van Geenhuizen & Nijkamp, 2012; Rooney & Hearn, 2012; Ted Books, 2013; Gilder, 2013; Westlund & Kobayashi, 2013).

Hence, KBD is concerned with the continuity of civilization (Rees, Wackernagel & Testemale, 1998). It deals with achieving a balance between production, consumption, distribution on the one side and non-renewable sources of energy and matter on the other (Smith & Max-Neef, 2011). It implies the identification, agreement, implementation and evaluation of a manageable set of collective preferences (Rutherford & Samuels, 2012; Chavance, 2012; Hodgson, 2013). Therefore, the knowledge-based attribute denotes an economic, political and cultural order emphasing intangible value or intellectual assets as much as material and monetary ones.

2. THE AXIOLOGICAL FOUNDATION OF CULTURE

A historical deconstruction is due on the relationship between community values, social organization, cultural products, and knowledge base based on a reinterpretation of economic and knowledge acts. The foundation of such reinterpretation is the evolution from a dominant experience of material reality to a dominant experience of represented or knowledge-based reality (see Table 1) by urban dwellers. Rather than material objects (sensory or instrumental records generated by matter and energy manifestations) it is the representation and interpretation of these objects (the ideas and emotions built on perceptions and further psychological elaborations) what dominates individual and collective human experience. This involves a shift in emphasis from things to the representation of things. The core of psychological life and knowledge-based behavior is based on such substitution process (Carrillo, 1998). Semiotics emerges from the association of meanings and economics unfold from the association of values. Eight decades ago, John Commons noticed: "Economic science has not, to my knowledge, incorporated within itself a theory of reasonable value. It separates ethics, public welfare, or national public interest as a postscript, different from economic theory. But a theory of reasonable value, which shall include these postscripts, has become obligatory…" (Rutherford & Samuels, 1996, p. 467).

2.1 Production as a Cultural Foundation

This functional substitution of objects by ideas was elegantly captured by B. F. Skinner, prominent behavioral scientist in the expression: "responding to x in the absence of x". The process through which a formerly neutral stimulus gains control over a given response through learning is the basis of most acquired behavior. Rudimentary ideas are hence formed, becoming the building blocks of memory, learning, thinking, language, motivation and emotion. The fact that knowledge-based behavior exists since the dawn of mankind it is often pointed out rightly when the emergence of knowledge societies is mentioned. This probably holds true for some other species with sufficient cognitive and emotional capacity. However, the cultural intensity of those behaviors has leap-frogged since the 20th Century when most people still earned their living by means of manual work, to the 21st Century where the sensibility and intelligence of knowledge workers, rather than their muscular strength and dexterity became the basis for value addition. The stages of emotional and cognitive consolidation in individual development might be being mirrored by the human species as a whole. For sure, a radical transformation can be witnessed through a vast variety of human actions as these shift from material-based to knowledge-based. Table 1 describes successive cultural bases according to the evolution of production elements (input / process / output). Such elements define economic activity, but also shape values, roles, practices and institutions.

A transition of cultures from nomadic tribes of hunter-gatherers, through agricultural and industrial civilizations, up to the emerging knowledge societies can be observed from such perspective. While major cultural transformations have taken place throughout history, it might be at the current transition from matter-based to knowledge-based societies that human experience becomes qualitatively leveraged and with it the space of possibilities for social organization. The European Commission study *Knowledge Economy Indicators* states: "the fundamental changes taking place at the level of the economy will have wide-ranging impacts throughout society that could result in major changes to how people live and work" (Arundel, Hansen & Kemp, 2008, p. 6). These profound transformations were foreseen several decades ago by visionaries such as Frederick Soddy in Britain, Fritz Machlup in the US, and Taichi Sakaiya in Japan.

Table 1. Prevailing factors of major production systems

	Production type	Input	Process		Output
			Agent	Instrument	
Physical Era	Hunting – gathering	Natural habitat	Human and animal	Hands and primitive tools and techniques	Game, fish and collected natural goods
	Agricultural	Land, water, seeds, fertilizers	Human and animal	Agricultural equipment and techniques	Agricultural goods
	Extractive	Natural deposits	Human and animal	Mining equipment and techniques	Stones, metals, minerals
	Industrial	Raw materials and energy	Human and automata	Industrial machinery, equipment and techniques	Manufactured goods and industrialized products
	Physical-based production	Matter and energy	Muscular strength and sensory-muscular dexterity	Physical tools, equipment and techniques	Physical goods
Knowledge Era	Knowledge-based production	(Relative) lower-level knowledge input	Rationality and emotion	Knowledge processing tools, systems and networks	(Relative) higher-level knowledge outputs & services

Gender role transformation provides a good example. Those were culturally shaped, amongst other factors, by specialized work requirements of hunting-gathering, agricultural, extractive or industrial activities. Muscular strength made a major difference to job specialization until the 20th Century. Not anymore. Nowadays, the knowledge intensity of much jobs implies an increasing levelling of the performance field, an increasing gender balance in economic production, and even an advantage for women in deploying some social and emotional competencies. While a vast cultural inertia may still be getting in the way of a full gender balance expressed in job opportunities political representation and power exercise, gender politics, role definition, family characterization, and workplace dynamics are all undergoing a profound transformations thanks to the nature of knowledge-based production and to the cultural construction of gender (WIGSAT, 2008; Rosin, 2010; Walby, 2010). As the economic historian Joel Mokyr claims, "The central phenomenon of the modern age is that as an aggregate we know more … Every aspect of our material existence has been altered by our new knowledge" (Mokyr, 2002, p. 2).

The horizontal line separating the physical era from the knowledge era in Table 1 marks our time, the beginning of the 21st Century. Knowledge and the city are meeting right now: the time when human activity has become predominantly knowledge-based, and the time the proportion of the human population living as city dwellers has passed the 50% mark. That moment was captured in the following passage of *Knowledge Cities*: "Few aspects of today's world may characterize better the dawn of the new millennium than the transformation of regions and cities into knowledge societies. The evolutionary significance of both the definite urbanization of the world's population and, above all, the *experience upgrade* of urban life in post-industrial economies is only beginning to be realized: *the 21st Century Society is Post-industrial, the Knowledge City its horizon*". "On the one hand, the 21st Century is being identified as the *Century of Cities* … On the other hand, the 21st Century has also been identified as the *Century of Knowledge*… [and as a consequence]… the convergence of these two emerging conditions of human civilization – cities and knowledge – at the dawn of the new millennium: The Century of Knowledge Cities." (Carrillo, 2006a. p. xi).

2.2 Knowledge Redefines Value

The assumption of a qualitative difference between the natural principles describing the behavior of objects (mainly physical, and chemical processes) and the natural principles describing the behavior of ideas and emotions (mainly biological, psychological and cultural processes) is central to the current rationale. Furthermore, it assumes a subsequent impact of such difference on the social and economic possibilities of each realm. For instance, insofar as space-time constraints determine human production upon matter and energy, social norms regulating their distribution and ownership are restricted by physical possession, thus resulting in property laws.

Similarly, the wasting of industrial production lines is determined by thermodynamics, resulting in diminishing returns. To the extent that energy cost are involved in all performed work, every successive unit in a production line entails a cumulative waste of moving parts and fluids. The increasing relative cost of each successive cycle becomes an aggregate effect. Every single factory in the world is subject to this condition and, due to the relentless effect of entropy, it has to continually re-invest in periodically replacing every active component of its production lines.

By contrast, the latest operating system version by a software company, or breaking news by a media business, or hit by a pop singer, or viral video, or trending topic in social networks, may be delivered millions or times at no additional production cost: the return of unit 1, 1+1i, …, 1+n, remains constant. This fact has profound implications and has revolutionazed business models. The iTunes Stores for instance, carries nearly a million apps, has paid over 10 billion to developers and is projected to surpass 75 billion downloads by the end of 2014 (Panzarino, 2013).

A basic contention of this paper is that we might be far from understanding the nature of knowledge-based value dynamics and tehrefore, of harnessing its potential. This holds even if it is now generally accepted that knowledge leverages economic growth and that it has special properties such as non-rivalry, partial excludability and increasing returns (Romer, 1990; Amidon *et al*., 2005).

The former is the typical portmodern condition: it can be confidently assured that it is not what it used to be, but it can only be guessed what it will be from now on. Brian Loasby sentenced in 1986: "It is now becoming widely recognized that many of the central unresolved problems in economics turn on questions of knowledge" (Loasby, 1986, p. 41). Overwhelming counterexamples to received views are ubiquituous, but what the new economic realities might be is largely conjectural.

Recent developments in cloud computing provide a good example of the distinctive but poorly understood economy of represented objects. Commenting on the case of an entrepreneur whose property rights over all his files stored on the cloud were legally challenged, once the servicing company was confiscated by the US Government, Professor Chris Reed at Queen Mary, London stated: "The problem is that our understanding of property is based on material objects" (Heaven, 2013, p. 35). Reed goes on: "While the government's defense may sound ridiculous, it is on pretty firm legal ground", since … "Possession, which is sort of what property is all about, is irrelevant" (Heaven, 2013, p. 35).

A problem with cloud storage services is that it may, unlike physical storage, partially reside simultaneously in several locations, be continuously downloaded and re-uploaded by many individuals other than the originator and constantly shifting amongst server locations. Since cloud storage is growing so rapidly as to become the main world digital repository by 2020 (Anderson & Rainie, 2010), many unforeseen situations are unfolding. Another such situations is associated to re-selling e-books and music, due to the curious circumstance of legally acquiring (limited) use rights but not property rights (Streitfeld, 2013). Heaven concludes: "Untangling relationships with your possessions in the cloud quickly gets confusing" (2013, p. 36). Clearly, ownership must be redefined in a global knowledge economy (Kelly, 2012).

Confusion has also emerged in the USA with regard to the ongoing dispute over Internet state sales taxes. A lengthy federal regulation process has proved sensitive to be the legal definition of a key element: "nexus". This would be the extent to which a business has a significant physical presence in a given state, therefore becoming subject to local sales and income taxes. The distinction has proved so slippery that, in a long legal dispute, Amazon sustained it had no physical presence in Texas, despite the fact that it operated a 630,800 square-foot distribution center for 15 years. Such confusion is due to the underlying distinction between brick-and-mortar and internet-based business. Barns & Noble, the once dominant bookstore chain, has in the meanwhile, lost market share to an Amazon claiming to be "Earth's Biggest Bookstore" (Elkin & Burke, 2013).

Thus, the universe of possibilities contained by physical reality determines the nature of material-based value dynamics. Until now, economic theory, management practices, accountancy systems and policy making have by far, been dominated by physical realities. As mentioned earlier, knowledge-based realities have been present since the dawn of mankind, being the basis of distinctively "human" psychological events. The ubiquitous and often masked intervention of intangibles has always puzzled private and public administrators.

The 1921 Nobel laureate Frederick Soddy provided one of the most perceptive insights into the differential bases of economic activity. He realized a distinction was required to understand the interplay between material-based and knowledge-based production, as much as between wealth and debt. Soddy outlined a naturalistic monism consistent with a complex systems perspective: "The principles and ethics of human law and convention must not run counter to those of thermodynamics" (quoted by Daly, 2009, p. 3). The full realization of the interplay between material-based and knowledge-based value creation might require a three-phase distinction between physical, monetary and intellectual capital, ideally synthesized in a holistic theory of value (Carrillo, 1998; Graeber, 2001, 2011; Rader, 2011).

So far, knowledge-based realities have not been granted an ontological status equivalent to that of material and monetary units, despite their ubiquity: these dimensions are treated as "intangible" due to this constraint. The way the measurement of intellectual or knowledge-based capital is tackled clearly reflects such reality. Hubbard (2010) exposed "The Illusion of Intangibles", by showing how the challenge to measuring intangibles is fundamental to overcome the current trap and frequent misconceptions concerning the nature and significance of measures in human civilizations. The warning that the development of knowledge societies will be constrained by the capacity to understand and capture collective value has been consistently raised (Rutherford & Samuels, 1996; Carrillo, 2006c, d; Stiglitz, Sen & Fitousi, 2010; Carrillo & Batra, 2012).

In fact, money is not less ethereal and tricky than software or technical procedures, and yet it has been at the core of economic activity and the making of cultures (Braudel, 1992; Smith & Max-Neef, 2011; Segall, 2012). Michael Reiss summarizes: "It is not much of an exaggeration to say that the history of economics has been a history of mankind's attempts, and mostly dismal failures, at establishing and sustaining a stable monetary system" (Reiss, 2011, p. 20). The monetary base and physical assets still restrict business and national accounts alike, thus imposing boundaries upon the universe of management and strategic development. By far, organizational and political language remain constrained to physical and monetary dimensions thus limiting the world—in Wittgenstein's criterion—of accountancy, economics, administration, and policy-making (Harris, 1989, 2011; Sraffa, 1975; Soddy, 1983; Gudeman, 1986; Braudel, 1992).

Alternative paradigms are bound to emerge insofar these limits get challenged by external realizations and internal contradictions in established practices. The door of formal economics, management and politics is being partially opened to knowledge-based events due to the increasing acceptance of behavioral or knowledge-based realities as well as to the recognition of their importance in human affairs.

3. CONCLUSION

As mentioned earlier, human production stemming from ideas and emotions has its own dynamic—since it lacks some important constraints of physical production. Nevertheless, no proper knowledge economy theory is yet available. Subsidiary theories such as Knowledge-Based Development Theory at the societal level or Knowledge-Based Theory of the Firm at the organizational level are far from a formal expression. Contributions to substantiating the need and prescribing specifications have been made at the organizational level (Sveiby, 2001; Grant 2002; von Krog & Grand, 2002; Morroni, 2006) and societal level (Romer, 1990; Wurzburg, 1998; Asian Development Bank, 2007) but theoretical and empirical grounding for a formal Theory of Knowledge-Based Value Production has a long way to go.

Kuhnian scientific paradigm shifts involve an increasing realization of counterexamples to received explanations, the documentation of boundary cases defying prevailing theories or the emergence of alternative conjectures. Hence, while no formal knowledge-based production theory is yet available, a number of descriptive features have been suggested.

As an example, a deconstruction of the market economy so deeply rooted in industrial societies was offered by De Long and Froomkin (2000). They were driven by the incapacity of conventional market attributes to deal with knowledge-intensive production and distribution along three axes: the capacity of sellers to prevent access to a good (excludability), the depletion of a good by use of an agent(rivalry) and the ability of individuals to determine what they want to buy (transparency). Once those three pillars are disrupted by knowledge-based production and distribution, market failures and externalities run wild (Romer, 1990; Carrillo, 1998; Amidon *et al.*, 2005).

Table 2. Attributes of knowledge based production

Non-rivalry	Possession and use of a good by an agent does not consume it and therefore does not prevent possession and use of the same good by another agent
Non-excludability	Access to a good by an agent does not prevent access by another agent
Non-scarcity	A good can be replicated indefinitely at no extra cost
Non-decrementality	The rent value of successive product units xi, xii, …, xn, may not diminish as a function of iterations of the production cycle
Capital / labor convertibility	Labor may simultaneously operate as capital and become the most critical factor (e.g., talent-intensive companies)
Ubiquity	A good may be simultaneously available to anyone, anywhere
Time and context dependency	A good may decrease in value as a function of time and sometimes may become obsolete soon after it is being released
Connectivity	The sum value of a network increases as the square of the number of members
Intangibility	The market value of a firm can (largely) surpass that of its book value
Externalities	Unintended consequences, both positive and negative, can (largely) surpass the value of producing a good

The following features of knowledge based value production were recently identified by The Australian Commonwealth Government (Commonwealth Department of Education, Science and Training, 2012): can be used by several at a time (non-subtractive), its use is limited only by renewal capacity (non-scarce), fixed cost is maintained regardless of how many people are using it (use-independent cost), many copies can be made at a negligible cost once you an item is available (easily replicable), low cost inputs and process can render high value outputs (creation cost independence), knowledge depreciation can happen very quickly (rapid obsolescence), and finally, knowledge can move quickly and efficiently across borders (easy transfer and globalization). Based on the former and further characterizations, a distinctive set of attributes of knowledge-based production is summarized in Table 2.

As the new millennium unfolds, the principles of value production and its consequences on social organization and culture are bound to radically change. It is conceivable that the options for the continuity of human civilization may depend upon our capacity to grasp such principles and consequently to redraw the patterns of coexistence with the planet and amongst ourselves. Consequently, paradigmatic roles and institutions of the industrial culture need to be revised in order to rewrite the tacit contract inherited from the still pervading industrial culture. Economic categories in force are the coins of a value universe, whose legitimacy, both structural and functional, tends to depreciate as a new breed of organizations redraw a new political and economic world map based on ideas and emotions.

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A LITTLE KNOWLEDGE IS A DANGEROUS THING

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ABSTRACT
Cities seek to be 'smart,' 'intelligent,' and 'connected' and we reserve praise for cities that have achieved Internet ubiquity linking a highly educated population. But what about places that aren't advanced or technologically sophisticated. At a time when we focus on the people and places that are part of the knowledge economy it is instructive to consider the fate of those who are not as well connected. Using a case study of the state of Michigan in the United States, this paper will analyse survey data that examines reasons for non-participation in the knowledge economy. Findings show that cost remains a barrier for some, but there are others who do not wish to participate by choice. This leaves policy makers, and society in general, with the challenge of managing the uninterested and disconnected.

KEYWORDS
Knowledge economy: Internet access; Social justice

1. INTRODUCTION
The essential elements of a knowledge city include the skills and experience of residents and an infrastructure able to handle the flows of information on which knowledge production and application depends. Cities seek to be 'smart,' 'intelligent,' and 'connected' and we reserve praise for cities that have achieved Internet ubiquity linking a highly educated population. But what about places that aren't so smart, intelligent or connected? What happens to places and people that struggle to join the knowledge economy? After considerable attention was directed to the Digital Divide during the 1990s, the concern for access has dropped off as more and more people find ways to be connected. The growth of connectivity, however, masks a far more significant issue that just being online; it hides the economic polarization of people and places. Being connected is not an end, it is a means to an end, and that end should be a productive and fulfilled society.

Having spent many years in pursuit of knowledge cities and information society, it is also valuable to consider places that do not fit that definition. If we take the common expressions used for our research topics—knowledge, smart, information, digital—and look at their opposites, what does that say about our cities? There is no prestige or excitement associated with a stupid city, the unimaginative class, an uninspired city, an inept city, or an ignorant society. None of the opposites of what we study is appealing or desirable; they are worrying, patronizing, if not offensive to both people and places.

Beyond jarring rhetoric, membership in the digital society of smart cities is not a binary decision—cities being included or excluded based on their broadband metrics—but a case of the proportion of urban residents who are benefitting from a knowledge based economy. People who fit poorly into a knowledge economy face dangerous circumstances because they have been, and will continue to be, marginalized as the economic valuation of individual ability changes. This paper will address two elements of the knowledge economy in terms of social justice: the willingness of people and firms to use information technologies, and workforce access to education and training. The core of the paper is based on surveys conducted over 2012-14 that examine personal and business experience with ICT in the US state of Michigan. Findings show that disconnection from information society is sometimes preferred but for many people disconnection is an economic decision. Both individuals and businesses may also need assistance to understand the mechanics of ICT as well as the potential benefits they may gain.

The state of Michigan has a population of almost 9.9 million in 2012 and an economy transitioning from manufacturing to services. Per capita income in the state was $35,624 in 2010, compared to a national average of $40,504 (Michigan 2013). Average income was lower than in peer Midwest states that have shared similar economic changes. In particular, the downturn in the automobile industry that has occurred in cycles since the 1970s has seriously affected the state and left it with an unemployment rate higher than the national average. Currently, the state's unemployment rate of 7.4% is 44th in the United States.

2. MICHIGAN'S ICT INFRASTRUCTURE
The approach follows Wilson, Kellerman & Corey (2013) who analyze information society in terms of four ICT characteristics. Each dimension shows the scale and scope of ICT use, forming a spectrum of experience across space. The four spectra are devices, access, culture and governance. Devices concern the technologies, such as a computer or mobile phone, while access reflects the willingness and ability of residents of a place to use a new information technology. Culture captures the unique characteristics of a location into which the new ICTs find a role, and governance reflects the policy environment that shapes ICTs, their use, and the behavior of users and suppliers. For any location, individuals, households, and the population in general owns or accesses a bundle of devices for which culture and governance play a role in where and how ICTs are used, and in the form and content of information available. This approach is applied to the US state of

Michigan as a way to explore the role of ICT in urban and regional development. Data are derived from 2012-14 surveys of individuals and businesses in Michigan and other states by Connected Nation.

2.1. Devices

The spectrum of devices employed by information society ranges from telephones (fixed line and cell) to computers (desktop, laptop, cell phone) with functions such as e-books, television, and global positioning system navigation possible for each. Globally, and for each place, the spectrum of devices available and in use varies significantly, as do the trends of use for each. Data for Michigan are presented in Table 1, showing that more than four-fifths of the population has access to a computer and 71% have broadband Internet access. Almost half have Internet access through their mobile phones. What the state averages obscure is the lower level of access of low income and older residents of the state. Disparities are especially apparent for mobile Internet access for low income, older and rural residents of the state.

Table 1. ICT Use by Michigan Residents 2012

	Computer	**Broadband**	**Mobile Internet**
Michigan	84%	71%	47%
Rural	84%	65%	37%
Age 65+	63%	44%	13%
Low Income	66%	46%	32%
African American	76%	63%	56%
Low Income Rural	70%	50%	30%

Source: Connected Nation

2.2 Access

Access to information and communication technologies on the surface seems a simple case of the presence or absence of the technology itself. Access, however, is far more complex, with the use of ICT reflecting a series of decisions, abilities, and technologies. First is the cognitive ability or desire to access ICT, second is ownership or presence of ICT, and third, the cost of ICT use. In Michigan, computer ownership is widespread, as is access through work, school and libraries. Beyond access to the technology, however, is the cost of access, which ranges up to US$150 per month, with most residents paying US$30-75 per month (data presented below in Figure 1).

In addition to cost and availability, another element of access is an interest or willingness by residents to use the Internet. When asked, Michigan residents identify a number of cost issues (see Table 2 below) but some also show a lack of interest in home access or in the content that is available. It is important to note that when asking about access it is also a question about the relevance of content. If users do not find the information they want online there is little incentive to seek access. If policy has a goal of universal access, as many countries sought for the telephone, one factor has to be awareness of the interests and information needs of users.

Figure 1: Monthly broadband Cost in Michigan 2012

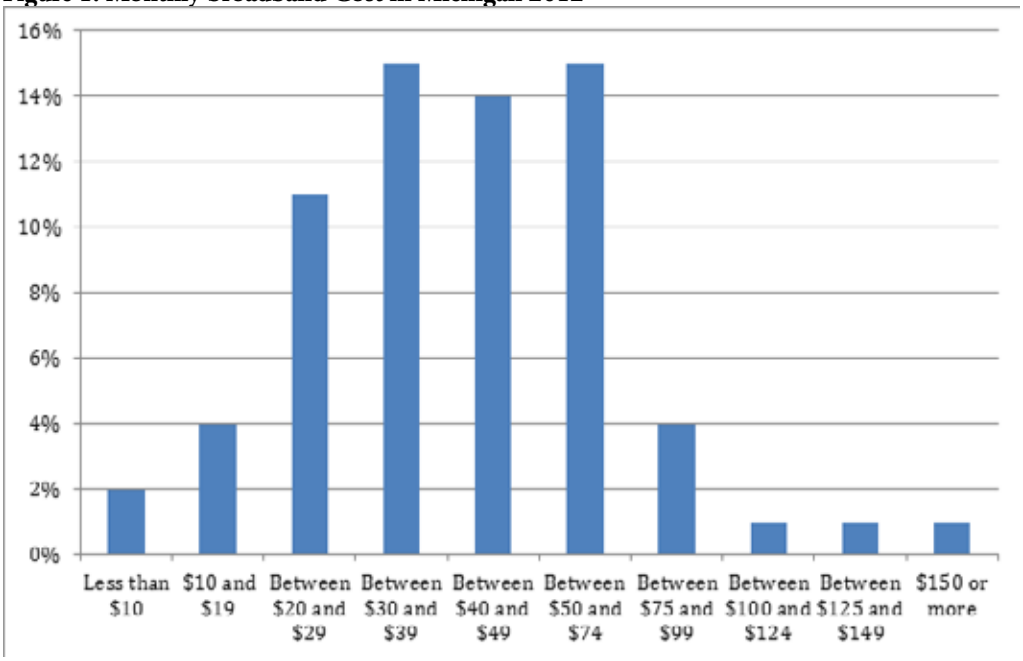

Table 2: Reasons for Non-use of Broadband in Michigan 2012

Do not want to have it in your home	16%
The monthly cost of service is too expensive	14%
You can get internet access somewhere else	9%
Would not use the Internet enough to make it worth the cost	7%
Broadband isn't available in your area	7%
There is nothing online that you want to see or use that requires it	6%
Don't know enough/anything about it	6%
You don't feel comfortable using a computer	5%
The cost of a computer is too expensive	4%
It is too complicated	4%
Don't own or have computer	2%
Concerns about fraud or identity theft	2%
An illness or physical condition makes the Internet difficult to use	2%
The activation and installation fees are too expensive	1%

2.3 Culture

Culture is an important element of information society and ICT use as it shapes the forms of information available, ICT content, and where and how that information is used. Culture reflects beliefs, traditions and languages and their role within a society, or the roles of multiple cultures within one country or location. Culture directly affects the relationship between technology and society in many ways, such as how mobile telephones are answered and used (Chan 2007), or adoption rates and openness to new ideas and technologies, such as e-commerce (Gong 2009). ICT adoption and use in Michigan will be affected by a national culture that recognizes and accepts ICT, but also local communities, where different values can shape ICT experience.

2.4Governance

Governance defines the ways that systems and societies are managed and organized. New technologies introduce new circumstances that require both informal and official protocols for implementation and behavior, such as the political and economic environment shaping infrastructure, content and use. As ICT use grows, so does government regulation of the systems. One set of regulations determines the provision of service for telephones, television, and the Internet. Policy often determines the number of service providers, with many areas having state endorsed monopolistic or oligopolistic telecommunications services. Access to spectra for broadcasting and mobile telephony is determined by regulation, as is licensing of internet service providers. The infrastructure of ICT – landlines, radio and TV broadcasting, mobile phone licenses – is determined by public policy that also controls ownership (local vs foreign), competition, rates and fees, and service areas.

While governance affects access and use of ICT, such as the ability to use mobile phones/text while driving, but possibly more important is the impact on service provision and ICT diffusion. One challenge is that low density and low income regions are less attractive to service providers, and in the absence of subsidies may find little interest from Internet providers. Areas with cable TV have the infrastructure in place for broadband, as do higher density areas through DSL telephone connections. Outside these areas, residents are forced to use slower and costlier services such as satellite or mobile phone systems. Further limiting the ability of more isolated areas to gain service is regulatory limitations on community broadband provision. Many areas able to provide community Internet service find limitations as commercial providers have prompted legislation to give them control of the market.

3. CONCLUSION

After more than a century of telephony and twenty years of Internet, the world presents a mosaic of the application and use of information and communication technologies. The lessons from the Michigan case study include recognition of those who do not want access and what that means for knowledge work; the continuing significance for some people of the cost of access; and the wide variety of infrastructure that serve as the knowledge economy foundation. The issue for the public and policy makers is how the role of ICT will unfold in the future and the importance of Internet access and use for individuals and communities. As a society we need to address the places that are not smart, creative or knowledge based, yet deserving of support as they transition to a new economy.

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CHALLENGES AND BENEFITS IN CROSS-SECTORIAL KNOWLEDGE MANAGEMENT IN A CROSS-BORDER CONTEXT

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ABSTRACT

Purpose: The purpose of the article is to study challenges and benefits in cross-sectorial knowledge management in a cross-border context
Scope: Cross-border cooperation can be viewed as one of the instruments to enhance competitiveness together. Cooperation, knowledge transfer and sharing between research and education institutions, enterprises and public sector might contribute to development of knowledge cities and regions.
Method: This article adopts a mix of secondary evidence and primary research, and Elite interviews on cross-border knowledge management processes were conducted.
Results: The research identifies challenges and benefits of development of a cross-border Knowledge region.
Recommendations: This article includes indications of choices of action towards the cross-border Knowledge region.
Conclusions: The paper identifies a number of challenges such as different working cultures, level of public-private-people-partnership partnerships, democratic inclusion processes**.** The mental geography, basic values, political, cultural, linguistic proximity and security issues support inter-sectorial collaboration.

KEYWORDS

Cross-sectorial knowledge management, cross-border cooperation, Knowledge creation and sharing (transfer), Knowledge region (KR), SECI, BA

1. INTRODUCTION

Rapid technological change and greater use of knowledge were supposed to offer new opportunities for local/regional development and knowledge transfer, but also for coping with the specifics and complexity of CB cooperation (CBC) and regionalization. The globalization of economic and social activities is testing the ability of local economies to adapt and exploit, or maintain, their competitive edge as scale becomes more important: economic activity continues to cluster and concentrate. Disparities in economic performance among different, even neighbouring countries tend to be persistent (OECD 2010). Still, aforementioned technological change (wider use of ICT in the first place) and greater use of knowledge are offering new opportunities for regional and inter-regional development and knowledge transfer, but they demand changes in local governments' governance philosophy, further involvement of innovative enterprises, and participation of universities and research institutions in local environment(s). According to the 2009 OECD report, the role of non-traditional factors, including users and consumers, has become more important in driving scientific discovery and innovation. For example, the public sector is an important purchaser and provider of services. Since innovation is closely linked to demand by users, government as a large scale purchaser can promote innovation by being a demanding buyer, signalling acceptance of innovations as a lead user and creator of new markets.

2. THEORETICAL FRAMEWORK

When analysing the meaning of knowledge management from various viewpoints (individuals, communities, society, regional development) in relation to people's daily lives, one cannot strictly adhere to a specific set of definitions. Instead, one can only attempt to highlight those meanings which people generally associate knowledge management with in various situations. When talking about knowledge management, one is dealing with communication, learning, ICT, networking, etc. Depending on the context, either the technological or the human aspects are emphasised. The new role of knowledge as a success factor for nations and organisations has drawn knowledge management, among other issues, to the focal point of politics. Knowledge management is a process where knowledge, skills, expertise and communication are cared for, administered and steered with skill and wisdom in a goal-oriented fashion.

There are several approaches to knowledge management; for example, the information technological and behavioural aspect, which, in principle, will lead to greatly deviating conventional viewpoints. What is emphasised is the human being, the working community, and goal-oriented reform of work methods and processes.

In general, the proponents of the technological approach are experts in information processing or economics. They regard information as identifiable objects that can be processed using information systems. Information technology manufacturers and software companies continually develop new methods for information processing with increasing efficiency and user-

friendliness.

In place of or alongside an ICT-oriented approach, knowledge management can concentrate on organisations and people. The representatives of this trend have investigated organisational information processes (communication), organisational development (change management, intellectual assets, core competence and various business ideologies for example), organisational knowledge and expertise.

Knowledge is created through a social process where unique individuals and their intellectual capital are the key factors. According to the Japanese view, oral and written explicit knowledge cannot express the ideas and in-depth expertise contained in tacit knowledge. What is needed instead, is the multifaceted intertwining of cognitive processes in social processes. This means that knowledge management has aroused new interest in human interaction, dialogue development, networking between individuals and communities, and in real functionality of information and communication, for example in a virtual environment.

In view of the shift towards a "Knowledge-driven economy" since the 1980s and 1990s, extra-economic relations and the capacity of regions to support processes of learning and innovation have been identified as significant sources of competitive advantage (Amin & Thrift 1994; Jessop 2000). Knowledge has been pointed out as an organisation's sustainable source of competitive advantage (Drucker 1988; Nonaka 1991; Morey & Frangioso 1997; Zwass 1999; Argote & Ingram 2000; Argote *et al*. 2000; Davenport & Prusak 2000; Lahti & Beyerlein 2000; Rulke *et al*. 2000) and academic attention on organisational knowledge creation, capture, and transfer prove the acceptance of this idea (Davenport *et al*. 1998; Marchand & Davenport 2000).

This view became dominant in the so-called Lisbon Strategy initiated in 2000 by the Lisbon Extraordinary European Council 2000. The Lisbon Strategy highlighted theories of Knowledge, Knowledge Management, Lifelong Learning and Learning/Knowledge organisations as future competitiveness and economic growth factors and sources. Unfortunately, the Lisbon process has not produced the expected change in pan-European world-class competitiveness (Kok 2004). In 2004, Kok advised broader involvement of the regional and local levels to implement the Strategy (Kok 2004, 10-11). The revised Lisbon Strategy (2005) turned attention to local governments as basis for considering regions as an appropriate level for stimulating innovation. The idea was not new: it had been presented more than a decade earlier by scholars and policy-makers (Lundvall 1992; Cooke 2003).

According to Perkmann (2003), building a cross-border region is a re-scaling process; questions like what are the general circumstances in which new scales are constructed, and what are necessary ingredients of such scale construction should be asked. According to Perkmann, regionalisation may be analysed as a specific type of re-scaling process, involving political mobilisation (coalition building), institutional restructuring (channelling political interests into decision-making) and functional needs (construction of a new scale). The question remains: what are the pushing and pulling powers that give rise to regionalisation. In neo-functionalist paradigm, the creation of framework by institutions, authorities and policies may be considered as a starting point and the governing bodies of these processes (Perkmann 2007). The question of bringing the different counter-parts behind the same table remains as one of basic communication challenges.

Knowledge creation, storage and transfer/sharing are key concepts in this type of regionalisation processes, aiming at creation of the "best" Space or Place or conditions for advancing the well-being of citizens and regional economic prosperity. Key authors in connecting different types of valuable Knowledge to Spaces (ba), are Nonaka, Konno and Takeuchi, later Etzkowitz. The starting point is distinguishing between explicit and tacit knowledge (Polanyi 1958).

Explicit knowledge can be codified, stored, and transmitted using formal language or symbols. It can be captured in texts or charts and it is easy to transfer and retain in the organisation, but the process may be costly (it takes time to transform tacit knowledge into explicit form), and the results poorer in quality, because of a lack of contextual elements (Benbya & Belabaly 2005). Tacit knowledge, instead, is rooted in action and gained through experiences. As individuals are the carriers and processors of knowledge, this Knowledge tends to be subjective, context dependent, socially constructed, and embedded in practice. In this view, knowledge is created and validated through social processes (Nonaka 1994). Tacit knowledge includes mental models and schemes that help individuals to perceive and interpret the world around them. "*Tacit knowledge is highly personal and hard to formalize, making it difficult to communicate or to share with others. Subjective insights, intuitions, and hunches fall into this category of knowledge. Furthermore, tacit knowledge is deeply rooted in an individual's action and experience, as well as in the ideals, values, or emotions he or she embraces"* (Nonaka & Takeuchi 1995, 8).

Nonaka, Toyama and Konno have proposed a model describing an organisation's knowledge creation consisting of three elements: (1) the SECI process, the process of knowledge creation through conversion between tacit and explicit knowledge; (2) *Ba,* the shared context for knowledge creation that combines physical and intellectual space, creating favourable conditions for knowledge creation; and (3) knowledge assets, the inputs, outputs and moderators of the knowledge creating process. These three elements have to interact with each other to form the knowledge spiral that creates new knowledge (Nonaka 1991, 1994; Nonaka *et al*., 1994; Nonaka & Takeuchi 1995; Nonaka & Konno 1998; Nonaka, Toyoma & Byosiere 2001; Nonaka & Toyoma 2003, Nonaka & Ichijo 2007).

The SECI involves knowledge transformation processes. Nonaka (1994), Nonaka *et al*., (1994), and Nonaka & Konno (1998) propose that knowledge can be transformed from one type to another via conversion processing: Through socialisation, an individual gains tacit organisational knowledge; through externalisation, an individual transforms tacit

knowledge into explicit form; through combination, collective explicit knowledge resources are combined; and through internalisation, an individual transforms explicit knowledge into personal tacit knowledge (Nonaka 1994, Nonaka *et al*., 2000).

The second important part of knowledge creation is *Ba,* which is the context shared by those who interact with each other. *Ba* is a Japanese word for a place that is not only a physical space, but also a specific time and space. The intention with *Ba* is that knowledge is never absolute, objective or free from the context. Instead, the knowledge creation process is always bound to some type of connection - it is a local process. Another possible word to describe Ba is a connection. Being present in a place is not enough; what is required is to produce an interactive, face-to-face connection between people, and between people and their environment. It is a place where people share tacit knowledge: their experience, feelings, emotions and mental models. Interaction is used to eliminate boundaries between people.

Nonaka emphasises Place as a term even with regard to virtual interaction between people. Ba is a Place with several events in progress during interaction between people, including the generation of new knowledge. In this perspective, the concept of knowledge is strongly related to a given material and cultural context, beyond the fact that it is has been considered a personal belief. At its best, *Ba* is characterised by love, care, trust and commitment, which provide the basis for knowledge conversion among individuals. The SECI process starts from Ba.

The dual sphere of the space has been developed by Etzkowitz and Ranga (2010): Our vision of spaces reflects the sense conveyed by the Finnish notion of "tila" as space, mode, status, but also passage from one status to another. The spaces are seen as the physical, but also virtual areas in which the three selection environments of industry, academia, and government interact.

The third component, Knowledge assets, the inputs, outputs and moderators of the Knowledge creating process include among others important factors enthusiasm of the workers and Knowledge agents or activists as moderators.

The English words knowledge and management have in the Estonian language a multitude of equivalents of various degrees, plus a wide variety of philosophical and conceptual connotations. The Estonian equivalent of knowledge may be used to refer to a single or several items of knowledge, awareness, experience and mastery of something, plus related skills. Management can be translated as handling and manipulation, catering for, administration, leadership, wisdom, skilfulness, prudent action, and accurate attention.

Fostering of contacts of universities-enterprises-(local) authorities, using triple-helix method in the framework of cross-sectorial and cross-border cooperation, is not sufficiently covered in the literature and under-exploited in practice. New modes of innovation factors have gained importance: in addition to companies, non-profits or universities from the same country or from abroad, new users, consumers, amateurs, philanthropists are emerging and influencing the demand for innovation.Even if the role of demand is recognized in the literature, it lacks for a structured theoretical basis for policy formulation.

The underlying framework is conditions and factors of success and failure that are relevant in a framework of a small country. The small country perspective is selected because the empirical evidence shows that there can be found successful innovation policies' models in small countries (like from Nordic countries Finland (Lemola, 2003).

3. METHODOLOGY

This paper is interdisciplinary by its nature, which leads to the use of different research methodologies. The systems approach combines and generalises concepts and ideas from different subjects (Luhmann 2009). In the paper the authors intend to use both rational positivistic approaches concentrated on variable analysis and generalisations, as well as qualitative approaches to investigate practitioner's experiences and actions in specific contexts (Tsoukas, Chia 2002). Both primary and secondary data will be used as the basis for analysis. Combination of different approaches allows achieving more complete picture as they serve different needs (Gerring 2012) and support our analysis by triangulation.

This research contributes to the theory and practice of cooperation between public and private sector and their efficient management. At the society level, the project proposes solutions for improving cooperation between different types of public organisations, cooperation between public and private organisations, and involvement of civil society organisations.

This article adopts a mix of primary research of three studies and secondary evidence provided by the literature, programs, strategic development documents (strategic plans of Tallinn, Helsinki, Uusimaa and Harjumaa), topical meetings, round-tables and fora.

The article relies on generalisation of the results of previous studies, implemented since 2004 – 2009: Helsinki-Tallinn Science Twin-City Research 2004, Questionnaire among Euregio stake-holders 2007, Elite interviews on regional development perspectives 2009. The criteria for selecting the interviewees were: (a) they are experts in the studied field and had personal experiences in it, (b) they represent different operative functions or areas of expertise in the field, including high leadership positions, and (c) they are more or less interested in Estonian-Finnish Cross-border development issues. The interviewees were promised that the interviews would be confidential and that when reporting the results, the interviewees' identities would not be linked to their statements in the interviews.

All interviews are recorded. Except for the 2004 research, when notes were taken, the interviews are tape-recorded and written down.

To verify the results and identify new trends additional in-depth elite interviews were conducted in 2011, this time

with the aspiration to include the highest level and culturally integrated experts in both countries (Estonian and Finnish): two Estonians on high positions in Finland, operating in all triple-helix fields: connection with local authorities, high-tech business and academia, the same level was attempted in Estonia, the connection with authorities by Finnish experts was significantly lower than Estonians' in Helsinki. To keep the expected criteria, it was difficult, if not possible to raise the number of interviewees. Interviews were recorded, in accordance of the wish of interviewees as the topic was considered sensitive by everybody of the questioned four. Interviews lasted about an hour and a half within the private atmosphere. The questions posed for research among elite experts in 2011 were:

What factors are essential for developing a Cross-border Knowledge region between the capital regions of Helsinki and Tallinn?

Which policy issues should be included in the regional cooperation spectrum?

What are the preconditions, opportunities, and difficulties in developing a Cross-border Knowledge region?

4. DISCUSSION

It is characteristic for regional co-operation that in addition to the movement of capital and goods also objects which are more difficult to transfer or receive/introduce like technology, skills and knowledge must move from one region to the other. When the co-operation deepens and the goals become more ambitious, the role of intangible components in co-operation increases, compared to the tangible ones. Instead of co-operation forms that can be dealt with separately (economic, cultural, administrative) complex tasks uniting several co-operation forms arise.

The need for closer cooperation in science and high-tech business development in Helsinki and Tallinn capital regions stems from the fact that neither of them is big enough to compete alone internationally. Pooling of the resources enables to profit from the strengths of both regions and is mutually beneficial. The role of capital regions' authorities is to raise competitiveness of the area and ensure well-being of citizens. In this process size matters, quality of life and availability of high quality services becomes important. Cross-border networks and functional integration in education, research and companies are essential for gaining competitive strength.

Interviewees mentioned factors that drive integration as follows: participating interest groups, participants in decision-making processes, political parties and/or decisions and the role of governmental institutions, aspirations of politicians, acting cross-border, or attempting inter-sectorial division of roles, or at least information sharing. These aspects form the ground for applying the Nonaka's models of SECI, ba and assets.

Helsinki-Tallinn Euregio was considered as a mediatory body for enhancing integration. Initially created (1999) as a network by "Estophiles" and "Fennophiles" from the representatives of local governments for the aim of applying jointly for EU funding, as the sources available for Finland and for Estonia were different. In the beginning there was no mention of any kind of integration, and the knowledge flow was mostly from Finland to Estonia. Very soon, directions were taken to overcome regional disparities, with preparing Estonia for joining the EU. By joining different working cultures, the founding members became represented through high-level officials and politicians: vice-mayors, regional mayors and CEOs.

By now, operating environment of Euregio is characterised by the need to invest more effort from both sides of the Gulf of Finland in common development of the Helsinki-Tallinn twin-region, in order to adjust to growing challenges of globalisation. Ageing population, declining labour force, brain drain fill the region with challenges, perceived as an obstacles to economic growth. In both cities there is growing need for both high quality and quantity of labour force.

Euregio's role has been seen as an active stakeholder supporting inter-regional development and competitiveness, based on complementary strengths and common innovative and creative cultural environment, being a cross-border, triple helix driven tool – a Knowledge agent or activist.

The research showed that the preconditions exist for the development of a Helsinki- Tallinn Knowledge region. Based on research, the following steps are suggested:

Firstly, political decisions should be taken on as high a level as possible: in mayors' offices, but also on the central government's level. An existent initiating group (the Knowledge agent) alone is not enough as the policies co-construct the knowledge-based innovation systems by introducing infrastructure, human resources, and public demand into the innovation processes.

Secondly, following sub-goals should be adopted: knowledge transfer cooperation, using the triple-helix principle and from this, or in parallel, for creating the Knowledge region, referred to as Ba.

In a sense, the idea of Ba is essential in the process of creating the knowledge region: a space, both physical and conceptual, to bring the assets of the region together to create new economic value and perpetuate a cycle of innovation.

Thirdly, high-level decision-makers and experts should work out a Cross-border joint strategy for the development of the Cross-border Knowledge region. Until now Euregio has been the only institution tasked to enhance regional integration. Euregio-type organisations should be part of the process, either as initiators or intermediaries, and also, for finding innovative ways for knowledge transfer and regional development. However, they cannot take charge of the processes without given the authority and being sufficiently upgraded with financial and human resources.

Fourthly, an important trend to consider in the enhancement of innovation by the public sector should be innovation in the public sector itself and the enterprises belonging to it. Planned services should be designed not only to resolve a current

problem, but also to restructure the whole sphere with innovative services. Several electronic and mobile phone services may be considered here.

Fifthly, an institution like Euregio would serve as an agent of change for CB innovation transfer and for speeding the process of moving from one innovation phase to the next one. The broader positive context includes the general Estonian-Finnish (Tallinn-Helsinki) knowledge transfer and exchange of experiences, which has produced positive results in several fields.

Difficulties in the implementation process were pointed out as follows: horizontal co-operation even within one institution's borders (e.g., city's different departments and agencies) is problematic; the role of path dependency is significant, i.e., how the institutions have developed over time, how the rules of the game were established, and the difficulties in breaking a "gatekeeper's" power; overestimation of cultural differences; different financial opportunities. Overcoming these barriers should be a subject for future research.

5. CONCLUSION

Creation of a cross-border Knowledge region is a long-term and complicated process, where the main obstacle in most cases of at least EU member countries is not related to borders as physical barriers but rather as mental, informational, cultural (including organisations' culture), communicational, spatial-economic, administrative or political barriers. The working cultures have proved to be different in Estonia and Finland. The aspiration of a public sector to elaborate partnerships with private sector is especially low in Estonia, Finnish local governments have long-standing connections with universities and R&D institutions, also the support of innovative enterprises is a wide-spread habit of action. Obstacles are also differences in democratic inclusion processes in Estonia and Finland.

From supporting side, the mental geography, basic values, political, cultural, even linguistic proximity, security issues – all support the aspiration to further integration, inter-sectorial communication and collaboration. The main driver in this process is the necessity – both countries are too small to answer the challenges of international demands.

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PARALLEL SESSION 4: KNOWLEDGE-BASED URBAN DEVELOPMENT

THE UNIVERSITY AS A CITY: THE FEDERAL UNIVERSITY CAMPUS AND THE URBAN MASTER PLANS OF THE CITY OF CURITIBA – BRAZIL

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ABSTRACT

Purpose: The fast and deep changes that higher education went through during the 1960s in Brazil, especially those concerning the federal universities were followed by changes in the university territory. This paper discusses the location of the Federal University of Paraná (UFPR).

Scope: Assuming that the location of the university campuses is an important variable for the planning of the city, this paper discusses the location of the Campus III, and its connection to the three Urban Plans prepared for the city of Curitiba.

Method: This is accomplished by: (1) an overview of the Urban Plans of Curitiba; (2) the identification of guidelines for the location of the Campus III in Urban Plans; (3) an analysis in terms of their integration into the urban territory.

Results: At the same time that UFPR has been working to integrate to the society and contribute to the development thereof, from the spatial viewpoint, Campus III, more specifically, is still isolated as an urban space and architectural ensemble.

Recommendations: This article can be the starting point for further studies, more extended on the spatial relationships between the universities and the city of Curitiba. We understand that Campus III needs more interaction with its environs

Conclusions: This research concludes that that the physical proximity and the interaction with the urban life must be part of the routine of the university environment, contrarily to the very common attitude of denying the city.

KEYWORDS

University campus; urban plans; Federal University of the State of Paraná; city of Curitiba.

INTRODUCTION

Since de 1960s, two major changes have occurred in the structure of higher education in Brazil: the expansion of the universities and the changes in the University precinct. The latter are represented by the transfer of the university buildings from the city centers to new sites, usually located outside the central areas or along the urban edges. The criteria used for the implementation of the new precincts have contributed to the lack of integration with the community, owing either to the geographical distance or the contrast between the morphological pattern of the campus and the surrounding urban fabric.

Federal University of Paraná - UFPR, with its 22,866 students (Ministry of Education - Brazil, 2013), has records of such location mobility in its history - moving from the city center to the edge of the urban area. Founded in 1912, it started operating as a private institution. Its first office building (Central Building) was built between 1913 and 1915, and it is located on Santos Andrade Square, in the city center, on a land donated by Curitiba's local government. In 1950, it became a federal public free institution, going through an expansion phase with the construction of the *Hospital de Clínicas* (University Hospital) (1953), the Rectorate Buildings (1958), and the Polytechnic Center (1961). The University Hospital and the Rectorate Buildings were built within the core of the urban center, 750 and 590 meters away from the Central Building, respectively. As opposed to the location of these three buildings, scattered and integrated to the urban network, the Polytechnic Center was built along BR-116 (Federal Highway), 5.3 km away from the traditional urban center.

Assuming that the location of the university campuses is an important variable for the planning of the city, this paper discusses the location of the Federal University of Paraná (UFPR), more specifically, Campus III and its connection to the three Urban Plans prepared for the city of Curitiba in 1943, 1965, and 2004.

The questions that guide this paper are the following: Which criteria were used in the urban plans of the city of Curitiba for the definition of the location and consolidation of Campus III? What does the location of this campus mean within the current context?

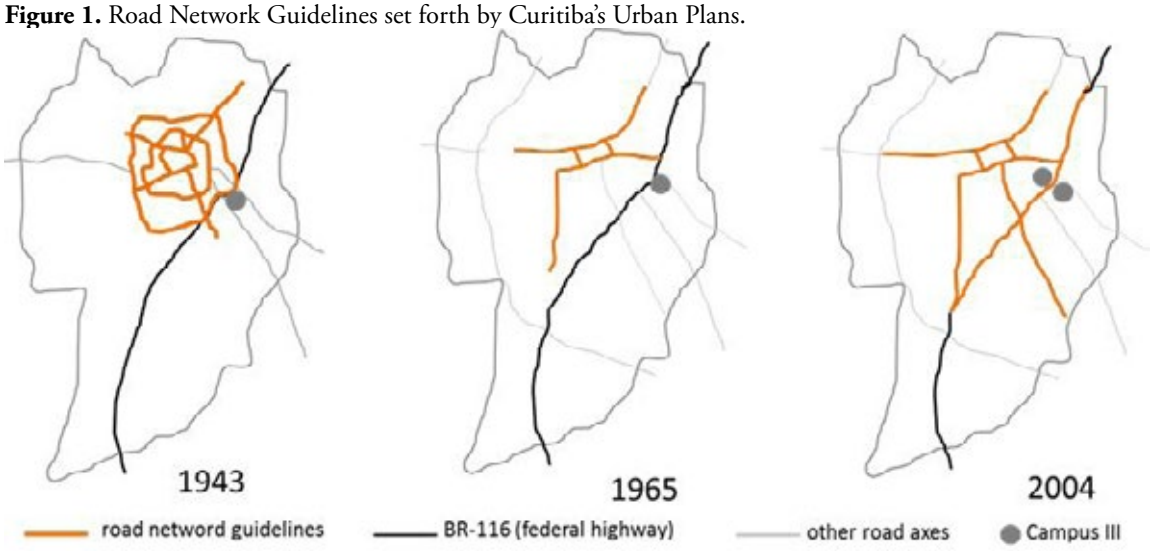
Starting from these questions and considering the need to go deeper into understanding the university-city relationships, we aim at assessing how the urban planning strategically dealt with the problems and needs of the population in relation to the location of Campus III. And, further, with the intention of promoting a spatial typological interpretation of Campus III, it will be compared to Campos Calvo-Sotelo's (2011) location models, discussing the location of the campus in terms of its integration to the urban territory.

2. THE URBAN PLANS OF THE CITY OF CURITIBA AND CAMPUS III (FEDERAL UNIVERSITY OF THE STATE OF PARANÁ).

Curitiba, the capital city of the state Paraná, is geographically located in the south of Brazil and has 1,746,896 inhabitants (IBGE, 2013). It is a city with strong population expansion movements. Following a European migration flow in the late 19th and early 20th centuries, the city has received, since the 1950s, a large number of immigrants coming from the country of the state of Paraná and other regions in Brazil, as a result of the urban industrialization and agricultural modernization.

Curitiba grows along urban guidelines set forth since the 1966 Master Plan, which changed the city's radial city growth pattern (1943 Master Plan) into a linear model of urban expansion, consolidated by the 2004 Master Plan (Figure 1).

Figure 1. Road Network Guidelines set forth by Curitiba's Urban Plans.



2.1. Curitiba's Urban Master Plan - 1943.

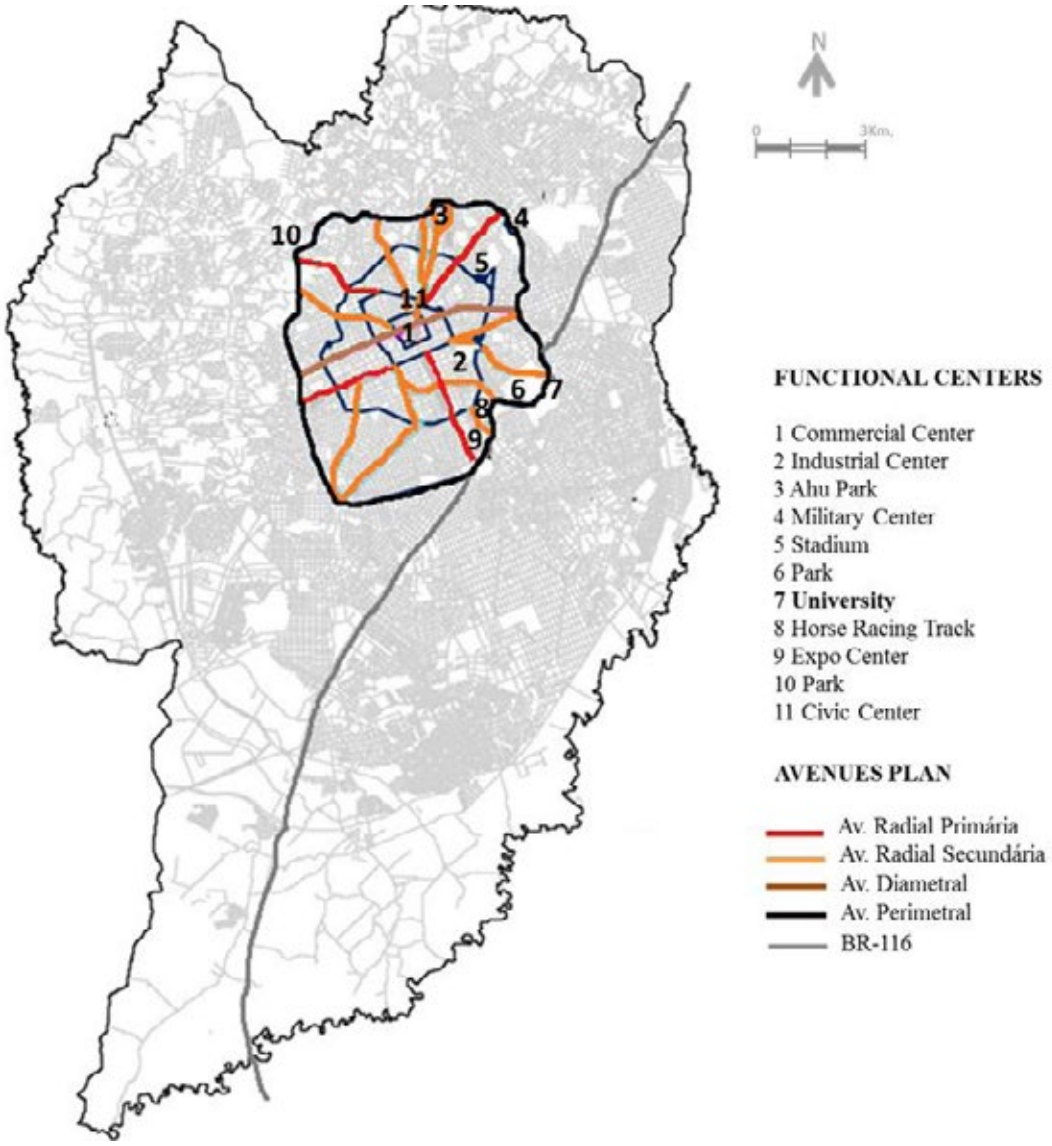
During the 1940s, Curitiba had around 127 thousand inhabitants. After noticing a process of deterioration of the infrastructure and with the intention of disciplining the occupation of the urban land, Curitiba local government commissioned an urban plan for the city, which was drawn up by French architect Donat-Alfred Agache.

The 1943 Urban Plan proposed the division of the city into specialty zones. It established the implementation of eleven functional centers (Figure 2): the civic center, the administrative center, the sports center, the inner transport center, the interurban transport center, the military center, the supply center (Municipal Market), the university center, the commercial and social center, the horse riding and expo center, and the industrial center.

One of the major sub-products of the 1943 Urban Plan was the Avenues Plan (Figure 2). These avenues established the interconnections between the several important functional centers in the city, and they were divided into three categories and conceived based on trigonometric notions: radial avenues (four main and ten secondary avenues); a diametric avenue; and perimeter avenues (ring roads) (AP-0, AP-1, AP-2, and AP-3). The radial avenues would join the center to the edges of the urbanized area; the long diametric avenue would cross the whole city, passing through the city center; and the four perimeter avenues would allow that the traffic flowed around the neighborhoods without going through the city center.

Figure 2 shows the overall scheme of the 1943 Urban Plan, indicating the circles formed by the perimeter avenues (ring roads). This plan aimed at containing Curitiba's urban area within a circle that extended as far as perimeter avenue AP-3.

Figure 2. Curitiba's Urban Master Plan - 1943.



Source: Curitiba, 1943.

As for the educational structures, the Plan formalized a single proposition for new buildings and facilities for the Federal University of Paraná, suggesting a design for the construction of a University Center, which later on was to become the space used for Campus III - Polytechnic Center:

"*The creation of a university city in Curitiba, like the modern education establishments in the sector, will be a reality one day. The university cities must be isolated from the urban centers, without however, being far from them to make things easy for teachers and students. They also require large open spaces for woods, sports pitches and courts etc. To house the future university city in Curitiba, we suggest the site located behind the Horse Racing Track, between AP-3 and the road to São José dos Pinhais, taking advantage of the hilliest area for park*" (Curitiba, 1943, p. 44, translation ours).

The site chosen for the implementation of the university center was an area along perimeter avenue AP-3, on the east boundary of the urban area. In this stretch, AP-3 runs in a tangent with BR-116 highway; this highway used to be a barrier for eastbound occupation.

2.2. The 1965 Preliminary Urban Plan

The accelerated growth of Curitiba, together with the lack of public financial funds for the execution of the civil work foreseen in the 1943 Plan, made it become obsolete in a short while.

Then, in 1965, the Preliminary Urban Plan was drawn up by Brazilian urbanist Jorge Wilheim, changing the city growth pattern from perimeter-radial to a linear model of urban expansion. Approved in 1966, the Plan's guiding line was a land use zoning that divided the city into functional zones, with specific occupation patterns for each of them.

From the 1970s onwards the Master Plan was actually implemented upon the execution of the large scale infrastructure

work, which spatially materialized the linear model of occupation proposed by the Plan. To promote such growth, road axes, called structural roads, were implemented to play the roles of catalysts for activities and traffic routes. The axes consisted of three parallel streets: a central two-lane street restricted to public transportation plus low speed lanes, between two fast-moving one-way streets running in opposite directions.

The structural axes were conceived and later implemented as lines that would combine the integrated tripod: road network; mass public transport, and land use. Two axes were proposed: the longer axis running northeast-southwest was implemented first; and the east-west axis, originally shorter and that was interrupted when it crossed BR-116 highway (Figure 3).

In the 1970s, the prevailing occupation direction was northeast-southeast. However, from then on, BR-116 highway was trespassed and, from the configuration of an expansion vector towards east, the occupation became more compact.

The 1965 Preliminary Plan reinforced the university function of the city - *The university nature of Curitiba should be favored by the development of a university zone near Polytechnic Center* (Curitiba, 1965, p.49, translation ours). To confirm the choice for the site, a survey was carried out with 50 students (that would be only 0.6% of the total university students) using the following questions:

Question 1 - *Would you like to live in a university campus away from the city center where you would have lodging, food, transport, and recreation?* Result: 65% yes and 35% no (Curitiba, 1965, p.50, translation ours).

Question 2 - *Grouping the university activities in the Polytechnic Center would be desirable?* Result: 82% yes and 18% no (Curitiba, 1965, p.50, translation ours).

The law that created the 1966 Master Plan consolidated the Polytechnic Center area and its surroundings as a special sector - university; with specific urban parameters, set forth by decree. As for the environs of this sector, the plan established low density residential areas.

The message that followed the Bill cleared reinforced the speech about the university function of the city:

"The university sector is of great importance given its prevailing role in Curitiba's urban society. This sector will be used in an appropriate way with the creation, in a suitable scale, of a university "campus" on the site where the Polytechnic Center is located. There are very favorable conditions in this location, and it is mandatory to foresee a considerable expansion to insert, in one single complex, the remaining institutes of the university" (Curitiba, 1966, p.11, translation ours).

2.3. The 2004 Master Plan

In 2004, Curitiba's Master Plan went through new changes to adjust it to the requirements of Federal Law nº 10,257/01, the City Statute (regulates the "Urban Policy" chapter of the 1988 Brazilian Constitution); however, it kept the occupation pattern set forth in 1966. The public transport and road network infrastructure work, associated with specific land occupation patterns, are still today the elements that define the spatial morphology of Curitiba.

This Plan consolidated new densification axes along important avenues of the city. And it transformed BR-116 highway into a new development axis, upon incentives for the diversification of use along it and the implementation of a high-capacity public transport system.

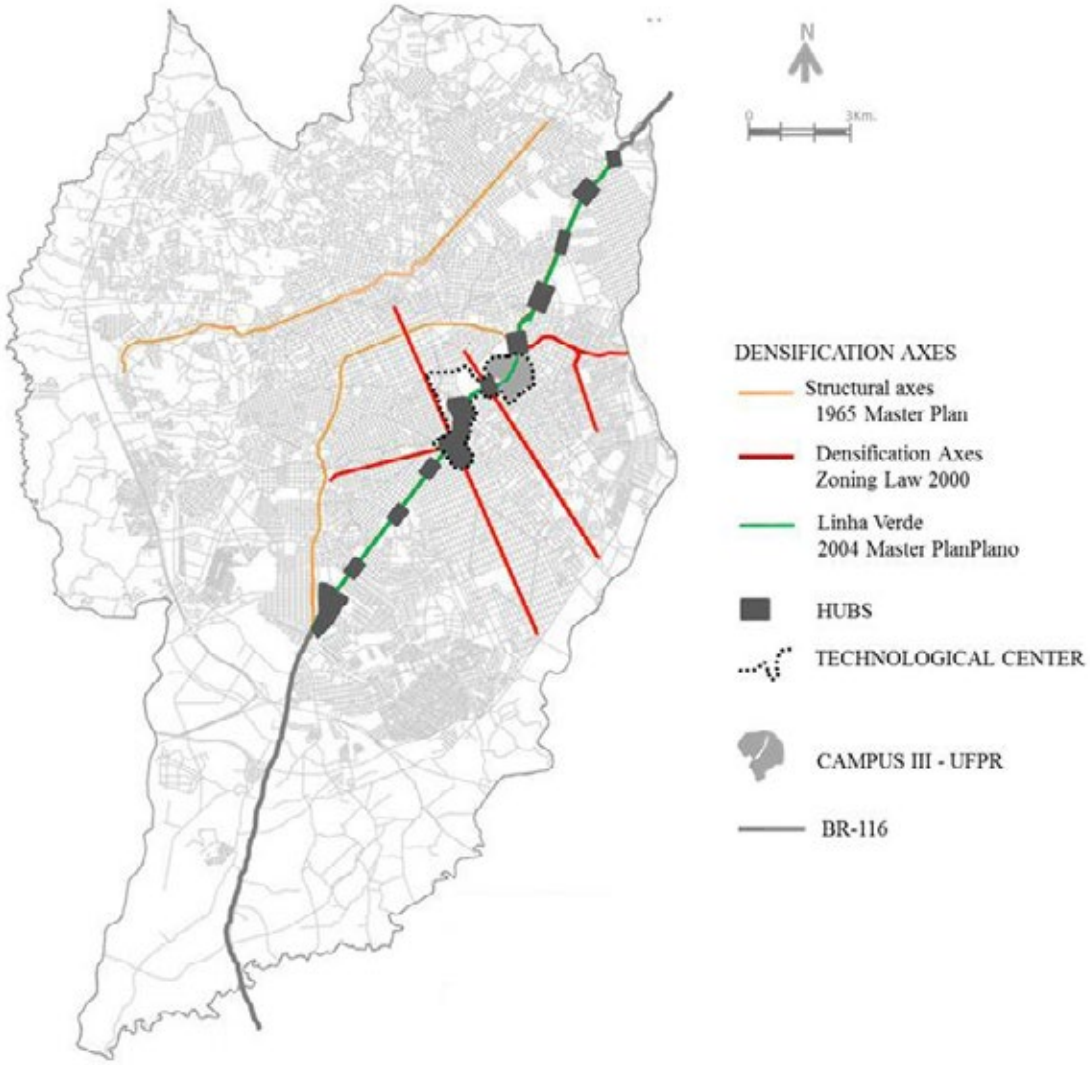
The *Linha Verde* Project (Figure 3) was conceived to transform this stretch of the former BR-116 highway into a metropolitan link road, turning the former highway into a ten-lane city road (60 to 80 meters wide) that includes lanes for the express bus system (buses running on exclusive corridors), which works under the ternary system, implemented in the city by the 1965/66 Plan.

To facilitate the consolidation of the new axis the land occupation and use parameters were modified, allowing for higher densification along the former highway. In addition, the services zone became a mixed-use zone, with the possibility of increasing its constructive potential by using the Building Right Transfer Instrument (instrument created by Federal Law nº 10,257/01).

The zoning divided the area into three sectors, namely: (1) Hubs (Zone: Hub-LV), which is expected to have high-density occupation with verticalization and prevalence of commerce and services; (2) Directly Benefited Area (Zone: SE-LV), regarding the densification axis along *Linha Verde*, between the hubs, where medium and high-density occupation is intended, with the predominance of high-rising residential use; and (3) Indirectly Benefited Area (remaining zones), where, as a whole, is intended to be a zone to reduce the impact of the land use and occupation, with medium density, limited verticalization, and prevalence of residential use.

The project establishes the implementation of twelve hubs, and some of them are: Hub-LV5 UFPR, Hub-LV-6 *Comendador Franco* Avenue, and Hub-LV7, *Marechal Floriano Peixoto* Avenue, where it proposes incentives for the implementation of companies, universities, and research and development institutions, to be called The Technological Center (Figure 3).

Figure 3. Guidelines of Curitiba's Urban Master Plans - 1946 and 2004.

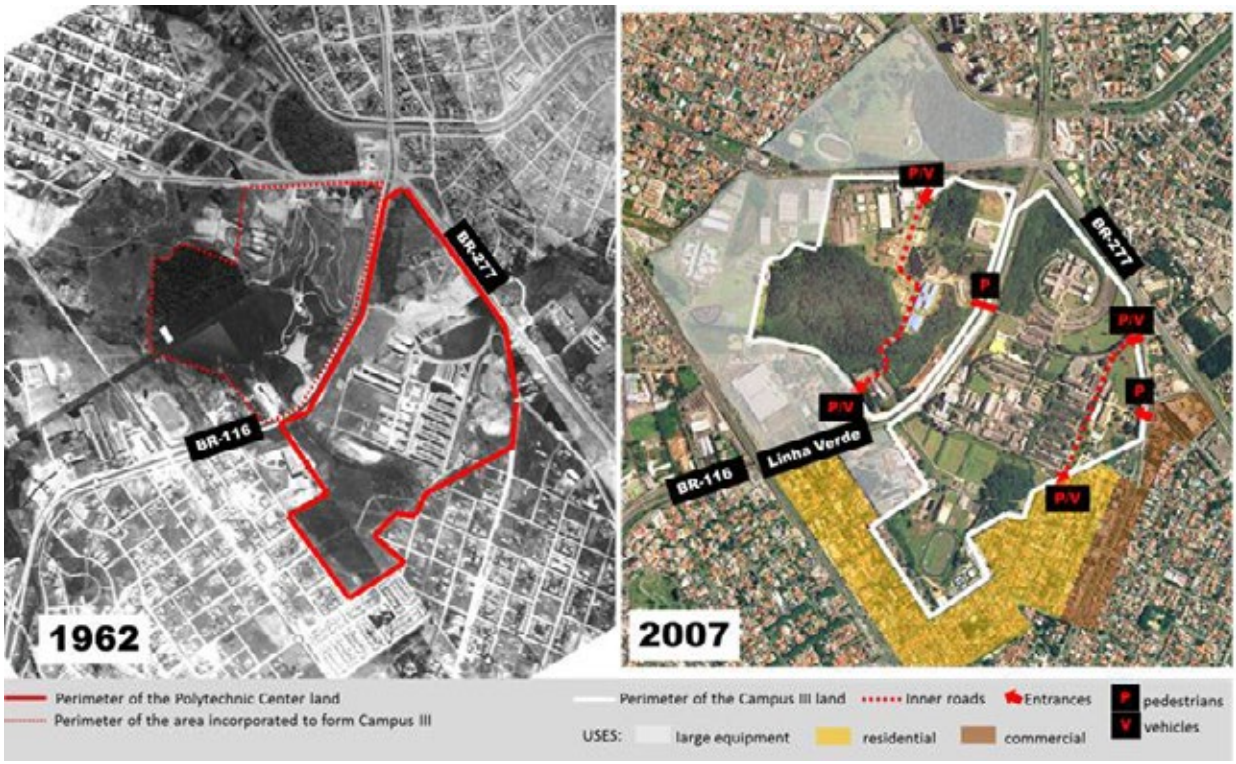


The Technological Center consists of a perimeter that includes two of the main university campuses, Campus III (UFPR) and the Campus of the Pontifical Catholic University - Paraná (PUC-PR), besides the Technology Institute for the Development (LATEC), and the Federation of the Industries of the State of Paraná (FIEP-PR).

Figure 4 shows Campus III and the evolution of the urbanization of the region where it is inserted in, as well as its interfaces with the urban fabric. Some points are worthy pointing out: (i) the Campus is located along major federal highways (BR-277 and BR-116), with little permeability; (ii) *Linha Verde* divides the area of the Campus, and there is only one connection for pedestrians (footbridge); (iii) the inner roads that connect to the urban network towards northeast-southwest have poor legibility; (iv) the land use in the region falls mainly into three types: large equipment, residential, and commercial.

The campus is currently fenced, and has a small number of entrances, and most of them are shared between pedestrians and vehicles. There is just one entrance for pedestrians only, which allows direct connection between the Campus and the commerce and services region.

Figure 4 - Campus III - Overview in 1962 and 2007.



Source: IPPUC, Orthophotograph in 1962 and 2007.

3. CAMPUS III (UFPR) AND ITS TYPOLOGICAL CLASSIFICATION

To understand the importance of the university in view of the urban dynamics, we need to know its physical space, its location and distribution within the territory, and the physical and functional relations it establishes with the surroundings.

Authors such as Claes Caldenby (2009) and Pablo Campos Calvo-Sotelo (2011), identify the ways the university spaces are linked to the cities, suggesting two basic classifications: i) integrated precincts; where these spaces are incorporated to the physical space and the urban dynamics, with no borders between the city and the university, which allows them to grow and merge to each other. And as opposed, ii) segregated precincts; which do not incorporate the city's functional dynamics. Campos Calvo-Sotelo, in turn, proposes a typological classification system for the campuses, emphasizing the configuration of the university space and its relationships to, and distances from the city. The location models proposed by the author provide a conceptual structure to the way the University actually relates to a city (2011, p.133).

These models are classified into four categories: 1) dissociated (*desvinculado*)- the university space is far from the city and there is no relationship whatsoever between them; 2) segregated (*segregado*)- this derives from the previous model, sharing therewith the physical separation from the urban fabric, but allowing that the campus relates to the city; 3) super-peripheral *(supeperiférico)* - the university space is not located in the major city in the region, but in peripheral towns; 4) *urban* - the university space is located within the boundaries of the city.

The urban category is divided into 4 location sub-categories: 4.1) peripheral *(periférico)* - when it is located in the urban suburbs; 4.2) as urban fabric (*tejido urbano*) - it assumes an aggregated configuration, but slightly dissolved within the urban structure; 4.3) isolated within the urban interior (*aislado en el interior urbano)*- it occupies a space totally inserted into the urban fabric, but with a configuration totally different from its immediate environs, and 4.4) diffuse within the urban interior (*difuso en el interior urbano*)- it occupies a series of isolated buildings scattered across the city, without any visible connections between them.

According to Campos Calvo-Sotelo's models (2011 and 2013), the initial proposition for the implementation of the UFPR Campus in the 1943 Plan would fall into the urban model - 4.1) peripheral *(periférico)*. The major characteristic considered for this classification was its isolation into a peripheral region within the limits of Curitiba's urbanized area.

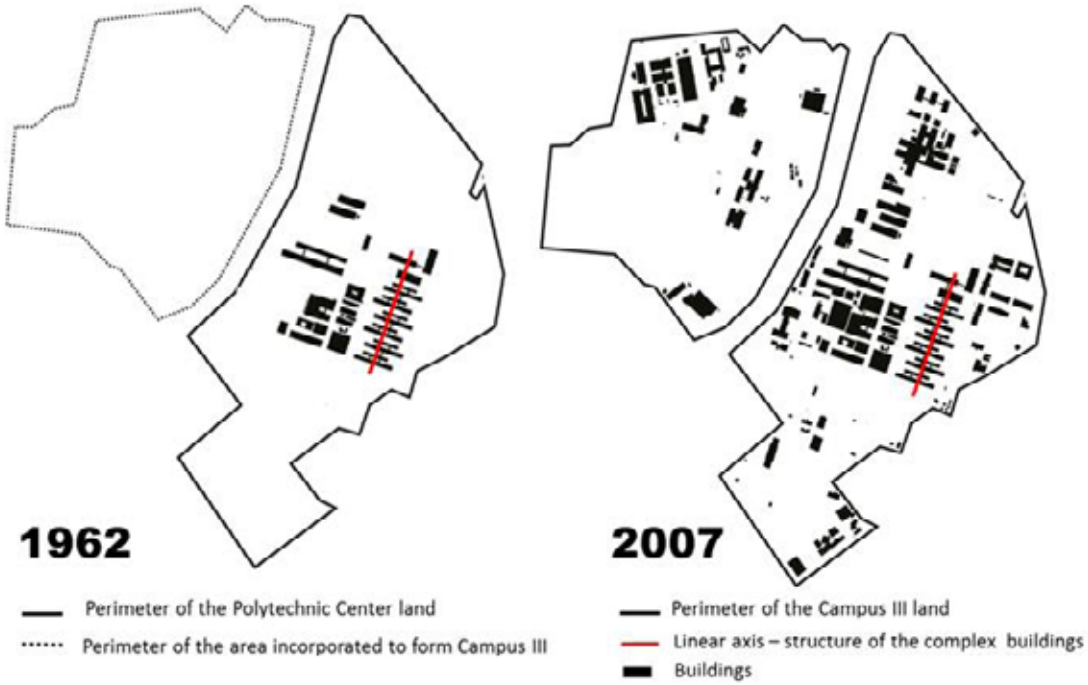
On the other hand, following the same author, Campus III would currently fall into the urban model - 4.3) isolated within the urban interior (*aislado en el interior urbano)*. The major characteristics that lead to this classification are: inserted into a consolidated urban area, with land use and occupation parameters that allow for densification; the physical boundaries are clearly defined and strongly marked; the structure for implementation is different from the immediate environs in two ways: the relation between the occupied and empty spaces, and the diversification in the composition of the complex.

The author also presents typological classifications for the physical organization of the university in terms of planning: symmetric *(simétrica*), balanced (*equilibrada*), and unbalanced *(desequilibrada*); and of the configuration of the buildings:

mesh *(malha),* linear *(linear),* central *(central),* radial (*radial*), organic (*orgânica*) and irregular geometries (*geometrías irregulares*).

Based on these classifications the original core of Campus III, in 1962, would fall into the following categories: symmetric (planning results from an axial symmetry around a central axis); and linear (the buildings are configured along a linear axis). On the other hand, Campus III may also fall into the following categories: balanced (where there is overall harmony between the buildings and the empty spaces); and irregular geometries (the buildings are configured in an irregular form), see Figure 5. Currently, Campus III reflects a multiple- implementation structure, with new buildings being implemented towards the southeast.

Figure 5. Organization of the buildings in Campus III - 1962 and 2007.



4. CONCLUSION

Accomplishing the main objective of interpreting the relationship between the location of Campus III and the spatial configuration of the city of Curitiba proposed by the 1943, 1965, and 2004 Master Plans, this paper identified the following aspects:

There are opposing concepts in the Plans: the 1943 Plan closes the city in itself, within a given area, as opposed to the 1965 and 2004 Plans that create a linear city, with an open expansion area, represented by the structural axes;

The implementation and consolidation of the *Linha Verde* Project tends to make the region a new vertical axis, running parallel to the existing northeast/southwest axis. The *Linha Verde* inserts Campus III into a high-density urban context, with diverse uses and intense flow of vehicles and pedestrians;

The barriers imposed to Campus III by federal highways directly reflect on its inner organization.

Along these 43 years, Campus III has kept its mono-functional structure and, despite being an urban entity, its configuration does not make it easy the interactions with its environs.

We understand that the physical proximity and the interaction with the urban life must be part of the routine of the university environment, contrarily to the very common attitude of denying the city. This article may be the starting point for further broader studies about the spatial relationships between the universities and the city of Curitiba.

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REGENERATIVE DEVELOPMENT: KNOWLEDGE-BASED URBAN DEVELOPMENT IN CONTEXTS OF URBAN REGENERATION

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ABSTRACT

Purpose: Although *Knowledge-based Urban Development* has progressed substantially lately, scholars have suggested the need for holistic and unified approaches to its practical formulation. This paper discusses it within the practical spectrum of *Urban Regeneration*, focusing on a 'strong urban sustainability' perspective.
Scope: The paper makes the case for a readdressed and innovative Knowledge-based Urban Development vision, which addresses Urban Regeneration contexts, while encouraging a more comprehensive and holistic foresight for a 'strong urban sustainability'.
Method: This is accomplished through (1) the overview of the principles of *Knowledge-based Urban Development* and *Urban Regeneration*, which are (2) readdressed according to a '*strong sustainability*' perspective and (3) systematised, rendering a redesigned *Knowledge-based Urban Development strategy* that supports a '*strong urban sustainability*'.
Results: This has resulted in the definition of the characteristics of a '*Regeneration-oriented KBUD strategy*', which goes one step further in suggesting a 'fresh approach' to the pursuit of 'strong sustainability', in contexts of *Urban Regeneration*.
Recommendations: This research proposes a new model for the pursuit of Sustainability 'Quintuple upper Line Model', which renders the 'Triple Bottom Line' model obsolete and supports Knowledge-based Development*, in* Urban Regeneration *contexts.*
Conclusions: This research concludes that *a planning foresight for* Knowledge-based Development*, in* Urban Regeneration *contexts, which pursues a* '*strong urban sustainability*'*, favors the practical application of* Knowledge-based Urban Development *and can be an important contribution to Sustainability, through an innovative planning perspective.*

KEYWORDS

Knowledge-based Urban Development (KBUD); Urban Regeneration (UR); Sustainable Urban Development (SUD); Strong Urban Sustainability (SUS).

1. INTRODUCTION

The lost of significance of traditional industrial sectors, the faded belief in growth-based development and the arising critics to modern urban planning, triggered forces of de-industrialization, globalization, regeneration and technological evolution that reshaped the image of urban cores from the 1970s onwards (see Pinho, 2009; Tallon, 2009; Wang, 2009). Moreover, the rise of the '*Knowledge Era*' (Carrillo, 2004, p. 32; Yigitcanlar, 2011, p. 391) saw: (1) the materialization of new 'Knowledge-based Economies' (KBEs), which placed '*knowledge*' at the centre of planning (see David & Foray, 2003; Powell & Snellman, 2004); (2) the embodiment of the 'Sustainable Development' (SD), which reinforced the sustained rethinking of cities (see Girardet, 1999; Waas, Hugé, Verbruggen, & Wright, 2011); and (3) the "*widespread comprehensive re-imagination of city centres*", through 'Urban Regeneration' (UR), which involved their socioeconomic and environmental enhancement (see Pinho, 2009; Tallon, 2009). From this perspective, 'Knowledge-based Urban Development' (KBUD), as '*a development paradigm designed to manage knowledge to generate economic prosperity, environmental sustainability, social equity and good governance*' (based on Yigitcanlar, 2011), has been suggested to enhance the economic competitiveness, social welfare and sustainable socio-spatial order of cities within KBEs (Yigitcanlar, Velibeyoglu, & Martinez-Fernandez, 2008, pp. 9–10).

Assertions that '*knowledge-intensive industries*' have become the core of development (Powell & Snellman, 2004, p. 199), testify for the continuous processes of spatial restructuring (Yigitcanlar, Velibeyoglu, & Martinez-Fernandez, 2008, p. 8), which have brought UR to the foreground of contemporary planning, as a '*comprehensive and integrated vision and action for the long-enhancement of the target areas*' (Roberts & Sykes, 2000, pp. 17–20). However, although the field of KBUD has progressed substantially, scholars have suggested the need for research on holistic approaches to the practical formulation of KBUD (Ergazakis & Metaxiotis, 2011, pp. 379–372). Furthermore, despite a growing literature this paradigm has not approached the 'theoretical framework of UR' (see Ergazakis & Metaxiotis, 2011; Yigitcanlar, Velibeyoglu, & Baum, 2008). Notwithstanding the 'sustainability outlines' of both KBUD and UR, implementation strategies have not yet focused on '*strong sustainability*' (Ergazakis & Metaxiotis, 2011, pp. 379–372; Tallon, 2009, pp. 154–171), i.e., on a '*systems-based approach that emphasises the embeddedness of the human sphere in a natural system, assuming the overall preservation of natural capital, over time, while supporting increases in human capital*' (Davies, 2013, p. 114; SANZ, 2009, p. 8). In this context, the

central goal of this paper is to discuss KBUD within the spectrum of UR, focusing on a '*strong sustainability*' perspective.

This paper makes the case for a readdressed KBUD strategy, which addresses UR contexts, while tackling the need for a holistic development vision that favours a 'strong sustainability'. This is accomplished through (1) the overview of KBUD and UR principles, which are (2) readdressed according to a '*strong sustainability*' perspective and (3) systematised, rendering a redesigned '*Regeneration-oriented KBUD strategy*' (ROKBUDS). The first section of this paper is composed by the overview of the thematic foci and development principles of KBUD and UR. The second section withstands the discussion of the 'strong sustainability' concept, including its transposition to the theoretical frameworks of KBUD and UR. The third section comprehends the systematisation and rendering of the redesigned ROKBUDS, which supports a '*strong urban sustainability*' within UR contexts. This paper highlights the importance of such framework and its contribution to tackle the promotion of SD as a dynamic process for achieving a 'strong urban sustainability'.

2. OVERVIEW OF THE THEMATIC FOCI AND DEVELOPMENT PRINCIPLES OF KBUD AND UR

The turn towards 'Knowledge Societies' (KSs), '-Economies' (KBEs) and '-Cities' (KCs), has emphasised a development 'model' in which (Karvalics, 2008, p. 34; Slaus, 2007, p. 988): (1) socioeconomic organisation is established around '*knowledge*', '*innovation*' and '*change*'; (2) '*knowledge*' and '*individuals*' are main assets; (3) new knowledge-based activities, operations and products come to light; (4) urban intervention focuses on competitiveness, tailored place-making and regeneration; (5) and '*knowledge*' is used for human development, allowing (6) Humanity to achieve higher living standards. This 'model' has highlighted the need for new spatial and socioeconomic arrangements, which have occupied the minds of urban scholars, decision-makers and practitioners over the last decades (Yigitcanlar, 2010, p. 1).

KBUD and UR have become the faces of the same 'development coin', which has been formulated to cope with the immense socioeconomic, environmental, political and physical urban challenges of KSs, KBEs and KCs. While KBUD has favoured '*economic prosperity and security, environmental sustainability, social equity and good governance patterns*' (Yigitcanlar, 2011, pp. 392–393), through the "*transformation of knowledge resources into local development*" (Knight, 1995, pp.225-226), UR has favoured the '*enhancement of the physical environment, quality of life, social welfare and economic prospects, and the promotion of good governance*' (Tallon, 2009, p. 8), through the '*long-lasting improvement and comprehensive enhancement of urban environments*' (Roberts & Sykes, 2000, pp. 17–20).

2.1. Thematic foci and development principles of KBUD

Urban planning has consolidated its interest in KBUD, which has been extensively seen as a potentially beneficial set of instruments that may improve the welfare and competitiveness of cities (Yigitcanlar, Velibeyoglu, & Martinez-Fernandez, 2008, pp. 8–10). From this perspective, KBUD can be defined as '*a strategic development and management paradigm that aims to nourish the transformation and renewal of cities into 'KCS' and their economies into 'KBEs', which promotes economic prosperity and security, environmental sustainability, social equity and good governance patterns, through encouraging the transformation of knowledge resources into local development*' (based on Knight, 1995, pp. 225–226; Yigitcanlar, 2009a, p. 228, 2010, pp. 3–6, 2011, pp. 392–393). The goal of KBUD is a 'KC' purposefully designed to encourage the production and circulation of abstract work. Hence, it can be regarded as a vision/strategy to nourish the transformation and renewal of cities into 'KCs' and their economies into 'KBEs' (Yigitcanlar, Velibeyoglu, & Martinez-Fernandez, 2008, p. 10).

According to Yigitcanlar & Velibeyoglu (2008, pp. 297–298), KBUD can be established within the (A) 'triple-bottom line' of Sustainability: (a1) *Environment* – encouraging sustainability; (a2) *Society* – promoting quality of life; and (a3) *Economy* – reinforcing competitiveness (the three pillars of KBUD). Yigitcanlar (2009a, pp. 239–240) has additionally established (B) a set of KBUD best practices, forged from the analysis of successful creative urban regions and KCs. Yigitcanlar (2010, pp. 3–6) has also defined (C) a '*conceptual KBUD framework*' which establishes KBUD's theoretical basis, foundations; and characteristics. *He* (2011, pp. 392–393) has readdressed this perspective by stressing t*hat (D)* KBUD can be seen as a paradigm with four major development domains – (d1) *Economic*, (d2) *Socio-cultural*, (d3) *Enviro-urban* and (d4) *Institutional development* - which form the pillars of KBUD - '*Economy*', '*Society*' and '*Environment*', to which he adds 'Management' (the forth pillar of KBUD).

Sarimin, Yigitcanlar, & Parker (2010, pp. 5–12) have (E) scrutinized and compared existing KBUD models with the aim of identifying key and common features for developing a new comprehensive and integrated '*KBUD model*' (2010, pp. 9–12). The authors compared a handful of models developed for KBUD, which offer conceptual differences for the establishment of a KBUD framework. They found, however, common characteristics and key features that drew a pattern of recurrence among them, which was identified and grouped accordingly in a new '*KBUD model*' (2010, pp. 9–12). This research has further summarized the previous approaches (A, B, C, D, E) in a redirected common theoretical basis of KBUD, presented in **Table 5.**

Table 5. Summary of the theoretical basis and common principles of KBUD.

	Category / goal	Development Bases	Foundations	Focus	Themes
Economy	**Economic development**	**'New Growth'** Theory	economic fundamentals	Knowledge Economy	Knowledge-based infrastructure
	economic prosperity'	role of knowledge and technology in driving productivity and growth		Economic Foundations	Competitiveness
			innovation/ creativity		Creativeness and innovativeness
Society	**Socio-cultural development**	**'Human, Social Capital'** and **'Creative Class'** Theories	education and training	Social and Human Capitals	Intellectual capital Level
	a just socio-spatial order'	people are the motor force of economic and social growth and urban development	technology diffusion		Human and social development
			democracy and participation	Culture and Diversity	Quality of life
Environment	**Enviro-urban development**	**Relational Sustainable Urban Development'** Theory	triple bottom line of sustainability	Sustainable Urban Development	Sustainability
	environmental sustainability'	complexity, multi layered functions and socioeconomic flows	mixed land use development	Quality of Life	Quality of place
			concentration and clustering		Unique identity Urban
Management	**Institutional development**	**Actors Network'** Theory	organization to orchestrate development	Governance and Planning	Strategic and integrated governance
	good governance'	institutional relations and non-human actors that mediate the process of urban development'	facilitate knowledge-intensive activities	Leadership and Participation	Democracy and transparency
			strategic planning and partnership building		Social equity

Thematic foci and development principles of UR

In recent years, urban landscapes have been subjected to a "*widespread and comprehensive re-imagination of city centres*" (Tallon, 2009, pp. 20–21), which has involved the combination of physical, cultural and socioeconomic enhancement, and environmental restoration and fortification. In this context, UR, as a '*comprehensive and integrated vision and action for the long-lasting resolution of urban problems and improvement of the socioeconomic, physical, and environmental conditions of the target areas*' (Roberts & Sykes, 2000, p. 17), has been promoted as a strategy that reinforces positive socioeconomic and environmental outcomes and the resolution of arising problems in KSs and KBEs. Roberts and Sykes (2000, pp. 17–23) have further defined UR as an interventionist activity that straddles public, private, voluntary and community sectors, which is likely to experience considerable changes in its frameworks in response to socioeconomic, environmental and political changes. They have additionally proposed (F) a set of principles, which constitute the hallmark of UR: (f1) analysis of local conditions; (f2) comprehensiveness of the approach; (f3) endorsing adaptation and integration; (f4) promoting SUD; (f5) efficient use of local resources; (f6) enhancing participation and cooperation; (f7) endorsing sustained management, self-organisation, and monitoring.

Jones & Evans (2008, p. 4) add that another key element of UR comprises (G) '*changing a city's image*'. UR thus constitutes a physical and a symbolic transformation, as part and parcel of rebuilding a city lies on its reinvention for a new generation. They (2008, p. 14) further add that the focus of UR is not on new urban environments, but rather on reforms to existing ones, while improving the conditions for KSs and KBEs. Tallon (2009, p. 8) has summarised (H) the concerns of UR as: (h1) '*physical environment*' - improve the built environment, through SUD patterns; (h2) '*quality of life*' - improve physical living conditions, cultural activities or facilities; (h3) '*social welfare*' - provision of basic social services and opportunities; (h4) '*economic prospects*' – enhancement of employment and investment prospects; and (h5) '*governance*' – partnerships, community engagement and multiple stakeholdership. Moreover, Ginot (2010, pp. 11–19) has elaborated a (I) a set of key regeneration strategies that promote and encourage a successful and sustainable UR. Additionally Lang (2005, pp. 11–16) has concentrated on the integration of social and economic strategies of urban regeneration in (J) a common '*socioeconomic regeneration framework*'. These perspectives (F, G, H, I, J) and their general objectives have been recombined by the authors of this paper in order generate **Table 6**, which summarizes the theoretical basis and common principles of UR.

Table 6. Summary of the theoretical basis and common principles of UR.

	Category / goal	Development Bases	Foundations	Focus	Themes
Environment	**Physical Environment**	Designing and organizing cities in accordance with the local and the global environment	triple bottom line of sustainability	Sustainable Urban Development	Local Integration
	SUD concerns				Local Resources
			compactness and clustering		Environmental Impacts
	Quality of Life		mixed development and local enhancement	Quality of Life	Place-making and Identity
	improve physical living conditions		sustainable mobility		Mobility
			safe and secure environments		Safety and Security
Society	**Social Welfare**	Designing and organizing cities for people	Education, culture, diversity and inclusion	Social and Human Capitals	Community Development
	provision of social services and opportunities		basic services and opportunities	Services and Housing	Community Provision
Economy	**Economic Prospects**	Promoting local economic development and enhancing external competitiveness	improving economic fundamentals	Economic Foundations	Local Economic Dynamism
	enhancement of employment and investment prospects		favoring technology diffusion	Knowledge Economy	Economic Development
			promoting innovation/ and creativity		
Management	**Governance**	Improving the governance and management	organizing development	Governance and Planning	Governance and Management
	good governance and management		enhancing democracy and participation	Involvement and Participation	Engagement

3. KBUD AND UR FROM A STRONG SUSTAINABILITY VIEWPOINT

In the 'Knowledge Era', urban planning has aimed to achieve a SUD by creating a strong urban core, harnessing its economic strength and fomenting social capital (Yigitcanlar, 2009b, pp. 231–239), while emphasizing the '*culture of knowledge*' (Yigitcanlar, Carrillo, Metaxiotis, & Ergazakis, 2010, pp. 153–157). However, traditional development and planning approaches have not provided a clear '*knowledge-based*' (Yigitcanlar *et al.*, 2010, p. 155), '*regenerative*' (Roberts & Sykes, 2000, pp. 9–35) and above all '*effectively sustainable*' development strategies for urban communities (Girardet, 1999, pp. 9–20). In this context, readdressing urban environments in order to promote '*strong, sustainable, friendly and vibrant*' communities entails reassessing traditional planning mechanisms that have refuged in the 'Triple Bottom Line model' (TBLM) of Sustainability, thus promoting an overall '*strong sustainability*'.

KBUD as "*the transformation of knowledge resources into local development*" has been considered to provide a basis for SD" (Knight, 1995, pp.225-226). UR, as an urban intervention strategy for existing urban environments, has also "been identified as a fundamental tool to promote SD" (Nunes, Tomé, & Pinheiro, 2013, p. 725). Yet both strategies have asserted a '*weak sustainability*', through the 'TBLM'. According to SANZ (2009, pp. 8–9), this model asserts a balance between economic, social and environmental outcomes, in which their inter-section represents the '*possibility of sustainability*'. SANZ adds that the limits imposed by the '*Environment*', on '*Society*' and the '*Economy*', are ignored, making the model wrong in scientific terms and misleading as a framework for human policy. The '*strong sustainability*' lens, on the other hand, reassesses this traditional 'TBLM', trough a more holistic vision for SD.

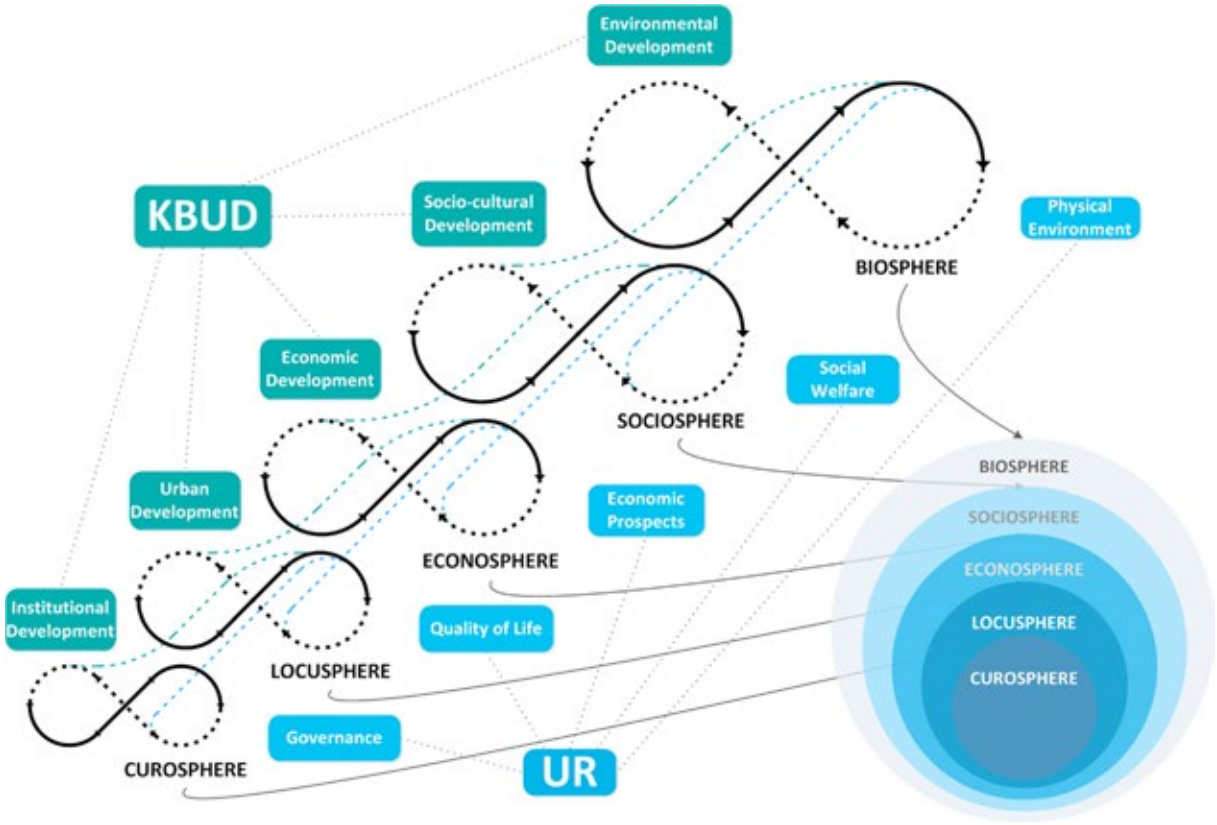
Contrary to interlinkages of the TBLM, the '*strong sustainability*' perspective entails' the '*nested circles model*' where the '*Economy*' (3) is nested within '*Society*' (2), which is nested within the '*Environment*' (1), proposed by Giddings *et al.* (2002, pp. 192–193). SANZ (2009, pp. 8–9) further emphasised that the '*Econosphere*' (3) is embedded in the '*Sociosphere*' (2), which is embedded in the '*Biosphere*' (1). This perspective entails that all life is contained within the '*Biosphere*': (1) the Earth is a self-contained system, thus, (2) all human life and actions are contained within the '*Biosphere*' and are part of it; the '*Economy*', as a subset of human actions, is then part of the '*Sociosphere*'. In this setting, Sustainability becomes the '*advanced-state in which a balanced set of local social, economic, and ecological patterns is achieved and maintained within the same structure, function and feedbacks, in a dynamic temporal and spatial frame*' (based on Neuman, 2011, pp. 101–102).

'Strong sustainability' is the prerequisite and foundation of any human development (SANZ, 2009, pp. 8–9), whether social, economic or technological, as it implies the preservation of the integrity of all 'Social-ecological Systems' (SESs) in the '*Biosphere*'. Thus, 'ecological integrity' comprehends 'the ability of an ecosystem to recover from disturbance and re-establish its stability, diversity and resilience'(SANZ, 2009, pp. 8–9; Walker & Salt, 2006, p. 89). Promoting '*resilience*' can allow the embracement of *"the idea of adaptation, learning and self-organization in addition to the general ability to persist disturbance*" (Folke, 2006, p. 259) in SESs. This approaches the management of SESs through recurring '*adaptive cycles*', consisting of four phases (Pisano, 2012, pp. 12–21): (a1) rapid growth - *r phase*; (a2) conservation - *K phase*; (a3) release - Ω *phase*, and (a4) reorganization - α *phase*. SES behaviour changes, from one phase to the next, as it's '*internal connections*', '*flexibility*', and '*resilience*' change (Walker & Salt, 2006, pp. 74–78). Every SES is also composed of a (b) hierarchy of linked '*adaptive cycles*', operating at different spatial and temporal scales - the '*panarchy*' (Pisano, 2012, pp. 12–21).

Based on approaches to KBUD (A, B, C, D, E) and UR (F, G, H, I, J), the authors of this paper suggest adding two '*nested circles*' to the existing '*strong sustainability*' vision, the first being the '*Locusphere*' (4), i.e., the '*Habitat*' or the place humans inhabit, which in this case is the '*urban environment*' that is nested in the '*Econosphere*' (3). The '*Locusphere*' can also be understood as a SES that is nested in higher-hierarchy SESs and nests lower-hierarchy SESs. The second proposed nested circle is the '*Curosphere*' (5), i.e., the '*Government*' or the agents that manage the place humans inhabit, which is a management sphere nested in the '*Locusphere*' (4). This model suggests the five main categories that serve as the basis for the proposed ROKBUDS: the '*Curosphere*' (5), which is nested in the '*Locusphere*' (4), which is nested in the '*Econosphere*' (3), which is nested in the '*Sociosphere*' (2), which is nested in the '*Biosphere*' (1).

From this standpoint, the authors suggest readdressing both KBUD and UR, according to this proposed '*nested circles model*', which could be referred to as the 'Quintuple upper Line Model' (QULM) because it relates to five distinct nested circles (1, 2, 3, 4 and 5) and promotes higher-hierarchy sustainability goals that focus on '*strong sustainability*'. Moreover, this involves understanding urban environments as continuously evolving SESs, whose life-cycle could be captured through consecutive '*adaptive cycles*'. These cycles are part of a broader-hierarchy of linked '*adaptive cycles*', operating at different spatial and temporal scales - the '*panarchy*'. The application of this development vision to KBUD and UR is summarised and presented in **Figure 5**, rendering the theoretical basis for the proposed ROKBUDS, which is further developed in the following section.

Figure 5. Theoretical basis of ROKBUDS: joining the theoretical bases of KBUD and UR.



4. ROKBUDS - A STRATEGY THAT SUPPORTS A 'STRONG URBAN SUSTAINABILITY' WITHIN KBUD AND UR CONTEXTS

Considering that SD represents a shift in the relationship between '*Society*' and the '*Environment*' (Hopwood, Mellor, & O'Brien, 2005, p. 40), the need for a more holistic, biophilic, regenerative and knowledge-based development perspective

becomes pressing, especially when Sustainability becomes a collective goal. Thus, '*strong sustainability*' becomes the ultimate goal of SD and, consequently SUD (SANZ, 2009, pp. 8–12). From this perspective, the previously proposed theoretical basis (**Figure 5**) acknowledges the development conceptions behind a '*strong urban sustainability*' by readdressing and expanding the 'nested circles' model (Giddings *et al.*, 2002, pp. 192–193) in a deeper vision for promoting SUD, through UR processes: the '*Curosphere*' (5) is nested in the '*Locusphere*' (4), which is nested in the '*Econosphere*' (3), which is nested in the '*Sociosphere*' (2), which is nested in the '*Biosphere*' (1), respecting the earlier suggested definitions of 'Sustainability' and '*strong urban sustainability*'.

Consequently, the five suggested '*nested circles*' correspond to the categories that compose the proposed ROKBUDS. In this context, several approaches (Applegath *et al.*, 2013, p. n.a.; Pisano, 2012; Walker *et al.*, 2002) have further evidenced the importance of promoting the following principles: (a) diversity; (b) modularity; (c) independence of SESs components; (d) redundancy; (e) feedback sensitivity; (f) capacity for adaptation; (g) social and human capital; (h) innovation; (i) environmental responsiveness and integration; (j) ecological variability; and (k) maintenance of SESs services. Moreover, an approach to the construction of a comprehensive '*KBUD framework*' (Sarimin *et al.*, 2010) has suggested a unified set of principles for the promotion of '*knowledge-based development*'.

Another approach (Ginot, 2010) has elaborated a set of key UR strategies. Yet another approach (Nunes *et al.*, 2013) suggested a framework for UR that focuses on achieving higher levels of sustainability. All these perspectives and their general principles have been recombined by the authors of this paper in order generate the subsequent final elaboration of the ROKBUDS ('*themes*' and '*sub-themes*') which, in conjunction with the formerly proposed '*categories*' and suggested '*good design practices*' (A, B, C, D, E, F, G, H, I, J), form the backbone of the suggested framework (see **Table 7** and **Table 8**).

Table 7. Categories, themes and sub-themes of the proposed ROKBUDS (A).

Category	Themes	Sub-Themes	**Good Practices**
Environmental Enhancement	Local Integration	Land Use	Promote sustainable land use, while reinforcing sustainable and compact development.
		Natural Ecosystems	Support ecological preservation, valorisation and biophilia.
	Resources	Energy	Sponsor renewable energy sources and energy effectiveness.
		Water	Encourage water effectiveness and sustainable water management.
		Local Sources	Boost and encourage the usage of local resources.
	Environmental Impacts	Waste	Endorse 4 Rs waste planning (reduce, re-use, recycle and recover).
		Pollution	Stimulate air, light, thermal and noise pollution mitigation.
Social Welfare	Community Enhancement	Social Capital	Promote well-developed social networks and local sense of belonging, reinforcing and boosting local identity.
		Human Capital	Develop the local stock of human competencies, literacy, knowledge, and skills of local stakeholders.
	Community Provision	Local Provision	Improve the provision of basic social services, housing, community facilities and utilities.
Economic Prosperity	Economic Dynamism	Diversity	Enhance local economic diversity and labour opportunities.
		Integration	Stimulate cooperation and integration between local economic entities and local stakeholders.
	Economic Development	Development	Endorse entrepreneurial activity and create new economic centralities, R&D centres and knowledge industries and businesses.
		Innovation	Encourage local innovation, innovation networks and systems.

Table 8. Categories, themes and sub-themes of the proposed ROKBUDS (B)

Category	Themes	Sub-Themes	Good Practices
Habitat Quality	Designed Communities	Place-making	Create strong, vibrant places, enhancing local heritage and landscape, as well as enhancing local identity.
		Changeability	Promote adaptability, modularity and upgradeability of urban modules, throughout all urban scales.
	Friendly Communities	Mobility	Sponsor pedestrian-friendly environments and sustainable mobility.
		Safety and Security	Guarantee local conditions of safety and security for all stakeholders, at all urban scales.
Urban Governance	Governance and Engagement	Local Governance	Promote sustained governance and sustainability awareness.
		Local Engagement	Require the active participation of community members and stakeholders, at all scales.
	Management	Local Management	Stimulate the sustainable management of local urban constituents.

5. CONCLUSION

As a consequent shift in understanding the relationship between the '*Biosphere*' and the '*Sociosphere*' (Hopwood *et al.*, 2005, p. 40), SD should be pursued through a '*strong sustainability*' perspective (Giddings *et al.*, 2002; Nunes *et al.*, 2013; SANZ, 2009). Thus, managing urban environments that reinforce a '*strong sustainability*', while continuously supporting the sustained development of KSs and KBEs for generations to come, becomes the fundamental goal of Sustainability. From this perspective, KBUD and UR have become important strategies for the development of 'urban sustainability'. However, notwithstanding the 'sustainability outlines' of both KBUD and UR, their implementation strategies have not yet focused on a '*strong sustainability*'. Moreover, despite a growing literature on KBUD, this paradigm has not approached the 'theoretical framework of UR'.

Although it should be understood as a modest milestone in trying to suppress such void, this research has suggested the expansion of the 'nested circles' model (Giddings *et al.*, 2002) in a deeper vision for promoting SUD, the QULM, through KBUD strategies in UR processes that target existing urban environments. This has resulted in the definition of the characteristics of a ROKBUDS, which acknowledges the value and contribution of existing approaches in the promotion of Sustainability, but goes one step further is suggesting a 'fresh approach' to the pursuit of 'strong sustainability'. This research concludes that *a planning foresight for Knowledge-based Development, in Urban Regeneration contexts, which pursues a* 'strong urban sustainability'*, can favor the practical application of Knowledge-based Urban Development and become an important contribution to the pursuit of Sustainability, adding an innovative perspective to the support of local urban planning.*

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KNOWLEDGE UTILIZATION AND THE NEW TRANSPORT PARADIGM

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ABSTRACT

Purpose: Transport is the lifeblood of well functioning societies. It is also one of the major problems of our time. Instead of making great advancements in the area during the recent decades, focus has been on expanding and fixing the existing transport system. There is a need for a substantial shift in how we perceive and plan transport systems. Knowledge plays a vital role in the journey towards a new transport paradigm. The purpose of our study is to understand how knowledge could be utilized more efficiently in order to shift towards the new transport paradigm.
Method: In our study we approach this issue by studying the state of current transport system. After that we give recommendations on what should be done in order to move towards the new transport paradigm and clarify the role of knowledge utilization. The suggested approach creates significant novelty value for policy-makers of Finnish transport system as well as for researchers in the knowledge management field.
Results: We show that there is a need for more comprehensive and intelligent information about the transport system and the underlying interrelationships. We also need prerequisites to use that information to its full potential and to turn it into knowledge. We also emphasise the importance of knowledge utilization between the multiple actors playing in the field of transport.

KEYWORDS

Knowledge; knowledge utilization; transport paradigm; transport system

1. INTRODUCTION

Transport is an essential part of society and its operations. Transport can even be seen as one of the fundamental prerequisites of a vital society and of growth. At the same time, transport generates some of the biggest challenges in the world. The current transport system is not effective, safe, sustainable or fluent enough (e.g. ADB, 2012; CEC, 2009; Givoni & Bannister, 2010). These problems tend to accumulate in expanding urban areas. The period of motorization around the 1950's changed the whole characteristics of the transport system. However, there have not been any remarkable improvements or progress in the field of transport since. Technological and service developments and changes in preferences are challenging the predominant paradigm. Incremental extensions or developments will not suffice in answering the challenges that must be met in the future.

Besides transport system is ineffective and not fluent, it is also fragmented. Different forms of traffic do not work as a whole. There are significant inequalities between different forms of traffic. The current situation necessitates for a paradigm shift into new kinds of transportation services and transport planning. The 21st century transport revolution will change the way we move, and our perceptions on moving.

Technology development (i.e. mobility) and changes in our behaviour are the key factors that enable the change (Cao & Mokhtarian, 2005; Bamberg, 2011). Above mentioned trends increase amount of data exponentially that enables dynamical development of transport system. It could be stated that knowledge plays an essential part in the journey towards a new transport paradigm. Literature (IBM, 2007; Givoni & Bannister, 2010) shows that there is a need for a) more comprehensive and intelligent information about the transport system and the underlying interrelationships, b) prerequisites to use that information to its full potential and to turn it into knowledge and c) better processes and practices to discuss, share and refine that knowledge between the multiple actors playing in the field of transport. However, there is a lack of understanding of knowledge utilization in a whole transport concept. The purpose of our study is to understand how knowledge could be utilized more efficiently in order to move towards the new transport paradigm.

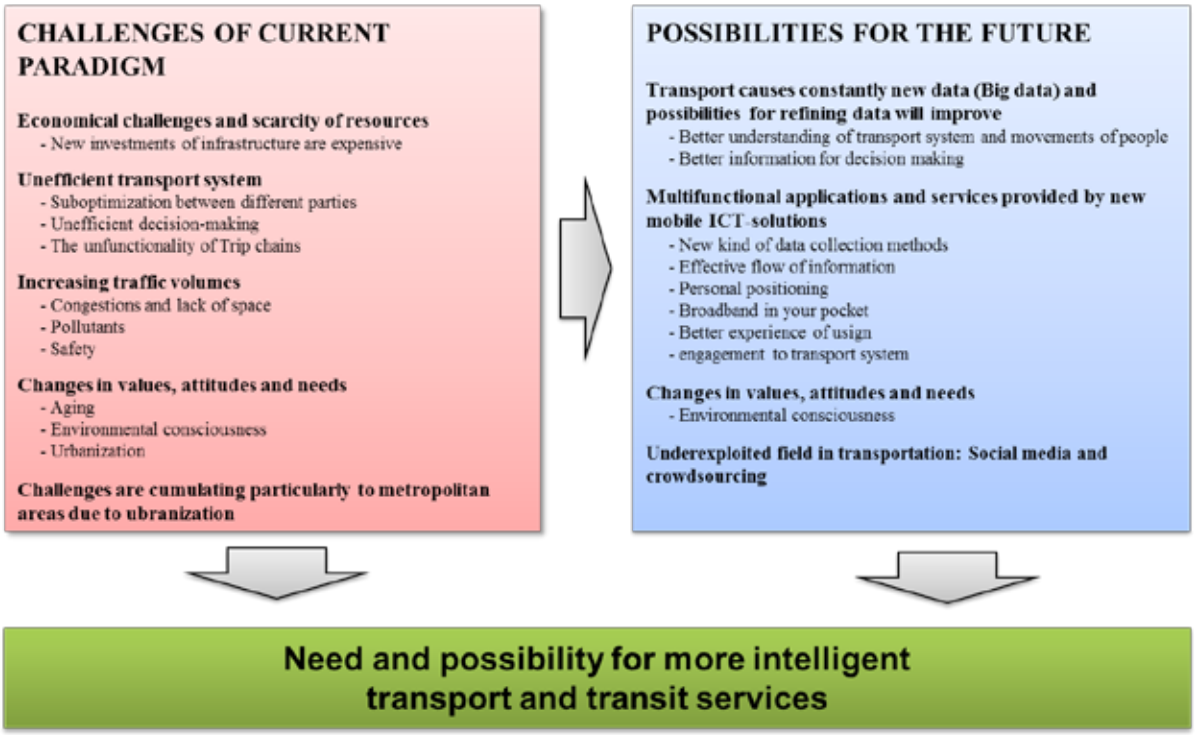
In our study we approach this issue by studying the state of current transport system, merely form Finnish point of view. This necessitates broad understanding of current transport paradigm as well as vision of the new paradigm. In our paper we highlight the challenges, especially from knowledge point of view, and give recommendations what should be done in order to move towards the new transport paradigm. Chapter two is about the current state of transport system while in chapter three we introduce the new transport paradigm and knowledge in it. Finally, we conclude our main ideas and give recommendations for readers.

2. THE CURRENT STATE OF TRANSPORT SYSTEM

We are switching from industrial production-centered time to a sustainable service based society. It means, for example, the emphasis on the significance of the immaterial and intellectual growth and individual solutions. This means also a service intensive industry and the active participation of the people, communities and companies in value creation. In sustainable society the infrastructure, transport and logistics are approached as services and a source of the welfare, not as a single investment. (Tuominen & Kanner, 2011).

Current transport system is facing lot of challenges. Economy is down trending and resources are scarce but we need a lot of investments in infrastructure due to increasing traffic volumes. Values and needs of residents are also becoming more demanding. On the other hand we have a lot of possibilities to improve the functionality of the transport system through new multifunctional applications and services. Figure 1 shows how the need and possibility for intelligent transport services is forming.

Figure 1. Towards new transport paradigm



The study and development of the intelligent transport have concentrated on a quite narrow area. Journal of Intelligent Transportation Systems has published 46 articles during 2.5 years and 78% of the study articles are related to the vehicles and improvement of the fluency of the vehicle traffic from the point of view of the passenger cars. This can be seen as a fairly conservative attitude for the intelligent transport when the big unused potential and need for the development work are in the field of information, customership and demand management (IBM, 2007). A comprehensive point of view which concentrates above all on the user, human being of the traffic system is needed.

Since the 1990's a sustainability has been raised more and more often as the objective of traffic planning. At the same time it has been noticed that this does not succeed without comprehensive and integrated planning (CEC, 2009; IPA, 2012; CIDD, 2010). The importance of cooperation and co-ordination has been already long emphasised in transport policy but the present state of the traffic system proves that the task is not easy. This is also a new theme from the point of view of the research. (Geerlings & Stead, 2003). There are numerous (Eggenberger & Partidário, 2000) tools for combining the separate substances, methods, ways of action, institutions and politics but so far a comprehensive and combined ecosystem of transport has not been achieved (Grayling, 2004; Preston, 2010; Walton & Shaw, 2010).

Many ongoing changes justify the need for a new paradigm in traffic planning. The aging of the population, the decreasing number of driving licence amongst young people and the favoring of multimodal transport are signs of the fact that there is need for a change in traffic system planning in the future. (Nelson, 2006; Polzin, 2006; Sivak & Shoettle, 2011; UN, 2012) Other significant trends and some of changes that have been perceived are higher prices of fuel, accelerating urbanisation, an increasing health and environmental consciousness and consumers' likings and attitudes towards change.

3. THE NEW TRANSPORT PARADIGM AND KNOWLEDGE IN IT

Enormous resources have been used to improve the functionality of current transport paradigm. However, fewer experts nowadays think that favoring cars is a suitable and efficient way of answering current problems in transportation. Instead, experts have distinguished the real need for new transport paradigm all over the world (e.g. mm. ADB, 2012; Litman, 2013; Milam & Breiland, 2011; Williamson, 2013; Struiksma & al., 2008; Deakin, 2008). In the table below we have gathered factors that slow down or even prevent answering challenges of current transport system. The table also presents thoughts and emphases considering the new transport paradigm. These factors enable the development of a transport system that answers modern needs of mobility and makes it more effective.

Table 1. The new transport paradigm

	Prevalent usage	The new paradigm
Focus	Vehicle	Human being
Object	One single crowd	Different user segments and individual service
Philosophy	Many rival transport modes	Transport system
Starting point for a development	Reachable needs and solutions. Reactivity. Problems can be tight and outline to one single framework. Problems and solutions can be chop into a small pieces and thereafter integrate	Wide-ranging vision and strategy for the city. Proactivity. Multivariable problems and Cause-and-Effect relationships recognised, problems are outlines extensively.
Principles for planning	Based on transport models' "black box" and mechanistic and predictable transport systems. Confidence in forecasts ja trust in sufficient resources. Planning is fully tasked for experts. Negotiation. Specialization.	Empirical demonstration, experimental sense, awareness of future uncertainty and limited resources. Planning is consensus on experts', users', residents' and other interest groups' opinion. Interaction. Understanding of totality and context.
Transport demand management	Increasing demand for transport →Growing capasity	Transport demand management via transport supply
Planning process		
Investment decisions	Politicking has a dominant role	Necessity and profitable of the initiatives are estimated on merit
Quality of transport services	Passenger car traffic dominance	Multimodal transport system: convenience, comfort, safety, reasonably prised, comprehensiveness.
Connectivity of transport network	Transport modelling based on major roads and public transport network	Fine-grained analysis of the connectivity between different transport modes and networks
Measurement of car traffic circumstances	Road's standard of service, average speed, cost of congestions, amount of accidents related to traffic volume	Travel time per resident, operating costs for passenger car, the amont of injured in traffic accidents

The main point of the new transport paradigm is to focus on the people (see figure 2). It means that transport system must serve effectively and safely different kinds of people, i.e. the mobility of people can not be considered as mobility of one big homogeneous behavior group. The new transport paradigm can also be understood as a shift from a complex transport system towards flexible and comprehensive services for people, which means that the interface between the transport system and people must appear as easy to use as possible.

To organize new transport paradigm kind of transport system traffic planning and management must work in collaboration and as wisely as possible. Knowledge is the key driver for the change towards the new paradigm and without explicit information from the real mobility of people, transport can not serve people as effectively as it should do. The current trend in transport planning is to increase the capacity of the transport system if the demand of the transport increases, however, road infrastructure is very expensive to build and especially in cities there is no space for new roads. Thus, in the new transport paradigm the demand of transport is managed together with the supply.

In the new transport paradigm the idea is to offer people an opportunity to travel as effectively as possible by choosing the transport mode that suits best the demands of the user. In order to organize a fluent transport system all different

transport modes must be integrated. This also means that different transport modes must be planned as a system, not as isolated networks. Different transport modes are suitable in different environments and combined the network of different transport modes enables fluent and flexible mobility for everyone. Thus the interfaces between different transport modes should always be highlighted in traffic planning.

In transportation planning information is mainly utilized in predicting future traffic demand and evaluating transportation plans. Prediction models of traffic demand are nowadays the best decision-making tools but those are either too simple or too complex. There is also the question of reliability (Bakker *et al*. 2010). What is more, traditional methods often lack openness and are opaque.

Individual socio-economic factors, such as individuals' routines and time use, are in more remarkable role in determining transportation behaviour than traditional factors such as accessibility and infrastructural issues (Mokhtarian & Salomon, 2001; Cao & Mokhtarian, 2005; Stead & Marshall, 2001). General view of transportation is formed without knowledge and understanding of, for example, walking as a real transport mode (Litman, 2011). Transportation planning demands more knowledge about the general view of transportation system and planning tools require openness and transparency (Short & Kopp, 2005).

Extensive information and knowledge and its consistent utilization to understand human behavior and transportation system's functionalities is a way towards the new transport paradigm. The new transport paradigm necessitates new kind of thinking, tools and services. For example, managing urban districts require ways to manage conceptually difficult knowledge related phenomenon, to find right and necessary information, and to assist cooperation in the transportation network (Lönnqvist & Laihonen, 2013). By knowledge utilization we could model human movement, better understand the models of travelling they use and study which models of travelling they should use.

An increase of information has started discussion of big data (Demchenko, 2013; Haas, 2011) and prerequisites to turn big data into knowledge. New kind of information and knowledge, for example geographical information, that could be acquired from multiple sources, for example from open data sources, opens new possibilities and generates new business (cf. Miller, 2012). Big data solutions have already developed to help solving traffic jams (e. g. Glatz *et al*., 2013; Haitao, 2013; IBM, 2013; Rosenbush, 2013). However, this is not enough from the whole transport systems point of view. Instead of concentrating developing solely new technical solutions we must solve how to find and share right information in order to support decision makers (Miller, 2012).

4. CONCLUSION

No matter how sophisticated ITS systems or how extensive data we have, the data is of no use unless effectively harnessed, and the ITS-systems are only gadgets unless the different parties using them do not work well together. Integration is needed in all levels. Integration between different organizations requires the insight of human behavior and a more truly customer-oriented culture. Car manufacturers have already understood that the future is all about holistic approaches and are now branding themselves as mobility solution providers. In the new paradigm, focus should be on understanding human behavior instead of developing mechanical business models where human beings are not the prior target.

Knowledge is lifeblood for future cooperation of transport system (Miller, 2012). It is typical for global ecosystems, like transportation systems, that different functions are spread out between multiple units. This causes complex and even unstable relationships between participants of ecosystems slowing down its development. Understanding of ecosystems' dynamics and its structure as well as understanding the possibility of knowledge utilization enable tight cooperation and value creation between participants.

With knowledge we could support decision-making concerning transport systems. It is obvious that we need multiform information from different sources. Besides quantitative traffic information we need information of human behavior from different situations. In this paper we have shown that versatile knowledge utilization also supports transport system's users' - individual movers' -decision-making.

There is need for a new paradigm and a new kind of thinking. For example, shifting passenger transport towards a more service intensive orientation means the redistribution of the transport market. As an average westerner spends about 500 euros per month on transport, the transport market is tenfold compared to the mobile communication market. Hence, even minor improvements in the transport efficiency mean billions of euros globally. The future relies on networked intelligent transport services where knowledge has a significant role.

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DIAGNOSING WEALTH CREATION POTENTIAL OF NATIONS IN THE KNOWLEDGE ECONOMY CONTEXT. ASSESSING INTANGIBLE ASSETS AND LIABILITIES ON THE SPANISH CASE

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Abstract

Following the principles and theory of wealth creation in the knowledge economy, the purpose of the paper is to enable an in-depth diagnosis of a nation's actual knowledge driven competitiveness foundations, with the aim to aiding in the definition of the possible vision, objectives and lines of action to embrace in order to enable innovation and sustainable economic growth. In order to perform the in depth diagnosis a thorough review of diverse studies and methodologies will be carried out. Among them we will specially consider the "Global Competitiveness Index" (WEF), the "World Competitiveness Yearbook" (IMD), and the different IC models that apply to the IC macroeconomic dimension. As a consequence of the review and thinking on the specific requirements of peripheral countries of the European Union, the suitable methodology or combination of methodologies will be chosen and later on will be used for reflecting on assessing intangible assets and liabilities on the Spanish case. The reflections arising from the paper have mainly practical implications and will guide in the decision making process not only savers and investors but also government and institutional authorities.

Keywords

Competitiveness, innovation, intellectual capital, intangibles, knowledge based- development, nation.

1. Introduction

During the last fifteen years some fundamental changes have occurred in the world and more specifically in the way the world economy creates wealth.

These changes are summarised by Laurence Prusak (Neef, Dale 1998) as follows:

a) The globalization of the economy, which is putting terrific pressure on firms for increase adaptability, innovation, and process speed.
b) The awareness of the value of specialized knowledge, as embedded in organizational processes and routines, in coping with the pressures of globalization.
c) The awareness of knowledge as the distinct factor of production and the role in the growing book value to marked value ratios within knowledge-based industries.
d) Cheap networked computing, which is at last giving us a tool for working with and learning from each other.

Since 1998, when Prusak wrote about the changes, an unstoppable progress on multimedia and information and telecommunication technologies has completed the above mentioned four changes.

Reflecting on the content of the changes we arrive to the conclusion that knowledge has become the fundamental factor of wealth creation in the present economy, because there is no sustainable advantage other than what a firm knows, how it can utilize what it knows, and how fast it can learn something new.

As a consequence of such great importance of knowledge as an economic factor a new phrase or expression has become almost commonplace. It is the phrase "knowledge economy" or the equivalent "knowledge-based economy". There are many definitions of this phrase or combined concept and two of them have been selected for the relevance in their content. They are the following:

"… one in which the generation and exploitation of knowledge has come to play the predominant part in the creation of wealth. It is not simply about pushing back the frontiers of knowledge; it is also about the most effective use and exploitation of all types of knowledge in all manner of economic activity" (DTI Competitiveness White Paper 1998)(Brinkley, 2008)

"economic success is increasingly based on upon the effective utilisation of intangible assets such as knowledge, skills and innovative potential as the key resource for competitive advantage. The term "knowledge economy" is used to describe this emerging economic structure" (Economic &Social Research Council 2005)(Brinkley, 2008)

The purpose of the paper is double:

First finding out the suitable methodology or framework in order to enable an in-depth diagnosis of a nation's actual knowledge driven competitiveness foundations, with the aim to aiding in the definition of the possible vision, objectives

and lines of action to embrace in order to enable innovation and sustainable economic growth.

Second applying the suitable methodology or framework to the in-depth diagnosis of the Spain case and using the insights given by the in-depth diagnosis for having some light on the future economic development possibilities and on lines of action to be taken in order to foster innovation and sustainable economic growth.

2. Wealth Creation in the Knowledge Economy

Wealth creation in the knowledge economy context is closely linked with the concept of competitiveness. There are many definitions of country competitiveness. Among them one of the most cited is the OCDE official definition that follows:

"The degree to which a country can, under free and fair market conditions, produce goods and services which meet the test of international markets, while simultaneously maintaining and expanding the real incomes of its people over the long term". (OECD "official" definition 2002)(Garelli, 2002)

At the same time relationships among country competitiveness, wealth creation and knowledge economy are stressed in the following citations:

"Nations themselves do not compete, rather, their enterprises do. There is no doubt that competitive enterprises are the main engines of a country's competitiveness".

"The role of nations in shaping the environment in which enterprises operate influence their competitiveness".

"Competition among nations can be seen in the areas of education and know-how. In a modern economy, nations do not rely only on products and services, they also compete with brains. The ability of a nation to develop an excellent education system and to improve knowledge in the labor force through training is vital to competitiveness". (Garelli 2002)

"It is well understood that sound fiscal and monetary policies, a trusted and efficient legal system, a stable set of democratic institutions, and progress on social conditions contribute greatly to a healthy economy.

I have found that these factors are necessary for economic development, but far from sufficient. These broader conditions provide the opportunity to create wealth but do not themselves create wealth.

Wealth is actually created in the microeconomic level of the economy. Wealth can only be created by firms. The capacity for wealth creation is rooted in the sophistication of the operating practices and strategies of companies, as well as in the quality of the microeconomic business environment in which a nation's companies compete. More than

80 percent of the variation of GDP per capita across countries is accounted for by microeconomic fundamentals. Unless microeconomic capabilities improve, macroeconomic, political, legal, and social reforms will not bear full fruit". (Porter 2005)

And because wealth can only be created by firms, the following Peter Drucker citations on efficiency and effectiveness will complete the landscape of wealth creation principles in the knowledge economy at nation or country level. They are:

Efficiency is the ability to get things done correctly. Managers who are able to minimize the cost of the resources they use to attain their goals, are acting efficiently.

Effectiveness, on the other hand, is the ability to choose appropriate objectives. An effective manager is one who selects the right things to get done. A manager who selects an inappropriate objective is an ineffective manager. No amount of efficiency can compensate for lack of effectiveness.

The manager's need to make the most of opportunities implies that effectiveness rather than efficiency is essential to business. The pertinent question is not how to do things right, but how to find the right things to do, and to concentrate resources and efforts on them. (Drucker, 1967)

The above fundamental citations pave the way for the more systematic description of wealth creation foundations in the knowledge economy that follows:

The advent of the knowledge economy has fundamentally changed the basis of wealth creation in modern social communities and knowledge and other human based intangibles have become the fundamental resources for wealth creation.

The theoretical foundations of wealth creation in the knowledge economy are mainly found at the micro level in the modern strategic management discipline and more specifically in the three well known following perspectives: the resource based view, the dynamic capabilities based view and more recently the knowledge based view.

These theoretical foundations at the micro level have to be complemented at the macro level with recent developments on what is called strategic management of intangibles in cities, regions and nations. These recent developments are based on a complex body of principles and theories, such as institutional and evolutionary economics, cultural and social economics, systems theory, systems and innovation, triple helix, regional science and more recently knowledge based development.

Based on the above mentioned theoretical foundations some basic principles on wealth creation in the knowledge

economy context can be deducted (Viedma & Cabrita, 2011). They are the following:

1) A free-market economy with inclusive democratic political institutions is the sine qua non condition for sustainable economic and social development.
2) Wealth or poverty of a specific nation is strongly dependant on the number of competitive or excellent companies that the specific nation has.
3) Government does not create wealth but contributes to facilitate or to hinder wealth creation.
4) An excellent or competitive company is the one that achieves long term extraordinary profits due to the fact that has a business model with sustainable competitive advantages.
5) In the knowledge economy sustainable competitive advantages are mainly based on intangibles. Consequently strategic management of intangibles or intellectual capital becomes a fundamental task.
6) In order to achieve business excellence strategy perspective is the key one.
7) Business excellence is always due to good strategy formulation and superior strategy implementation.
8) Good strategy formulation and superior strategy implementation is always a human task and strongly depends on the quality of the top management team and the key professional people.
9) In a continuous changing environment business models quickly get out-of-date and as a consequence of that, innovation in business models[1] becomes an urgent need.
10) In any company the essential activity to perform is always innovation in the business model so it can be converted in an excellent or competitive business model.
11) Companies alone do not create wealth. They need the collaboration of other companies, universities and research institutes, financial institutions, government and other organisations and institutions and specially the existing ones in the cluster, region or nation where the company is located. In other words they need to be active part of a territorial open innovation system and of, what some authors like to call, knowledge based ecologies.
12) When in principle 5 we state that strategic management of intangibles or intellectual capital is a fundamental task for gaining and sustaining competitive advantages we refer mainly to companies but strategic management of intangibles needs also to be applied to the government of clusters, regions or nations in order to build territorial open innovation systems or knowledge based ecologies.

Following the criteria of the above principles this paper is dealing with wealth creation at the macro level in the knowledge economy context and consequently mainly considers knowledge based ecologies that have been mentioned in principle 11. Because that reason some more details are given on these ecologies.

As it has been said before in the knowledge economy firms alone are unable to create wealth. They need to be part of a suitable micro cluster, cluster, region or nation where innovation is considered a key competitiveness factor and where knowledge and learning capabilities (i.e. technical and learning skills and capabilities, knowledge infrastructure, networking capacity, values systems and attitudes) are the main ingredients that conduce to innovation systems and innovation processes. That means that governments should play a role, not only in providing macroeconomic stability, adequate incentives, and the technology and financial infrastructure for firms to compete, but also in promoting the types of linkages (across the triple helix of industry, government and universities) and institutions and a collaborative trust-based innovative culture, that are the sine qua non conditions for a sustainable economic development.

3. Finding out methodologies and frameworks for an in-depth diagnosis of a nation's knowledge driven competitiveness foundations.

Trying to find out methodologies and frameworks for an in-depth diagnosis of a nation's knowledge driven competitiveness foundations, we quickly realize that World Competitiveness Report from World Economic Forum (WEF) and World Competitiveness Yearbook from International Institute for Management Development (IMD) are the two most relevant considering their historic performance and scientific approach. The analysis of alternative methodologies and frameworks other than the two mentioned above has not been made in this paper. More information dealing with this analysis can be found in RICBS (Viedma&Martins 2006). The criteria for selecting these methodologies have two support points. The first point concerns the scientific foundation and the second point refers to the systematic information on competitiveness of developed economies, which over a long period of time these methodologies have provided.

In section 3.1 we will note the main competitiveness methodologies and frameworks.

Next in section 3.2 we will describe the IC community frameworks or in other words the IC community contributions to enable an in-depth diagnosis of a nation´s knowledge driven competitiveness foundations.

Subsequently in section 3.3 we will introduce NICBS as the methodology that synthesizes and embodies the micro and macro principles of wealth creation formulated and described in section 2.

1 We consider, in this particular context, that innovation in business models, encompass all types of innovations, including products, services, processes, technical, management, etc.

Finally in section 3.4 we integrate the WEF competitiveness framework into the NICBS framework in order to produce the Enhanced NICBS framework, that later on will be used for reflecting on the case of Spain.

3.1 Competitivenessframeworks.

We have stated in section 3 that the two main methodologies and frameworks were the following:

World Competitiveness Report from World Economic Forum (WEF) (Schwab, *et al*, 2011) and World Competitiveness Yearbook from International Institute for Management Development (IMD 2010).

There are other methodologies such as the European Innovation Scoreboard (EIS2011) and K4D (K4D2011) World Bank that cover specific aspects and consequently are less relevant considering the specific purpose of the paper.

Following in figures 1 and 2 we illustrate the main factors or components of the two above mentioned methodologies.

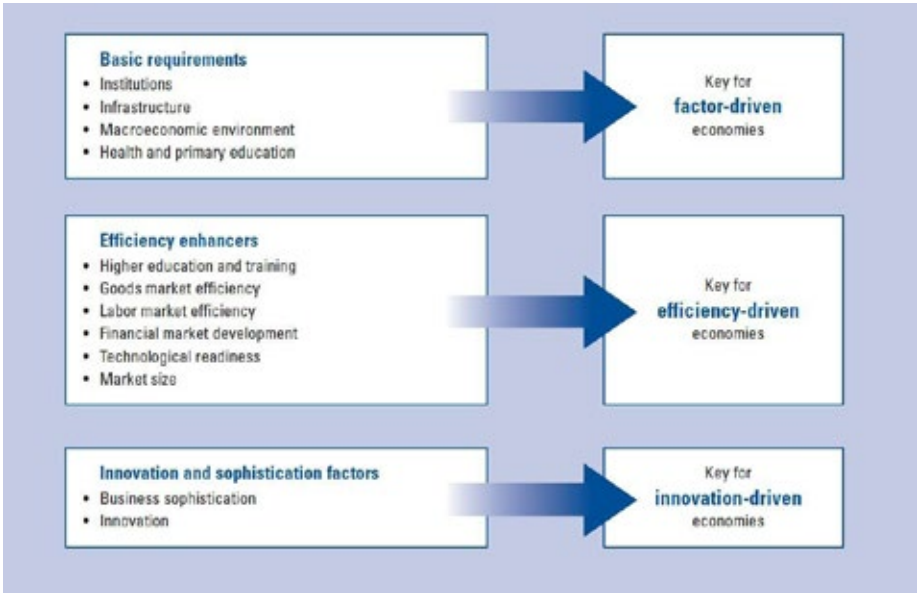

Figure 1: The 12 factors of competitiveness of W.E.F.
Source: The Global Competitiveness Report 2012–2013.
http://www3.weforum.org/docs/WEF_GlobalCompetitivenessReport_2012-13.pdf

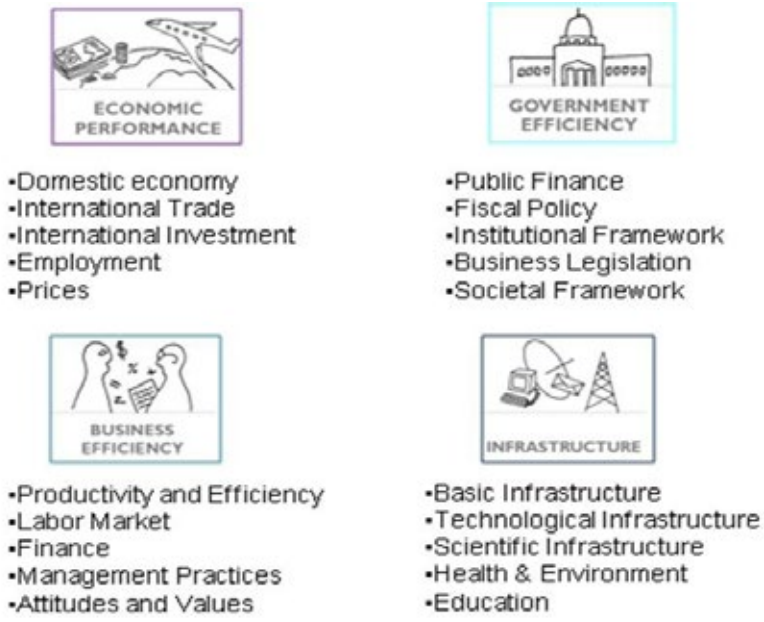

Figure 2: The I.M.D.World Competitiveness Yearbook 2009 4 factors.
http://www.imd.org/news/WorldCompetitiveness2013.cfm

3.2 IC Community frameworks

Considering that the mode of wealth creation has shifted from a mass-production economy to an economy of knowledge, where the key drivers of growth are intangible (Romer 1986; Drucker 1993) , national level IC has recently emerged as a new topic of research, where the focus is on understanding intangible drivers of national wealth creation.

The IC community efforts have crystallized in a set of IC models at nation level. Some of these models are noted in figure 3 that follows.

Country	Author/year	STRUCTURE
European Union	Bounfour, 2003	Resources, processes and outputs.
	Andriessen y Stam, 2004	Human, structural and relational.
Spain	Martins and Viedma, 2005	Region's Competitiveness Intellectual Capital Platform and Microcluster's Competitiveness Intellectual Capital frame.
OECD	Hervás and Dalmau, 2007	Human and educational, technological infrastructure, linkages, firm's strategies, business policy, social block, market block, economic performance.
51 countries	Stähle and Bounfour, 2008	Economic performance, government efficiency, business efficiency, and infraestructure on a national level (stucture from IMD Competitiveness Report).

	From Skandia Navigator						
		Financial	Human	Market	Process	Renewal & Development	Others
Sweden	Stenfelt *et al.*, 1996; Rembe, 1999		x	x	x	x	
Iarael	Pasher, 1999		x	x	x	x	
Malasya	Bontis *et al.*, 2000	x	x	x	x	x	
Spain	Pomeda *et al.*, 2002		x				Technological and Social
Arab Region	Bontis, 2004	x	x	x	x	x	
Nordic Countries	Yeh-Yun and Edvinsson, 2008		x	x	x	x	

Figure 3. IC Community contributions. Source: Hervas-Oliver, J.L.; Rojas,R.; Martins,B.; Cervelló-Royo,R. (2011) "The overlapping of national IC and innovation systems", Journal of Intellectual Capital, Vol. 12 Iss: 1, 111 – 131

A more systematic approach of IC community contributions can be found in a new recently issued book on National Intellectual Capital (Yeh-Yun Lin.C, Edvinsson Leif, 2011), where National Intellectual Capital Models proposed by individual researchers are listed. An excerpt of this list with some key features is given in figure 4.

Initiatives	General Basic Model	Structure	Indicators
Sweden (Rembe, 1999)	Navigator Skandia	Human Capital Market Capital Process Capital Renewal Capital	Financial indicators Descriptive indicators
State of Israel (Edna Pasher & Associated, 1999)	Navigator Skandia	Human Capital Market Capital Process Capital Renewal & Development Capital	Financial indicators
Arab Region (Bontis, 2002)	Navigator Skandia	Financial wealth Human Capital Market Capital Process Capital Renewal Capital	Descriptive indicators. Intangibles indicators. Financial indicators.
Malasya (Bontis, 2002)	Navigator Skandia	Financial wealth Human Capital Market Capital Process Capital Renewal Capital	Descriptive indicators. Intangibles indicators. Financial indicators.
Sweden (SPRING PROJECT 2002)	Navigator Skandia	Business Recipe Human Capital Structural Capital Relational Capital	Innovation indicators. Competence indicators. Industrial indicators. Company- Universities indicators.
Madrid, Spain	Navigator Skandia	Human Capital -Organizational capital -Technological capital -Relay capital -Social capital	Descriptive indicators. Intangibles indicators Innovation indicators
Finland (Stähle and Pöyhönene 2005)	Navigator Skandia	-Human focus -Market focus -Process capital -Renewal & development focus	Industrial indicators National indicators Financial indicators

Figure 4. IC Comunity contributions from Yeh-Yun Lin.C and Edvinsson Leif, 2011 Source: Revised from Pomeda *et al.*(2002)

In addition C.Y.-Y.Lin and L. Edvinsson have proposed a new National Intellectual Capital Measurement Model that includes a carefully selection and validation of indicators. In figure 5 we include the variables in each type of capital of their model.

Variables included in National Intellectual Capital Model

Human capital index	Market capital index
Skilled labor a	1. Corporate tax a
Employee training a	2. Cross-border venture a
Literacy rate	3. Culture openness a
Higher education enrollment	4. Globalization a
Pupil-teacher ratio	5. Transparency a
Internet subscribers	6. Image of country a
Public expenditure on education	7. Exports and imports of services
Process capital index	Renewal capital index
Business competition environment a	1. Business R&D spending
Government efficiency	2. Basic research a
Intellectual property right protection a	3. R&D spending/GDP
Capital availability	4. R&D researchers a
Computers in use per capita	5. Cooperation universities and enterprises
Convenience of establishing new firms a	6. Scientific articles a
7. Mobile phone subscripts	Patents per capita (USPTO þ EPO)

Figure 5. The variables in each type of capital of C.Y.-Y.Lin and L. Edvinsson' model.

Source: Yen-Yun Lin,C. and Edvinsson,L.(2008),"National intellectual capital: comparison of the Nordic countries", Journal of Intellectual Capital, Vol.9 No.4,pp.529-530.

Finally we would like to stress that some researchers are discussing the IC community contributions. In that sense they are arguing:

National level IC has recently emerged as a new topic of research, where the focus is on understanding intangible drivers of national wealth creation. However, given that reporting and valuation systems for national competitiveness already exist, why is an IC perspective needed? (Stahle and Poyhonen 2005)

The IC perspective should re-focus to return to its original roots, and to concentrate on knowledge- creation and innovation. (Stahle and Poyhonen 2005)

3.3 NICBS framework.

In this section we describe the highlights of NICBS methodology and framework. NICBS is a methodology that synthesizes and embodies the micro and macro principles of wealth creation formulated and described in section 2. Some excerpts of the main features of NICBS (Viedma & Martins, 2006) are given as follows:

"NICBS was primarily conceived as a learning strategy tool to help nations, and the micro clusters within them, make the transition (from Sn to Sn+1 in Fig.6) to more competitive knowledge economies by:

1) Enabling an *in-depth diagnosis* of the nation's actual knowledge-driven competitiveness foundations.
- What are the resources, competencies, traditions, patterns of behaviour, etc. that act as path-dependencies in the nation's way to growth?

2) Aiding in the definition of the *possible* vision, objectives and lines of action to embrace sustainable economic growth.
- What is the model of excellence that we want for the nation?
- What competencies, values and attitudes should we promote to enable innovation and sustainable growth?

3) Developing *awareness* of a nation's potential risks and opportunities.
- How does the nation cope with change?

Specifically, the first two points are basically attained through disclosure skills and *competencies*; social and legal frameworks; technology upgrade and use; market access and openness; the quality of primary education, universities and research centres; industry-based collaboration, etc. for both the nation as a whole and each of the core microclusters. The third point, to which we assign the greatest importance, is the result of a dynamic and systematic assessment of the nation's innovative capacity, in the face of first-class competitors, and a process of cross-fertilised analysis. Moreover, carrying out a rigorous diagnosis (point 1) is an essential step before embarking on the definition of the vision and the objectives (point 2).

Figure 6 depicts the NICBS's main constituents and linkages, which are subsequently explained.

The general structure of the NICBS is grounded in regional innovation systems theory (Andersson and Karlsson, 2002; Carlsson *et al.*, 2002; Enright and Roberts, 2001; Cooke and Schienstock, 2000; Cooke *et al.*, 1997) and more specifically on the Furman *et al.* (2002) model for assessing a nation's innovative capacity and Viedma's (2003) Cities'

Intellectual Capital Benchmarking System (CICBS), chiefly in relation to the nation's microclusters' capacity for competitiveness. It is made up of two sub- models and the linkages between them, as well as a set of indicators and extensive questionnaires to operationalise them. The nation's competitiveness intellectual capital platform (hereinafter NCICP) represents the bundle of core resources and competencies (capabilities, when tied to the vision and objectives) that are bound together by core activities. In conjunction with the norms, guides and principles set by public and private institutions (*institutions and national governance* building block); the technological skills and capabilities (*technology* block); the environmental quality of life, as determined by public services, cost of living, and other territorial endowments (*living-environment- based resources* block); and an educated, skilled and values-nurtured human broad base with the aim of creating, sharing and using knowledge (*human capital* and *social capital* blocks), these core resources and competencies condition economic actors' patterns of behaviour, shape the nation's culture, and determine the extent to which the nation as a whole is capable of supporting and fostering an innovative and competitive productive system as displayed by the microclusters. In essence, the NCICP represents the intricacies of resources and relationships that, *assuming* macroeconomic stability (*economy performance* block), can either boost or hinder microclusters' wealth creation capacity.

However, to gain a comprehensive view of the nation's capacity to grow, we must consider the micro clusters' ecology of value chains and supportive business environment—as that is where an economy's real possibilities for growth reside—and also the quality and density of information and knowledge exchanges between the two subsystems, which is what the nation's microclusters' competitiveness intellectual capital frame (MCICF) aims for: to unveil the microeconomic environment and capacity for innovation at each of the nation's core micro clusters. The MCICF builds mainly on Porter's (1990, 1998) cluster-based theory of competition and Viedma's (2003) methodology for assessing micro clusters' core competencies. Finally, the *linkages* between the national competitiveness platform and the micro clusters account for the strength of the system as a whole. It is the density, quality and dynamism of these exchanges that grants the system the mechanisms for self-renewal and the ability to generate knowledge-driven ideas that enable long-term economic growth (see thick black arrows in Figure 6)."

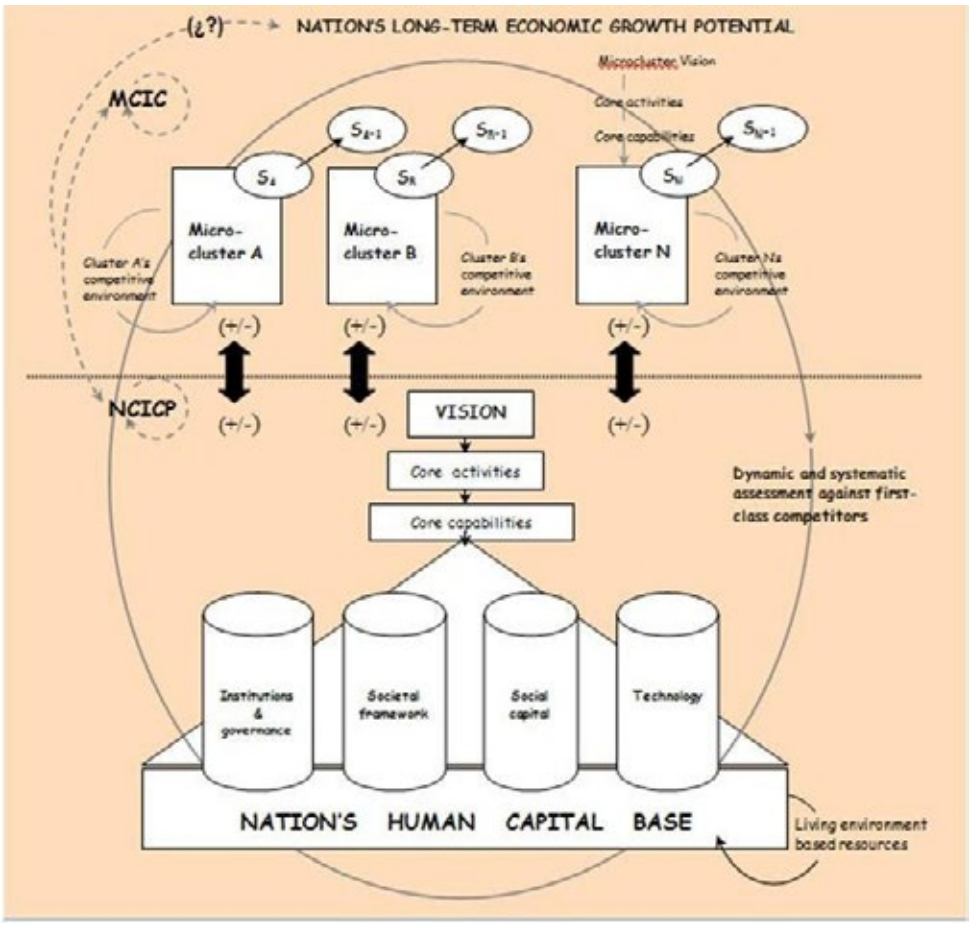

Figure 6. NICBS's main components and linkages.

Source: Viedma, J.M. & Martins, B. (2006)"The region's intellectual Capital benchmarking system: enabling economic growth through evaluation". Journal of Knowledge Management,Vol.10 Iss:5,41– 54

3.4 Integrating WEF competitiveness framework in the NICBS framework = Enhanced NICBS.

Section 3.3 has supported NICBS as the most complete methodology for an in-depth diagnosis of a nation's knowledge driven competitiveness foundations. Nevertheless and because systematic information on the indicators and factors of the different building blocks that integrate the NCICP is not available for the specific cases of Spain we considered that an imaginative solution was needed in order to make it possible an in depth diagnosis of Spain knowledge driven competitiveness foundations.

The imaginative solution comes from integrating WEF competitiveness framework in the NICBS framework or more precisely from replacing in the NICBS framework the NCICP platform by the WEF competitiveness framework. We will call the new generated framework Enhanced NICBS and its structure is shown in figure 7.

The enhanced NICBS framework essentially improves the WEF competitiveness framework with two fundamental constructs :

The Humans Capital Base and the Microclusters´ Competitiveness Intellectual Capital Frame (MCICF).

The Human Capital Base refers to what people know, what they do and what they can do. Human Capital Base it`s about people Knowledge and current economic activities. What they can do in the future is strongly dependent on what they know and specially what they are doing now.

The Microclusters´ Competitiveness Intellectual Capital Frame (MCICF) refers to main economic activities where people are working and are developed in the so-called clusters and microclusters´. Knowing the core activities, core competences and core capabilities on the main firms in each particular microcluster as well as the clusters´ competitive environment, give as light on the nation´s wealth creation potential. Special considerations deserve R+D activities because are central to the generation of new knowledge.

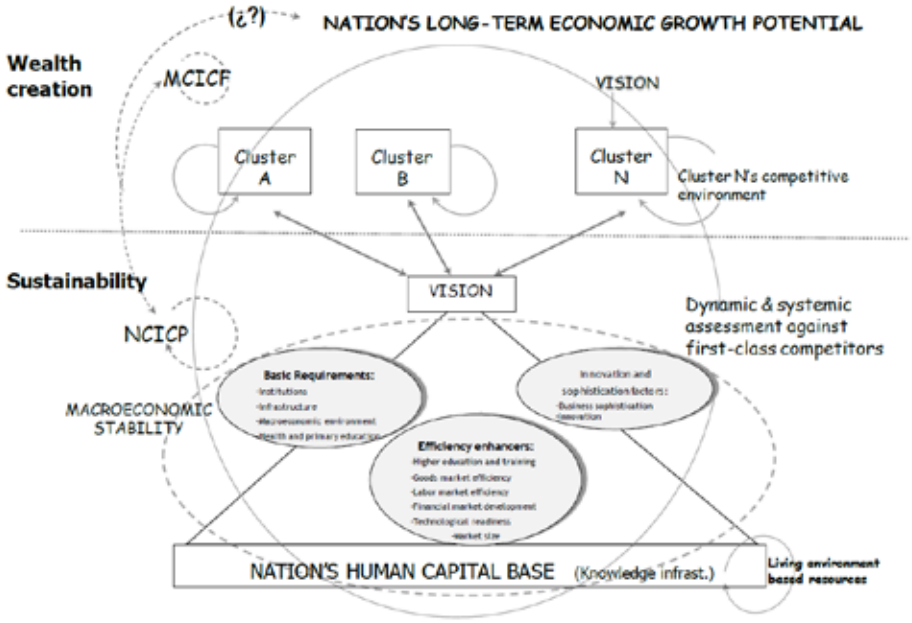

Figure 7. Enhanced NICBS: Main Structure & Key Elements

4. Using enhanced NICBS framework for reflections on the Spanish case.

The NICBS framework give us the possibility for an in depth diagnosis of a nation's knowledge driven competitive foundations.

In sections 4.1 and 4.2 some of the main features corresponding to the case of Spain are described.

4.1 Reflecting on assessing intangible assets and liabilities on the Spanish case.

Reflections on the case of Spain are mainly taken from 2.1: Country/Economy Profiles of the Global Competitiveness Report 2013-2014 (Schwab, 2013). Figures 8 and 9 show the details of Spain's Global Competitiveness Index and The most problematic factors for doing business.

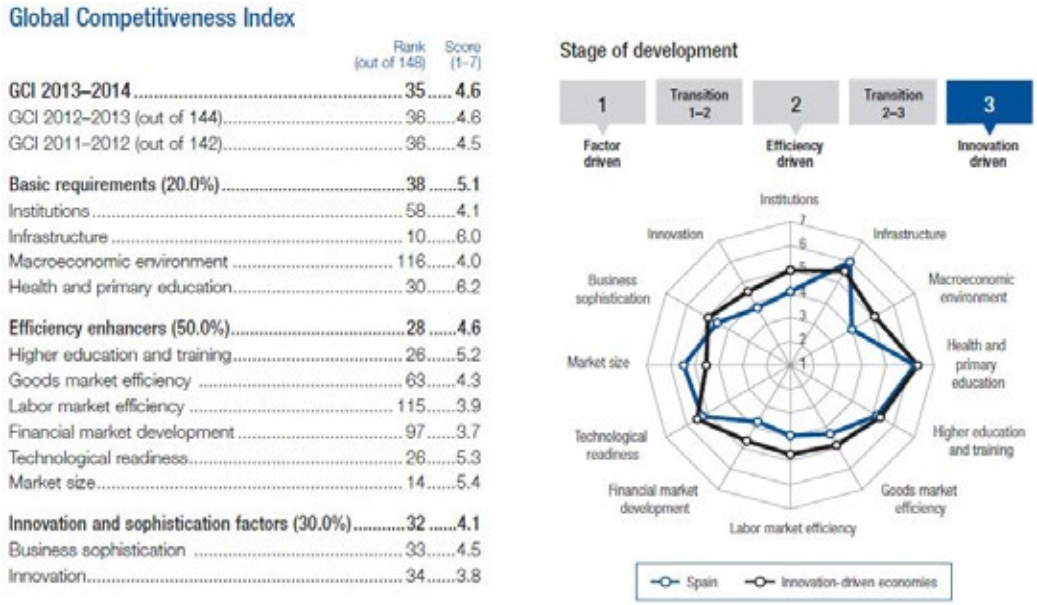

Figure 8. Spain. Global Competitiveness Index.

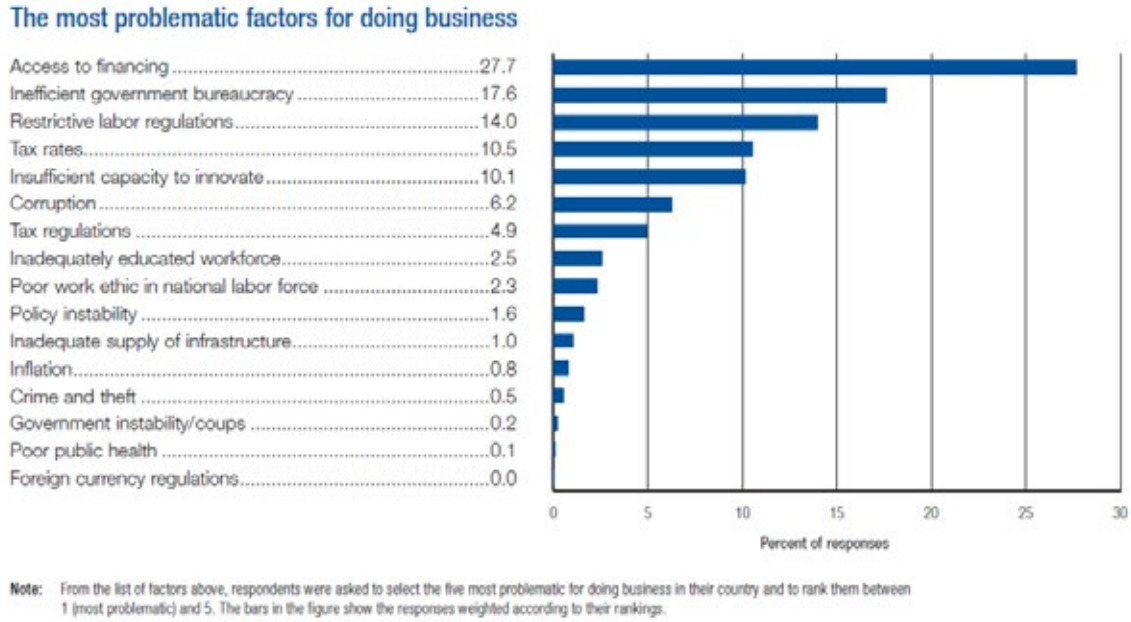

Figure 9. Spain. The most problematic factors for doing business.

Some comments on the content of both figures are given next:

"Despite the current difficult conditions, Spain goes up one notch in the rankings to 35th place.

The country continues to leverage its traditional competitiveness strengths in terms of a world-class transport infrastructure (6th), a good use of ICTs (23rd), and—despite the high unemployment rate—a large and skilled labor force, thanks to one of the highest tertiary education enrollment rates in the world (8th). Moreover, the country has started to address some of its most pressing challenges. In the past year, Spain undertook sharp public budget cuts that will help improve its still weak macroeconomic situation; it also implemented a series of structural reforms to improve the functioning of its goods, labor, and financial markets. The liberalization of certain services, the implementation of a labor market reform to mitigate the rigidities of a dual labor market, and the restructuring of the banking system are all measures aimed at improving the efficiency in the allocation of resources, whose full effects are likely to become more visible in the medium term. As a result of these and other measures at the European level, the country has obtained access to international financing markets at a more affordable cost than it had at the time the previous edition of this Report was released. However, this situation has not translated in an improvement in access to financing for local firms— which still suffer from an important credit crunch—to upgrade or transform their production facilities. Access

to financing is regarded as the most problematic factor for doing business, and the country ranks very low in terms of the ease of accessing loans (138th) or other sources of financing, either through equity markets (101th) or venture capital (105th). In addition, the reduction of both public and private budgets for research and innovation could hamper the capacity of local firms to innovate (57th) and contribute to the economic transformation of the country. Addressing these weaknesses will be crucial in order to bridge the competitiveness gap with Northern European economies the country continues to suffer".

The above reflections correspond with NCICP, the lower part of the NICBS model, the one that gives sustainability to the whole system.

The paper does not cover MCICF, the upper part of NICBS where the wealth is essentially created, because there is not systematic and up to date information available on clusters, microcluster and economic sector. Same way the paper does not cover Nation`s Human Capital Base because there is not systematic and up to date information.

5. Conclusions.

After an introduction on the fundamental changes that have occurred in the world and more specifically in the way the world economy creates wealth, the paper tries, in section 2, to highlight the close relationship between wealth creation and competitiveness and to formulate the principles of wealth creation on the knowledge economy context.

Relying on the principles of wealth creation in the knowledge economy, section 3 tries to find out the suitable methodology or framework in order to enable an in-depth diagnosis of a nation´s actual knowledge driven competitiveness foundations. For achieving this specific purpose a critical review of competitiveness frameworks and IC community frameworks are carried out. Next and as a consequence of the critical review we conclude stating that probably NICBS is the most complete and comprehensive methodology. Nevertheless and for practical purposes we decided in section 3.4 to integrate WEF competitiveness framework into the NICBS framework producing what we call Enhanced NICBS framework.

Finally and in section 4 we use the Enhanced NICBS framework for reflecting on the case of Spain. Nevertheless the reflection is incomplete because the lacks of available information on micro clusters' competitiveness intellectual capital frame (MCICF), where wealth is fundamentally created. Future quality research is needed in this particular issue for achieving better results in the in-depth diagnosis and in Human Capital Base where wealth is fundamentally originated.

The paper tries to contribute in the search for methodologies and frameworks that facilitate at a nation level to an in-depth diagnosis of actual knowledge driven competitive foundations, giving at the same time some light on the future economic development possibilities and on lines of action to be taken in order to foster innovation and sustainable economic growth.

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BRANDING AND PLANNING URBAN KNOWLEDGE PRECINCTS: INSIGHTS FROM BRISBANE, AUSTRALIA

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ABSTRACT
Purpose: The paper aims to investigate urban knowledge precincts from the angle of urban planning and place branding.
Scope: The paper focuses on urban knowledge precinct development experiences of Brisbane, Australia.
Method: The paper uses literature review, policy and content analyses and field observation methods to explore Brisbane's urban knowledge precincts.
Results: The paper reveals insights from Brisbane's urban knowledge precincts development journey.
Recommendations: The paper suggests further research on the topic of branding and planning urban knowledge precincts.
Conclusions: The paper reveals that urban knowledge precincts are the nexus of knowledge-based urban development and Brisbane's precincts potentially provide a competitive edge to the city in the global knowledge economy era.

KEYWORDS
Knowledge-based urban development; Place branding; Urban knowledge precinct; Urban planning.

1. INTRODUCTION
Given that cities are facing increasing global competition, branding places, especially with labels indicating their knowledge basis has become a popular marketing tool for place making and attracting investment and talent (Merrilles *et al.*, 2013). This paper investigates urban planning and place branding with a particular interest on the 'urban knowledge precincts' (UKPs). The paper reviews the literature and analyzes plans, policies and branding documents thoroughly, and investigates relevant UKP case studies. It adopts an empirical approach for the investigation of the case studies focusing on the planning and place branding experiences of two UKPs from Brisbane, Australia. The paper concludes by highlighting the insights from Brisbane's UKPs.

2. URBAN KNOWLEDGE PRECINCTS
Making place that concentrates on knowledge generation has become a priority for many nations and cities that are competing in the global knowledge economy (Asheim, 2007; Yigitcanlar & Lonnqvist, 2013). As knowledge generation profoundly depends on creativity and innovation, which are human centered activities and dominantly urban phenomena, particular attention has been paid to building urban places with a certain scale, accessibility to and intensity of knowledge infrastructure as well as vibrant urban life with a full mix of diversity and tolerance (Florida, 2005; Yigitcanlar *et al.*, 2008a; Yigitcanlar, 2014). Such places that house knowledge worker communities are referred interchangeably as 'innovation park', 'science park', 'technology park', 'knowledge hub', 'knowledge precinct', 'UKP' and so on (Ratinho & Henriques, 2010). Carrillo *et al.* (2014) view UKPs as community hubs where citizenship undertakes a deliberate and systematic initiative for founding its development on the identification and sustainable balance of its shared value system, and bases its ability to create wealth on its capacity to generate and leverage its knowledge capabilities. In other words, UKP is the spatial nexus of KBUD, as it is a mixed use postmodern urban setting that includes a critical mass of knowledge enterprises and advanced networked infrastructures, and developed with the aim of collecting the benefits of blurring the boundaries of living, shopping, recreation and working facilities of a knowledge worker community (Yigitcanlar *et al.*, 2008b; Yigitcanlar & Dur, 2013).

High dependence of knowledge generation on a large pool of talented labor power and consumption is critical to form a functional urban region that is suitable for UKP development (Petruzzelli *et al.*, 2007). Nevertheless, once established due to the dynamism and intangibility of knowledge worker community it is a bigger challenge to sustain knowledge generation process and retain these communities (Darchen & Tremblay, 2010). A global city with evidence of world-class city formation accommodates high quality urban services and a diversified economic base including extensive supplier and distribution networks and specialized services have a big advantage (Vanolo, 2008). However, today the global knowledge economy creates opportunities for newly developed cities to compete with more established cities in attracting talent and investment (McGranahan & Wojan, 2007).

In such landscape, the most common strategies to attract and retain knowledge worker communities include: concentrating on extensive global networks as intense mediums of exchange for UKPs to flourish (Van den Berg *et al.*, 2005), and focusing on knowledge workers as primary sources of UKPs that prefer inspiring cities with a thriving cultural life, an international orientation, and high levels of social and cultural diversity (Yigitcanlar *et al.*, 2007). Furthermore,

literature highlights the following five common characteristics of successful UKPs: Mixed-use environment; Centrality; Connectivity; Learning and playing, and; Branding (Yigitcanlar *et al.*, 2008b).

In UKPs the generation and flow of knowledge is one of the elements that determine its identity by driving the design of space, defining the use of the place, determining the perceived image through patterns of behavior and social interaction. In these communities, production and distribution of knowledge is what constructs the 'meaning' that makes these spaces a place, and determines the elements of its identity. The branding of these new places are generally based on the conceived ideas for the new spaces and focused on attracting a specific target audience (Stigel & Frimann, 2006). Place branding, therefore, is the initial trigger to attract the talented audience that will construct the desired knowledge-focused community base (Eshuis & Edwards, 2013).

In the global knowledge economy and culture, place branding has become a central basis for successful competition (Okano & Samson, 2010). Knowledge worker community as a target group is particularly popular in place branding as cities are in a tough competition for residents and workers in general, but in particular for the ones with talent (Vanolo, 2008). In an empirical study, Zenker (2009) found that the main desire of knowledge workers is urbanity and diversity, and claims that "meeting the special needs of these social groups with place marketing and place branding will support the goal of attracting the creative class to a city" (p.31).

UKP development has a great symbolic value as it helps distinguish a particular area. At present many cities worldwide apply innovative strategies, including forming new niche markets through the development of UKPs, for transforming themselves successfully into knowledge cities. Creating brands for these UKPs come almost naturally as a stage of their planning. Many of the successful global UKP examples have been using place branding as an effective strategic tool, e.g., 22@bcn Barcelona, Brainport Eindhoven, One-North Singapore, Orestad Copenhagen, and Taipei 101 (Hospers, 2006).

3. BRISBANE'S URBAN KNOWLEDGE PRECINCTS

3.1. Boggo Road Knowledge Precinct

Boggo Road Knowledge Precinct (BRKP) is an inner city UKP developed on a brownfield site at the South of Brisbane CBD. In this UKP the idea of knowledge community has been strongly promoted in the first stage of the project. Initially the vision for this precinct was loosely based on R&D with focus on biomedical, bioinformatics and ICT, to take advantage of the proximity to major health and research facilities. In a second stage the character of the precinct was more firmly defined and promoted as an environmentally and culturally responsible project envisioning sustainable outcomes. The idea of the Ecosciences Precinct was assumed as flagship element in the promotion of the project articulating the concept of a landmark development as promised in the preliminary proposal. During the third stage, the promotion of the precinct was realigned to the heritage and character of the site suggesting a vibrant and innovative urban UKP. Although the presence of the historic Boggo Road Gaol was acknowledged in all stages of the project, it was only after the Ecosciences Precinct was under construction and the complementary mixed used buildings were planned, that this element became central in the promotional materials.

Some constant features are promoted on BRKP's communication material, such as proximity to CBD, accessibility through integrated public transport systems, mixed use development, high quality environment and lifestyle. The concept of lifestyle is strongly promoted in the third stage of the development. The visual communication that illustrate the project through artists' impressions presents an environment characterized by an active community, based on pedestrian friendly streetscape with a clear presence of outdoor dining and coffee shops. UKP features are rendered through rhetoric that stresses the innovation and uniqueness of the precinct as a vibrant sustainable community.

From a planning point of view, the precinct follows the typology of the UKP with a layout based on a main street dominated by the anchor project, the Ecosciences precinct, and by the reused historic gaol. The master plan follows transit oriented development principles promoting a pedestrian mixed used environment strongly integrated with existing transport facilities. Built form is limited to nine-story in height and provisions are made to guarantee permeability through blocks. The promise of a vibrant community is translated in design guidelines aimed to promote a safe suburb based on human scale spaces and an interconnected open space system. The amenity of the site is enhanced by maintaining visual connections through the different areas of the UKP and also setting views on landmarks outside the village, like the Brisbane CBD. The legibility of the urban environment is also prescribed as a key factor in this development.

The data collected about BRKP makes it evident that the brand is constructed upon the vision of a sustainable community based on a research center focused on environmental sciences and innovation. This characteristic has been a key factor in promoting the project to the broader knowledge community. This changes, however, when the target audience is potential buyers: the promotional message becomes more focused on the potential of a high-quality lifestyle in and around the UKP. This is evident in the role of emotional stimuli like the heritage and history of the area. It was clearly observed that these qualities are not promoted in early stages of the development, but are increasingly present in promotional and advertising material recently released. Figure 1 illustrates the layout of the UKP, where Table 1 lists the key findings of the analysis.

Figure 1. Layout of Boggo Road Knowledge Precinct.

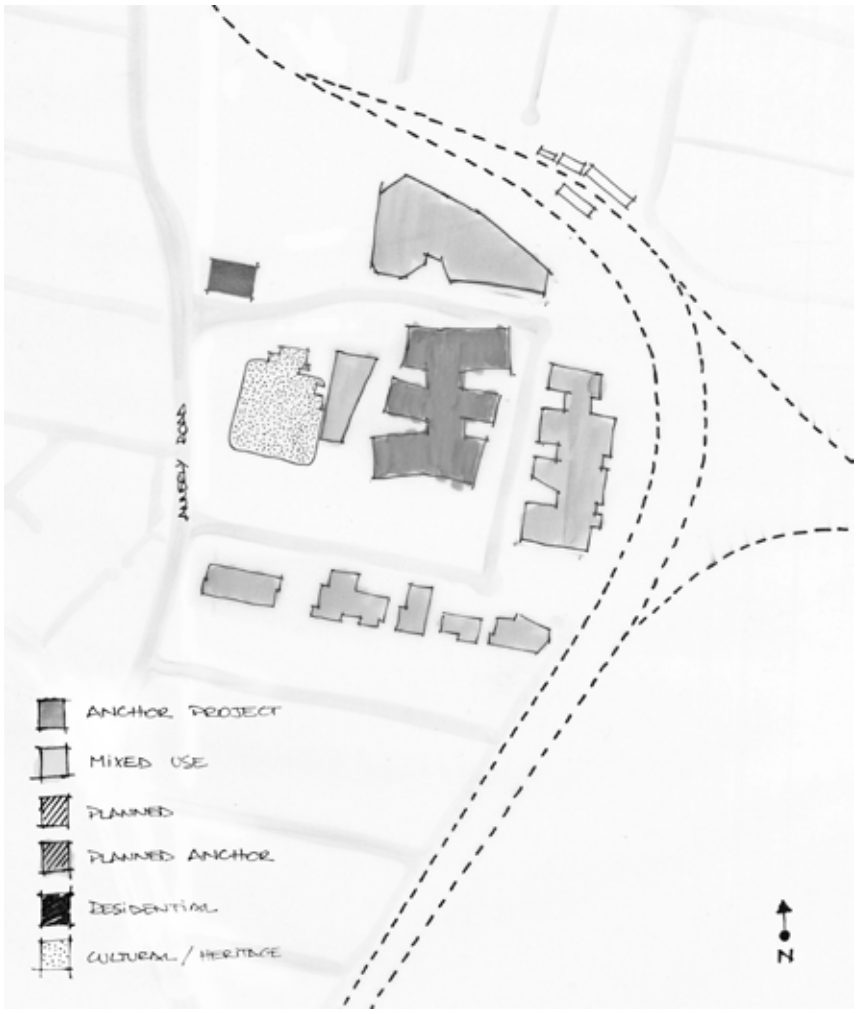

Table 1. Boggo Road Knowledge Precinct Brand and Plan Analysis Findings.

	STAGE I (2003-2007) QG (2003)	STAGE II (2007-2009) HRPPC (2007)	STAGE III (2009-2013) QG (2009)
BRAND	• Former site of Boggo Road Gaol as opportunity to develop a unique precinct for knowledge industries and living community	• Importance of environmentally and culturally responsible development in order to achieve a environmentally and economically sustainable future	• BRKP as unique and vibrant community based on historic heritage site
Promise	• Landmark project • Focus on Medical research, ICT, computer modelling and bioinformatics • Innovative business incubator	• Integration with the existing context • Mixed urban village lifestyle • Lifestyle opportunities	• World class research facilities • Exiting and vibrant environment • Benefits for the local and broader community
Features	• Mixed use development • Location close to the CBD • Accessibility through existing transport hub • Proximity to other major facilities and institutions	• Integration with the existing context • Mixed urban village lifestyle • Lifestyle opportunities • Ecoscience Precinct • Affordable Housing • Sustainable development • Mix of education and community facilities structured around open and public spaces	• Mixed use development • Location close to the CBD
Stimuli	• Visual elements based on strong use of green • Vegetation and natural feature are emphasised • Built form is presented as low impact, medium density blended in with the contest • Prominence given to existing transport hub	• Rhetoric emphasises how the development will be innovative, sustainable and enable a specific unique community lifestyle	• Emphasis on the former Gaol and the heritage legacy of the site • Vibrant colour scheme • Visual elements referring to technology, but with clear sustainable features • Images of vibrant environment with a clear focus on lifestyle and urban atmosphere
PLAN	na	• Urban knowledge precinct based on the reuse of heritage structure and developed following as TOD close to the CBD	na
Character	na	• High quality mixed used development anchored by the ecoscience precinct project • Sustainable and resource efficient development; Passive design principles • Synergy between new development, heritage listed gaol and existing neighbourhood	na
Layout	na	• Open space network as framework for the precinct • Urban form up to 9 storeys in height • Highly active main street • Permeable urban form with linkages between public spaces through buildings	na
Design	na	• Legible and safe pedestrian environment • Visual connections between elements within and outside the precinct • Human scale • CPTED principles • Enhancement of amenity of the area	na

3.2. Kelvin Grove Urban Village

Kelvin Grove Urban Village (KGUV) is recognized as a successful knowledge community building effort and a signature initiative in Brisbane (Charles, 2011). Its development is characterized by a specific approach since its first and second stages: to achieve a real social mix providing different housing solutions and cater for different needs. The interest of Queensland University of Technology (QUT) to acquire and develop the site of dismissed army barracks close to existing teaching facilities was negotiated with Queensland Department of Housing. The general idea of the project was to promote an innovative joint venture between university, public and private sectors. The preliminary brand was based on the idea of a vibrant village atmosphere where living, working, playing and learning are integrated in a lively environment that is characterized by a constant presence of 'creativity'.

The aim for uniqueness in the conceptualization of this UKP is strongly promoted in its planning documentations. The Queenslander character and a design based on sustainable and subtropical principles were constantly present in the communication material. Two kinds of feature were promoted: on one level, a specific lifestyle based on the proximity to the CBD and other major urban facilities as well as strong integration with the surrounding neighborhoods and accessibility to the area through major transport hubs. On another level, the promise was based on the peculiar character and history of the area. The use of public art and the involvement of artists in the development of the site were clearly communicated in promotional material and design guidelines. KGUV has a high level of sophistication in the detailing of the different components of public open spaces. Pavements, street furniture, landscaping, artwork and the use of color are all controlled elements that communicate the creative environment and its mixed indigenous, European and military heritages.

The built form is based on a main street connecting two landmark elements: the historic QUT campus at the top of the hill and the former Upper Parade Ground alongside Kelvin Grove Road. The latter was redesigned as the core of QUT Creative Industries precinct comprising a system of interconnected squares. The built form was promoted as variegated and differentiated to achieve a sense of vibrancy and the promised village atmosphere. The legibility and permeability of the built form were promoted in the design guidelines for the site and prescriptions were made about making building entrances evident trough awnings, landscaping or arcades.

While the creative component of the site is constant in the promotion of the development, this element is more evident in its design and promotions during the early (first and second) and late (fourth) stages of the project. KGUV had a third stage when the focus was placed on lifestyle and the vibrancy of community. This coincides with the development of a major health research facility in the center of the village that was promoted as a new element enriching the diversity of the area. In the fourth stage the selling point was brought back to the creative nature of the site. Creativity then became so central that prescriptions were made for the provision of artworks on new buildings. The reuse of military facilities and the integration with university structures was later promoted as the main feature of KGUV. Figure 2 illustrates the layout of the UKP, where Table 2 presents the key findings.

Table 2. Kelvin Grove Urban Village Brand and Plan Analysis Findings.

	STAGE I (2001-2004) QG (2001, 2002)	STAGE II (2004-2008) QG (2004a, b, c), BCC (2005)	STAGE III (2008-2010) QG (2008a, b)	STAGE IV (2010-2013) QG (2010), KGUV (2012)
BRAND	• Dynamic village atmosphere joining together learning, working and leisure activities in a socially and culturally relevant site	• KGUV is an exciting first for Queensland and will lead the way for future sustainable developments	• Master planned community highly integrated with the rest of the city and offering unique village atmosphere	• Primacy of KGUV as first development of this kind in Australia based on learning, creativity, community and sustainability
Promise	• Integrate urban environment blending University and village activities to achieve a national point of reference for creative Industries • New exiting living and learning opportunities in a sustainable development where creativity is at the centre • First creative industries precinct in Australia	• New urban environment that offers unique elements in the Brisbane context • Innovative and successful type of development	• A diverse city fringe community where learning is linked with enterprise, creativity industries with community • Connection with the CDB and the surroundings • Lifestyle community • Award winning urban design	• KGUV in time will become a vibrant suburb with village atmosphere based on an inner city community • The development is unique in terms of style, innovation, diversity and for its focus on people
Features	• High quality facilities • Proximity to the CBD and accessibility of the area. • Lifestyle • Recognisable Queenslander architectural style • Use of subtropical design principles to achieve a sustainable development • Integration of art features to represent the history and relevance of the area • Themes of the development are creativity, indigenous as well as European heritage. Legacy of the former barracks • Housing and social mix • Mixed use development	• Innovative research facilities such as the new health precinct • Vibrant and integrated urban village atmosphere • New development as business incubator • New leading research and teaching facilities in Australia • State of the art performance and teaching spaces	na	• Reuse of military heritage buildings • Integration with university facilities
Stimuli	• Rhetoric has strong emphasis on the creative element of the development • Text focuses on the heritage of the area • Documents reiterate the concepts like quality, high standards and innovation	• Rhetoric stresses innovation and primacy of the development • Visual communication is based on research related images as well as modern and vibrant urban environment • Colour scheme based on grey, purple, Prussia blue and green conveying an idea of sophistication	• Images present a vibrant community and a specific lifestyle where work, play and research are integrated	• Rhetoric promotes innovation and uniqueness of the development • Strong images of a creative and dynamic environment
PLAN	• Urban village on brown site aimed to integrate existing and new research/education facilities in a mixed used development	• Integrated and master planned urban village within a mixed use and highly urban environment	na	na
Character	• Distinctive character rendered in the quality of open and public spaces through you of art and visual stimuli	• Combination of different uses • Buildings to reflect subtropical and sustainable design principles • Retail at street level to enhance the main street image • Environment to be visually interesting	na	• Built form to educate public about sustainability and subtropical design principles
Layout	na	• Main street development • Village centre up to 7 storeys • Mixed use precinct 3-4 storeys • Built form to respect heritage legacies as the Upper Parade ground • Built form to be differentiated • Integration with the surrounding suburbs	na	• Public real is the robust backbone of the development
Design	na	• Amenity and security • Accessibility and permeability • Attractive pedestrian environment with active frontage • Safe and supportive community • Design to provide a sense of community and highly legible urban environment • Recognisable feature to identify buildings entrances	na	• Buildings required to integrate public art, especially when in corner sites • Artworks to contribute to the general atmosphere of the area

Figure 2. Layout of Kelvin Grove Urban Village.

4.

4. CONCLUSION

The literature suggests that just providing space and facilities is not enough to become competitive in attracting talent and investment. The quality of the environment as well as the specific character and appeal of new locales are central elements in the competition between urban centers in general and knowledge communities in particular. Place branding, hence, has become a popular practice adopted by many cities around the world in the context of intensified urban competition (Zhang & Zhao, 2009). The literature reveals that the comparison between the three UKPs brought our attention to that location is indeed a critical issue in relation to UKP developments. Although, there are rare successful examples of regional or rural UKPs such as the Desert Knowledge Precinct of Australia, UKP is mainly an urban phenomenon. Examples from around the world all take advantage from the infrastructure, services and amenities that inner city locations provide. In this regard, BRUP and KGUV are conveniently placed at the urban core.

The case studies investigated represent different conditions in terms of size, location and development phases. KGUV is the most advanced and consolidated UKP. Its built form is growing constantly and is closer to its completion than BRKP. KGUV has a specific brand that in time has been revamped and restyled, but has maintained a clear focus. BRKP is a smaller intervention and is in the phase where only the anchor project has been completed. Its brand focuses on the cutting edge sustainability and eco-sciences research, but this vision is not fully translated in the image or design of the space.

BRKP and KGUV both start with a clear vision of the precinct as a unique site, and this is communicated in a specific and detailed way. Interestingly in this case the stimuli are the more appealing and specific while the concepts delivered are the most vague and stereotypical. In terms of features only KGUV seems attempting to really provide something unique; generally all the cases align to Yigitcanlar *et al.*'s (2007) findings, promoting a mixed used environment, proximity to premium activities, connectivity and networking, a work-live-learn-play settings. In each case the brand appeals to potential buyers and in different stages the message shifts from a more specific one, to a more generic based on lifestyle and possibilities. The specific site is generally discussed in terms of location and marginally for its actual character; although this is sold as unique often this is communicated with typical images of vibrant public spaces. The design of the three cases generally aligns with preconceived templates; a main street with commercial activities, interconnected public spaces, pedestrian environments. All the precincts aim to provide sustainable subtropical environments; only KGUV suggest a unique approach stressing the importance specific public art will have within the project.

Summarizing the findings of the two case studies, it is possible to evaluate the alignment between the intended brands and how this has been translated win the actual planning of the UKP developments. This leads to Brisbane's precincts potentially to provide a competitive edge to the city in the global knowledge economy era.

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EMPIRICAL ANALYSIS OF KNOWLEDGE INTENSIVE CLUSTERS IN THE HELSINKI METROPOLITAN AREA

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ABSTRACT
This paper analyses industrial clusters in the Helsinki Metropolitan Area (HMA) in Finland. The HMA is the largest and most powerful concentration of population and economic activity in Finland. The paper analyses knowledge intensive industrial clusters and their structures. Clusters are identified according to statistical analysis that provides analytical perspective on the knowledge intensive economic geography of the HMA. Knowledge-based industries focusing on immaterial products tend to have closer central proximity than other industries but variations are extensive. The cluster diversity indicates that HMA has gained critical threshold for manifesting agglomeration gains that generates and extends industrial diversities within key-clusters. The most diverse clusters tend to locate in the urban core whereas the more narrowly focused clusters may be found in relatively peripheral locations.

KEYWORDS
Clusters; Knowledge-based development; Knowledge Intensive Businesses; Helsinki Metropolitan Area; GIS.

1. INTRODUCTION
Urban and regional development (and differentiation) is one of the key topics in economic geography. There are fundamental spatial variations involved: the scale and scope of production process, the geographical scale of markets, arrangement of after sales services, marketing management and labour markets, determining the availability of educated know-how workers. Knowledge creation in specific locations requires acknowledgement of these contextual characteristics and networks (Bathelt *et al*. 2004).

In this paper knowledge-based industry statistics are applied to examine the current condition of clustering in the Helsinki Metropolitan Area (HMA). Geographical measuring provides a grounded starting point, because spatial scales interact and tend to create clusters of specific industries (e.g. Gordon & McCann 2000). This paper examines and presents preliminary findings of our cluster study on economic geography in the HMA.

2. SPATIAL CLUSTERS AND KNOWLEDGE-BASED GROWTH
Knowledge-based development is approached here through three main concepts: knowledge intensive business services (KIBS), innovation system and clusters. The literature on these topics has traditionally focused on areas in which knowledge-based development is associated with creative class and human capital, whereas the innovation system is oriented more towards technology and production economies (Pratt 2008; Vorley *et al*. 2008). Innovation research traditionally uses patents; intellectual property rights (IPRs); number of highly educated people; and years of research as indicators.

The development of contemporary societies is tightly interwoven with economic development, competition and growth. Bristow (2010) has produced an extensive analysis of regional competition and its measures. She makes a distinction between "cultural political" and "neoliberal" approaches. According to Bristow, the doctrine of competition has a hegemonic position in regional policymaking across industrialised countries. Bristow's view is in accordance with Martin (2006), who uses evolutionary economics, thereby espousing a neo-Schumpeterian view of development. Innovation creation is a multidimensional process originating from one or several individuals and their networks (Tang & Le 2007). The understanding of the aggregated local clusters, therefore, involves recognition of the socio-spatial context. Scales have varying characteristics, and they manifest in accordance to the locations history and tradition (Makkonen & Inkinen 2014).

Martin (2006) points out that regional competitiveness is profoundly driven by innovation and adoption. In effect, the cycle of adoption and innovation creation leads to the notion of path-dependency, a term describing an historical development process that determines future outcomes of economic decisions (see also Mackinnon *et al*. 2009). Evolutionary economics is relevant to this study in an empirical sense as Finland has had national technology policies since the 1980s, and thus, the innovation system tradition has deep roots in the study location of HMA. Implementation and integration into the societal fabric is dependent on a society's values and traditions (Bristow 2010; Polenske 2007; Mayer 2007).

3. RESULTS FROM THE HMA

3.1. Data and methods

The main data source for the study was the statistical and geographic dataset on HMA business establishments maintained by Helsinki Region Environmental Services Authority in cooperation with the cities of Helsinki, Espoo and Vantaa. In practice, we have applied 10-year period (averages) from the June 2001 till the end of May 2011 as our unit of observation. This, in turn, is based on Statistics Finland's Register of Enterprises and Establishments, the data of which are obtained from two main sources: Tax Administration's registers and Statistics Finland's own surveys. Our database provides each establishment with exact coordinates according to their street address and we used these coordinates to place them on a 150m*150m grid, which we found apt for identifying the clusters. In our analysis we included only genuinely trading, at least "one-person year" enterprises.

Recognising the problems that accompany the visualisation of the locational data on a colour-scaled map (setting a certain scale of map necessarily either cuts off the highest concentrations of economic activity or blurs areas of weaker concentrations into unreadable zero-values) we opted for smoothing the data as a means to get a more realistic picture of cluster volumes. This was done by creating a map where establishments with more than 400 employees were pinned down with a box sized 300m*300m, whereas establishments smaller than 100 employees were marked with a 150m*150m box. As for the establishments with a number of employees that fell in between these limits, we used linear interpolation to determine their box size on the map. We still want to emphasize here that each of these boxes are placed on the exact coordinates of the respective establishment, that is, independently of the grid lines, and that the resulting map thus forms a sharp picture of the way enterprises spread over and cluster within the HMA.

3.2. Mapping knowledge-based clusters

1 2

The first task to perform is to identify cluster locations within the HMA. Figure 1 includes six maps illustrating the overall concentrations of economic activity (all companies) employing more than 100 persons (map 1 in Figure 1). The other map indicates the distributions and locations of knowledge intensive businesses as a whole identified here as "KIBS broad" (map 2 in Figure 1).

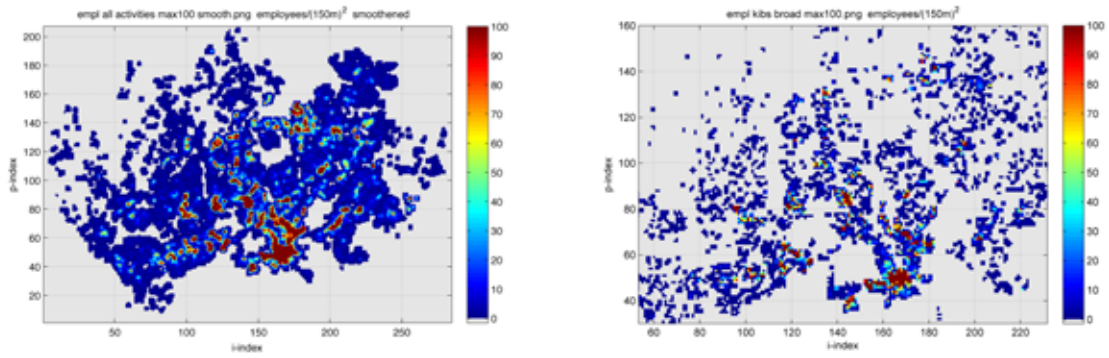

Figure 1. Economic clusters in HMA. The maps represent the spatial variation for 1) sum of all employees in 150m*150m grid cells in all establishments; 2) employees in KIBS broad (sum variable of companies employing more than 30 persons).

There are three main interpretations observable from the Figure 1. First, the geographical distribution of economic activity within HMA is presented in the map 1 of Figure 1 based on number of employee. We identified 25 clusters within HMA space and conduct the statistical analysis according to these clusters. The most significant employment cluster both in terms of total employment and KIBS activities is the centre of Helsinki. Second, KIBS clusters are relatively small in terms of their employment levels. They do have significant impact on the overall clusters but they present around one third of the current employment within the most knowledge-intensive cluster of the centre. Third, KIBS follow quite similar path compared to other more production oriented industries. They tend to accumulate to certain locations with variation factor of some 20%. This means that around every fifth KIBS locates to non-knowledge-intensive clusters and therefore they experience locational freedom.

3.3. Selected properties of cluster structures

We want also to focus on the economic importance of companies in respect to their age. We applied 10-year turnover average as an indicator of economic activity within each cluster. Figure 2 illustrates a compilation of four diagrams divided into the classes of KIBS. It indicates median turnover per employee within a cluster. In addition, it shows the significance of company age (years of operation) for the turnover per employee. This is important aspect as it indicates that how cluster

from each other in relation to employee efficiency pect to time. The figures also show the differentiation of nies according to their KIBS definition. Figure 2 y indicates that clusters in the HMA have their distinct profiles. All subsections comprising "KIBS broad" (Diagram 1 in Figure 2) have very distinct profiles. Particularly KIBS2 companies have highly specialized profile in respect to their cluster as there are two highly producing clusters (Vantaanportti and Nihtisilta-Mankaa) that have significantly higher per employee turnover adding ration compared to other clusters.

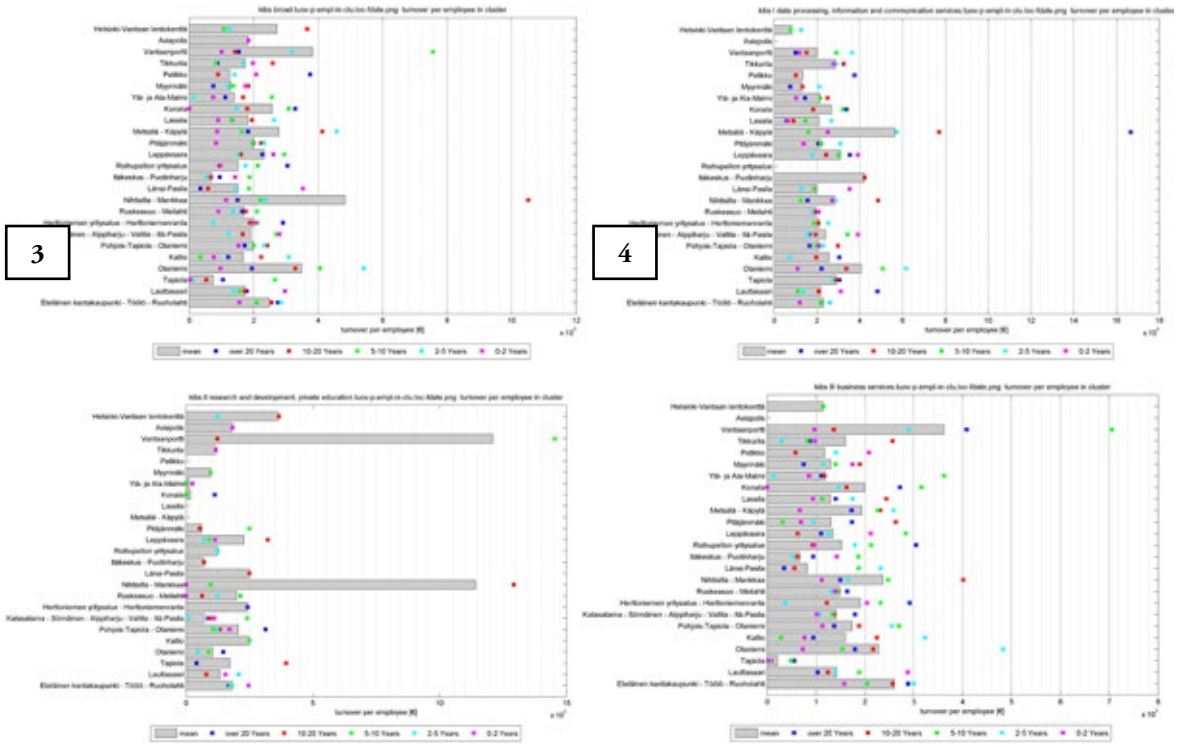

Figure 2. Identified 25 clusters and turnover per employee in 1) all knowledge-intensive companies (KIBS broad); 2) KIBS1 (data processing, information and communication services) 3) KIBS3 (research and development); 4) KIBS4 (business services). The charts indicate average addition to turnover per employee and the significance of the years of operation.

Figure 2 provides unique perspective on cluster dynamics in terms of turnover adding per personnel. First, the figure shows that there are great variations within each cluster on how companies of different life-spans perform. In some cases older (more than 10 years of operation) are more efficient than younger ones but there are also a number a clusters in which the relatively young companies (0 to 5 years of operation) have the most significant impact on cluster turnover adding. Overall the most efficient companies considering all clusters added together are those that have operated more than 5 but less than 10 years. The result may be interpreted as that enough time has gone for the companies to ensure their business model and simultaneously they have acquired enough reputation and experience to function efficiently. There are some cases in which start-up companies with life-span less than 2 years are the most efficient ones but those cases are rather rare. Only four clusters out of 25 gain the most efficiency from these young enterprises.

5. CONCLUSION

The cluster diversity is significant in the identified 25 clusters and the locational composition of knowledge-based development is not reflected as clear patterns in the data. Centrality naturally contributes to the number of employed but their total variations are too large to provide a coherent view on the locational processes of the knowledge-based development. The internal structures of clusters experience significant variations in terms of the number of cluster employment as well as economic efficiency in turnover adding. We applied the age of the companies (years of operation) as selected indicator. The analysis showed that the most successful per employee turnover adding companies tend to be operational between 5 to 10 years. The result also challenges to think about the older companies (more than 10 years of activities) as well established organizations that do not necessarily function as dynamically as younger freshly founded companies. However, there are significant variations in the data in this regard.

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PARALLEL SESSION 5: KNOWLEDGE-BASED BUSINESS AND PUBLIC SERVICES

MANAGING A CITY WITH KNOWLEDGE – FOUR SUCCESS FACTORS

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ABSTRACT

Purpose: This paper describes how the city of Tampere in Finland approached strategic knowledge management and systemized its knowledge-based decision-support.
Scope: Public decision-making requires timely information about the costs, customer needs, efficiency of operations, quality and effectiveness of services and many other important aspects of service provision. The paper describes how knowledge-based management was empirically developed in one case environment.
Method: The primary data for the paper was gathered in an intense action research process with city officials. This process included three development workshops and several preliminary and follow-up discussions where the contents of the workshops were planned, analyzed and iterated.
Results: The paper recognizes four success factors of public knowledge management and calls for a shift towards knowledge-based management in public domain. It also lays a foundation for developing a knowledge-based management culture in public organizations.
Recommendations: The paper recommends a strategy-originated approach for recognizing managerial knowledge needs. Performance improvement of public service provision should be the guiding principle for all development efforts.
Conclusions: At least in Finland it seems that knowledge-based development initiatives of public management are strongly driven by technology. A thorough understanding of service provision is missing and decisions are not focused on finding more productive ways of organizing services.

KEYWORDS

Knowledge management; Public management; public services

1. INTRODUCTION

Public services are provided by a complex and integrated service system where individual organizations interact and collaborate with each other to provide value for customers (e.g., Laihonen *et al.*, 2014; Grönroos and Helle, 2010; Spohrer *et al.*, 2007; Tucker and Pitt, 2009). Public management literature presents New Public Management (NPM) (Hood, 1995; Pollitt *et al.*, 2007) and New Public Governance (NPG) to respond to changes in public management practice. NPM highlights decentralization of decision-making, customer-orientation and management by results (e.g., Sanderson 2001; van Helden *et al.*, 2008). NPG on the other hand aims to understand the fragmented production and delivery of public services (e.g., Billis, 2010; Vuori, 2011). Both NPM and NPG pay only modest attention to information flows and knowledge process. Their main contribution in knowledge area relates to the recognition of knowledge as an important resource for public decision making and acknowledging that networked and systemic nature of public service provision increases the complexity of knowledge-based decision making.

At the same time, knowledge management literature states that "current examples of public sector knowledge management are narrowly focused and do not provide rich data on the strategies and experiences of those engaged in the process at the organizational level" (Edge, 2005, p. 45). Focus has been on the role of technology or e-government (Ling, 2002) or in some specific branch of public services, such as, police (Luen & Al-Hawamdeh, 2001), education (Edge, 2005; Syysnummi & Laihonen, 2014), and health care (van Beveren, 2003; Laihonen, 2012; 2014). Also the practical need for new understanding and solutions to support public decision-making at various levels of the system is high.

The paper aims to bridge the gap in current understanding about the role of knowledge management as a tool for supporting public management. The paper describes how the city of Tampere in Finland approached strategic knowledge management and systemized its knowledge-based decision-support. The remainder of the paper is organized as follows. Section 2 shortly discusses about the theoretical basis of the paper. Section 3 describes the empirical methods used and the process of developing knowledge-based management in Tampere. Section 4 reports the key findings of the empirical exercise. The concluding section summarizes the discussion and suggests directions for further research.

2. THEORETICAL FRAMEWORK

Three main phases can be recognized in public management thinking. Under *public administration* regime public services and organizations were managed with a hierarchical chain of command (Hartley, 2005; Osborne, 2010). The managerial knowledge needs related mostly to cost management and measurement of service outputs (i.e. units of service usage). Focus was on individual organizations and specific services, not on service chains and customer-perceived value. The role of a

client was passive. Nevertheless, the provided information served well the needs of hierarchal decision-making.

Criticism towards efficiency and effectiveness of public services was raised in many OECD countries in 1980s (Hood, 1995; Pollitt *et al.*, 2007). As a result, along with many other changes, new management techniques were applied as a part of the *New Public management* approach, which aimed to overcome the self-orientation of bureaucratic systems (Hood, 1995; Pollitt and Summa, 1997; Ongaro, 2004). There are some common trends among different applications of NPM but practices vary (Lane, 2000; Pollitt, 1993; Pollitt *et al.*, 2007; Sanderson, 2001; van Helden, 2005). For example, NPM introduced the decentralization of decision-making, which was followed by various outsourcing and privatization initiatives. It also focused more on service operations than organizational functions and structures. Furthermore, an underlying theme in all NPM approaches concerns employees' productivity awareness and management by results.

The most recent trend in public management is *New Public Governance* (NPG), which aims to understand the production and delivery of public services in a fragmented and pluralist society (e.g., Billis, 2010; Vuori, 2011). NPG has gained increasing popularity (Osborne, 2007; 2010) and can be defined as "the third wave" of public management (Klijn, 2008; Osborne 2007; Salamon 2002; Torfing & Triantfillou, 2012). An essential feature of NPG is that it does not completely reject earlier administrative reforms, but rather complements them with new solutions. NPG is based on the view that public administration is no longer able alone to control society, but the success is based on the partnership with the private and third sectors as well as with the citizens (Peters, 2011; Salamon, 2002).

Together with the management thinking, also the surrounding society has evolved and changed the landscape of public managers. Along with this development knowledge as a strategic resource and a source of competitive advantage has aroused a lot of academic interest (Barney, 1991; Grant, 1996; Spender, 1996). From this perspective, NPM and NPG have expanded managerial knowledge needs. Wiig (2002) identifies four areas of public knowledge management: 1) decision support, 2) public participation; 3) building of competitive societal intellectual capital and 4) developing knowledge-competitive work force. It is argued that knowledge management offers new options, capabilities, and practices to assist public administration in strengthening effectiveness of services and improving the society in general (Wiig, 2002).

Nevertheless, Edge (2005) states that the deficiency of the existing literature is that it has approached public knowledge management mainly from the technological perspective and concentrated predominantly on certain functional areas like, police (Luen & Al-Hawamdeh, 2001), education (Edge, 2005; Syysnummi & Laihonen, 2014) or health care (van Beveren, 2003; Laihonen, 2012; 2014). In case of diversified service provision, like within a city, it becomes challenging to develop a knowledge strategy. The literature suggests starting from the recognition of performance gaps and discovering where organization's capabilities do not match the intended "business" strategy (e.g., Earl, 2001; Zack, 1999). The next step is to ask how knowledge can make a difference in filling these gaps. Zack (1999) uses knowledge-based SWOT analysis as a tool and states that every strategic decision has a profound influence on knowledge, skills, and core competencies. In parallel, what an organization does know limits the ways it can compete. Thus, an analysis of organizations' knowledge assets (Edvinsson & Malone, 1997; Sveiby, 1997; Seetharaman *et al.*, 2002) lays the foundation for recognizing knowledge gaps and constituting a knowledge strategy.

Considering public management and management of a city in particular, the above would mean that the starting point for any knowledge management initiative should be a careful analysis of the city strategy and the underlying purpose and aims of public service provision. Knowledge strategy should be derived from the basic tasks and strategic objectives of the city. From this arise two interesting research questions to be explored in practice: 1) are the current knowledge-based management initiatives guided by the city strategy and are they organized to appropriately fulfill strategic objectives? and 2) what are the main focus areas in developing a knowledge strategy in public domain? Empirical part of the paper aims to provide answers to these difficult but essential questions of public knowledge management.

3. EMPIRICAL CONTEXT AND METHODS

Tampere is a city in southern Finland. It is the most populous inland city in any of the Nordic countries. The city has a population of 220,609. Tampere is the second-largest urban area and third most-populous municipality in Finland. The city is also the largest employer in the area (15 152 employees) and annual expenditure of the services is € 1,380 million. Welfare services (health care, social care and education) is the biggest sector (76 % of employees) and 59% of these services is provided by city`s own production.

In 2013, the maturity of city`s knowledge management was evaluated with fairly poor results. Unsatisfying results of the maturity analysis, earlier experiences on city's productivity program and various performance measurement initiatives laid the foundation for the research project concerning knowledge-based management. The primary data for the paper was gathered in an intense action research process between December 2013 and January 2014. This process included three development workshops and several preliminary and follow-up discussions where the contents of the workshops were planned, analyzed and iterated.

Three workshops were arranged with two different groups, one for each and one joint gathering. The two groups were: management group of knowledge-based management (steering-group) and more operative group of key actors around knowledge-based management. Participants of both workshops represented general management, information management, service management and administrative specialists. Each has their particular view to knowledge-based management, either as decision-makers or information producers. A dialogue between technical and service oriented

officials was considered necessary.

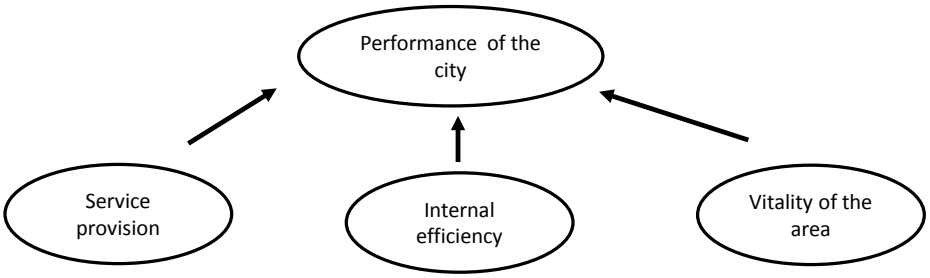
The aim of the process was to: 1) compose a shared understanding about knowledge-based management, 2) create a holistic view and rules for knowledge-based management within the city, and 3) specify the future steps for knowledge-based management. The focus of the first workshop with the management group was on the linkage of knowledge-based management and city strategy. This discussion acted as the starting point for the second workshop, which focused more on the concrete steps for advancing knowledge-based management. Two researchers participated to all workshops; while the other led the discussion, the other made detailed notes. The next section describes how the process was carried out in practice. The process reflects the new managing model, new strategic aims, customer-oriented approach and governance of fragmented service provision, which all call for new solutions also for knowledge-based management in public domain.

4. RESULTS

4.1. City strategy and knowledge-based management

To support knowledge-based management, various development tasks have been implemented during the last years. However, preliminary discussions with the city officials revealed that development work is scattered into unrelated projects and the overall picture is unclear. This has complicated both internal and external communication. Thus, it was considered important to connect knowledge-based management to wider, city-level objectives. This is expected to clarify the overall aim and meaning of knowledge-based management and ease the communication and building of a shared knowledge culture. The ultimate aim of knowledge-based management in Tampere is to improve performance of the city. Performance was considered widely to retain productivity, efficiency, quality and effectiveness of services. To concretize this overall aim, it was divided into three sub-objectives: service provision internal efficiency and new opportunities, as presented in Figure 1.

Figure 1. Knowledge-based management supports performance improvement.



Each sub-objective improves overall performance and was considered to encompass strategic focus areas (working together, preventive measures and narrowing disparities in well-being, vitality and competitiveness, sustainable community, balanced finances and innovative organization). In this way knowledge-based management becomes a central medium for implementing city strategy. Two main questions arise: ”What are the specific tasks advancing these aims” and ”What information and knowledge is needed in order to reach these aims?” answering these questions creates a basis for all knowledge-based development.

In addition to strategic aims, an important aspect of knowledge-based management is its connection to general management system of the city. It creates real knowledge needs, which helps in resource allocation and prioritization of information requests. Naturally, ad-hoc knowledge needs will still arise on a regular basis, which requires efficient organization and handling of these needs as well. Nevertheless, without a clear linkage to a basic task of the city, information provision and knowledge-based management remain detached from every-day operations and management. Thus, a knowledge-based management culture requires a tight linkage between service operations and knowledge strategy. Currently, this linkage was considered weak.

4.1. Main focus areas in developing a knowledge strategy in public domain

In workshop discussions, four essential tasks were recognized as the main development areas for knowledge-based management: 1) recognition of the leading indicators and other managerial information to support decision-making, 2) representing and modelling the information need, 3) gathering and presenting information, and 4) refining and analysing data and information. These are essential tasks of the support function enabling the actual knowledge-based management. Related to these, more concrete issues like reliability of the data (Master Data Management, Data Warehousing etc.) and definition of roles, responsibilities and tools were underlined in workshops. Currently, a clear juxtaposition between supply and demand for management information prevails. Information provision and strategic knowledge needs do not meet.

On the demand side, it is expected that recognition of the leading indicators creates a starting point for knowledge-based management. Both workshops recognized the need for special capabilities related to this task. In this role, a holistic

and in-depth understanding of the city strategy and the various paths for implementing it plays a crucial role. Service architecture and strategic objectives need to be assimilated in order to recognize and prioritize knowledge needs. Only from these, a coherent knowledge strategy and the supporting infrastructure can be derived and designed. Thus, understanding of the information infrastructure, information modelling and a basic understanding about the technological possibilities are needed as well.

There is also work to be done on creating a shared language between actors. For example, in the joint workshop, different interpretations between information management and service managers on the concept of 'service process' became evident. This relates and concretizes also a bigger change taking place in the public sector. When management focus is transferring to inter-organizational and cross-functional service processes a shared language depicts a crucial determinant enabling collaboration and knowledge sharing. Focusing on the leading indicators is expected not only to diminish the amount of knowledge requests received but also clarify where the management focus should be.

Finally, more from the supply perspective (3 and 4 above), refining and analyzing information is strongly dependent on the quality and reliability of the underlying data. Currently the quality of the data is not on a satisfying level. This problem is recognized and the city has already started a process for acquiring a master data management system, which should improve the quality of the data. This is not merely a technical process, it is important also to carefully design and implement a rigid process for guaranteeing the quality in the future. Again, these processes need to be developed and technological decisions made in line with the managerial information needs and strategic aims. Managerial information need and service architecture should guide the information provision and the related processes.

5. DISCUSSION AND CONCLUDING REMARKS

Contribution of the paper relates to two aspects. First, the paper links the literature on knowledge management to public management. Previously this has been made primarily within a certain service area or process (Edge, 2005). Here the focus was on strategic management and a city level perspective was chosen in order to gain a holistic perspective to public knowledge management. The paper acknowledges the continuously evolving public environment (Sanderson 2001; van Helden *et al.*, 2008) and considers how this should be taken into account in public knowledge management. Second, to knowledge management stream, the paper provides a practical illustration on how to apply knowledge management and to compose a holistic knowledge strategy for a complex service system like a city (cf. Hansen *et al.*, 1999; Zack, 1999; Earl, 2001) and thus implements a knowledge-based view in public environment (Grant, 1996; Spender, 1996).

The literature has considered knowledge management mainly as a group of separate tasks supporting public administration and management. The novelty value of this paper lies in the very simple argument – public management is increasingly about knowledge management. This paper calls for a shift towards more informed and knowledge-based management in public domain. Decisions should be based on the best available knowledge and lead to benefit of citizens. This puts knowledge-based management into a new role and a managerial challenge is to communicate this perspective.

Both the literature and empirical findings highlight the importance of connecting knowledge-based management to strategic objectives, recognizing knowledge gaps and aiming knowledge initiatives to fulfilling these. In public service systems, it is often difficult to compose a shared understanding about the objectives but the paper described how this was done in one particular service system. Then, the implementation of the cultural change rests on the management system. Strategic objectives need to be operationalized into units' and individuals' targets and these have to be regularly followed. This kind of knowledge-based and performance-driven culture is very slowly gaining ground also in public sector.

The issue of public knowledge management offers several avenues for future research. Highly important one relates to implementation and operationalization of knowledge-based management as a part of the general management system. Central question is "How to build a management culture, which relies on knowledge-based management and informed decision-making". And further, what kind of management system would be most suitable for contemporary public organizations. Other interesting research questions relate to the role of customer and knowledge that is needed to better respond and manage the increasing demand for public services. The main limitation of the paper relates to having only one case organization. On the other hand, it is also a key strength of the paper: the action-oriented approach of the paper made it possible to study the process of developing a knowledge strategy under certain contextual settings.

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INNOVATION STRATEGY FOR PUBLIC TRANSIT SERVICES USING PUBLIC-PRIVATE-PEOPLE-PARTNERSHIP

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ABSTRACT
This paper aims to investigate a current status and to propose an integrated service management system on the public-private-People-partnership (PPPP, 4P) of the public transit services. Objective of 4P in public transit services is to provide relevant information for knowledge-based understanding transit management problems and making decision. Therefore, 4P to monitor and evaluate public transit services of Daejeon Metropolitan City was organized in 2008. Taking the complexity and uniqueness of public transit services into account, this study proposes a systematic framework based on the principle of 4P to outline the elements and its associated guidance required for a knowledge-based public transit services. Furthermore, the concepts of the disclosure of public information and evaluation of public services are also embedded into such a planning for the purpose of offering a self-evolutional public transit services. Interactive transit service promotion mechanism can be established via cooperation between monitoring group of private sector and evaluation support group of academic and Non-Government Organization sector. The missions for monitoring group are to check periodically overall transit services based on evaluation categories and to report evaluation records to government on internet. On the other hand, the missions for evaluation support group are to build an evaluation and distribution of check lists and educate a member of monitoring group and propose prize and give an incentive to transit company according to result of self-improvement effort. Finally, the performance and overall scheme of 4P in public transit services of Daejeon Metropolitan City is used as a case study in this paper.

KEYWORDS
Public-private-people-partnership; public transit services; innovation strategy; information disclosure; knowledge-based management.

1. INTRODUCTION
A city can be sustainable by settling economic, social and environmental problems within the given scope of capacity and also executing the vision which the city is intended to under the agreement of all the members. In addition, in order to settle various problems which the city is faced with, the most important thing is to figure out the potential needs of users and innovative social scheme in the technology-oriented approach method. For example, in order to construct a sustainable traffic system, various traffic means like metro-bus-private car-bicycle, infrastructures of those traffic means like road-signal-traffic system, etc., the administrative or financial support and regulation policy of the local government, an evaluation of service and monitoring policy are required at the same time. Activities to construct a sustainable social and technical system and to improve a quality of life by settling those complex problems are forming a new market and demand so that they give a chance for technical innovation. In this regard, 'user-centered innovation' model catches an attention, which users actively participate in innovative activities to settle those city problems. Cooperation between innovative bodies has been mainly carried out to figure out a new possible innovation by public (the Government-private (enterprise and research center) partnership but, lately, the concept is extended to the PPPP (Public-Private-People-Partnership, 4P) which the users (civil society) participates in the PPP. The concept, Living Lab, established by 'Urban Transition Lab' and William J. Mitchell, the Professor of the Urban Planning Department at MIT in the process of the development for the sustainable improvement of some European cities is the typical case (Nevens *et al.*, 2013; Alcotra, 2011).

In this paper, an innovative strategy is introduced to improve public bus services in Daejeon using the concept of PPPP (4P) for promoting the public transport and its aim is to figure out the future development of the public transport. Furthermore, in order to settle the city traffic problems, national and international cases of the innovative strategies on the people's participation are compared and also supporting methods of traffic services are described in creative cities based on the knowledge including expert groups in this paper.

2. INNOVATIVE STRATEGY SUPPORTING PUBLIC TRANSPORT SERVICES USING 4P

2.1 Study of the Existing Cases

Since the mid-1990s, introduction and expansion of the ICT (Information and Communication Technology) such as IT, BT, NT, etc. which have been rapidly developed have brought a large change on the technology innovation. Spread of internet and mobile phone has largely effected on our life style and pattern (Yigitcanlar and Lee, 2013). However, as a result of the long-term introduction of one-sided growth, social polarization, severe environment problem, etc. have been taking place. In particular, in the transport discipline, the number of private cars has been extremely increased, which led to environmental problems such as traffic congestion, traffic accidents, noise, dust, etc. Also, all cities have faced the problems on the transport supporting services targeting traffic-vulnerable and lower income bracket so that the method to settle this issue has been figured out. There is an alternative to settle the traffic problem like bus, metro, etc. which is to promote the public transport and regarded as an alternative to find out the traffic congestion, environmental pollution and transport supporting services.

Various activities using experiences and knowledge accumulated in the daily life have been actively proceeded with worldwide by attracting citizen's active participation to be sustainable cities. Community-based innovation activities which community activities in a local unit is combined with the technology innovation and Living Lab sufficiently reflecting the point of view of users in the innovative process are the typical innovative activities the people (users) are participating in. The case that the activities of the user's participation are connected to the public transport service improvement etc. has not been figured out yet but, the reference can be carried out by PPPP application methodology in this Chapter. The community-based innovation is the concept combining the community action in a location unit with technology innovation and carried out on a basis of the social economy like a social enterprise and cooperative association. In addition, the community-based innovation stresses the joint and several cooperation between citizens and efforts on the common realization of the value rather than economic benefits. In other words, a renewable energy power plant is operated on the community-owned basis and provide the type of energy which users want to be supplied with and simultaneously the joint and several cooperation is reinforced by the method of the operation. Therefore, the Community Innovation for Sustainable Energy, CISE is the typical case in 12 bases targeting the local communities (Seyfang *et al.*, 2013).

In the meantime, the Living Lab, the user-centered innovation is for the users to actively participate in the innovation activities and is called the user-centered open innovative ecosystem constructed to sufficiently reflect the point of view of the users. It has been established by William J. Mitchell, the professor of the Urban Planning Department at MIT (Eriksson *et al.*, 2005). The Living Lab is the open innovative model settling the problems by active participating by the final users in certain spaces or regions and the development reflecting the needs of regions and users is carried out. Recently, the users are participating in the active development activities by providing the development idea. The Living Lab has been extended to the PPPP which public, private community and people are joining together from the existing PPP and the gap between steps of the technology development can be reduced by mutual operations. Also, since the Living Lab includes the participation of the users, cooperation between public and private sectors, open innovation and the utilization of the ICT, 4 factors, it has the benefit on the settlement of local problems and flexible treatment of the sustainable development issues (Alcotra, 2011). As of October, 2013, the Living Lab has been rapidly spreaded enough to be 345 and its trend is ongoing. 287 (80.6%) of 345 Living Labs are situated in Europe and 67 (19.4%) of the Living Lab are distributed in non-European countries. The activities of the Living Lab tends to be focused on the citizens and local society such as the energy, residence, traffic, training, health, etc. (Song *et al.*, 2013). As a result of the investigation on the activity disciplines of the Living Lab by Alcotra (2011), the development activities are highly connected to the actual living such as the energy, architecture, traffic, logistics, health, well-being, etc. accounted for over half of overall activities.

In the meantime, the PPPP cases in Korea exist in the environmental sector but there is almost no case on the issues related to the traffic. However, activities by citizen monitoring groups on the city bus service similar to the one in Daejeon are benchmarking the activities of Daejeon city so that it has been enforced in Seoul, Daegu, Jeonju, Gwangju, etc. Jeonju city is collecting an evaluation and information on 4 sectors, safe driving, operation status, the level of kindness, management of vehicle, etc. by approximately 100 monitoring members through 'Agenda and Meeting for Public Transport in Jeonju'. Also, the collected results are used to get the result report by the analysis and are utilized in the establishment of the policy in Jeonju and bus enterprises.

Table 1. Evaluation item of city bus by monitoring group in Jeonju

Description	Evaluation item
Safety operation	Sudden departure, sudden braking, sudden change of lane, Start driving while car door opening, overspeed, wild driving and violation of traffic regulation
Operation status	Non-stop, suspension of service, adequacy on mark of route and adequacy on automatic guide announcement

Level of Kindness	Attitude for passenger's question, driving attitude (whether using mobile phone), attire status of driver and considerations for the traffic vulnerable
Management of vehicle	Status of heating, cooling and ventilation, cleaning status of external vehicle, cleaning status of internal vehicle, damage of internal facilities and check on existence of major stuff

Daegu is also making effort to improve the bus service by evaluating the kindness of drivers, non-stop, violation of traffic signal, overspeed, wild driving, safety, guide announcement, status of facilities inside the buses, etc. by 300 monitoring members and 3 in each route of the city bus. In the meantime, in case of Gwangju checking 2018 drivers and 910 vehicles by 180 monitoring members, drivers and bus companies can get strong penalties depending on the result of the evaluation. After noticing the warning several times, it has a regulation to enable the stop of driving, suspension of the job, fire, etc.

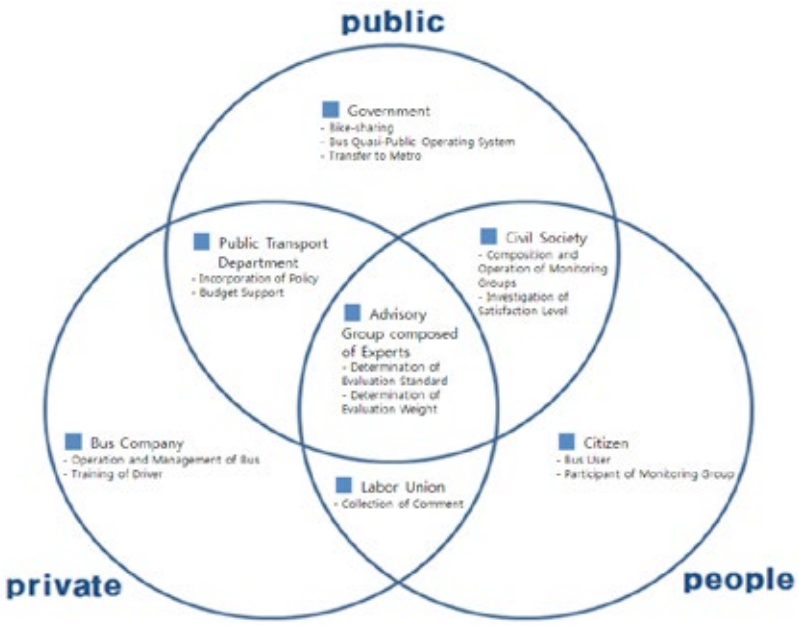
2.2 Concept of PPPP and Citizen Monitoring Group for City Bus Service in Daejeon

In order to improve the public transport system, the level of service should be maintained or improved to use the public transport again after citizens use it. To do this, in the process of the investigation on the satisfaction level of service targeting the users of the public transport, this paper introduces the case of Daejeon where systematic operation is carried out using 4P concept together with Public-Private-People.

The citizen monitoring group of city bus service in Daejeon established the plan on the service improvement of the public transport in common with the users introducing the 4P concept. Also, evaluation items and their weight were determined by the monitoring group to secure fairness of the evaluation process. The result obtained from the satisfaction investigation on the city bus service is to be incorporated into the next year policy by the city authorities and boost the public transport by improving the service for the users of the city bus and by modifying the evaluation items.

First of all, according to the activities and function of each participant body supporting the citizen monitoring group of the city bus service in Daejeon, municipalities (public) give a change for free transfer and sharing system to the other traffic means (metro, bicycle, etc.) to boost the public transport and introduce Bus Quasi-Public Operating System to provide low price transport service to citizens by constructing administrative and financial support. In the meantime, bus companies (private) regularly carries out the training for bus driving and control, and kindness and safe driving targeting drivers and have an obligation to improve complaints pointed out by the investigation on the satisfaction level of service. People act as a member of monitoring group for the city bus service and its user at the same time. Civil Society (in case of Daejeon, proceeding council of Daejeon 21) selected some monitoring groups of the city bus users and supported their activities. It carries out a critical role of the citizen monitoring group for the city bus service. In particular, the main bodies of 4P are the civil society representing citizen and public transport department and the labor union representing the bus drivers of bus companies. In particular, in order to fairly evaluate the service, the advisory group composed of professors, researchers, public services, broadcasts and civil society is in charge of the selection of the evaluation standard and determination on the weight in each standard.

Figure 1. Relationship of Public-Private-People-Partnership in Public transit service



Daejeon City has operated the citizen monitoring group of Daejeon city bus service since 2008 and the evaluation and information over 20,000 events have been uploaded by approximately 250 monitoring members every year including complaints and complimentary issues. The activities of the monitoring group are to find out kind drivers, high quality of the service, etc. and give them compliment and also to obtain the effect on the improvement of the service for overall bus companies and transport related persons. Some of the citizen monitoring groups in each route evaluate the use of buses from January to December every year and also drivers, the circumstances of the use and status of operation in detail.

- Driver: evaluation on attire, kindness, attitude of driving, etc.
- Circumstance of the use: guide announcement, cleaning, noise, mark, status of facility management, etc.
- Status of operation: evaluation on sudden departure, sudden braking, wild driving, etc.

Evaluation items have been composed almost the same every year and the score (weight of the evaluation) has not been largely changed. However, the evaluation items largely improved by deliberation of the advisory group composed of experts have been improved by deleting them or reducing its score. In particular, since the attire of drivers and a greeting level for passengers have been recently highly improved, which accounted for high weights in the initially introduced 2008, their scores have been reduced. According to the detailed evaluation items in 2012, 40 scores for safe driving, 20 scores for the kindness, 20 scores for the guide system and 20 scours for vehicle control have been distributed. In particular, the item recently introduced is whether drivers give a ride for passengers at the bus bay for their conveniences and safety.

Table 2 Evaluation item and score of the city bus service in Daejeon

Classification	Evaluation Item	Score
Safe operation and its status (40)	Sudden departure, sudden braking and sudden change of lane	10
	Use unnecessary klaxon, overspeed and wild driving	10
	Level of stopping at bus stop (non-stop, avoid access to bus bay etc.)	10
	Attitude of driving – use mobile phone etc.	10
Kindness (20)	General kindness (guide the route, consider the old, and passenger's movement and getting off, rough expression, etc.)	10
	Attire of drivers (get on uniform, tidy image, etc.)	5
	Greeting for passengers	5
Guide system (20)	Adequacy of guide announcement at bus stop	10
	Adequacy of guide mark(normality of route, LED guide panel, etc.)	5
	Status of driver's tablet and preparation of postcard to report inconvenience	5
Vehicle management (20)	Condition of internal vehicle (seat, window, lighting, bell for getting off, advertisement, bus strap, floor, etc.)	10
	Cleaning status of external vehicle	5
	Status of heating, cooling and ventilating system	5
Total		100

Therefore, it is considered that Daejeon city has continuously and systematically supported the monitoring groups since 2008 to boost the public transport and improve the service of the city bus and traffic service of creative city on a knowledge basis including experts and incorporated the result of the evaluation into the policy.

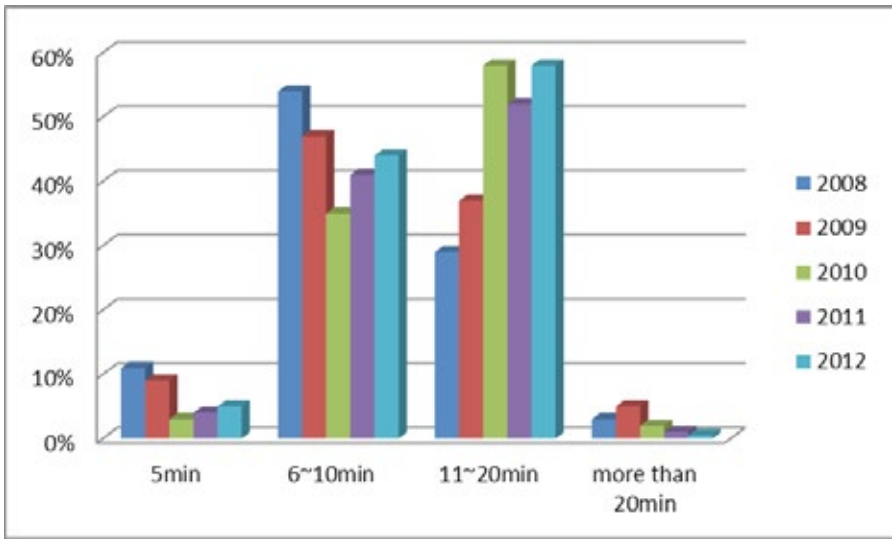
3. ANALYSIS OF SERVICE SATISFACTION BY MONITORING

3.1 Analysis Result of Service Monitoring

1) Confirmation of bus interval and arriving on time

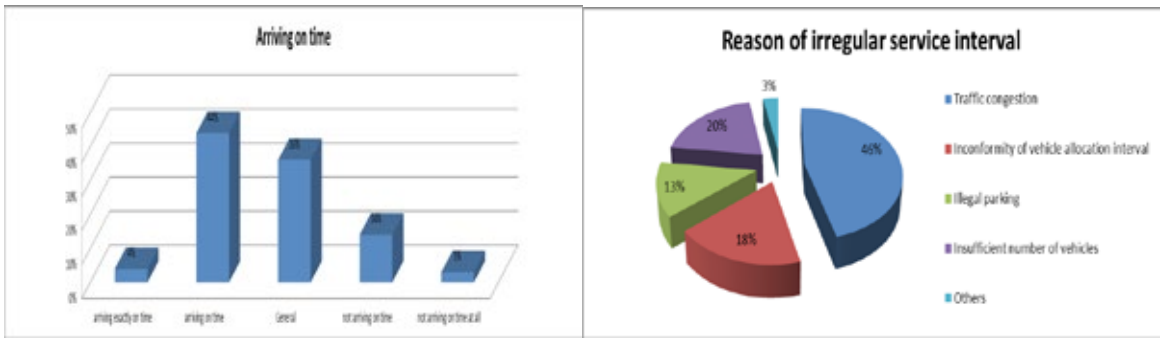
Among evaluation items, according to the result on the confirmation of bus interval and arriving on time, a waiting time was 57.9% in 2009, reduced to 38.6% in 2010, 45% in 2011 and 50% in 2012. For over half citizens of all, the waiting time was less than 10 minutes and 48% for 11 minutes ~20 minutes so that it was average 10 minutes. However, according to the analysis on the recent 4-year data, it is considered that the waiting time which citizens feel has been reduced.

Figure 2. Average waiting time in each year



For the question that the bus is arriving on time, 48% of respondents answered 'arriving on time' and 'arrival exactly on time' and the other 36% answered 'General'. The rest 16% answered 'not arriving on time'. For the main reason why the interval does not be regularly maintained, 46% of respondents selected 'traffic congestion' as the first reason and the others chose the insufficient number of vehicles, inconformity of the interval and illegal parking in order.

Figure 3. Arriving of the city bus on time and reason of irregular driving distance



2) Driving status by drivers and satisfaction level of the city bus

For the comment on the consideration for passengers, greeting and attitude, 38% answered 'kind' and 'very kind' which about 2% has been increased compared with the last year (36%), For conforming to the driving speed of drivers, departure and stopping, traffic regulation, etc. 38% answered 'satisfied' and 'very satisfied' which about 8% has been increased compared with the last year. For the issues which should be improved by drivers on the driving status, 28% selected 'required to be improved because respondents feel uncomfortable by a sudden start' and 14% pointed out incorrect stopping at a bus bay and violation of a traffic signal and the stop line.

Figure 4. Result of satisfaction on status of service and operation

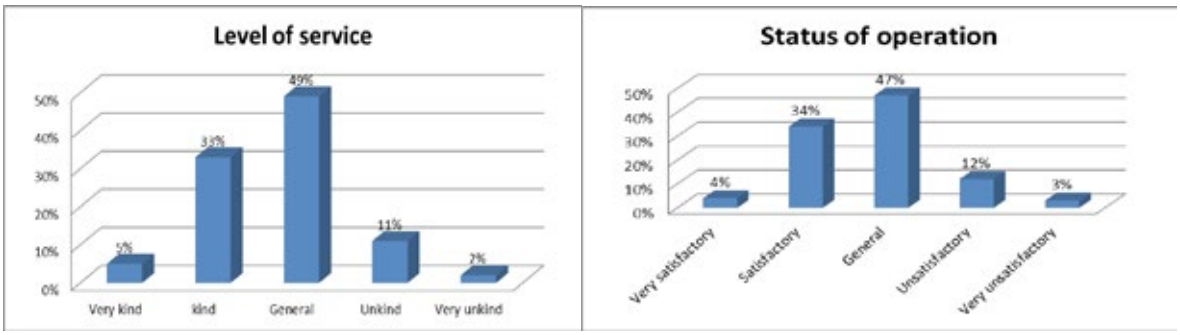
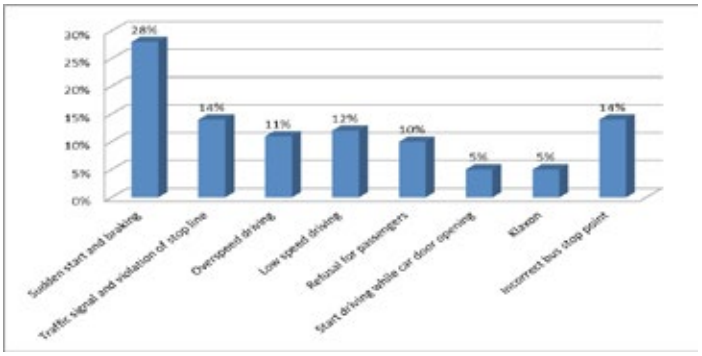


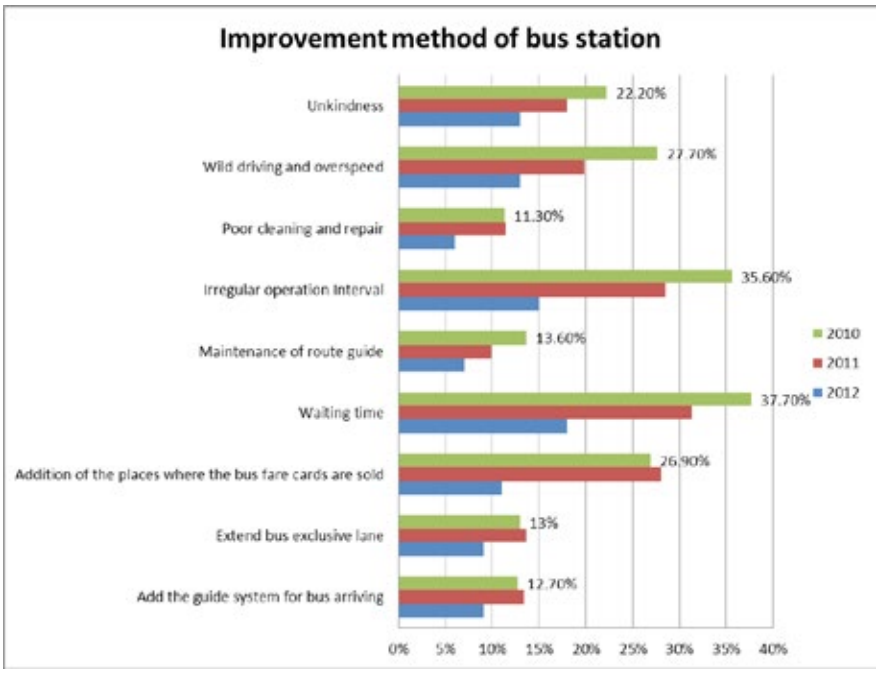
Figure 5. Improved items of drivers



3) Items to be improved

For the most improved issues for city bus services, 18% of respondents pointed out 'long waiting time', which showed the highest level. Also, 15% answered 'irregular internal of the bus operation' and 13% pointed out 'unkind drivers' and 'wild and overspeed driving' as issues to be improved. In addition, 11% suggested 'expansion of stores selling traffic fare cards' and 'expansion of bus exclusive lane' and 'additional installation of guide announcement system for bus arriving' were answered by 9% each. In addition, 7% proposed 'maintenance of route guide map at bus stops' and 6% pointed out 'bad condition for bus cleaning and repair' for the improvement.

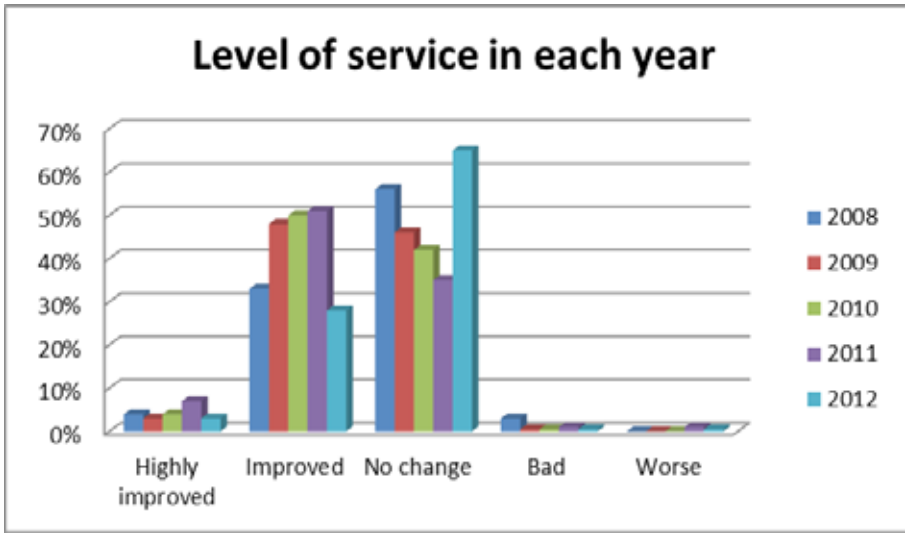
Figure 6. Improvement method of bus station



3.2 Result of Satisfaction Level After Monitoring the Services

For the satisfaction level of citizens for general city bus service in Daejeon Metropolitan City, 67% of respondents answered 'satisfied' and 'very satisfied', 27% answered 'so so' and 5% said 'unsatisfied' and 'very unsatisfied'. Therefore, it is considered that most of the Daejeon citizens have a positive recognition for the general service of the city bus in Daejeon. For the improvement of the city bus services since 2008 that civil monitoring groups had started monitoring, positive answers have been increased to 39.4% in 2008, 50.3% in 2009, 55% in 2010 and 59.8% in 2011 but 67% answered that there was not much difference on the service improvement, which was rapidly increased value. On the other hand, the comment that it has been worse has been reduced from 2008 to 2010 and a bit increased in 2011. However, the respondents answering that it had been worse has been a bit reduced in 2012.

Figure 7. Level of service in each year



4. CONCLUSION AND FUTURE STUDY

This study introduced contents of innovative strategy to improve the city bus services in Daejeon using the concept of PPPP and to boost the public transport. In particular, the innovative strategies based on the civil participation model are to organize the civil monitoring groups for the city bus service since 2008, improve the services and boost the public transport. Therefore, their outcome and efforts have been taken into consideration in this paper.

The efforts on cooperation of Daejeon City, bus companies and citizens brought the positive recognition of the general services on the city bus. Also, the complaints registered on the internet through the civil monitoring group were incorporated into the policy or improved so that the improvement structure with a virtuous cycle has been taken to be formed. However, since improvement of driving speed and securing arrival on time have not been improved due to the increased traffic congestion by the increased number of vehicle, it is considered that middle and long term plan should be carried out simultaneously by improving infrastructure and securing competitiveness of the public transport. In addition, other municipalities benchmark the experience and efforts in Daejeon for the civil monitoring groups on the city bus services. Based on that, it is necessary to construct traffic services of creative city based on the knowledge and also prepare the composition of organization for preparing the supporting method.

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PRIMARY SCHOOL ALLOCATION MECHANISMS IN TALLINN: PROPERTIES OF A HYBRID MECHANISM

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ABSTRACT
Within the first 20 years of the market economy in Estonia, the public school market has been decentralized in Tallinn. Firstly, we describe how students are allocated to primary schools in a narrative, and secondly, in a formal mechanism design language. We indicate the closest equivalent algorithms from the matching markets design theory and conclude that the current system is a hybrid. The decentralized part of the market – namely inter-district exam schools – apply autonomous school proposing deferred acceptance; and the centralized part of the market – intra-district regular schools – apply random serial dictatorship with enforced common utility functions. Finally, we show by an empirical evaluation of the mechanism that currently mechanisms fail to promote stability and efficiency, while hybrid mechanism is performing well in enforcing common utility.

KEYWORDS
School choice; mechanism design; school market; decentralised matching.

1. INTRODUCTION
Economists have gained significant experience (and fame) in practical market design in the recent years. The applications of the theoretical principles of market design demonstrate that institutions matter at a level of details that economists have not often had to deal with. Moreover, there has been much research into allocating primary school spaces to students in primary (e.g. Abdulkadiroglu & Sönmez, 2003; Dur *et al.* 2013), secondary (Dur *et al.*, 2013) and high schools (Abdulkadiroglu *et al.*, 2009). Much of this research is based on seminal papers by Gale and Shapley (1962) and were initially used for entry-level job markets such as the National-Resident Matching Program and others (Roth, 2008). The core of the curricula is to apply a central mechanism that collects information from market participants as preferences and finds the allocation that has some merits.

The existing matching mechanism literature is growing, not only by new cases and designs, but also by adding new problematic design areas, i.e. encouraging diversity using quotas or priority classes that in many cases can fail to enforce social justice (Dur *et al.*, 2013; Kominers & Sönmez, 2013; Fragiadakis & Troyan, 2013; Erdil & Kumano, 2012). However, to our best knowledge, there is no literature dealing with post-communist systems which were previously centralized and mostly school-proposing, but which have abandoned the previous traditional ways of matching and mostly decentralized their school markets over the last 20 years. Our attempt is to contribute to this research gap by adding a case-specific description of the struggle that such systems go through by constant amendments to the allocation principles and the administrative urge for an improved (or politically justified) match. Moreover, we suggest that such school-proposing mechanisms are in use in many other post-communist countries, and revelations of the faults and merits of the current systems reveal valuable policy implications not only for Tallinn, but also for other areas with similar systems in place.

As an empirical strategy, we naively compare the seat allocations of the Tallinn mechanism to other well- known mechanisms, such as the deferred acceptance and Boston mechanisms, by using data from the centralized database, e-kool (e-school). The e-kool database is an electronic register where approximately 4000 7-year old children with known home address list their school preferences annually. There was a somewhat special situation in 2011, when students could apply to any school in Tallinn (as intra-district policies were abolished). Before and after 2011, only inter-district schools have been privileged to accept student from other districts. Obviously the results can only be interpreted under the assumption of a truthful preference revelation, which might not always be the case.

Our research strategy is as follows. First, we describe existing literature, highlighting the properties of the mechanisms, mainly stability, efficiency and strategy-proofness. We also list the popular mechanisms and causes of the recent changes in choice policies. The second section is entirely dedicated to Tallinn's school choice mechanism, giving interpretive ground and case limitations, but moreover aiming at 'translating' administrative decisions and legal regulations into a mechanism design language. The following section comprises the main body of the analysis, revealing the features of the current mechanism through empirical tests. Finally, we conclude by highlighting the policy implications for Estonia and for other decentralized markets.

2. LITERATURE OVERVIEW: MATCHING MECHANISMS

Our main aim is to reveal properties such as stability and efficiency in Tallinn's allocation mechanism. For this, we first briefly review some school place allocation algorithms that are or have been used mostly in the US and UK, the most infamous being the Boston mechanism. The literature gives us insights into their good properties and the trade-off between them that centralized markets allow to gain.

2.1 Student-optimal deferred acceptance

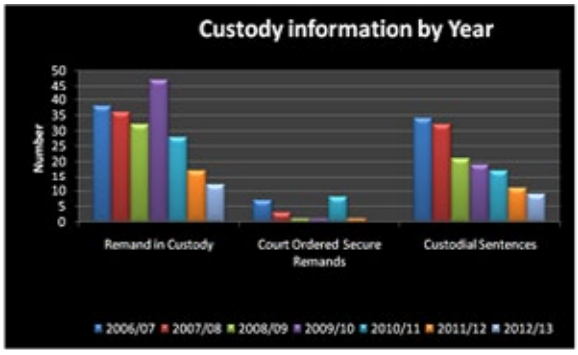
Deferred acceptance (DA) is the best- known principle (Roth, 2008), with many applications including school choice. Given student's preferences over schools and school priorities over students', the student proposing DA determines the match using the following procedure:

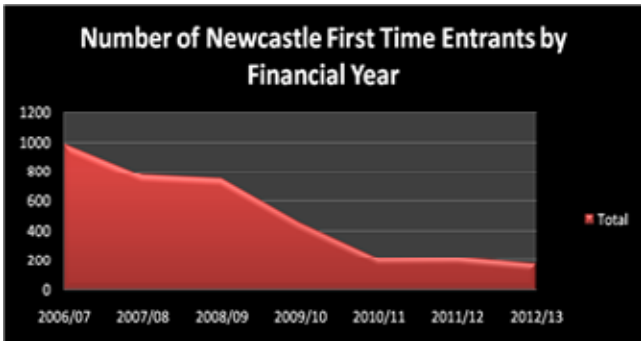
Round 1: Students apply to their first choice. Schools reject students not on their priority list and students who are over the school's capacity. Assign others tentatively to the school.

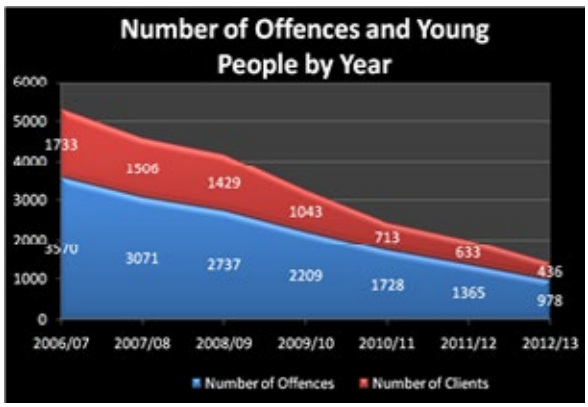
Round k: Students previously rejected apply to their second-choice school. New proposals and students on the tentative list are considered, and applications on schools' priority list that are not over school's capacity are tentatively accepted. Reject others.

Terminate algorithm when there are no more proposals: i.e. all students are assigned to a school or rejected by all schools in their list.

The important properties of allocation are stability, strategy-proofness and efficiency. Stability means that (a) no student is preferred for a place over his current match in a school that also has a higher priority for the current student (such pairs are called blocking pairs), (b) every student weakly prefers his assigned seat to any remaining unassigned. Thus, the stable mechanism eliminates justified envy – it has no blocking-pairs. Strategy-proofness means that the outcome is not vulnerable to manipulation, indicating that for each student, the dominant strategy is to state true preferences for schools; in other words, students cannot do better than by stating their true preferences. Efficiency means that allocation should promote students or schools' welfare. In the case of Pareto efficiency, it is granted that an individual's welfare cannot be increased without hurting others'. In most cases, it is specified whether the mechanism promotes only the student's (or in peculiar cases only the school's) welfare. In school choice, because of its properties, a popular mechanism is often referred as a student optimal stable mechanism (SOSM). The particularity of the SOSM is that it offers stable matching which is best for the students, meaning the proposing side (Abdulkadiroglu & Sönmez, 2003; Roth, 2008), but this does not mean that allocation is efficient. The latter points to the fact that, in recent literature, strategy-proofness or non-manipulability is the most referred desirable characteristic of matching mechanisms over alternatives such as efficiency and welfare gains







(Ergin & Sönmez, 2006; Chen & Sönmez, 2006). However, some recent research also shows that, in some cases, Boston-type mechanisms over-perform SOSM (Abdulkadiroglu *et al.*, 2011; Featherstone & Niederle, 2011) in terms of efficiency without any considerable loss in stability. It is the case that more (Pareto) efficient matching can be found by breaking

the stability requirement. For example, top-trading cycles allow Pareto improvements. This could be desirable and welfare enhancing when one side (schools) does not have a strict preference over the alternatives.

2.2 First preference First and Boston Mechanism

First preferences first (FPF) is a mechanism that gives priority to students according to their (parents') stated preferences, and has been used mostly in England (Pathak & Sönmez, 2011). It is a hybrid between the DA (SOSM) and Boston mechanisms. The latter gained its name due to its being applied in Boston, MA, until 2005 (Abdulkadiroglu & Sönmez, 2003). The Boston mechanism works as follows:

Round 1: For each school, consider the students who have listed the school as their first choice. Assign these students to the school in priority order (e.g. based on distance and siblings) until no more places or students are available.

Round k: For each school that has free places, consider students who have listed the school as their k-th choice. Assign these students to the school in priority order until no more places or students are left.

The procedure terminates when each student is assigned a place in a school or no more places remain available.

Besides Boston, this mechanism has been used in many US and UK school districts (Pathak & Sönmez, 2011). However, it has recently been abandoned in many school districts and substituted mostly by DA because of its strategic complexity and openness to manipulation (Abdulkadiroglu *et al.*, 2006). The latter means that it discriminates against some students because of how they ranked schools and thus makes them act strategically by misrepresenting their preferences. Moreover, Boston suffers from instability, as it can result in blocking pairs and may thus prevent the elimination of justified envy.

The mechanism used in England (FPF) is slightly different from the Boston mechanism. There may be two types of schools: for one set of schools, the allocation mechanism is DA, and for the rest, the Boston mechanism is used. This means it is a hybrid. The mechanisms are executed sequentially: first, students are allocated to DA schools, and the remaining students are considered for Boston mechanism schools. Thus FPF has the same strategic properties as Boston and in 2007 it was ruled illegal and substituted mostly by DA (Pathak & Sönmez, 2011).

Despite the fact that the Boston mechanism has created a general rule of thumb for the manipulation of preferences (Pathak & Sönmez, 2008), there are still different levels of sophistication among families who participate in the mechanism. One possible school strategy is to avoid ranking two over-demanded schools as their top choices (ibid. 2008: 1637). Recommendations were made to give a popular school as a first choice, plus a 'safe' second choice. As a result, Pathak and Sönmez (2008) showed that the Boston mechanism is a coordination game among sophisticated students. Thus, 'levelling the playing field' by diminishing the harm done to parents who do not strategize or do not strategize well is emphasized as a condition in designing an appropriate mechanism.

2.3 Top-Trading Cycles and Serial Dictatorship

One candidate for an alternative choice mechanism is top trading cycles (TTC), a mechanism that has been discussed in several contributions (Abdulkadiroglu *et al.*, 2006; Abdulkadiroglu & Sönmez, 2013), that does not consider schools' priorities as strict preferences. It allows for the option of two students with a preference for the other's place to swap, regardless of the school's priorities or preferences. It might be the case that a student is assigned to a school for reasons of proximity or because a sibling attends the school too, but the student would prefer to go to a different school. In that case, with TTC, the student is considered as having an option to exchange his seat with a student assigned to a different school, where the first student does not have such a high priority.

Moreover, TTC reduces to serial-dictatorship (SD) when all schools have the same priority ordering over students (Abdulkadiroglu & Sönmez, 2003). SD will order students by some sort of procedure, mostly by test results or similar, giving the most able priority in the choice of his top preference. Abdulkadiroglu and Sönmez (1999) discuss the possibility of using random SD, which orders students using a lottery, and assigns them to their top choice, the next student their top choice among the remaining slots, and so on. This random SD is not only Pareto efficient, but also strategy-proof. That is, a truthful preference revelation is a dominant strategy for the student (or their parents). The limits in using such mechanism is based on local policies or community preferences, which often prioritize students according to distance from school or those whose siblings already attend the school. Therefore, it will be problematic to use a single lottery to create initial positions. However, it is possible to consider that some places within the schools may be allocated through random serial dictatorship. However, the student admission mechanism should be flexible enough to give students different priorities at different schools.

Table 1. Properties of the mechanisms

Mechanism	Strategy-proofness	Stability	Efficiency
Boston	No	No	No
First Preference First	No	No	No

Deferred Acceptance (Student Proposing)	Yes (for students) No (schools)	Yes	No
Deferred Acceptance (School Proposing)	No	Yes	No
Top Trading Cycles	Yes	No	Yes
Serial-Dictatorship	Yes	No	Yes

Thus, the guiding policy is to promote student welfare to the extent possible as TTC introduced by Abdulkadiroglu & Sönmez (2003). According to TCC, initially every student and school is available.

Round 1: Create a graph where each student indicates her top-choice school and simultaneously, that school indicates their top-choice student. If there are cycles, assign students to schools in a cycle. Every student is part of at most one cycle.

Round k: Among remaining students and school places, create a graph where each student indicates her top-choice school and simultaneously that school points to their top-choice student. If there are cycles, assign students to schools in a cycle. Every student is part of at most one cycle.

The process terminates when all students are assigned or when there are no available places in any school.

TTC does not necessarily produce a stable matching. We can interpret stability as a proxy for eliminating justified envy. Thus, the policy choice here indicates the trade-off between efficiency and equity (elimination of justified envy). TCC (and SD) promotes welfare while DA promotes equal treatment of students.

3. TALLINN SCHOOL MARKET

We are interested in contributing to the many-to-one matchings in two-sided markets research. We investigate the specific cases or the microstructure of the decentralized and centralized markets. Moreover, we show that even in decentralized cases, the DA algorithm was discovered by trial and error. This may be due to the fact that DA captures the idea of how decentralized markets should operate. But this explains only one part of the Tallinn school market, specifically the oversubscribed inter-district schools, which are also not without problems. Admission to intra-district schools was centralized after 2011 and a version of SD is applied to find a match.

3.1 Background: Admission policy and market reform in 2011

Before 2011, the gradual evolution of the distinction between inter- and intra-district schools became a widely accepted policy (for a more detailed description, see Põder & Lauri, 2014). Over the years, some schools in Tallinn have become over-subscribed. These schools have inter-district admissions to primary school and have all introduced aptitude entrance tests (hereinafter exam schools). For intra-district admission schools (hereinafter regular schools), the tradition has been a central or semi-central catchment-based allocation based on an application (single preference) from the parent.

In 2011, the admission procedure was changed. This was the year of the so-called free market – the distinction between inter- and intra-district schools was abolished. All schools had autonomy over student intake, which most often took the form of aptitude tests. Latter means that in 2011 all schools could use preference orders over students, and parents (or students) would have the option of applying to whichever school they deemed best, while information about school preferences was not public. The admission procedure was decentralized, but students still had to register their applications centrally because, in the event that they ended up without a place, final allocations would be made by the commission.

After the applications were submitted, schools ran either aptitude tests or some sort of an interview with the students. This was independently organized and without any central guidelines. Based on their preferences, schools started making independent offers to students. Mechanism works as follows:

Round 1: Schools make offers to top students based on the exam results. The student accepts his preferred offer and rejects the others. If the proposing school is not a first choice for the student, it is unclear if a student should accept, as a preferred place may open up in following rounds.

Round k: Schools that have free places make offers to top students that have not already accepted or rejected them. The students accept an offer from their top choice and reject any previous offer they might have had.

Procedure is terminated when the end date is reached.

We propose that in 2011 the decentralized market applied a school-proposing DA (ScDA) that is optimal for neither student nor school for several reasons. Firstly, the decentralized nature of the aptitude tests makes students think strategically about the schools (total number and specific schools), as they have time constraints when taking tests (high opportunity cost of presenting truthful information). Secondly, due to the time constraints (on the application procedure) the algorithm may be considered to have terminated mid-run, indicating that it has not yet reached an optimal stable allocation. Thirdly, we may speculate that due to the nature of the school offers, the algorithm does not produce student optimality (equivalently to SOSM).

3.2 Admission policies from 2012 onwards

From 2012 onwards, policy reverted back to the previous model where some (exam) schools had the option to state their preferences for students while for other (regular) schools students were assigned centrally. Eight over-demanded exam schools or classes still had decentralized admissions similarly to the procedure already described in 2011. However, there have been some minor modifications. All the examinations are run on the same weekend to force families to think more clearly about their preferences, which can of course become a more strategic choice than it used to be. Students, in addition to their preferences, now have to consider which school they are more likely to be accepted to. This limits the number of preferences parents are able to submit, while schools had the hope to shorten the application procedure and thus find a more efficient match for the proposing side.

In addition, the application procedure to regular schools has been changed. Firstly, regular school applications have been limited to three options, i.e. the parent has the right to list three schools, but these are not considered as an ordered list. Secondly, the application can contain information about siblings and their school. Centralized school priorities are considered as follows: (1) siblings, and (2) distance from school (in meters) from the officially registered address. We argue that in regular schools, a centralized matching common utility SD (ScSD) was used, by the latter, we mean the sort of school selecting one-at-a-time matching, where the students are considered in a random order. Thus, we define 2012 Tallinn mechanism as a hybrid:

Step 1: Students are assigned to exam schools based on decentralized schools proposing DA (ScDA) algorithm;

Step 2: Remaining students are centrally assigned to regular schools based on SD mechanism using priority lists drawn up by local authority (ScSD).

2a: Create randomly ordered list of students.

2b: Assign first student to the school that has highest priority over him.

2c: Assign next student to the school that has highest priority over him. When the school where the student has the highest priority is full, consider the next school and if two schools have the same priority (which is unlikely to occur in real life, e.g. in cases where child has siblings in multiple schools or if two schools are located equidistant from a particular location) consider parental preferences.

School priorities are set by the principle of 'common utility'. The following priority classes are used in Tallinn: (a) siblings in the same school; (b) distance from home (in kilometers).

The admission process to the exam schools takes place between January and March. We note that it has been shifting from March (in 2012) to February (in 2013) and even to January (in 2014). The second stage (step 2) in regular schools starts on 1 March with the submission of an electronic application to the e-school register. Central but manual entries are made by 25 May. By 10 June, parents must either accept or decline offers. There is late and decentralized round of applications open after 15 June.

4. PROPERTIES OF THE TALLINN MATCHING MECHANISM

In this section, we use data from the e-kool electronic register. Annually, approximately 4000 students each year start school in Tallinn, and there are around 60 elementary schools. We investigate the characteristics of the Tallinn 2011 (market experiment) and hybrid mechanism (after 2011); and compare these to DA, TTC and Boston.

4.1 Naive analysis of the mechanisms

One primary concern is that the current design and implementation of the Tallinn hybrid mechanism and Tallinn 2011 will hurt participants, mainly students, the very people it is intended to help.

Observation 1: Tallinn hybrid mechanism for the exam schools – School proposing DA (ScDA) – can be stable but may not be student-optimal.

Roth (2008) demonstrates that school proposing DA need not be strategy-proof for the schools or students, intuitively since schools have multiple places they have more options for manipulation. From the students' perspective this could also be considered as group strategy-proofness, where a group of students cannot manipulate their preferences for a better outcome.

Excluding discussion about the unacceptability of the allocation of primary school places using test scores or some other ability measures, we observe that most of the current problems related to the exam school mechanism are inherited from the decentralized nature of the process. As the decentralized acceptance process has a time limit, it may force students or schools to close the allocation before finding an optimal match.

Observation 2: common utility random SD (ScSD) is not stable and does not promote welfare for the students, but is strategy-proof and promotes school (policymakers') welfare.

Firstly, common utility SD considers students in serial – the precedence order is either: (a) alphabetical; (b) random; (c) based on timing (who has made application first) etc.; and secondly, students are matched to the school that has highest priority over the student. The latter currently means that a student is assigned to the school closest to her regardless of her preferences.

Currently, we assume that in Step 2a as described above, a random serial is created. In Step 2b and 2c ties are seldom. We

observed by example that ScSD part of the hybrid (Step 2) can be unstable similarly to TTC. The latter indicates that the mechanism does not eliminate justified envy and thus does not promote equity. Whether or not this is acceptable in 'good policy design' is debatable, even if instability is compensated by efficiency (students welfare enhancement). Currently, the latter must not be true either. However, school proposing (or common utility) nature of the mechanisms can promote schools' (as proposing side) welfare.

In addition to the 'bad' properties of the ScSD, we also note additional costs to welfare and equal treatment of the students imposed by human error. This is revealed through an empirical investigation of the mechanisms.

4.2 Empirical results: comparison of the allocations

We conduct an empirical investigation of the matching mechanisms in two consecutive years – 2011 and 2012. First, 2011 was the year that Tallinn officials gave up any kind of zoning or other distance-based priorities, and decentralized the market. This experiment lasted only for a single year and was transformed to a semi-centralized (hybrid) market in 2012.

Table 2: Welfare of the students: Preference utilization

Rank	TTC	StDA	ScDA	Tallinn 2011	Tallinn Hybrid
1st	3159 (73)	3017 (69)	3017 (69)	2619 (60)	1101 (25)
2nd	287 (7)	382 (9)	382 (9)	525 (12)	283 (7)
3rd	116 (3)	133 (3)	133 (3)	230 (5)	132 (3)
4th	57 (1)	67 (2)	67 (2)	139 (3)	63 (1)
5th	31 (1)	44 (1)	44 (1)	70 (2)	29 (1)
…					
Total	3669	3669	3669	3646	3677
Blocking pairs	430	0	0	2020	1859

Notes: Percentages of total number of applications (4346) in parentheses. * There are 2040 students (50% of applications) who were matched to the school that was not in their preference list. One student can appear in many blocking pairs.

There are some simplifying assumptions made compared to the actual mechanisms. Firstly, in Step 1, exam school preferences are not represented in exam scores (which are unknown to us), but in distance between the home address and the school. Secondly, in Step 2, similarly to the case of regular schools, we simplify the common utility function by assuming that for the community, only distance from the school matters – meaning that social welfare is obtained by minimizing each student's distance from the school. In both cases, we measure direct distances (not by road) in kilometers between school and home address.

We report results in two tables. Table 2 shows the properties of the match from the students' perspectives. We report preference utilization and number of blocking pairs. Table 3 similarly looks at the proposing side, or schools. Here, we show the average distances and their distribution by frequencies in Figure 1. Distance can be interpreted as a common utility obtained by applying different allocation principles.

Table 3: Welfare of the society: Priority utilization

Mechanism	Mean distance (km)
TTC	1.29
StDA	1.14
Tallinn 2011	2.03
Tallinn Hybrid	1.05

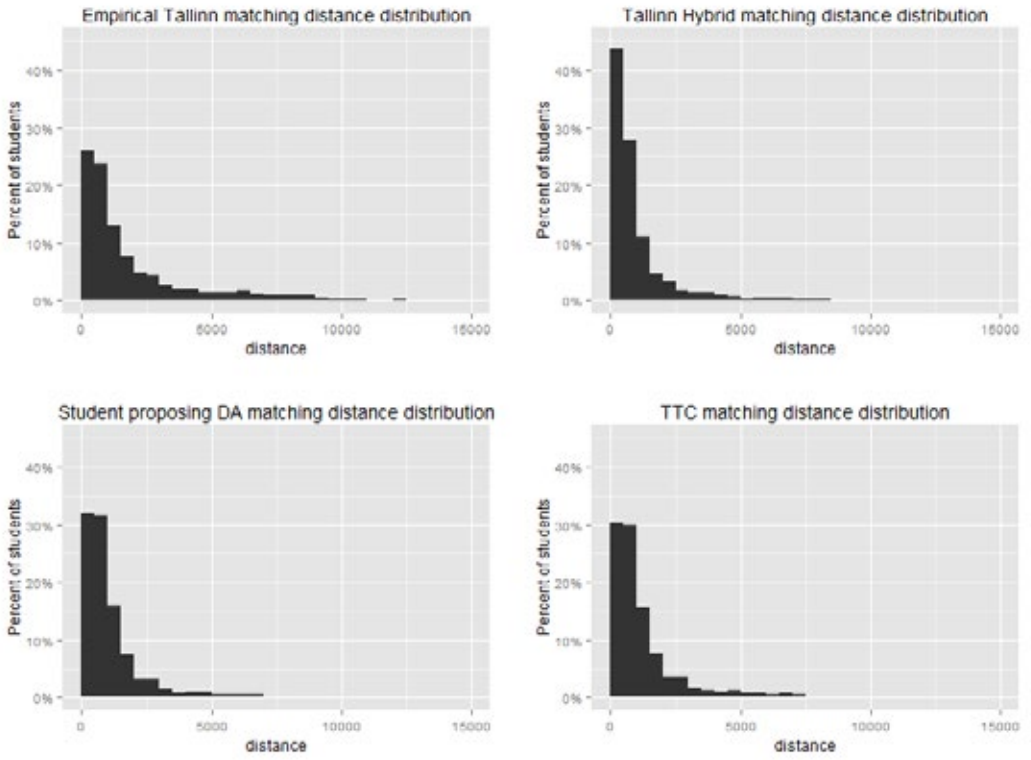
In all cases, there are 4346 students in total, while 1233 of them applied to exam schools. In the proposing side, there are 59 schools, 8 of them are exam schools and the rest are regular schools. At the same time in public schools 3677 places were finally allocated, indicating that approximately 700 students must have some sort of outside option – private schooling, a school in another municipality, home schooling etc.

In Table 2 we observe that the decentralized (manually executed) DA (Tallinn 2011) produced slightly fewer matches in total than the centralized DA algorithm. In addition, students' preference utilization is worse, including multiple blocking pairs. Interestingly, there is no difference between the student or the school proposed DA, which means that schools cannot really manipulate the matching. As expected, DA is somewhat less efficient (from the student side) than TCC, indicating that some students can swap for a more preferred school.

Conclusively, the naive comparative analysis is able to demonstrate that "Tallinn 2011" (decentralized ScDA) is hurting students through instability (not envy-free) and also through efficiency (not student-optimal allocation). Moreover, we are

interested in the empirical properties of the "Tallinn Hybrid". There were two steps – in the first step, exam schools were considered. There were 1233 applications to these schools and 522 places (2.4 students per place). Those who remained unmatched in the first step applied to the regular schools in the second step, where there were 3972 students and 3709 places. In total, the hybrid allowed more students to be matched than any alternative mechanism. However, the hybrid system's ability to promote student welfare is very limited, as approximately half of the students were assigned to schools that they did not apply to. In addition, the mechanism suffers from instability.

Figure 1. Distance distributions.



Note: We report only four distributional plots, because student and school proposing DA have overlapping matchings.

From the schools' side (Table 3), we noted the mean distances between schools and students' home addresses. As intuitively expected, the "Tallinn Hybrid" gives us the shortest distance when compared to the alternatives. Most of all, it is obvious that the manual and decentralized DA (Tallinn 2011) is the worst from a societal perspective in minimizing distance. By giving more consideration to student preferences, we only slightly loose on overall average distance, while assigning many more students their first preference. This is again evidence that the decentralized market suffers from timing problems or/ and human errors.

More detailed comparison of the distances is in Figure 1, which shows that the empirical "Tallinn 2011" creates distribution with a flatter tail – there are even some students whose school is more than 10 km from home (Tallinn covers an area of 159 km^2). Centralized DA has, on average, worse results than the hybrid, but it has a lighter tail.

5. CONCLUSION

We deconstructed the current Tallinn mechanism being used for primary school place allocations and found it to be a hybrid of the decentralized school proposing deferred acceptance algorithm for inter- district exam schools and a centralized common utility serial dictatorship for the intra-district regular schools. The latter is a mechanism where students are randomly listed and matched many-to-few, according to school priorities which we have named common utility. There are currently two priority groups (without quotas): siblings and distance from the school.

To the best of our knowledge, this hybrid is not an often-referenced mechanism in school choice literature, i.e. Abdulkadiroglu (2011) describes the high school mechanisms in Boston Public Schools as a relatively similar, albeit student proposing, procedure. Similar to our Step 1 in the hybrid, Roth (2008) has described decentralized matching markets in other situations. One example of the hybrid mechanism (Boston or first-preferences-first) have been outlawed in the United Kingdom mainly because applicants must misrepresent their preferences in order to get into a preferred school, but not all manage to determine what the optimal manipulation might be (Pathak & Sönmez, 2011). We see some similar tendencies in the case of Tallinn. First, decentralized entrance exams limit the number of preferences submitted and make students act strategically, that is, not choose the most competitive schools, even if they are at the top of their preference list.

Second, the decentralized nature of the market does not absorb all the benefits from deferred acceptance, because of the time limit. We argue that neither of the mechanisms in the hybrid are without the problems of instability and inefficiency. However, school proposing deferred acceptance need not harm the equal treatment (stability) property of the mechanism. In addition to the possibility of harming student welfare, the problem arises from the decentralized and time-limited execution of the algorithm that has also been observed by Roth (2008) for some markets in US.

We proposed that common utility serial dictatorship is not stable, indicating that despite the 'common utility' promotion, it does not eliminate justified envy. In addition, it also does not enhance welfare for the students. In addition to these failures, the final match hurts students much more than the algorithm would suggest, due to manual execution. Thus, the outcome is either human error or discretionary manipulation. While we propose that common utility serial dictatorship can be non-manipulable from the students' side, non-manipulability, which means that it is safe to reveal preferences to the market mechanism (without any sort of manipulation with preferences or other attribute of the mechanism, i.e. priorities) is put under question.

As an empirical conclusion, the differences between central deferred acceptance and decentralized "Tallinn 2011" indicate the efficiency and stability losses created by manual (intentional or unintentional) treatment of the algorithm. Market clearing is not currently the case, meaning that the decentralized mechanism is not solving congestion and is not finding a solution within a reasonable period of time. In addition, it may be that discretionary procedure allows the manipulation of the mechanism by the assignment commission. Decentralization has its cost, meaning that "Tallinn 2011" indicates a much higher average distance from the school than any alternative (including the hybrid).

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PARALLEL SESSION 6: THE ROLE OF UNIVERSITIES IN KNOWLEDGE SOCIETY

IMPROVING THE WELFARE AND PROSPERITY OF CITIES: EXPLORING THE RELEVANCE OF KBD RESEARCH

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ABSTRACT

Purpose: This conceptual paper explores the managerial relevance of KBD research.
Scope: First, the importance of knowledge as a managerial issue is discussed. Second, the nature and limitations of academic work are examined.
Results: This paper argues that too much of todays' academic research on KBD is oriented towards publishing in highly ranked journals while the more pragmatic knowledge needs of the managerial community are not sufficiently met.
Recommendations: In order to improve the managerial relevance of KBD research the projects should be more practice-driven, case-specific, multidisciplinary and multimethodological. Knowledge should be managed as a part of general management systems and linked to the concrete management challenges.

KEYWORDS

Knowledge-based development; Relevance; Management; Cities.

1. INTRODUCTION

As the humanity is moving more and more into cities, they have become the key locus of economic activity, innovation and service production. However, cities of today also face various severe challenges related to, e.g., cost-effective public service production, unemployment and environmental issues. At the same time, knowledge has become a key source for the development and prosperity of cities (Dahlström & James, 2012; Knight, 1995; Yigitcanlar, Carillo & Metaxiotis, 2010). As a result, the knowledge-based development (KBD) research field has evolved. KBD research examines the role and significance of knowledge in the development of cities and regions (Carrillo, Yigitcanlar, Garcia & Lönnqvist, 2014).

KBD is connected to the more general development of knowledge management (KM) and other knowledge-related disciplines. During the past two decades these disciplines have produced a lot of academic understanding on the theme as well as introduced a wide array of various frameworks and tools for dealing with knowledge-related issues in companies, public sector organizations and regions (Lönnqvist & Laihonen, 2013).

It appears that even though the importance of knowledge as a driver of regional performance is widely accepted the impact of KM or KBD on the managerial practices of cities has so far been modest. This argument is based on the observation that there is a lack of evidence of a) wide-spread use of any specific KM model in cities (or in companies) or b) impacts of successful knowledge-related initiatives. This is a serious concern because a major part of the knowledge-related research can be characterized as applied research, i.e. it is motivated by the aim of contributing to the practical analysis, planning and / or management work by helping managers to better deal with knowledge.

There are several potential explanations why the implementation of knowledge-related managerial models has been slow. First, the field is still fairly new. It takes time for new concepts and models to be taken into use. On the other hand, the field probably is still a bit immature – as new frameworks are constantly being introduced – and thus the currently available models may seem somehow incomplete from the practitioners' perspective. Second, it may also be so that the models academics are producing simply do not match the actual needs of the managers (Salonius & Lönnqvist, 2012). For example, while knowledge is no doubt an important driver of success managers have also many other concerns on their agenda, such as controlling the budget, dealing with personnel issues, managing stakeholder relations, guiding service operations and so on. They simply might not have the time and energy to take any new items on their agenda. Moreover, the most severe problems cities are facing might be related to other issues than knowledge as such. For example, many South European countries are struggling with debt issues and youth employment, huge mega cities face environmental and safety concerns and so on. Therefore, it is understandable that the managers in cities focus on other things that on the application of KM models.

Another possible explanation is that there might be a mismatch between the work academics do and the kind of knowledge or managerial models practitioners would like to have. This could be the result of a conflict between what academics are expected to do in order to advance their careers (i.e., publish "rigorous", theoretically oriented research in highly ranked journals and acquire competitive project funding) and the complex and "messy" practical challenges managers are faced with (cf. Correa & Laine, 2013). Scholars may be tempted to plan their research projects based on what seems most potential from high quality publication perspective (e.g., favour quantitative research methodologies and research topics for which there is data available) – not based on the actual challenges faced by cities. Moreover, the major problems cities face – e.g., those related to sustainable environment – are very complex and multidisciplinary problems (e.g., Lönnqvist & Laihonen, 2012). They cannot be solved by analyzing them from any narrow disciplinary perspective.

Therefore, it may not even be possible nor motivating for an individual scholar to approach them.

This paper argues that too much of todays' academic research on KBD – and KM more generally – is oriented towards publishing in highly ranked journals and pursuing grants while the more pragmatic knowledge needs of the managerial community are not sufficiently met. This conceptual paper identifies the some key issues that should be improved in order to increase the societal impact of academic work on KBD. The aim is to provide a critical view towards the value of academic research on KBD in the development of cities and to question whether it is really making a contribution.

2. IS THE KNOWLEDGE PERSPECTIVE RELEVANT FOR MANAGERS IN THE CITY CONTEXT?

Nowadays, the managers of cities face various tasks related to knowledge. Carrillo *et al.* (2014) mention the following as examples of relevant knowledge-related questions for city managers: how to attract and retain knowledge-intensive companies in the city, how to attract knowledge workers, how to ensure the continuous in-flow of new ideas and new knowledge and how to support the application of new knowledge? It seems obvious that knowledge-related phenomena are important for the development and prosperity of a city and, therefore, they should be important to managers as well (Lönnqvist & Laihonen, 2013).

Knowledge is a key value driver for public value provision (Lerro & Schiuma, 2011; Lönnqvist *et al.*, 2014). Knowledge is embedded in the skills of personnel as well as in the processes and systems that help deliver services. Information and knowledge also affect the operations of a city in numerous ways. For example, knowledge about customer needs is required in order to plan how service operations are carried out in practice. Lack of knowledge or flawed knowledge may result in mistakes (e.g., making misinformed decisions) and inefficiency (e.g., searching or producing information that already exist). Thus, there is a clear link between these knowledge-related phenomena and the productivity of the city.

Cities are highly complex organizations from knowledge perspective: various service areas, such as healthcare, social services, technical infrastructure and education, require specialist knowledge regarding the sector in question. Things are also interconnected: a change in one aspect of the public service system is likely to impact another. Thus, the management of the complex service system is not an easy task. As the way knowledge-related issues are handled impacts the productivity of a city the management of knowledge should be an important task for city officials. In fact, the current programme of the Finnish National Government states that public sector productivity is improved, among other means, through the use of knowledge-based management practices. However, what this means in practice is not explicitly defined.

In public sector, knowledge management has been applied in numerous contexts and from different perspectives. For example, Goldberg *et al.* (2006) and Garcia (2006) examined knowledge sharing between the city and its citizens. Ergazakis *et al.* (2007) developed an integrated decision support model for a knowledge city's strategy formulation. Case examples are available, for example, related to applying knowledge management in a public sector accounting organization (Chong *et al.*, 2011), in a school district (Edge, 2005) and in a police department (Seba *et al.*, 2012). Some prior research on applying 'knowledge assets management' in cities is available as well. For example, Ramírez (2010) has studied knowledge assets in the Spanish public sector while Bañegil Palacios and Sanguino Galván (2006) in Iberian municipalities. Furthermore, there is even more studies examining knowledge assets at the level of city-regions (Martins & Viedma, 2006; Schiuma *et al.*, 2008).

To summarize the existing literature, there is a versatile set of studies exploring the knowledge perspective in cities. For example, there is some information available considering cities' knowledge sharing practices. On the other hand, there is a lack of studies on how cities are actually managing knowledge. Overall, there is not enough information available about cities' knowledge-based management practices in order to be able to identify some kind of best practices. Studies exploring the impacts of knowledge-based management initiatives in cities are also largely missing. In the literature on KM/KBD, there is a lot of frameworks, models and tools available that are intended to help managers deal with knowledge related phenomena (e.g., Carrillo *et al.*, 2014). Managers at various levels of the city organization – perhaps also at regional level – are the key actors who either take into use the KM/KBD models or do not. It seems that quite often the scholars are eagerly introducing new managerial models, which are expected to be useful, but these models not being widely used in practice (Kujansivu, 2009). It seems that despite the fact that the models seem managerially relevant from an academic perspective they somehow do not match the needs of practitioners (Salonius & Lönnqvist, 2012).

One explanation for the slow up-take of KM/KBD models in cities (and private sector firms as well) is that while the "knowledge age" has increased the importance knowledge as a managerial phenomenon the traditional managerial tasks remain there also. That is, managers must deal with many issues related to the operative and strategic management of operations. They must take care of their personnel and customers, take into account the ongoing political debates, develop new services and carry out all the administrative duties as well. This means that 'knowledge' as a managerial objective is something extra for the busy managers. In other words, even though the importance of knowledge is widely acknowledged as a value driver, managers have many other issues on their minds. Moreover, many of those other issues probably appear more important and "concrete" compared to knowledge. For example, many European cities currently face severe financial problems, employment and related social issues. Such problems are acute: they need to be solved urgently. It is understandable that in such a context city managers must focus their attention to such matters – even though

knowledge would be an important managerial phenomenon as well.

It may also be the case that the literature reveals only a part of the reality of cities' and knowledge-based management practices. This part is that of explicit and planned knowledge-based management practices. That is, those cases in which a city has made a conscious decision to apply a specific knowledge-based management model or approach (and someone has also written about it). Another part of the story are the more generic management practices in use, which have been developed during the years without necessarily considering them 'knowledge-based management practices' (Riege & Lindsay, 2006). In these cases, there may exist highly sophisticated knowledge-based management practices even though the actors involved have not considered them as such.

Riege and Lindsay (2006) claim that the reason for the lack of knowledge on how knowledge management theories and frameworks are applied in the public sector is the little evidence being published in the literature. They state that "[d]uring the past ten years, a large number of national governments, departments and agencies have embraced [KM] practices with a quest to creating more innovative and complex systems that connect people to information and knowledge" (p. 25). Thus, they call for more qualitative empirical research in order to, for example, examine the suitability of the frameworks for different types of public policy using case study applications of the frameworks in actual organizational settings.

To conclude, the knowledge-related phenomena really seem relevant for city managers but the key issue seems to be fitting knowledge-related management activities in their busy agendas. On one hand, it is the practitioners' responsibility to solve this issue. On the other hand, there are probably some things that scholars could also do in order to help the knowledge-related managerial practices become more actively utilized.

First, it seems that city managers urgently need managerial tools and practices, which help them in dealing with the major challenges their cities are facing (e.g., financial or environmental issues). However, managing knowledge is not the ultimate aim of any city's activities – instead, managing knowledge should be seen as a means to achieve the more concrete aims (such as sustainable environmental development). Thus, knowledge-related managerial tools should be strongly linked or even totally integrated to the key objectives and management processes of cities. In this way, there would not be distinct KM systems for cities but instead there would be generic management systems (for dealing with the major challenges) which include the knowledge perspective as one central aspect. In other words, a potential direction for further development is to come up with KM/KBD practices for cities which are better aligned or integrated with the general management processes and, as a result, match better the need of city managers.

Second, related to the previous point, it seems likely that scholars must select different kinds of research questions and to design different research strategies if they want to create new knowledge and come up with better models for matching the practitioners' needs. For example, instead of trying to develop generalizable KM models (which get cited a lot) it might be worth focusing on the real challenges of a selected city and try to understand the role and relevance of knowledge for dealing with the problems at hand. However, this issue is not as simple as it appears here due to the nature academic work and its objectives. This issue is explored further in the following section.

3. ARE KBD SCHOLARS CURRENTLY PURSUING THE RIGHT OBJECTIVES WITH THE RIGHT MEANS?

In the general management literature there is an ongoing discussion on rigor versus relevance in research (Gulati, 2007). This refers to the balancing between the objectives of doing academically rigorous research and producing socially relevant outcomes. For example, Andriessen (2004) has stated, related to research on knowledge assets, that the more traditional explanatory approach to research often leads to rigorous results that are not of much help in solving practical problems.

Academics are under increasing pressure to publish in order to be able to get tenure. Moreover, many universities are emphasising publication forums with a high impact factor. Thus, the competition in getting one's paper published in top forums is tough. Quite often the top outlets prefer to publish papers, which meet certain quality criteria related to, e.g., research methods and data used. Commonly, quantitative papers are preferred over qualitative ones. Generalizability of results is a virtue to be pursued. Typically, journal papers have a fixed length of 5000 to 8000 words including "compulsory" sections such as references and literature review. This means that a journal article needs to focus on a narrowly limited topic in order to be able to fit an in-depth discussion inside the word limits. The characteristic of academic publishing are common to all disciplines. However, KM and KBD are fairly new disciplines and, thus, scholars in the field may feel extra pressure to meet the expectations of journal in terms of quality standards.

As discussed in the previous section, the managerial problems faced by cities are context-specific (rather than generic) as well as complex and systemic (rather than narrowly focused and limited). Producing managerially relevant and comprehensive knowledge of a given problem in a given context is likely to require the use of many research methods in order to get different perspectives to the phenomenon. It is likely that the use of qualitative research methods, such as action research, would be especially useful in producing understanding of complex societal phenomena. Qualitative research, which naturally has its weaknesses, has many strengths such as the ability to capture various issues – both tangible and intangible. Quantitative research has many strengths but is often limited and guided by data availability. Often the most interesting phenomena cannot be captured quantitatively. This is common in the case of knowledge-related research, which deals with intangible and qualitative phenomena. Sometimes quantitative research utilizes proxies that capture the

underlying factors poorly or, at worst, even the choice of research question can be based on the availability of data, not on the importance of the issues in question.

It seems quite obvious that there is tension between rigor and relevance – or academic research and the practical managerial audience – also in case of KBD field. Considering these tensions, it is no wonder that academic work does not often meet the needs of practitioners. Naturally, academic work is valuable as such and does not always have to serve the practitioner. Nevertheless, it seems possible to improve the fit between academia and practice by taking the actual needs of city managers better into account. This would suggest more case-specific research settings, utilization of many research methods – especially qualitative ones – and examining the problems comprehensively from the perspectives of different disciplines.

4. DISCUSSION

This conceptual paper has explored the managerial relevance of KBD research from two perspectives. First, the importance of knowledge as a managerial issue was discussed. Second, the limitations of academic work and the conflicting objectives were examined. The discussion led to two main conclusions:

Knowledge is an important value driver for cities and thus a genuinely relevant management objective. However, in the challenging managerial landscape the city managers' attention is occupied by concrete and severe challenges related to city operations. Thus, there is no room for distinct KM/KBD systems. Instead, it is here suggested that knowledge should be managed as a part of general management systems – they should be linked to the concrete management challenges so that KM/KBD would be viewed as a means to reach the objectives of the city.

It can be assumed that nowadays academics are excessively pressured to carry out publishable research work that may not ideally meet the requirements of the practice. In order to improve the managerial relevance of KBD research the projects should be more practice-driven, case-specific, multidisciplinary and multimethodological. It seems likely that a research that is linked to real managerial challenges and that examines them in an in-depth manner will ultimately lead to academically valuable results as well as to practical solutions.

The paper at hand can be characterized a critical meta-analysis of the KBD research field. Producing this kind of knowledge can be considered particularly important for the debate on KBD / knowledge cities as the discipline is based on the idea of knowledge as the driver of city development. Thus, it must the duty of the KBD scholarly community to be self-critical and to find areas of developing the discipline further.

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ASSESSING THE ROLE OF TECHNOLOGY TRANSFER OFFICES FOR BEING AN INNOVATIVE CITY: THE CASE OF ISTANBUL

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ABSTRACT
Universities play a key role in translating newly produced knowledge into new business opportunities, products, and services. Universities in that sense can significantly contribute to the regional development and innovation capability of a city only if the produced knowledge can be appropriately diffused into the city. There are a few channels including technoparks, building research platforms with enterprises in different ways, and technology transfer offices to diffuse the knowledge. This paper highlights the contribution of technology transfer offices (TTOs) on Istanbul's potential to become an innovative city. We provide a brief, yet up-to date review of studies in the literature to understand the contribution of TTOs on cities' innovativeness. We discuss Istanbul's position as an innovative city from the perspective of innovation built up by the university-based technology transfer offices as an outcome of this review.

KEYWORDS
Technology Transfer Offices (TTOs); Innovative City; Knowledge City; Istanbul; University

1. INTRODUCTION
Universities produce a substantial amount of knowledge through various research activities. However, the outputs of these research activities can be used in the form of new products and services only if the produced knowledge and technology can properly be transformed to industrial actors. There are a variety of channels to exploit the basic research produced at universities. The main channels for technology transfer are technology or research parks, licensing activities between the university and firms, incubators and university-based startups (Phan & Siegel, 2006).

Many of the technology transfer activities are gathered at the university-based technology transfer organizations. The technology transfer activities include academic spin-off activities (Shane, 2004), patenting and licensing (Siegel et. al., 2003; Thursby & Kemp, 2002), and university based start-ups (Rothaermel & Thursby, 2005). Technology transfer offices form interfaces between the university and industry allowing the knowledge and technology the industry needs to be envisaged and produced at the university. University technology transfer offices in that sense play a critical role in enhancing the cooperation and collaboration between the university and industry to increase the amount of transfer between the two. Thus, technology transfer mechanisms are facilitated through university-based technology transfer offices and contribute to knowledge spillovers at local firms, and the economic development and innovativeness of the region.

The effectiveness of university-based technology transfer initiatives has long been discussed in the literature. Many of these initiatives have been new making policymakers and university officials seek an understanding of best practices (Phan & Siegel, 2006). Best practices explore the organizational practices on the basis of incentives, strategic objectives, and measurement and monitoring mechanisms facilitating technology transfer. Moreover, the notion of technology transfer effectiveness also changes depending on from which perspective it is being analyzed. The performance can change considerably across the different types of initiatives and across the players who are involved in these mechanisms (Link & Siegel, 2005).

We will discuss Istanbul's potential from the perspective of the contribution of TTOs to the innovativeness of the city. To strengthen the technology transfer practices, the Turkish government introduced new initiatives to establish new technology transfer offices and further support the existing ones starting in 2011. We explore the effectiveness of this initiative evaluating the up-to-date contributions of university-based TTOs in Istanbul.

This paper is structured as follows. Section 2 focuses on the role of university-based technology transfer offices in diffusing basic research and technology to industry. Section 3 reviews the literature on innovative cities. We evaluate Istanbul's potential for being an innovative city in Section 4. Finally, recommendations and avenues for future research are given in Section 5.

2. TECHNOLOGY TRANSFER THROUGH TTOs
Many universities have established TTOs to capture the financial reward associated with technological innovation by capturing and passing on the intellectual property of a university. Licensing and patenting intellectual property is a significant function of TTOs. In this respect, TTOs facilitate regional innovation and development through licensing inventions and intellectual property resulting from the basic research and technology produced at the region's universities

(Siegel et. al., 2003). There is a substantial amount of increase in licensing activities in recent years, which might be associated with the increased university resources. However, the productivity of university licensing activity is associated with factors beyond increased resources, such as university characteristics based on an empirical study by Thursby and Kemp (2002). According to the results of this study, universities are commercially more productive today as compared to the past, but, private universities are more efficient in commercialization than public ones and medical schools are the least efficient.

Debackere and Veugelers (2005) point to the role of academic technology transfer offices as a mediating institution in fostering industry-science links. Industry-science links refer to the various interactions between the university and industry ultimately targeting to boost the commercialization of the academic science base. Industry-science links include: (a) start-up enterprises by researchers, (b) collaborative research, (c) contract research and consulting, (d) development of intellectual property rights including licensing and patenting, and (e) cooperation in graduate education and staff training that can be carried out through the organizational arrangements in the form of technology transfer offices. All these industry-science links or activities have significant economic and policy implications (Siegel *et al.*, 2007). University-based technology transfer activities result in additional income from patent licenses, employment opportunities for university academics, revenues from companies born at the university, market capitalization of these firms, jobs created in the region, and technological spillovers of the new innovation investments.

Clearly, TTOs acting as an intermediary between the university and industry have important implications for a knowledge-based economy and regional development (McAdam *et al.*, 2012; Howells, 2006). The substantial increase in the number of technology transfer offices established in the last two decades raise the question of how successful are these organizations in increasing revenues from commercializing intellectual property into new products, services or new start-ups. The effectiveness of the university-based technology transfer offices particularly with respect to licensing and patenting have been studied in the prior literature (Macho-Stadler *et al.*, 2007; Siegel *et al.*, 2007; Thursby & Thursby, 2002; Anderson *et al.*, 2007).

Relative efficiency of TTOs located in different regions across the world has also been questioned in the literature. Chapple *et al.* (2004) found the UK-based TTOs show low levels of efficiency in technology transfer as compared to their US counterparts. They also suggest TTOs that are more sector- or region-focused and reconfigured into smaller units are more likely to enhance technology transfer and regional spillovers. From a different angle, Siegel *et al.* (2003) assessed the impact of organizational practices on the relative productivity of technology transfer offices concluding the faculty reward systems, TTOs staffing, and cultural barriers between the university and firms are the most critical impediments.

The literature overall suggests university administrators should make strategic decisions in terms of the mode of commercialization they choose, the technological field of emphasis, and intellectual and patent strategies to further stimulate the technology and knowledge transfer between universities and firms.

3. INNOVATIVE CITY

Rapid technological developments and increased globalization have forced the economic activity of traditional industries to move to the low-cost countries. Shifting production to low-cost countries caused the high-cost countries of Europe and North America to loose their comparative advantage. While this resulted in the loss of jobs and corporate downsizing, it turned into a comparative advantage for regions employing knowledge-based economic activity (Audretsch, 2002). When one in every 20 workers was losing a job in 1990s in the US, the employment rose by 15% in Silicon Valley during the same period. Government policies and initiatives supporting basic research at universities and enhancing interaction between universities and industry resulted in high-technology clusters in several regions in US. In the light of these arguments, Audretsch (2002) suggests knowledge and innovation are less likely to be transferred across geographical spaces, on the contrary, they concentrate geographically forming innovative cities or regions.

Simmie (2002) argues knowledge spillovers and international knowledge-enabled innovation is concentrated in a limited number of cities in Europe and North America. High-tech industries, universities, public and semi-public technology transfer organizations, and political actors are the most important elements by which innovation areas are concentrated (Strambach, 2002). Thus, the most innovative cities are the ones who have high concentrations of institutions such as universities conducting R&D with local innovative industrial firms.

We investigated the universities' contribution, paying special attention to the university-based technology transfer office, in making an innovative city. Link and Scott (2007) put forward the strategic role of university parks in national innovation systems as a catalyst for regional development and their impact on knowledge-based and employment-based spillovers. The dramatic increase in the amount of licensing and patent activities of research universities should clearly be reflected in economic development and innovativeness of the region. Commercialization of intellectual property translates to knowledge spillovers, new start-ups, creation of new jobs, and thus increased regional innovation.

4. ANALYSIS OF ISTANBUL'S POSITION AS AN INNOVATIVE CITY FROM THE PERSPECTIVE OF TTOs

While analyzing the TTO's in Istanbul, primary and secondary research was conducted. The web sites of TTO's in Istanbul were the main source of secondary research. Also regulations regarding the latest support program were analyzed. The Scientific and Technological Research Council of Turkey (TÜBİTAK) launched a new support program for TTOs. According to this program ten University TTOs were supported financially in 2014. Three of them are located in Istanbul (Istanbul University, Istanbul Şehir University, and Istanbul Technical University).

Table 1 shows the active TTOs located in Istanbul. In the study, a TTO was considered active based on the availability of an active web site. As it can be seen in the Table, eight of the TTOs have active web sites. Only Istanbul University does not have a web site. We decided to include this TTO, since the TTO of Istanbul University has been granted TÜBİTAK support in 2014. Considering there are 50 universities in Istanbul, nearly 20% percent of Istanbul Universities have active TTOs. Even though these TTOs are very new, most of them became very active mainly through receiving TÜBİTAK support, which was one million TL per TTO annually.

Table 1. Active Technology Transfer Offices in Istanbul

TTO	Web Address
Boğaziçi University	https://tto.boun.edu.tr
Istanbul Şehir University	http://tto.sehir.edu.tr/Pages/Home.aspx
Istanbul Technical University	http://itunovatto.com
Istanbul University	Not available
Koç University	https://tto.ku.edu.tr
Marmara University	http://mitto.marmara.edu.tr
Özyeğin University	http://www.ozyegin.edu.tr/RESEARCH/Technology-Transfer-Office
Sabancı University	http://rgp.sabanciuniv.edu/tr/teknoloji-transfer-ofisi
Yıldız Technical University	http://www.tto.yildiz.edu.tr

After the secondary data collection we contacted TTO managers for in-depth interviews. The aim of the in-depth interviews was to understand the role of TTOs for Istanbul's innovative capacity. Due to time and business schedule constraints we reached only three TTO managers for this study. The in-depth interviews with these three managers suggest there are three main functions of TTOs. These are related to: intellectual property, new company launching, and industry-university interface. Moreover, there some secondary functions such as promotion of the TTO activities, creating awareness about inventions, etc.. We grouped the analysis of the current situation of these Istanbul-based TTO functions into four sections:

a) Intellectual property: TTOs in Istanbul are very active in patenting and licensing activities. They support university researchers in obtaining patents and licenses for their innovative ideas/products. They also work to seek and match potential investors to the related patents and licenses for creating new businesses.
b) Support for new company formation: TTOs in Istanbul are very successful in initiating new companies. These new companies are mainly based in university technoparks and incubation centers.
c) Interface mission between university and industry: Interface mission between industry and university is fueled by TTO activities. TTO managers state the most critical point is the support of the university's top management. Without their support, TTOs would not function at full capacity. University top management needs to give more priority to their TTOs.
d) Other services: TTOs are giving trainings to potential inventors about legal issues, government supports, and other similar services. Moreover, TTOs provide promotion opportunities to potential inventors.

The output of the interviews is summarized in Table 2.

Table 2. TTO's functions towards being an innovative city for Istanbul

TTO function	Current Situation
Intellectual property	TTOs in Istanbul are very active in patenting and licensing. They are supporting university staff in obtaining patents and licenses for their innovative ideas/products. They also work to seek and match potential investors to the related patents and licenses for creating new businesses.
Support for new company formation	TTOs in Istanbul are very successful in initiating new companies mainly based on university technoparks and incubation centers.
Interface mission between university and industry	Interface mission between industry and university is fueled due to TTO activities.
Other services	TTOs are giving trainings to potential inventors about legal issues, government supports, and etc. TTOs also provide promotion opportunities to potential inventors.

In our primary and secondary data analysis we found TTOs in Istanbul are increasing their activity level at an accelerating rate. One of the reasons behind this is to meet TÜBİTAK's financial support expectations. If certain activity is not achieved, TÜBİTAK's financial support can be cancelled for under-performing TTOs. Moreover we saw the interface need between industry and universities in Istanbul was crucial. All the interviewees stated TTOs are the most appropriate candidates for meeting this demand. Therefore the activity level of TTOs is increasing significantly.

Another important outcome of our analysis shows the main problem of TTOs is their interaction with university management. Interviewees reported they would function better and faster if top university management listened and understood their requirements. Therefore the organizational structure of TTOs in university organization needs to be revamped.

Academic researcher motivation is another issue we found in our analysis. TTOs have many tools in order to motivate academic researchers in a university. Therefore even though there is very attractive project for a TTO, most of the time it is very difficult to convince related researchers to become involved in the project.

In our analysis we found TTOs currently giving their priorities to promotion activities. This is because most of the industries do not know about TTOs and their services. As industries understand the opportunities coming from universities via their TTOs there will be an acceleration of useful outcomes occurring such as patent and license use in industry, new company formation, common projects between university and industry. TTOs in Istanbul are quite new, however their effect on Istanbul's innovative capacity is increasing at an accelerating rate.

5. RECOMMENDATIONS AND FURTHER RESEARCH

Even though there are approximately 50 universities in Istanbul, only nine of them have active Technology Transfer Offices. Also, Technology Transfer Offices are quite new in Istanbul's innovative space. Most TTOs have been in operation for only one or two years. Despite these weaknesses, primary and secondary search pointed out the recent developments in Istanbul's TTOs are quite impressive. Specifically the financial support of TÜBİTAK has accelerated the developments in TTO's functioning. The annual audit criterion of this support pushes TTOs to raise their performance each year.

Our preliminary analysis suggests TTOs are successful in intellectual property development and new company formation, however, university-private sector interface mission needs to be further developed. Especially university top management needs to give priority to their TTOs. They need to understand their requests and spend enough time and resources to fulfill them. Our recommendation to universities is to assign a vice–rector responsible for TTOs. This will increase the efficiency and effectiveness of TTOs. Another important issue is to motivate academic researchers to be involved in private sector projects. Our recommendation is to put "being in the TTO approved project" as one of the criteria for the academic promotion.

For further research, we recommend the framework of TTO analysis in Istanbul can be extended to the other members of innovative space, such as technoparks and incubators. Thus, a complete analysis will be possible for the innovative space of Istanbul. Another further research item can be based on the criteria we developed in this paper for the analysis of TTO and innovative city relations. Therefore, researchers can use the approach we used in this paper in order to analyze the efficiency and effectiveness of TTOs in other cities as well.

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LEARNING SPACES IN UNIVERSITY CONTEXT

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ABSTRACT
This paper is focused on a research project aiming at exploring how the social interaction process and learning (knowledge generation, sharing, acquisition and transmission) are a result of space design and its mode of appropriation. The relationship between space and learning in university context are emphasized. This relation is analyzed in the scope of the theoretical framework of the Educational Campus (Campos 2010b) that defines the university learning setting in a broader context, from personal spaces to shared facilities.

The first phase grasps the case study selection. Every activity held in the university context is described and grouped in functions. Each function contains several categories of space and each category of space considers a set of illustrations. These illustrations comprehend diverse functional representative spaces.

The second phase comprehends the scope of several topics: scale, actors, learning category, interaction, environmental characteristics and morphology. These subjects are typified for the definition of the analysis criteria.

The third phase consists on the execution and analysis of the illustrations' characterization sheets; according to the analysis criteria of phase two. This will lead to the category of space characterization sheet and the complete mapping profile.

The final output considers the design of a mapping profile, which will provide guidelines to create or modify a setting in order to facilitate predetermined learning experiences and interactions. It will provide a practical support for the creation and renovation of higher education facilities.

KEYWORDS
Learning Spaces; University; Campus; Knowledge; Mapping Profile.

1. INTRODUCTION
The Bologna Process and the consequent volunteer unification of higher education across Europe provided an excellent opportunity to question university facilities.

This treaty consists on the volunteer unification of higher education across Europe. It was developed in to "*strengthen the competitiveness and attractiveness of European higher education and to foster student mobility and employability through the introduction of a system based on undergraduate and postgraduate studies with easily readable programmes and degrees*" (Benelux Bologna Secretariat, 2009, p. 3). Its core underlying values are the social dimension, employability, lifelong learning, mobility and the fair academic recognition of the qualifications (Benelux Bologna Secretariat, 2009, p. 8). It was given a clear focus on student centered learning that meant the "(…) change of paradigm from teacher centered learning to putting the students at the center of interest." (Benelux Bologna Secretariat, 2009, p. 6). Under the Bologna framework the Professor is seen as facilitator of knowledge, instead of the knowledge keeper, which reaffirms the pressing need to rethink learning methodologies. With the informational technology era, learning is no longer restricted to the classroom space and time, enabling new opportunities and modes of learning.

The structural reform is in place, but the paradigm shift, focusing on the student centered learning, instead of the teacher centered one, is yet to be fully complete (Benelux Bologna Secretariat, 2009, p. 6). Therefore it is of the utmost importance to rethink not only the ways of teaching and learning, but also the settings that support these activities. The university facilities must be creatively thought as a city (Broussard, 2009, p. B12) and the academia perceived as a community that replicates our society (Kenney, Dummont, & Kenney, 2005, p. 7). The social component of the university is essential not only for the healthy interaction among the academia, but also for the innovative multidisciplinary research:

"Today's higher education institutions find themselves juggling new roles and expectations with traditional identities and conceptions."(Benelux Bologna Secretariat, 2009, p. 18).

In face of these changes it makes sense to question if the existing university physical settings suit the new European higher education paradigm and perform as an adequate scenario. Thus, this research aims at exploring how the social interaction process and consequent knowledge generation, sharing, acquisition and transmission are a result of space design and its mode of appropriation.

This paper focuses on the space design of universities within the theoretical framework of the Educational Campus (Campos Calvo-Sotelo, 2010b, p. 2-3). The Educational Campus embodies ten principles that scope many thematics linking urban and space design to sociology, sustainability and pedagogy. Some principles of the Educational Campus focus on the space design, which include integrated planning, university/city relationship, spatial harmony, image and accessibility or sustainability. Other principles focus on the metaphysical side of the university: community learning, emotional and intellectual harmony, nature and art, memory, and innovative pedagogy. The Educational Campus concept

also defines the university learning setting in a broader context, from personal spaces to shared facilities. As advocated by Campos Calvo-Sotelo, *(2010a, p. 189)* the built environment should provide for the needs of its users *"(…) quality in architecture will bring about a more extensive integration of the institution with its immediate environment and will thereby simulate innovation in the latter's economic, social and cultural fabric."*

The physical setting has a direct impact on the behavior (Scott-Webber, 2004). Thus it is important to promote a healthy environment that encourages the researchers' interaction and simultaneously contributes to the creation of a university identity: *"It is the university as a place, and nor a collection of buildings, that creates memories for students." (Broussard, 2009, p. B12)*.

The new modes of learning and appropriation of the space are typically more casual and occur in a social context. Randomness and causality play a determinant role: *"Students can learn wherever they have opportunities for interaction; and the more chance for running into friends, teachers, fellow students, or colleagues, the better." (Kenney et al., 2005, p. 28).* The configuration of the precinct must foresee all these fructuous interactions and promote the serendipity. It has been proved that most of the learning is informal and a consequence of fertile and complex random not planned encounters (American Association for Higher Education *apud* (Scott-Webber, 2004)). Therefore, *"(...) the learning campus is one that maximizes the probability of chance encounters, and encourages lingering once an encounter - whether by chance or by plan - takes place" (Kenney et al., 2005, p. 39).*

"Instead of dispersing activities in a random fashion across campus we could look at a number of factors which might suggest improved key performance indicators such as an improvement in serendipitous interaction"(Fisher, 2007, p. 6).

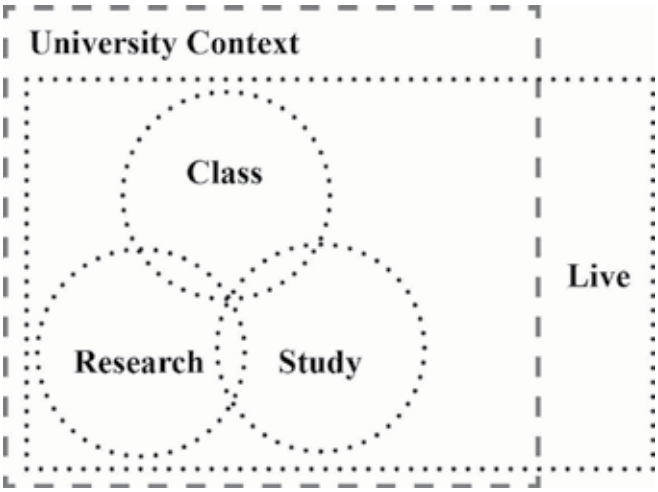
Communication is also essential for knowledge generation, sharing, acquisition and transmission. It is argued that the physical environment predisposes social interactions and consequent knowledge transfer. The physical setting influences the users' perception and induces them to certain actions: *"(…) the specificity and power of architecture lie in its ability to provide an embodied experience of the future as it unfolds in time and space" (Ellsworth, 2005, p. 127).*

These actions may be as trivial as non-verbal communication. Non-verbal communication includes gestures, looks and positioning (Goffman, 1967, p. 1). These are external intentional or involuntary signals of behavior guidance and orientation (Goffman, 1967, p. 1). Sommer (1969) *apud* Scott-Webber(2004) states that the behavior patterns are rarely changed. This type of communication plays a vital role, determining whether if it is pertinent or not the increase or decrease of the social distance and formality (Goffman, 1959, pp. 226–227). Most of the times we are not consciously aware of these small hints that lead us to engage (or not) in interactions with others. These hints can help us to encourage these indicators of knowledge engagement receptivity. Therefore it essential not only to understand how to promote these interactions, but to know which physical settings support them and how to reestablish them in other spaces.

2. FIRST PHASE – CASE STUDY SELECTION

One needs to understand the behavior in order to plan its hosting environment (Scott-Webber, 2004), for if the design of the physical setting is not compatible with the activity it hosts it may lead to productivity reduction (Scott-Webber, 2004) Therefore the major activities held within the university context were outlined in four dominant functions: Class, Research, Study/Work and Live. The class function comprises the educational study sessions, which students must attend in order to be successfully approved in their courses. The research function covers all the activities related to research projects. The study function includes all individual and group work that students do, as well as the labor done for the university faculty and staff. The live function comprehends all the other functions that one does in a university precinct like eating, doing sports, sleeping, *etc.* The first three (class, research and study) are characterized as the dominant functions, *i.e.* the core of the university, and the fourth (live) is an associative function. See Figure1.

Figure 1. Functions within the University Context



Based on these functions, the activities held in the university context were defined and characterized according to their physical setting: (1) Amphitheatre: The amphitheatre hosts the most traditional learning setting and has an unique shape, which typically characterizes it. (2) Library: Reading or lounge library rooms. (3) Classroom: A room with desks and chairs meant for class. (4) Learning space: A space meant for individual and group study/work. (5) Simulation Space: A copy of a real life setting, where one simulates an activity, under the supervision of an expert. (6) Practice Space: In this physical setting one practices with real problems and solutions. Sometimes these types of settings aren't confined to the university premises. (7) Office: Single or collective workplace. (8) Laboratory: A specialized space, which provides all the physical utilities for the fulfilment of experiments. (9) Plaza: A symbolic outdoor space where people gather. (10) Green Spaces: Lands or gardens typically used for recreational purpose. (11) Showcase: A space that hosts an object that is a reference for the students. The students learn by watching/observing this object. (12) Lounge Spaces: Relaxing space for social purposes. (13) Reflection Space: Introspective space for thinking and meditation. This type of space doesn't have to have a religious connotation. (14) Café and Cafeterias: Catering spaces. (15) Atrium: A foyer or central court. (16) Circulation: Medium and large circulation spaces that can host several activities besides circulation. (17) Sports Facilities: Settings that host sport activities. (18) Iconic Place: A symbolic space can be a space used for rites or ceremonies (such as a football) or processions (such as parades). It can also be a perspective-dominant space or a refuge space (typically small and intimate) (Broussard, 2009). (19) Accommodation: Students' housing facilities.

2. SECOND PHASE - ANALYSIS CRITERIA

2.1 Learning Mode

Learning is continuous and cumulative (OECD, 2007, p. 215) and, nowadays, can be defined as *"a change in the efficiency or use of basic cognitive processes, both conscious and unconscious, that promote more effective problem solving and performance in the tasks of everyday life"* (OECD, 2007, p. 212). "*Motivation has a pivotal role in the success of learning, especially intrinsic motivation. The individual learns more easily if s/he is doing it for him/herself, with the desire to understand."* (OECD, 2007, p. 27).

Traditionally students had a passive role in the learning process. Nowadays the educators promote a more active learning environment, for it is known that the information retention rate is higher when the learning process is more active (Dale, 1969).

"I hear and I forget, I see and I remember, I do and I understand." Confucius

There are several learning types typically practiced in university context: collaborative learning (based in small groups' interaction, where students socialize, discuss and reflect), project based learning (aimed at solving stimulating and pertinent questions or problems, based on several research methods), hands-on learning (a spiral learning cycle model: the learner will acquire a new concrete experience and the learning cycle spiral evolves (Kolb & Fry, 1975)) or tutoring (requires a clear and objective organization and knowledge transmission (Walberg & Paik, 1999). Based on these and more learning types seven learning categories were outlined, in order to sort each space. The learning categories are: presentation, seminar, brainstorm, study, simulation, contemplative and social.

2.2 Scale

Learning isn't restricted to the classroom, informal learning typically happens where students tend to gather: outside the classroom. The proper design of such spaces is critical (Lomas & Oblinger, 2006) and they do not have to be necessarily

inside the building or the precinct. Therefore it is important to analyze the university space at different scales, instead of focusing exclusively in the classroom. Thus, the space analysis focuses in four scales: urban space, precinct, building and compartment.

2.3 Actors

Based on Bruno Latour's, Michel Callon's and John Law's ANT the users of the university space were characterized in three types: Expert, Student and Object. The Actor-Network Theory (ANT) is a sociological theory which states that, in a network, the actors are not only people, but also objects and organizations (York University, 2011).

2.4 Communication

Communication is a social activity (Emmitt & Gorse, 2003, p. 27). We communicate and interact even when we are not speaking (Goffman, 1967, p. 1). *"Any act or event that a person perceives can be deemed to be an act of communication. It may be information gained from verbal and non-verbal information, body language, facial expression, touch and olfactory information from our immediate environment that is made manifest and therefore has meaning."* (Emmitt & Gorse, 2003, p. 24).

However, the communication process requires that the sender and receiver can encode and decode the message and that the communicated message influences the receiver (Emmitt & Gorse, 2003, p. 35). According to Shannon (1948) in order to have knowledge transfer it is necessary that the message is encrypted by the sender, sent, resists distortion noise (*i.e.*, everything that can interfere with the transmission of the message) and be decoded by receptor. It implies the spontaneous involvement of the participants and their visual and hearing attention must be focused and kept (Goffman, 1967, pp. 123–4 and 134). Still, the transmitted message will never be understood in the same manner for each individual, for it depends on the experience, education and prior information process ability inherent in each person (Emmitt & Gorse, 2003, p. 38), as well as the needs, perceptions, goals, past, external pressures, expectations, reactions and feedback from participants. Feldberg *apud* Emmitt & Gorse (2003, pp. 41–2).

2.5 Environmental Characteristics

This research doesn't intend to be an environmental study, however it is necessary to characterize the environmental characteristics. It is accessed weather the noise, temperature, light or color is confortable and/or controlled. For instance: whether the user can control the temperature or not and its range; if there is artificial and/or natural light or which is the dominant and associated color.

2.6 Morphology

Regarding the morphology the spaces are briefly characterized: as interior or exterior; regarding their shape, dimensions, capacity, configuration, accessibility and visibility.

3. THIRD PHASE - EXECUTION AND ANALYSIS

The third phase grasps the execution of the analysis sheets of the illustrations. An analysis sheet is composed to juxtapose every illustration and category of space. Each category of space has six illustrations making up the total of 114 illustrations. The selected illustrations are referenced learning spaces that have been acknowledged as noteworthy.

The data analysis is based on an empirical analysis, according to the theoretical framework and the predetermined variables and indicators.

This research is currently in this phase; therefore we will only present a brief sample of the analysis and conclusions. For example Table 1. represents the recommended learning modes for each category of space. In this table we chose to represent only ten categories of spaces, for the research is still dealing with the preliminary results.

Table 1. Learning Modes vs. Categories of Spaces Matrix.

	Presentation	Seminar	Brainstorm	Study	Simulation	Contemplative	Social
Amphitheater	✓✓	✗	✓	–	✗✗	–	✓
Library	✗✗	✗✗	✗	✓✓	✗	✓	–
Learning Space	–	–	✓✓	✓✓	✓✓	–	✓✓
Simulation Space	✓	✓	✓	✓✓	✓✓	✓✓	–
Green Spaces	✗✗	✗✗	✓✓	✓✓	✗✗	✓✓	✓✓
Reflexion Space	✗✗	✗✗	✗	✗✗	✗✗	✓✓	✗
Café and Cafeteria	✗✗	✗✗	✓✓	✓	✗✗	✓✓	✓✓
Atrium	–	–	✓✓	✓	–	✓✓	✓✓
Circulation	✗✗	✗✗	✓	✗	✗	✓✓	✓✓
Iconic Place	✗	✗	✓✓	✓	✗	✓✓	✓✓

Legend
- ✗✗ Not Recommended
- ✗ Unsuitable
- – Suitable
- ✓ Recommended
- ✓✓ Highly Recommended

4. CONCLUSION

We can retrieve al lot of information from this single matrix. For instance, the reflexion space is an extremely specialized space, in the sense that it hosts exclusively the contemplative learning mode. On the other hand, the simulation space type seems to host properly almost every learning mode.

This type of matrix will be applied for every analysis criteria. Afterwards a transversal analysis of the categories of space is done, in order to summarize and interpose similarities.

The final goal is to identify settings that host knowledge acquisition and transmission, providing a practical support for the creation and renovation of higher education facilities.

"Learner centered" (…) environments (…) pay careful attention to the knowledge, skills, attitudes, and beliefs that learners bring to the educational setting." (National Research Council. 2000: 133)

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KNOWLEDGE-BASED SERVICES FOR SUPPORTING DIFFERENT ENTREPRENEURIAL ORIENTATIONS

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ABSTRACT

Purpose: Purpose of the paper is to explain the need to differentiate knowledge-based services for potential and acting entrepreneurs depending on their entrepreneurial orientations.

Scope: Entrepreneurial orientations of entrepreneurs are analyzed in order to specify their knowledge sharing readiness and needs to use knowledge-based services that could support their entrepreneurial orientations.

Method: Self-analysis questionnaire survey data of 1075 acting and potential entrepreneurs and focus group discussions based on this data are combined with discussing the Global Entrepreneurship Monitor Estonian survey results.

Results: The nature of personal knowledge management and their specific needs to use knowledge-based services are different for imitators of the best practices, for potential entrepreneurs focused on commercialization efforts of long-term research and development, possibly leading to new intellectual property in need of protection, and for co-creators in online and face to face networks.

Recommendations: Knowledge cities in their incubation and development programs for entrepreneurs would target their knowledge services better if entrepreneurial orientations of people involved in scalable start-ups and in more traditional new ventures are analyzed in order to specify the right package of local and cross-border networking support and knowledge management services for each stage of new venture creation and development.

Conclusions: Knowledge cities should offer different knowledge-based services to entrepreneurs that follow international growth ambitions and are ready to innovate in international networks and to these entrepreneurs that have more local focus or attitude barriers inhibiting their involvement in the co-creative approach to entrepreneurship.

KEYWORDS

Entrepreneurial orientation; personal knowledge management; networking; co-creation, knowledge cities.

1. INTRODUCTION

Knowledge cities have important role in catering and attracting knowledge-based activities and high-technology industries that are expected to contribute to employment, gross domestic product and exports. (Sarimin & Yigitanlar, 2012). Knowledge communities need space and place but also a critical mass of knowledge enterprises (Yigitcanlar & Dur, 2013). Entrepreneurial initiatives that increase exports and cross-border co-operation are essential for the economic growth in such small open economies as Estonia, where both the critical mass of participants in knowledge-based networking and the limited economy of scale potential of the domestic market are challenges for entrepreneurs.

A literature review on knowledge-based development research from 2000-2010 (Ergazakis *et al.*, 2013) demonstrated intensive reflection of the role of creative class, information and communication technology and knowledge-based development strategies in research during the recent decade but the role of entrepreneurship in knowledge-based development of cities has received more limited attention.

Multi-industry cities facilitate innovation through knowledge spillovers (Firestone, 2010). Innovative entrepreneurship can utilize combination of ideas and advanced practices from different business sectors but also R&D based business opportunities. Quian & Acs (2013) link the knowledge spillover theory of entrepreneurship and the entrepreneurial absorptive capacity theory. These authors point out that high degree of uncertainty and high extent of asymmetry in interpretations of the potential value of new invention-based knowledge leads to situations, where researchers have to leave large organizations in order to start their own venture in order to commercialize their research outcomes. Another career choice for them is to co-operate for commercialization of their research results with entrepreneurs that have ability to understand new knowledge and recognize its value for markets. Quian & Acs (2013) demonstrate the value of the absorptive capacity for entrepreneurs of metropolitan areas in the United States involved in commercialization of research-based innovative ideas.

Networked knowledge innovation zones can support the flow of information, goods and people from one area to another (Sarimin & Yigitanlar, 2012). Frenkel *et al.* (2013) have studied the linkage between the lifestyle of knowledge workers and their residential choice. Their clustering approach based on the self-organizing maps and Tel-Aviv metropolitan area data demonstrates that different types of knowledge workers have different life styles reflected in their residential preferences. Entrepreneurs in their sample had strong preference for residing in the core and inner city and strong preference for culture and entertainment opportunities in their location. In the context of Tallinn, physical commuting and online knowledge sharing across the Finnish Gulf should also be taken into consideration when discussing networking opportunities of entrepreneurs and their residential preferences.

This paper addresses the following research question: How the Global Entrepreneurship Monitor results and tools for understanding imitative, individually innovative and co-creative entrepreneurial orientations can be taken into consideration for differentiating knowledge-based services of a knowledge city?

At first we present the concept of three optional entrepreneurial orientations and the tool for analyzing these orientations. Then we discuss results of studying these orientations in the context of business opportunity identification, business development and implementation stages and relate these three orientations to the Estonian data of the Global Entrepreneurship Monitor, where the author has been one of the members of the Estonian national research team. Finally we make suggestions and present conclusions for adapting knowledge-based services to the knowledge sharing and networking needs of entrepreneurs in order to support different entrepreneurial orientations and development paths.

2. EARLY-STAGE ENTREPREURSHIP AND ENTREPRENEURIAL ORIENTATIONS

Hayne *et al*. (2009) stressed the central role of knowledge resources and social capital for nascent entrepreneurs and linkage between new and earlier knowledge in the process of opportunity identification. Entrepreneurial opportunity recognition can initiate learning processes on the level of an individual but also knowledge sharing with stakeholders that can participate in knowledge creation for understanding the opportunity or even contribute to conditions needed for the entrepreneurial initiative leading to creating a new entrepreneurial opportunity and re-shaping existing markets.

Proximity created by a knowledge city environment for the start-ups' knowledge acquisition and exploitation has been an issue for intensive debate (Presutti *et al*., 2011). Some researchers have concluded that geographical proximity is the key facilitator of knowledge spillovers for start-up entrepreneurs (Audretsch & Lehnmann, 2006; Alcacer & Chung, 2007). Others have pointed out that being too much embedded in a local cluster constrain new knowledge acquisition because of the problem of lock in (Davenport, 2005). Presutti *et al*., 2011) have empirically demonstrated that for knowledge acquisition and exploitations high level of cognitive and social proximity with global customers is more important than geographical proximity. We have to understand, how the role of proximity inside a knowledge city can change depending on entrepreneurial orientations of entrepreneurs and their ambitions to offer innovative solutions for customers outside Estonia. In this context interpersonal networking actions aimed at network-broadening (Vissa 2012) deserve attention. Different local or cross-border networking partners are needed for sharing experience of end users at different markets, for accessing research-based knowledge and for obtaining financial capital for rapid growth. Passing from one stage of the entrepreneurial process to another also leads to changes in networking priorities (Casson & Giusta, 2007).

Early-stage entrepreneurs can foster a greater ability to discover existing business opportunities and to create innovative and internationally competitive entrepreneurial opportunities if they are involved in international networking and knowledge sharing. Relationships and international networking have for some time been promoted as tools for overcoming the "resource poverty" of born globals (Mort & Weerawardena, 2006). Co-creation can support synergy at different stages of the entrepreneurial initiative, starting from discovering or creating business opportunities to implementing the business model and pooling resources for daily operations and funding growth in the new venture.

Entrepreneurship researchers have developed the entrepreneurial orientation construct that integrates five dimensions: innovation, proactiveness, risk-taking, autonomy and competitive aggressiveness (Lumpkin and Dess 1996; 2001). The construct of a single entrepreneurial orientation has been further developed by differentiating three entrepreneurial orientations: imitative entrepreneurship, individual innovative entrepreneurship and co-creative entrepreneurship (Elenurm *et al*. 2007).

The imitative orientation is assumed to be successful in a business environment where empty market niches can be filled by introducing business ideas that have proved their effectiveness and efficiency in similar conditions in other markets. This should not be seen simply as copying the ideas of other entrepreneurs, but also as a readiness to monitor and introduce existing best practices efficiently without losing time inventing new "bicycles" if the old ones can meet the needs of customers in the home market of the entrepreneur. Imitation in a non-saturated market can support market proactiveness and the competitive aggressiveness of a fast mover. Followers of the imitative orientation could benefit from following experienced entrepreneurs in their neighborhood but also from scanning and filtering such business practices in more advanced market economies that can easily be transferred to a less advanced business environment. Imitation can however lead to fierce competition if imitators try to position themselves at the same small marketplace.

The individual innovative orientation is a good basis for entrepreneurial ventures in a business environment where creative differentiation is the main prerequisite for creating and retaining competitive advantage. This orientation will produce business growth if the creative entrepreneur is able to protect his/her innovative intellectual capital and to individually control human resources and investments that are needed in order to implement an innovative product or technology. Knowledge cities that have internationally well-known universities can attract researchers interested in commercializing their R&D results. Small technology firms play an important role in revitalizing the economy, but they face infrastructural, marketing, financing and internationalization challenges during the early stages of their business development even in such an advanced market economy as Finland (Pellikka & Virtanen, 2009). Consistent individual innovators have to focus on protecting their innovative ideas and as a result, their opportunities to rely on open innovation and networking practices may be more limited both locally and at the global scale.

The co-creative orientation is a reflection of the emerging network economy of the 21st century. Software development

projects that are based on open source code and communities of practice are examples of co-creative environments that may generate synergetic entrepreneurial ideas. The co-creative entrepreneurial orientation utilizes knowledge sharing in networks and open innovation for developing new business ideas. Open innovation assumes the use of purposive inflows and outflows of knowledge to accelerate internal innovation and simultaneously to expand markets for external use of innovation (Chesbrough *et al.*, 2006).

In order to enable self-analyzis and monitoring of these three entrepreneurial orientations, we developed fifteen questions that cover guiding principles and priorities in these main phases of the entrepreneurial process: business opportunity identification, business idea development and implementation. Sources of entrepreneurial ideas, interaction with customers and partners and risk management in the entrepreneurial activity are reflected in the questionnaire. These issues were, however, not separate questionnaire sections, but presented through alternative statements that had a mixed sequence in order not to disclose the questionnaire pattern in the process of self-assessment.

Respondents were asked to compare three statements under each question and to choose only one statement that is most suitable for describing his/her preferences in the role of an entrepreneur. The full statements are sentences that describe entrepreneurial action priorities and principles such as: "The best way to succeed in business is not to "invent a bicycle", but to introduce an existing product that will best serve the market need" that had to be compared with statements such as, "The best way to succeed in business is to trust your own intuition every time you have a creative business insight" and "The best way to succeed in business is to develop new business ideas with other people, although there is never a guarantee of success if you match people with different visions." Additional questions about entrepreneurial experience, age and gender were included in the questionnaire.

During the period 2005-2010 surveys were mainly conducted in the business and entrepreneurship training environment in order to discuss survey results with participants. The respondents comprised 51% females and 49% males. Among the respondents, 32% (98 females and 245 males) had practical entrepreneurship experience. Of the survey participants, 49% represented the age group 18-24 years, followed by 21% in the age 25-29, 12% in the age 30-34, 8% in the age 34-39. Just 10% of the respondents were older than 40 years. The age composition of the sample represents well such age groups where young people involved in business studies should consider entrepreneurship as an option for their business career.

In the total sample of 1075 respondents, 40% gave priority to statements that correspond to the co-creative entrepreneurship orientation. Individual innovative orientation was supported by 35% and imitative orientation by 25% when summarizing answers related to all stages of the business creation, development and implementation process.

At the stage of business opportunity identification more than 46% of respondents preferred statements that represent co-creative entrepreneurship orientation, whereas at the later stage of business development this percentage has diminished to 42% and at the implementation stage to 34%. At the stage of business opportunity identification, the individual innovative orientation is preferred by 26% of the respondents. However, this preference is higher at the business development stage, 37% and reaches the highest point, 48% at the implementation stage.

High support for co-creative orientation is expressed at the business opportunity identification stage especially by preferring to develop new business ideas with other people (57% respondents support) instead of introducing existing products that will best serve the market need (12% support). At the next business development stage, co-creative orientation is still the most popular, but its support is lower in the field of using initiative of customers, business partners and employees to revolutionize business (10% support) and sharing even negative information with customers (35% support).

At the stage of implementation and commercialization, the individual innovative orientation tends to dominate over the co-creative orientation. It is reflected in low support for the "open book" approach to financial information (13% support this). Individual innovative orientation is most clearly manifested in the statement that only the entrepreneur should know the cost structure of the business (68% support this). An entrepreneur may encourage other people to develop new ideas collectively and combine good business solutions of partners at the business opportunity identification stage. Then, however, if he/she does not disclose business information to the earlier contributors or insists on owning the innovation individually at the implementation stage, this may lead to conflicts of interest. Proximity of earlier partners in a knowledge city environment is not an automatic solution to avoid or to overcome such conflicts.

These data indicate that although the co-creative orientation is popular, especially among potential and early-stage entrepreneurs, they mainly stress knowledge sharing and co-operation with partners at the stage of discovering or creating business opportunities and stress more individualistic principles and less knowledge sharing with business partners, employees and customers at later stages of their entrepreneurial activity. This may also influence their readiness to use knowledge services that assume trust and transparency among start-up entrepreneurs allocated in business incubators or using other proximity-based knowledge services. We had a chance to visit a business incubator in Norway, where start-up companies had boxes separated by glass walls. Management of the incubator admitted that they have to fight intensively against attempts of entrepreneurs to cover these walls with posters that would restrict attempts of neighboring ventures to see their confidential business information. Evidently many entrepreneurs were not ready to the radical transparency and co-creation push that this incubator space introduced.

3. LINKGING GLOBAL ENTREPRENEURSHIP MONITOR ESTONIAN DATA AND THE TOOL FOR UNDERSTANDING ENTREPRENEURIAL ORIENTATIONS

Knowledge management in small firms and in networks of such firms has in recent years become a topical research issue (Valkokari & Helander 2007) but in order to understand knowledge management challenges of established firms, the research should focus already on the stage, where new entrepreneurs enter the process of setting up a venture and monitor knowledge sources that could support their entrepreneurial initiative.

The Global Entrepreneurship Monitor (GEM) aims to identify factors that encourage or hinder entrepreneurial activities (Xavier *et al.* 2013). From the knowledge sharing and networking point of view are important these factors of the GEM model that reflect education and training, cultural and social norms, fears and perceived opportunities, innovation and international orientation but also sources of advice used by new entrepreneurs. The GEM concept differentiates necessity-driven and opportunity-driven entrepreneurs. Necessity-driven entrepreneurs are forced to become entrepreneurs because they do not find a job as salary-earners and necessity to get some income drives to use available opportunities. Opportunity-driven entrepreneurs choose to become entrepreneurs when they discover or create new entrepreneurial opportunities that they perceive to be a better choice for increasing their income and/or self-actualization than the role of salary earner. GEM applies the concept of the World Economic Forum that has divided economies into factor-driven, efficiency-driven and innovation-driven in its Global Competitiveness Report (Schwab 2012). In factor-driven economies international competitiveness of enterprises is mainly based on cheap labor and low cost of other production factors. In efficiency-driven economies success of new entrepreneurs depends heavily on their access to investments. Innovation-driven economies are by their nature knowledge-based and access to new knowledge and networking for knowledge creation become crucial success factors for entrepreneurs.

The GEM definition of early-stage entrepreneurs includes start-up nascent entrepreneurs currently setting up their business and new entrepreneurs that have been running their business more than 3 months but less than 3.5 years. Estonian first GEM survey in 2012 gave evidence of high early-stage entrepreneurial activity. In Estonia the share of early-stage entrepreneurs was 14% of the survey population, the highest in Europe. It was also high in Latvia (13%), the southern neighboring country of Estonia but much lower in Finland (6%), the northern overseas neighboring country of Estonia. In 2013 survey the share of early-stage entrepreneurs in Estonia is marginally lower, 13.1% and Latvia has the highest early-stage entrepreneurship rate in Europe, 13.3% (Amorós & Bosma, 2014).

Earlier researchers have demonstrated that potential entrepreneurs are more likely to have inspiration for their entrepreneurially oriented careers if they have contacts with other entrepreneurs, including entrepreneurs in their family or among their friends (Davidsson and Honig 2003; Arenius and Minniti 2006; Özdemir and Karadeniz 2011). In the 2012 GEM Estonian survey 51.6% of potential entrepreneurs in Estonia know somebody with extensive business experience.

In 2012 a special optional GEM section was used in Estonia for identifying sources of advice used by entrepreneurs. Among nascent entrepreneurs 76% had received advice from their friends and 64% from somebody with business experience. Comparison of nascent entrepreneurs with potential entrepreneurs who have not started start-up activities yet, shows that potential entrepreneurs have less business-related networking with friends. However, at later business development stages the role of friends again decreases. Open nature of Estonian economy is demonstrated by the data that 30% of nascent entrepreneurs had also received advice from somebody that had arrived from abroad. That is more often than receiving advice from public advisory services (25%).

Among innovative nascent entrepreneurs whose intention was offering new products or services to international markets, 66.1% had received advice from a potential investor and 28% of such entrepreneurs had received advice from a researcher or inventor. Only 24% of foreign market focused innovative entrepreneurs had received advice from their spouses of life-companions. At the same time among all nascent entrepreneurs, spouses or life-companions were mentioned as sources of advice by 52% of respondents.

GEM survey offers a representative sample of Estonian population but does not allow qualitative analysis for linking potential implications of entrepreneurial ambitions and knowledge sharing patterns to entrepreneurial orientations. In 2009-2013 we used in the Entrepreneurship MBA program entrepreneurship orientation self-assessment and business opportunity identification exercises in order to understand business development priorities and knowledge sharing patterns of real and potential entrepreneurs in recognizing business opportunities and in following different entrepreneurial orientations taking into consideration the global financial crisis.

4. ADAPTING KNOWLEDGE-BASED SERVICES TO ORIENTATIONS AND DEVELOPMENT PATHS OF ENTREPRENEURS

Managers and course participants that had some entrepreneurship experience mainly focused on opportunities for locating new export markets for existing products and on opportunities for taking over local enterprises that face bankruptcy or opportunities to acquire cheap resources available in the current depressed markets for industrial goods. Their vision of knowledge-based business services was mainly to receive just in time information, flexible access to risk capital and good business contacts in order to exploit "window of opportunity" in time and profitably. This reflects some kind of combination between the imitative and co-creative entrepreneurial orientations taking into consideration the limited

capital base of these individuals that forces them to find business partners. Knowledge-based services for such entrepreneurs do not assume business incubators but rather bringing together different stakeholders and assisting them in understanding how their common business interest can be linked to the real estate development opportunities in line with the future vision of Tallinn as a knowledge city.

Participants that lacked entrepreneurship experience were in fact more focused on innovative business opportunities in the field of green products and alternative energy production. They also described life style entrepreneurship opportunities such as arranging cost efficient tourist trips to new destinations chosen in line with their own travelling interests. Some serial entrepreneurs with extensive business start-up experience, were, however, also inspired by such business opportunities.

Among potential entrepreneurs there were also training participants focused on long-term technology development as the sources of their individual innovative orientation. They perceived lack of risk capital as the main obstacle to implement their business development vision. Embedding them to a cluster that has strong technological core and technologically knowable risk capital providers would be a useful function of a knowledge city for such entrepreneurs.

MBA students that were interested in life style entrepreneurship usually did not assume any institutional support to their small scale-business although they were ready to use extended network of friend in order to market their services in co-creative mode. There is however increasing number of young potential entrepreneurs interested to contribute to scalable start-ups in the field on social networking tools and related mobile applications. Taking into consideration rapid changes in this field, their ideas have to be implemented in a limited "time window" at the global scale. The challenge of the entrepreneurship support system is to create more such opportunities as Garage48 for using the environment of Tallinn as a knowledge city for rapid prototyping and testing such services by applying co-creative orientation. At the same time we have to accept that Tallinn and Estonia are quite small markets and some creators of new scalable business models have to move at the business development and implementation stages to Silicon Valley or to other similar global centers.

5. CONCLUSION

Concepts of knowledge cities are especially relevant for countries that are in the transition process from the efficiency-driven economies to innovation-driven economies.

Demand for knowledge can vary during the early stages of entrepreneurial activities. For example some entrepreneurs need experience-based knowledge about practicalities of start-up activities; others need contacts for accessing new distant markets or personal coaching and emotional support.

In their classical article on knowledge management, Nonaka and Konno (1998) link the benefits of online networking primarily to the phase where firms combine ideas that are already externalized. Contemporary online social networks such as LinkedIn and special networking sites for start-up entrepreneurs, however, enable some forms of socialization and tacit knowledge sharing between potential and nascent entrepreneurs that often do not share the same physical space for face-to-face networking. Knowledge cities face the challenge of enhancing the value of proximity in their business environment for people that represent different entrepreneurial orientations.

It is important to link early-stage entrepreneurs who are mainly influenced by tacit knowledge of their family and close friends to the networks that enable access to explicit knowledge about new technology and market trends for discovering new business opportunities and for participating in open innovation activities. However, we should remind that not all potential entrepreneurs are ready for co-creative entrepreneurship and open innovation and therefore the same support mechanism does not suit for everybody.

Many entrepreneurs give value to co-creation at the early stage of business opportunity identification and knowledge cities can create both physical and virtual spaces for such activities.

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THE SKILL MILL: AN EXAMPLE FROM NORTH EAST ENGLAND OF DIVERSIFICATION AND A CATCHMENT-BASED APPROACH FOR MULTIPLE BENEFIT

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ABSTRACT

The conventional wisdom for juvenile justice services in England and Wales, UK, is to assess, plan, intervene and review therapeutic treatment for a time-limited, court ordered, or statutory period.

In the current financial climate, this model has diminished effectiveness, especially for those of working age.

The unemployment rate in the UK for 16-24 year olds is 20% (the highest in 17 years), with re-offending rates at 36%, compared to 24% across all age groups.

Our preliminary research into a pilot initiative in Newcastle, UK, found that youth justice services are best placed to lead multi-agency partnerships for employability of the most disadvantaged and justice-involved of this age group.

The Newcastle example shows innovation and creativity by bringing together public, private and voluntary sector organisations to develop a Social Enterprise, The Skill Mill, to deliver multiple benefits across a broad range of agencies.

The formation of this enterprise has a 3-year evidence base. Continued research will develop a fuller understanding of the key success factors associated with the project, and will consider the feasibility of scaling up the project to develop a UK social franchise. The Social Return on Investment (SROI) assessment for this approach has been calculated at 12:1, including the employment, cost of crime and environmental impacts.

The strategic synergies of risk management as it applies to flooding, young people and communities brings a diverse partnership of organisations together with a unique approach to meeting each other's aims and objectives, pooling expertise, in a cost-effective, knowledge-based and original way.

KEYWORDS

Justice; Innovation; Intrapreneurship; Environment; Employment

INTRODUCTION

"Intrapreneurship is not a choice, it is the only survival attitude" Pinchot (2000).

There is an English proverb, "necessity is the mother of invention". If this is true, then competition or the pursuit of competitive advantage is the father of innovation.

This paper describes the intrapreneurial journey taken by two public sector employees seeking to create a new multiple benefit enterprise for youth at risk. The term *intrapreneur*, first defined by Pinchot and Pinchot (1985), is helpful in describing this process of creativity and change: *"Creativity and innovation are fuelled by the intelligence of people who have the freedom and right to express their ideas"* Pinchot & Pinchot (1994). The term was developed further by McCrae (1982) and defined in the American Heritage Dictionary (1992) as: *"a person within a large corporation who takes direct responsibility for turning an idea into a profitable finished product through assertive risk-taking and innovation"* Kautz (1999). Intrapreneurs take new ideas and turn them into profitable realities, therefore suggesting that '**intrapreneurship** can be defined as the process in which: *"innovative products or processes are developed by creating an entrepreneurial culture within an already existing organisation"* Fry (1993).

This paper provides an account of a journey by practitioners, involving calculated risk-taking, meteorological events, evaluation, evidence-based practice, practice-based evidence, a global financial crisis, political ideology, hard work, and a deep-seated belief that outcomes can be further improved for young people at risk.

In order to make this journey, a number of key ideas have come into play, involving leadership, intrapreneurialism, practice-based evidence, evidence-based practice, strategy, and social innovation. It is important to note that the multi-disciplinary nature of the developments we describe are such that the supporting framework is in itself broad and diverse. In particular, this paper will also address the important role that nature and the natural environment has played as we explore desistance in the context of the green economy and ecosystem services.

This story begins at Newcastle Youth Offending Team (YOT), one of 158 multi-agency statutory partnerships in England and Wales, established by the Crime and Disorder Act 1998, and 'located' with Local Authority structures, charged with preventing offending and reducing reoffending by children and young people aged 10-18. The statutory partners who resource and govern YOTs are Police, Social Work, Health and Education. Partners are mandated to provide staff and funding and to pool resources in order to meet the following statutory aims and subsidiary performance indicators set by The Ministry of Justice (MoJ).

- Prevent offending - Reduce the numbers of first time entrants to the youth justice system
- Reduce reoffending - both binary rate and the frequency rate
- Minimise the use of custody
- Improve the suitability of accommodation of young offenders
- Increase the numbers of offenders in education, training and employment
- Ensure that there is no disproportionality in the ethnic composition of the local youth justice system

YOTs operate to a set of national standards and evidenced-based guidance documents which are also set by the MoJ[1] and the Youth Justice Board for England and Wales (YJB)[2]. Due to the raft of national standards, legislation, mandatory guidance and the governance and supporting infrastructure and strict regulatory and inspection frameworks, YOTs are not organisations who are known for independent development or practice innovation. They are by nature and design inward-looking, due to a primary focus on strict performance measures, as well as financial constraints.

According to Senge (1990) learning organisations are: "…organizations where people continually expand their capacity to create the results they truly desire, where new and expansive patterns of thinking are nurtured, where collective aspiration is set free, and where people are continually learning to see the whole together".

During 2007, Newcastle YOT set some ambitious targets to improve performance using a combination of robust performance management approaches and challenges to the perceived wisdom of the time. In doing so, it became apparent that a close working relationship between the two YOT Managers (the authors) enabled the development of a close working partnership which encouraged others and laid the building blocks for the YOT to work towards becoming a learning organization. The authors recognised the value of evidence-based practice and entered into a formal partnership with Northumbria University to include some external evaluation of the service.

By 2009 significant improvements were being delivered and most key performance indicators were on an upward trajectory. By 2013 all key performance targets had been achieved

Fundamental to this improvement programme was the effort to improve the numbers of young people engaged in full-time education, training and employment, a particular and complex challenge in Newcastle, as the performance data was showing.

In order to understand this problem, the YOT engaged Northumbria University researchers to investigate the issue and make recommendations for improvements. The paper led to the establishment of a bespoke programme for YOT clients and an investment of £225k from The Young People's Development Agency (European Social Fund). The initial work also led to further discussions about greater partnership work between the YOT and Northumbria University to further improvise the local youth justice system.

It was at this time, late 2008 that the authors began to consider key ideas and methodologies from the private sector and potential application in youth justice context to improve 'readiness' for (as would transpire) austere budget setting. This provided the authors with an insight and the space to consider different approaches to organizational and system development. In October 2009 The Conservative Party published 'Control Shift'[3] which outlined a future Conservative Government's proposed funding model of local government and made the case for the private and social enterprise sectors delivering services rather than centrally funding local authorities. This approach, partly influenced by the economic climate in 2009 and partly influenced by centre-right political ideology, would require public sector organisations to operate in a new environment and require leaders to develop a 'new map of the world' and to be more innovative and entrepreneurial and respond to the challenges that would eventually arise from the expected change on a massive scale. The prospect was of wholesale cuts to public services that could not be managed through 'tinkering around the edges'.

When the Conservative Party eventually came to power in 2010 many of the policies ideas outlined in "Control Shift" became reality. Austerity measures and large reductions in public spending forced local authorities to cut budgets, close services and re-examine the way services were funded and delivered.

As the new government spending plans became apparent, it was clear that the learning and skill development that the authors had achieved were to be vital to the success and sustainability of the YOT. It was also clear that the authors would need to bring their experience of managing risk to promote good outcomes for young people and develop new services and secure new resources (if we were to continue to meet our statutory objectives).

Hisrich and Peters (1992) state that the guiding principles in a traditional corporate culture are "to *follow the instructions given; do not make any mistakes; do not fail; do not take the initiative but wait for instructions; stay within your turf; and protect your backside. This restrictive environment is of course not conducive to creativity, flexibility, independence, and risk taking - the jargon of intrapreneurs".*

As has been previously noted, YOTs, and to some extent local government, were and still are insular organisations not given to diverse relationship building or networking in the same way that private sector organisations are. The historical

1 Ministry of Justice: http://www.justice.gov.uk

2 Youth Justice Board:http://www.justice.gov.uk/about/yjb

3 http://www.conservatives.com/~/media/files/green%20papers/localism-policy-paper.ashx?dl=true,

funding sources were such that YOTs have not needed to develop such a common understanding of 'customers' or 'clients', secure contracts or use informal networks to further their interests and meet goals. The authors recognised this need to change and began exploring every available lead and option to secure funding or develop supportive networks. The power of business links and network has been noted by Turnbull, Ford and Cunningham (1996) and the authors began to look at international and national supporters to achieve growth.

Robbins and Judge (2013) believes that today's successful organization must foster innovation or become "candidates for extinction", and that victory will go to the organisations that "maintain their flexibility, continually improve their quality, and beat their competition to the marketplace with a constant stream of innovative products and services".

SERENDIPITY, SPONTANEITY AND STRATEGY

A chance contact with senior representatives of the Environment Agency (EA) an England-only non-departmental public body of the Department for Environment, Food and Rural Affairs who were looking to develop a project which involved young people in environmental activity, was especially catalytic. These individuals are also people the authors recognised as being intrapreneurial. There was a stated desire to 'think outside the box' in order to meet coastal and flooding risk management aims. A community of entrepreneurs was emerging; building a forward momentum of creative energy. Serendipity, if you like, being converted to new output.

Perhaps in an era of austerity, entrepreneurs, looking for solutions to their internal problems, and for ways to do things differently (naturally or forced), income generate and become more efficient, seek other entrepreneurs out under these circumstances; a mix of fortuitous happy coincidences, tactical planning and effort.

As a result Newcastle YOT set up a reparation scheme[1] with the EA. It soon became apparent that young people involved in the environmental reparation programme enjoyed the experience with attendance and successful completions appearing to be higher than for any other reparation activity. In order to understand the benefits of the model the authors commissioned Northumbria University once again to examine the reparation programme and determine any long-term benefits from continuing with the programme.

Aside from the positive qualitative outcomes the programme showed a 16% re-offending rate compared with a national rate of 45%.

By late 2012, the 2007-08 financial crisis and subsequent UK austerity measures were beginning to have an impact upon the ability of the YOT to support young people in to employment following a YOT intervention. Young people with few (if any) qualifications, criminal convictions, poor literacy and numeracy levels were, in the prevailing economic climate not only unemployed but for their foreseeable future appeared to be unemployable. The importance of employment to the YOT was key due to the positive association with desistance. According to Farrell *et al* (2012) desistance is about more than criminal justice. Desistance requires engagement with families, communities, civil society and the state itself. All of these parties must be involved if rehabilitation in all of its forms (judicial, social, psychological and moral) is to be possible. Secondly, it contributes significantly to improving primary physical and mental health outcomes. In particular, engagement with the natural environment brings positive health benefits as Pretty *et al* (2005) have shown.

It was apparent to the authors that we ourselves held a solution to the employment issue for some of the young people (and the associated benefits to reducing reoffending and negative health outcomes) in the existing environmental reparation programme. In addition, our experience of 'the training offer' to many young people in the city, supported by the research, as being merely a 'revolving door' with poor progression or relevance to the labor market. The option for the authors was clear, become part of the labor market and align the learning to it.

The Northumbria University research had identified the recidivism and SROI benefits, the young people themselves were saying they enjoyed the activity particularly the contact with nature and partners were willing to continue to fund the reparation activity. A compelling business case was emerging to extend the reparation programme into a viable business that employed "graduates" from the programme. This idea clearly fitted with the approach outlined in "control shift". It was evidenced based and would support the YOTs performance goals i.e. a need for sustainable resourcing and it captured the imagination of the authors with a sound moral and intellectual rationale. The authors took the decision to establish a social enterprise[2] without delay during summer 2013.

The plan to set up a social enterprise, employing ex young offenders in flood risk prevention makes a good example of social innovation - a new idea that works to meet pressing unmet needs and improve peoples' lives Mulgan *et al* (2007).

As such this would be the first example of a YOT initiated social enterprise employing young people directly and one which the authors could foresee as having the potential to be replicated nationally.

The authors recognised the need to convince a community of interest of the viability of the idea, the credibility of the benefits to their own agenda and promote the wider Social Return on Investment of undertaking flood risk prevention works. It was also clear that risk taking and new found passion for social intrapreneurial activity would need to be supported by a network of industry experts and sector specific advisers.

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1 Reparative processes include a variety of activities to pay back to the community, including work similar to community service activity.

2 Social enterprises are businesses that trade to tackle social problems, improve communities, people's life chances, or the environment. They make their money from selling goods and services in the open market, but they reinvest their profits back into the business or the local community

In addition to harnessing the resources and wisdom of collaborators and supporters it was apparent that it would be necessary to consider how to manage those detractors who did not have the same map of the world, the competitors who would be personally and professionally challenged by the idea, the ambition (and the potential success) and the prevailing culture where incremental progression was seen as good enough. The National Audit Office recognised these limiting factors to public sector innovation in a report in 2007 (*Seeing the light - innovations in the local public sector* NAO 2007) but little or no progress in implementing the recommendations was visible in 2012.

"understanding the environment, being visionary and flexible, creating management options, encouraging teamwork while employing a multi-disciplined approach, encouraging open discussion, building a coalition of supporters, and persisting" Hisrich & Peters (1995).

The authors considered a long term plan much like that described by Collins and Porras (1994) as being 'big, hairy and audacious' whereby an idea and the pursuance of it could be realized in 10 years or more. A deliberate decision was taken to do at least one thing each day to make it happen.

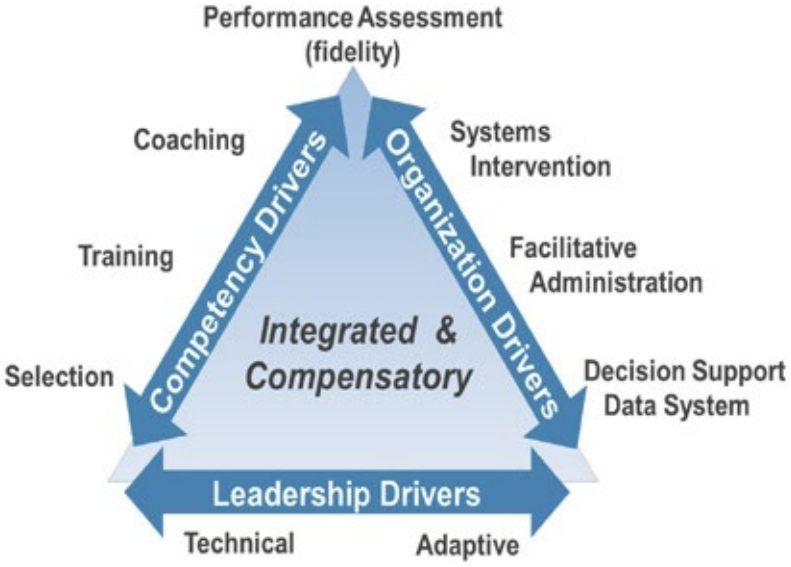
The team was assembled, and would later become a formal advisory board were very successful individuals in their respective fields, with significant influence and knowledge. The collective expertise of the board assisted in covering most if not all of the six bases of leadership power as described by French and Raven. It was recognised early on in the venture that there were significant benefits to increasing our network of contacts and drew inspiration and energy from being in communication with other successful, innovative and resourceful people, who invariably knew other like-minded people who could bring benefit.

In deciding to set up the Social Enterprise, the name the Skill Mill was chosen, we looked at some of the other new and successful ways of working that the authors had been instrumental establishing in recent years e.g. a formal partnership with Northumbria University, a Multi Systemic Therapy Team and embedding YOT social workers in schools. It became apparent to the authors that there was a proven track record in managing change, developing innovative and untried approaches to youth justice service delivery and were able to effectively understand business risks and more importantly envisage the rewards and performance improvements that successful implementation brings.

Fixsen *et al* (2013) noted that to secure the implementation of previously tested models a number of critical elements need to be in place

1) Competency Drivers – are mechanisms to develop, improve and sustain one's ability to implement an intervention as intended.
2) Organization Drivers – are mechanisms to create and sustain hospitable organizational and system environments for effective services.
3) Leadership Driver – focuses on providing the right leadership strategies for the types of leadership challenges. These leadership challenges often emerge as part of the change management process needed to make decisions, provide guidance, and support organization functioning.

The interdependency of the drivers and sub elements are highlighted in the diagram below



Fixsen *et al* (2013)

In order to successfully move from the environmental reparation programme to the Skill Mill the authors identified the key drivers and sub-elements that aided previous success and sought to establish them before launching the enterprise. An

example of this is the secondment of the former reparation supervisor form the reparation programme to the Skill Mill.

Despite previous successes with internal projects and changes to service design the process of setting up a company was extremely complex and challenging. The legal process and deciding on the most useful structure for the Skill Mill required additional expert advice and some considerable time to work through the administrative process. In the end a company limited by guarantee structure was agreed with an asset lock. This provided the required social enterprise status (with all assets remaining in the company) and the necessary flexibility to respond to future opportunities.

RISK, RISK AND MORE RISK

Audentes Fortuna iuuat - Fortune favours the brave

As Franklin D. Roosevelt (1935) said "*Rules are not necessarily sacred, principles are*." The development of the Skill Mill embraces this notion to develop something new but the process has required bravery and risk-taking from a number of partners and takes a cue from Eleanor Roosevelt (1960) "*Do one thing every day that scares you*"

It is important to note that whilst setting up the Skill Mill the authors were and remain principally responsible for managing and improving the YOT, a range of targeted and specialist services for 13-19 year olds in one of the 7 core cities of England and Wales. Leaps of faith were required on many levels. Firstly, in order to become directors of the Skill Mill the authors needed permission from their employers, the Local Authority, and are grateful to the vision and support of key directors and the Chief Executive of Newcastle City Council who recognised the synergies, integration with other priorities and wide benefits of the Skill Mill early in its development. Morris (2001) defines the entrepreneurial organization as "one that proactively seeks to grow and is not constrained by the resources currently under its control".

The support of the leadership team was important to give 'the green light' to proceed and demonstrated the principles described by Barsh et al (2008) in their online paper - *Leadership and Innovation*. Their research highlighted that many executives allow innovation to occur rather than manage or lead it. They also noted the difficulties and frustrations that innovators have when they try operate in organisations that publicly support innovation but do not have infrastructure or dedicated systems in place to actively support innovation to occur.

Once the company was established and the support and resources of the advisory board was harnessed the authors then began working on the practicalities and the infrastructure of the business. Once again the authors had to draw upon their experience of successfully managing risk when sourcing insurance cover for ex young offenders engaging in watercourse work. Understanding and meeting the health and safety requirements for this type of work is a complex task and only one insurance company would provide cover. Even then, an independent risk assessor was dispatched to validate the policies and operating practice. The assessor was so impressed with the approach and values of the enterprise that the confirmation letter offered free consultancy in order to support our growth and success. This has been feature of the Skill Mill to date. *"Organisations need 'intrapreneurs' and an intrapreneurial culture if they are to grow and prosper. This suggests that organisations do not have these qualities automatically, but require who are willing to be exposed to situations with uncertain outcomes, who enjoy new and exciting, risk-taking activities, do not tire easily and are skillful in persuading others to achieve a certain goal"* Van Aardt et al (2000).

THE OUTCOME

The Skill Mill was formally incorporated in September 2013 and began trading in February 2014.

Fry (1993) describes this as a new product subsidiary; a separate unit funded by the parent company. An organization can therefore benefit from the results of intrapreneurial activities without those activities disrupting the rest of the parent company. In practice, this means that the organization receives proposals from individuals within the organization, and evaluates them and works with those individuals to develop them if they appear profitable. The Skill Mill similarly evolved as a subsidiary of YOT yet with an independent legal structure and accountable body.

9 young people have been have been employed. 8 are operatives, ex-offenders with a history of youth custody and the care system aged 17 and 18 and one is former student from Northumbria University who is in a development officer role. None of the cohort has re-offended since the company began trading February 2014. 15 contracts have been completed and have a full order book for 2014/15. All of the employees are engaged on a nationally recognised vocational qualification and our list of corporate partners who are working with us to secure future employment of the young people is growing.

In keeping with evidenced based approach, all employees are paid the minimum wage (NMW). As has been set out by Department for Business Innovation and Skills (UK government evidence paper to the Low Pay Commission, 2012) the minimum wage reduces poverty and incentivizes work. The Skill Mill is unique locally in paying young people the NMW with most other training providers using only a bursary scheme of a maximum £45 per week or only providing travel allowance to trainees. A decision was taken to incur additional costs by seconding an experienced YOT reparation supervisor to support the Skill Mill employees. We could have opted to employ an experienced youth trainer from another organization and employ them on significantly less. However our practice based evidence from the environmental reparation programme and the finding of international studies into relationships Andrews and Kiesling (1980) Skeem *et al* (2007) and more latterly Smith *et al* (2012) that the quality of the relationship between the young people and the supervisor was a key element in the success of the programme.

Plans are now well developed to take forward a social franchises of the Skill Mill in other parts of the UK and maximize the benefits to both young people through paid employment, communities through reduced recidivism and improved food risk works and local authorities and other customers through a reduced cost base and the benefits of a 12 to 1 Social Return On Investment. In a report by the UK's Department for Innovation and Skills this relationship between Social Impact and growth was made out,

"Today, significant opportunity exists to continue to scale up these solutions. UK businesses have the potential to achieve around £100 billion a year from productivity improvements, if these innovations are implemented across the board15, whilst at the same time generating positive societal and environmental benefits such as employment opportunities and emissions reduction. Over 40,000 jobs could be created annually in the environmental and clean technology sector alone……." The UK Department for Business, Innovation and Skills (2012). Low Carbon and Environmental Goods and Services, Report for 2010/11

CONCLUSION

It has certainly been important to connect with innovators in new sectors who have re-defined their own new map of the world and who are keen to challenge the traditional paradigm in order to solve new problems in context of reduced resources. By working collaboratively with diverse partners it has been possible to be more creative and more easily share ideas, and meet societal needs and make a positive difference with benefits realized for all stakeholders.

In reviewing our progress to date and looking to identify the key components of our working partnership it is evident that the authors both meet the 5 characteristics of successful innovators as described by Chamorro-Premuzic (2013); an opportunistic mindset, substantial training and experience in our field, proactive and persistent, prudent and able to manage risks, make best use of social capital and networks. These attributes coupled with a long term vision linked to the strategic aims of the YOT have supported the initial success of the Skill Mill.

The authors also understand that there will always be those who struggle to recognize that the world has changed and that traditional ways of working or outdated technologies are no longer relevant. There are also those who are threatened by new successes. The authors will concentrate on being the best social innovators and intrapreneurial investors in young people's futures that we can be.

"Intrapreneurship is not just a way to increase the level of innovation and productivity of organisations, although it will do that. More importantly, it is a way of organising vast businesses so that work again becomes a joyful expression of one's contribution to society" Pinchot (2000).

Creating capital through environmental and social value is at the core of The Skill Mill. Our aim to develop a catchment based approach to delivering multiple benefits is one which draws in the expertise of new partners with a common aim to improve society whilst simultaneously providing quality services will be tested over time. Hopefully it will be big, at times it will be hairy but it will certainly be joyful.

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THE INFLUENCE OF CAPITAL SYSTEM CATEGORIES ON HUMAN DEVELOPMENT INDEX IN BRAZIL

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ABSTRACT

Purpose: With the capital system taxonomy adapted to Brazilian indicators as was done in previous studies, the objective of this study is to improve the understanding of the correlation among the capitals categories and how in Brazil each one impacts on HDI.

Scope: The capital system is a value-based tool for Knowledge Cities that systematically attempts to identify and develop their entire capital assets. The HDI aims measure the living conditions by diverting the focus away from merely accounting statistics related to the national income.

Method: HDI and capital system indicators from 150 Brazilian cities were listed. Statistical techniques were used for data analysis. The relationships between capital indicators were correlated and then we used multivariate linear regression to identify indicator loadings in HDI formation.

Results: The results indicates those capitals categories that have the highest impact of the HDI and also demonstrates that there is a correlation between the indicators that compose the capitals, what in turn confirms the influence of determined capitals categories over others.

Recommendations: The statistic analysis used demands that the resulting variables are mutually exclusive. This restrains the complete application of the taxonomy. This apparent shortcoming can be compensated by mimicking the incorporation of specific information's and evidences of each region.

Conclusions: The most significant correlation was from the identity capital with the financial capital. In fact identity capital imbeds formal and informal elements of local urban culture and highlights the symbolic value of goods and services produced in a Knowledge Cities perspective.

KEYWORDS

Capital System Taxonomy; Human Development Index; Knowledge Cities; Brazil

1. INTRODUCTION

The generic capital system taxonomy is a value-based tool for knowledge cities that systematically attempts to identify and develop their entire capital assets, tangible as well as intangible (Carrillo, 2006). It attends the acquisition and organization of information in an accountable way allowing a systematic and integrative perspective for a city and thus, reveals the knowledge-leveraging capabilities that greatly impact a knowledge-city development.

Information, when well organized, can untangle new economic value-sources, provide new scientific insights, and as support governments in the development and execution of policies aimed at stimulating the common good. In fact the world has an unimaginable large and continuously growing quantity of digital information available. The cost of producing data in large scales has been falling while the quality of that data is increasing (Rosling, 2007). In addition to this the development of "Open Data Movement" that consists of series of statistic data provided by governments agencies, statistical organizations, and other sources to the public has added significantly to the information freely available (Hienert, Zapilko, Schaer, & Mathiak, 2011). This availability of high quality and easy accessible data makes its analysis possible by integrated systems like the generic capital system. The movement of open information is also allowing for a more detailed view of the individual elements that form the data and this helps create a better understating of the singular characteristics of these elements and how they are interacting, that in turn demands a revision and adaptation of the indicators that compose the generic capital system taxonomy. In other words, data is analyzed by the system and the findings help recalibrate and improve that same system.

This adaptation or recalibration of the system was already done in an earlier study in Brazil where characteristics of various singularities revealed information that lead to a more detailed understanding of the knowledge-leveraging capabilities of a knowledge city being studied (Fachinelli,Carrillo,Darisbo,2014). That is why this article looks to increase the understanding of the generic capital system from the perspective of its relationship with the indicators internationally used such as the HDI and also from the internal correlation among the capitals categories.

In this way the study aims to advance the understanding of the development of the cities and the use of information to shape future local behavior, under an academic scientific perspective.

2. THEORETICAL FOUNDATIONS

The HDI (Human Development Index) was created in 1990 as an alternative for measuring the economic condition in a region by diverting the focus away from merely accounting statistics related to the national income and use statistical data that can measure the living conditions and the effects of political decisions on the lives of people in the region instead (Haq, 1995). Since then the HDI has been used as an indicator by the United Nations Development Program (UNDP) to rank its member states. It is a comparative measure formed by data such as live expectancy, average years of education and per capita income. This collection of data composes the dimensions of long and healthy lives, access to education, and overall quality of life that is used to rank the countries by their level of human development. In other words, development is measured not just by economic growth, but by improvements in human welfare.

Since its creation the HDI has evolved in terms of methods and even while being criticized by some it is highly valued by other authors specializing in development issues. The HDI is an international indicator recognized and applied by the United Nations member states. In addition to this it is an index that facilitated the analysis at the level cities independently from the development of the country they are in. In agreement with the OECD the economic development in countries can be explained and even determined much more by factors related to the generation, acquisition, sharing, and use of knowledge than by conventional economical values like land, labor, and capital (OECD, 1996).

The study Measures For Knowledge-Based Economic Development done by the State of Georgia and the US South, Shapira and Youtie, 2006 states that "in introducing new applications of knowledge-based measures, several challenges present themselves. First, economic development practitioners are generally not familiar with sources and uses of information on knowledge. Second, when they become aware of these new knowledge data sources, they will likely seek to incorporate them into existing paradigms, rather than use them to pursue dramatically different strategies. Third, in exploring a new technique, state and local economic development professionals will typically seek specific insights and information that can be used to meet their goals and objectives. Applications that build up from a micro-data base rather than relying on aggregate benchmarks are likely to be a more effective way to diffuse knowledge measures into economic development decision-making. Disaggregated methods are more apt to be taken on board than summative methods, and disaggregation is crucial to engage practitioners' interest, even if this alone does not guarantee continued follow through". Following that line of thought, the generic capital system is a value-based third generation knowledge management formal system structured by categories in a complete and consistent taxonomy. A capital system also aims to include all major tangible and intangible capital dimensions, as well as to be applicable in all possible cases with the lowest possible number of proto-categories (Carrillo, 2002; 2004). On the descriptive side, all empirically documented sub-categories must be able to be hierarchically included within the mayor categories. This allows the consideration of all possible cases and the determination of the general attributes of the value universe. (Carrillo, 2006). The integration of all value dimensions into a unified system of categories aims at rendering a general construct of capital. This is deemed a necessary condition to develop a genuine accounting system for the knowledge economy and thus to integrate an index or a composed indicator.

As presented in previous studies (Fachinelli, Carrillo, Darisbo, 2014), in the research context of Knowledge Cities, the generic capital system 'adheres to the notion of knowledge as a social construction, in which the emergence of knowledge societies adopting knowledge-based frameworks is encouraged […] It elicits a systemic assessment of a city's capital base (both tangible and intangible) and its capacity to recombine it in innovative ways' (Leal & Garcia, 2012, pp.353). The adherence of the capital system to the concepts and experiences of knowledge cities has been reported in some earlier works (Carrillo, 2002, 2004; Flores, 2006; González, 2011; González & Carrillo, 2012; Garcia, 2012; Leal & Garcia, 2012). According to Carrillo (2006),when simplified to the irreducible form of an input/process/output system, all production systems consist of (*i*) an input capital that is the given value base with which the system begins to operate (in the case of cities, the set of favorable circumstances that led to the foundation of a city—water supply, topography, climate, etc.); two process capitals—(*ii*) the agent capital which performs production (in the case of contemporary cities, basically its functional population) and (*iii*) the instrumental capital, which constitutes all the means of production (in the case of cities, most of the traditional objects of urban planning such as layout, water supply and sewage, etc.); finally, some form of value exists as (*iv*) product capital (surplus yield from primitive farming was simultaneous to the transition from nomadic to urban societies). To sum up, all value creation systems include an input capital, process capitals (agent capital plus instrumental capital), and an output capital. From this perspective, rather than seeking a traditional planning approach based on needs, communities should be planned considering its endogenous assets and emphasizing the strengths and positive value capitals that may be developed. Some cities build on endogenous assets, such as the brand. Other cities attract exogenous investments and talents, or both. In either case, the development should be driven by the characteristics and needs of a specific community (Yigitcanlar & Dur, 2013).

3. METHOD

Initially all indicators that form each capital were selected and this resulted in a collection of 65 indicators, subsequently the most recent data was collected corresponding to 150 Brazilian municipalities, 50 with the highest, 50 with the lowest , and 50 with the medium HDI. The data to compose each capital was obtained from official Brazilian institutes keeping statistical data such as Atlas Brasil and the IBGE (Brazilian Institute of Geography and Statistics). For analysis purposes the software IBM SPSS version 19 was used. A factorial analysis was conducted in order to asses unidimensionality of

the capitals followed by multiple regression analysis that considered the HDI as a dependent variable and seven capitals as independent variables.

3.1 Results

In an initial stage an analysis was done separately for each capital. After that a matrix of correlations and an evaluation on a one-dimensional basis was done though a construct of the factorial analysis. To determine if the sample is adequate for analysis its adaptability is considered through the Kaiser-Mayer-Olkin (KMO) by comparing the magnitude of the observed coefficients of correlation and the partial coefficients (Hair, 2005). High values indicate that the analysis is adequate. During the analysis the KMO values of the factor vary from 0,51 to 0,93. The explication percentages, on the other hand vary from 62% to 88% within the parameters recommended by the corresponding literature.

Bartlett's test of sphericity looks at the association between the indicators and is used to test the void hypotheses that the matrix variables of correlation of the population are not correlated. Since all capitals reject this hypothesis, this again suggests that the indicators of the same capital present a high level of correlation. The Table 1 shows the factors generated with an eigenvalue greater than 1 and the percentage of explanations accumulated between them.

Table 1. Capitals, Indicators, KMO, Bartlett's test of sphericity

Capital	Indicators	KMO	Bartlett's test of sphericity	Nº of factors	% explaining
Identity Capital	17	0,930	0,000	2	80,2
Intelligence Capital	7	0,893	0,000	1	81,6
Relational Capital	7	0,766	0,000	2	87,2
Financial Capital	5	0,510	0,000	2	85,1
Human Individual Capital	8	0,823	0,000	2	84,4
Human Collective Capital	11	0,881	0,000	2	73,5
Instrumental Material Capital	10	0,830	0,000	2	62,7

From this phase on, the analyses proceeds using a total of 13 generated factors for the capitals.

3.2 Correlation Analysis

The correlation coefficients of Pearson for the 13 factors generated from the 7 capitals indicates the more prominent correlations: The factor referring to the macro-indicators of the financial capital shows a strong positive correlation with the factor of attractiveness of the identity capital (r=0.921), with the intelligence capital (r=0.921), and with the environmental and social factors of the human individual capital (r=0.779). On the other hand a negative correlation appears with the factor of socio-cultural cohesion of the relational capital (r=-0,921).The factor sense of attractiveness of the identity capital is correlating with the environmental and social factor of the human individual capital (r=0,905) and is negatively correlating with the factor of social cultural cohesion of the relational capital (r=-801). The sense of belonging factor of the identity capital is correlating positively with the factor of educational environment and the production factor of individual human capital (r=0,838) and negatively correlated to the factor of urban environment of the instrumental capital (r= -0,778). The intelligence capital is positively correlating with the organic structural factor of the collective human capital (r=0,844) and also shows a strong negative correlation with the socio-cultural cohesion factor of the relational capital (r= -0,936). The organic structural factor of the human collective capital is positively correlated to the environmental educational factor(r=0,747) and negatively correlated with the urban environmental factor of the instrumental capital (r= -0,799). The organic environmental and social factor of the human individual capital shows a negative correlation with the factor of the social-cultural cohesion of the relational capital (r= -0,704). The educational environment and the production factor of individual human capital shows a negative correlation with the urban environment factor of the instrumental capital (r= -0,877). It is interesting to note that the socio-cultural cohesion factor of the relational capital shows elevated and negative correlations with the majority of the other capitals. This is because those capital joint indicators associated to socio-cultural vulnerabilities, thus the higher the indexes, the worst the social effects are, like the index of Gini that measures the social inequality.

3.3 Regression

The model of regression to explain the HDI was constructed using the 13 generated factors as independent variables in the Factorial Analyzes based on the 65 indicators. The backward procedure was used. Initially all the factors were considered. In each round of the analysis one of the factors whose significance was not verified was left out. After the generation of the six models the best adjustment was reached with R^2 adjusted to 0.994. Its factors that compose the model of regression are shown in Table 2.

Table 2. Regression

Model	Standardized Coefficients Beta	t	Sig.
Identity capital - sense of attractiveness	,679	22,017	,000
Identity capital - sense of belonging	,371	12,700	,000
Human collective capital- organic structure	,130	4,109	,000
Human collective capital- Intellectual work	,039	2,464	,015
Human individual capital - school environments and production	,082	4,719	,000
Relational capital - socio-cultural cohesion	-,067	-1,938	,055
Relational capital- socio-economical cohesion	,030	2,435	,016
Instrumental capital - urban environment	,051	1,986	,049

Of the seven capitals, after the analysis five were left based on criteria of levels of significance inferior to 0,06. The capital with the highest supported coefficient (beta), which has the most impact on the HDI, is the factor sense of attractiveness of identity capital (0,679) followed by the factor sense of belonging of identity capital (0,371), by the factor organic structure of human collective capital (0,130) and by the factor school environments and production of the individual human capital (0,082). On the other hand, despite having less impact, the betas of the factor sociocultural cohesion of the relational capital are negative what indicates inverse relationship with HDI. The financial and intelligence capital as well as environmental and social factors of the individual human capital, were removed for not presenting high level of significance to explain the HDI.

4. DISCUSSION

The first data analysis reveal that the seven capitals proposed by the capital system taxonomy can be identified through factor analysis of the 65 indicators. The analysis of the 150 Brazilian municipalities confirms the existence of such classification. Secondly a multiple regression analysis, where the seven capitals were treated as independent variables and the HDI as a dependent variable shows initially the relative high impact of the identity capital and the two human capitals, individual and collective. This way the growth in municipal HDI having as base the sample population considered depends primarily not only on the financial aspects but also on the human aspects and that of knowledge. On the other hand the HDI received negative influence even in a lesser degree of the relational and instrumental capital.

The calculation of the HDI is associated with income, education and longevity. However, analysis of the effect of capital systems among HDI revealed other dimensions. Even if they are present in the HDI elements, the individual and collective human capital include dimensions of value that go beyond longevity and income. Likewise, the identity capital includes dimensions that go further education and longevity, as the attractiveness and sense of belonging. The result of the quality of life in a city is represented in terms of education levels, longevity and income, our study revealed that their development is associated to capital systems, specifically identity, human individual and collective capitals.

5. CONCLUSION

The objective of this study was to identify the impact of the capital system categories on the HDI, based on a sample population of 150 Brazilian cities, as well as the correlation among the capitals. The results identify those capitals categories that have the highest impact of the HDI: The factor of the sense of attractiveness and the sense of belonging of the identity capital; the structural factor of the human collective capital, and the factor of educational environment and the production of individual human capital. In addition to this, differently from the weight on the impact of each capital on the HDI, the analysis of the betas from the multiple regression point to a dynamic of human development that surpasses the traditional calculation of equal weighs. This result reinforces the systematic and integrative perspective of the capitals system.

The results showing the existence of the correlation among the capitals categories also revealed that there is a correlation between the indicators that compose the capitals, what in turn confirms the influence of determined capitals categories over others. This correlation can differ depending on the origin of the data. On the present study the most significant positive correlation was from the sense of attractiveness of the identity capital with the macro-indicators of the level of income from the financial capital (r=0,921). This result is in line with the findings of the earlier study which indicates that identity capital imbeds formal and informal elements of local urban culture and highlights the symbolic value of goods and services produced. Thus, the cultural factor characterizes the uniqueness of a city and can be a guide to the future by providing a platform for knowledge-based development. (Fachinelli, Carrillo, Darisbo, 2014). Even so one limitation of the study must be considered. In the taxonomy some indicators can be considered for more than one capital, while in the present

study there were no repetitions of the same indicators in multiple capitals. This since the statistic analysis used demands that the resulting variables are mutually exclusive. This restrains the complete application of the capital system taxonomy. This apparent shortcoming can be compensated by mimicking the incorporation of specific information's and evidences of each region. This set of data when organized will reveal what the literature calls knowledge-leveraging capabilities that greatly impact a knowledge-city development.

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