Empirical Approaches in Knowledge City Research

In the 21st century, it has become apparent that 'knowledge' is a major factor of postmodern production (Yigitcanlar *et al.,* 2007). Beyond this, in today's rapidly globalizing world, knowledge, along with the social and technological settings, is seen as a key to secure economic prosperity and quality of life (Yigitcanlar *et al.,* 2008a). However, limiting the benefits of a 'knowledge-based development' to only economic gains—and to a degree to social ones—is quite a narrow sighted view (Yigitcanlar *et al.,* 2008b). Thus, the concept of 'knowledge-based urban development' is coined to bring economic prosperity, environmental sustainability, a just socio-spatial order and good governance to cities, and as a result producing a purposefully designed city—i.e., 'knowledge city'—generating positive environmental and governance outcomes as well as economic and societal ones (Yigitcanlar, 2011; Carrillo *et al.,* 2014).

The competitive nature of the global knowledge economy pushes cities to invest on their knowledge edges. This ultimately means almost all cities face the challenge of developing as knowledge cities (Yigitcanlar, 2010). Hence, many cities worldwide have already undergone major transformations in the 21st century, an era in which the role of knowledge in economic, social, environmental and governance issues becomes highly critical for city competitiveness (Yigitcanlar, 2009). Presently, urban administrations, policymakers and planners are in need of new approaches to harness the considerable opportunities of knowledge-based urban development for knowledge city transformation (Lonnqvist *et al.,* 2014).

Within cities, concepts of knowledge city and knowledge-based urban development have become emerging areas of research interest, which links interests of planners, economists, geographers, and environmental, social and other scientists (Yigitcanlar *et al.,* 2012). Despite this growing interest, there has been limited empirical research conducted in the field (Yigitcanlar & Lonnqvist, 2013). Therefore, there is an urgent need for comprehensive research in this area. For this reason, the Special Issue focuses on investigating knowledge cities. It aims at exemplifying empirical approaches in knowledge city research to generate new insights, and potential avenues and directions for building prosperous knowledge cities across the globe.

This Special Issue of the Expert Systems with Applications contains the full versions of a selection of best papers that were presented at the 6th Knowledge Cities World Summit (KCWS-2013) held from September 9-12, 2013 in Istanbul, Turkey, which is co-organized by the World Capital Institute and Istanbul Sehir University. This Special Issue consists of the following ten papers focusing on complementary aspects of the empirical knowledge city investigation. The guest editor has selectively identified and invited the authors to re-write and extend their short articles for re-submission to the Special Issue. These extended versions underwent a second round of independent double-blind and editorial review before final decision was made. The papers contained in this Special Issue represent the latest research in the field. Collectively I hope this collection of papers, which provide rich and diverse perspectives on the topic, will function as an acknowledgment of the centrality of empirical knowledge city research for our cities to achieve a thriving knowledge-based urban development, bridge the research gap, and shed light on the new empirical research directions in the field.

1) Benchmarking the performance of global and emerging knowledge cities
2) Knowledge-city index construction: an intellectual capital perspective
3) Regional evolution and waves of growth: a knowledge-based perspective

4) Knowledge patterns and spatial dynamics of industrial districts in knowledge cities: Hsinchu, Taiwan
5) Innovation quality in knowledge cities: empirical evidence of innovation award competitions in Finland
6) Migrant knowledge workers: an empirical study of global Sydney as a knowledge city
7) Capital system, creative economy and knowledge city transformation: insights from Bento Gonçalves, Brazil
8) Algorithm-embedded IT applications for an emerging knowledge city: Istanbul, Turkey
9) Network-based innovation systems: a capital base for the Monterrey city-region, Mexico
10) Knowledge spaces and places: from the perspective of a "born-global" start-up in the field of urban technology

Following this brief editorial introduction, the Special Issue starts with a Position Paper by Tan Yigitcanlar (Paper 1: Benchmarking the performance of global and emerging knowledge cities). This paper advocates the essential role of city benchmarking to achieve a prosperous knowledge-based urban development and knowledge city transformation. The paper first introduces the methodology of a novel performance assessment model—the Knowledge-Based Urban Development Assessment Model (KBUD/AM). It then highlights lessons from the application of the model in an international knowledge city performance analysis study conducted with 11 global and emerging knowledge cities.

Next in Paper 2, Víctor-Raúl López-Ruiz, José-Luis Alfaro-Navarro and Domingo Nevado-Peña (Knowledge-city index construction: an intellectual capital perspective) proceed on the same topic of knowledge city performance assessment, and first classify and review popular city indices, and then propose a new indexing methodology—the Knowledge City Index (KCI)—to measure intangible capital as the growth capacity of knowledge cities. Authors discuss the results of the application of the methodology in the European context.

Paper 3 by Robert Huggins, Hiro Izushi, Daniel Prokop and Piers Thompson (Regional evolution and waves of growth: a knowledge-based perspective) offers an analysis of the major world regions according to a set of key economic evolution trends—i.e., the fifth wave growth, the third & fourth wave growth, and government-led third wave growth—by presenting a novel empirical approach. In doing so, the authors aim to uncover the underlying structure of the changes in knowledge-based resources, capabilities and outputs across the major knowledge city-regions of the world.

In Paper 4 (Knowledge patterns and spatial dynamics of industrial districts in knowledge cities: Hsinchu, Taiwan), Hung-Nien Hsieh, Tai-Shan Hu, Ping-Ching Chia and Chieh-Chung Liu focus on the development of clusters of knowledge-based corporations that has become an important strategic factor in increasing the competitiveness of knowledge cities. This paper scrutinizes a knowledge city-region—Hsinchu, Taiwan—by focusing on the correlation between the spatial dynamics of knowledge in major industries and innovation based on empirical data.

In turn, Teemu Makkonen and Tommi Inkinen in Paper 5 (Innovation quality in knowledge cities: empirical evidence of innovation award competitions in Finland) deal with the innovation awards as a supporting tool in innovation policy of knowledge cities. The paper searches for firm-level evidence by surveying innovation award winning companies from Finland. The research indicates that innovation awards are an additional tool for innovation promotion, alongside innovation inducement policies and an additional indicator of innovation quality in the context of knowledge cities.

Richard Hu (Paper 6: Migrant knowledge workers: an empirical study of global Sydney as a knowledge city) looks at knowledge city formation from the angle of creative class of knowledge workers. The paper reveals insightful findings of a study on migrant knowledge workers employed in the knowledge-intensive industries and highly skilled occupations in Sydney, Australia. The research provides a better understanding of global Sydney as a knowledge city and its relationship with migration.

Ana Cristina Fachinelli, Francisco Javier Carrillo and Anelise D'Arisbo, with Paper 7 (Capital system, creative economy and knowledge city transformation: insights from Bento Gonçalves, Brazil), focus on the points of conceptual convergence between the generic capital system taxonomy and creative economy, and the potential value of this convergence for the development of an emerging knowledge city. Authors, within this perspective, investigate the case of Bento Gonçalves, Brazil.

Next, Melih Bulu, Muhammed Ali Önder and Vural Aksakalli offer Paper 8 (Algorithm-embedded IT applications for an emerging knowledge city: Istanbul, Turkey). This paper advocates the role of infrastructural resources in the knowledge city transformation—particularly algorithm-embedded information technology applications. In the case of an emerging knowledge city—i.e., Istanbul, Turkey—authors classify and investigate algorithm-embedded information technology application areas related to management of infrastructural resources of the city in a systematic way.

Then, in Paper 9 (Network-based innovation systems: a capital base for the Monterrey city-region, Mexico) Blanca Garcia and Danilo Chavez aim to shed light on the research question of how knowledge-intensive clustering communities, such as higher education institutions and other local actors, are building their communities in the knowledge-based arena. In order to do so, they investigate the City of Monterrey as the case study in the context of Mexico-Texas borderland with the help of regional innovation systems perspective.

Lastly, Paper 10, (Knowledge spaces and places: from the perspective of a "born-global" start-up in the field of urban technology) by Luís Carvalho, Inês Plácido Santos and Willem van Winden, analyzes how a global start-up firm, namely Living PlanIT, is linked to different types of places, and how it explores and exploits territorial innovation potentials. By doing so, it illustrates how the interaction with different knowledge milieus provides unique resources for the technology development, commercialization and societal legitimation for the case study.

I wish to thank the authors of the abovementioned papers for accepting the invitation and submitting and revising their manuscripts within a short time frame, and thank the referees for their thorough and timely reviews. Finally, I want to thank Founding Editor Professor Jay Liebowitz and Editor-in-Chief Professor Binshan Lin of the Expert Systems with Applications for inviting me to edit this Special Issue.

Guest Editor
Tan Yigitcanlar
School of Civil Engineering and Built Environment
Queensland University of Technology
2 George Street, Brisbane, QLD 4001, Australia
Tel: +61.7.3138.2418
E-mail: tan.yigitcanlar@qut.edu.au

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