

KNOWLEDGE-BASED INNOVATION AND THE CITY: THE CASE OF BELGRADE

Jelena Ivanović Vojvodić, John Naisbitt University, Faculty of Arts and Design, Belgrade, Serbia
*Aleksandra Stupar*¹, University of Belgrade, Faculty of Architecture, Belgrade, Serbia

The critical role of research in overall progress generates a pressing need to study the relationship between a city and knowledge-based innovation. A number of socio-economic and political processes influence the development of contemporary cities by defining the beneficial balance between financial ambitions, environmental awareness and sustainability. Consequently, the role of innovation and knowledge has been emphasized as one of the crucial generators of urban success. The most recent initiatives originating from universities and research establishments stimulate the emergence of new spatial formations and digital upgrading, thus setting up a fertile environment for intellectual exchange and the production and diffusion of knowledge and innovations. This article questions the historical, social and technological implications of research on urban space. The focus is set on the case of Belgrade and the newly proposed project of a university campus with its evaluation based on the latest concepts related to the economy of knowledge. This new type of knowledge-based innovation node is intended to serve as a driver of Belgrade's inclusion into the global network of innovative cities. However, this initiative is still in the domain of paper-architecture due to financial limitations and a change in development priorities by the new government.

Key words: city, knowledge, innovation, urban transformations, competitiveness.

Ipsa scientia potestas est.

Francis Bacon

INTRODUCTION

Contemporary society has recognized the importance of a knowledge-based economy, innovation, research and the interdisciplinary approach that guides the current development of the cities (Scott, 1990; Porter, 1990; Hall, 1998; Simmie, 2001; Komninos 2002, 2008, 2014; Jucevičius and Liugailaitė-Radzvickienė 2014). Since the largest share of the overall higher value of communities comes from the improvement of productivity and innovation, it is not surprising that the global interconnectivity of universities, scientific hubs and global finance and production flows has been stimulated through numerous programs of exchange and cooperation, thus generating solutions for evolving urban problems (OECD, 1996; Sassen, 1991). The global rankings of cities usually focus on the presence of research and development (R&D) as the main competitive advantages - alongside the economy, cultural interaction, liveability, environment and accessibility (e.g. Global Power City Index 2014 - Mori Memorial Foundation, 2014). Consequently,

urban nodes around the world tend to create a platform for sustainable development, which links science, art and cultural industries, resulting in the stimulation of innovation as a factor leading to urban enhancement.

In this regard, the present article focuses on urban spaces dedicated to research and university education (R&D areas) and discusses the latest trends observed on two levels—general and local. The former is based on contemporary multidisciplinary literature research and provides a review of current efforts in describing the relationship between cities and innovation, mainly through an emphasis of the role of universities and other knowledge-driven innovative nodes on general urban development and spatial transformations. The review of relevant theories and concepts of the cities, innovative processes and their inherited, modified and emerging spaces is presented through the retrospection of the spatial and socio-economic implications of this phenomenon. At the local level, the case of Belgrade and the related project for the Centre for Promotion of Science (designed by Wolfgang Tschapeller in 2010) is discussed for its particular historical, socio-economic and symbolic background, as well as the originality of the proposed

¹ Bulevar kralja Aleksandra 73/2, 11000 Belgrade, Serbia
stupar@afrodita.rcub.bg.ac.rs

solution, which suggested a completely new spatial concept and typology for the R&D node model. The related section of this contribution is structured around three main issues - the general context and motives of the initiative; the historical (dis)continuity of idea(s), and the innovativeness of the proposed solution with its anticipated effects.

CITIES OF/FOR KNOWLEDGE AND INNOVATION

Science, innovation and technology, due to their vital role in contemporary society have become the main ingredients of development strategies on the local and global levels (Komninos, 2002). Simultaneously, the rankings of innovative districts, cities and regions have become an effective tool to anticipate urban progress, while the relationship between cities and innovation has been elaborated and reinforced by numerous initiatives based on new environmental concepts with digital, intelligent and innovative premises (Komninos, 2014). They all influence general technological advancement, ecological quality, economy, competitiveness, functional and economic diversification, resulting in increased employment and decreased poverty (Stupar, 2012).

Schumpeter (1943) identified innovation as the critical dimension of economic change and growth. This relationship is further observed in contemporary cities as the development of innovation results in the creation of new products, services, processes and business models, contributing to urban development and improvement of its competitiveness. Therefore, the label of 'innovativeness' represents the preferred element of the urban image applicable to several spheres of urban existence - from social phenomena, spatial typologies, strategies, formal and informal processes, flows and activities, to the latest technologies and their integration into urban space and urban life. At the same time, the types of urban innovation are defined by different processes, which trigger a higher level of creativity within cities (Hall, 2004).

Urban space(s) may be observed as the unique mixture of human resources and technology, embedded in the centre(s) of knowledge and innovation, from localised systems of innovation (e.g. clusters, industrial districts, and innovative agglomerations), larger regional systems of innovation and learning regions, to intelligent districts, cities and regions (Komninos, 2002). For example, the concept of the intelligent/digital city underlines the importance of intelligence, creation of productive knowledge, intelligent decisions and supporting infrastructure (Jucevičius and Liugailaitė-Radzvickienė, 2014). The very concept of a smart city is based on the intensive application of Information and Communications Technology infrastructure (ICT), but additionally considers the significance of environmental issues, as well as the role of human, social and relational capital in urban growth (Lombardi *et al.*, 2009).

It can be concluded that the notion of innovation has acquired a new meaning, which comprises knowledge, management tools, telematics for learning and virtual spaces for interaction and experimentation (Komninos, 2002, 2008). Therefore, this trend has generated new three-layered intelligent environments for innovation:

(1) physical space and human resources (observed on the level of agglomerations, or as clusters and companies); (2) institutional mechanisms and policy instruments related to the process of innovation; and (3) the layer of virtual spaces and tools supporting collaboration and user participation (Komninos, 2008). These changes, caused by the flows of the post-industrial era, are believed to influence shifts at many levels, including urban planning (Stupar, 2008). Consequently, the traditional theoretical framework, which usually focuses on the physical aspect of the cities, needs to be modified and redirected toward the social, economic and innovative aspects of urban life, in order to provide an adequate setting for emerging needs - in both the material and digital realms.

Creating the setting

The first nodes of innovation and knowledge exchange are easily observed in the public spaces of ancient cities (Figure 1). Agora (Ἄγορά - square, public place) represents both the main square and the religious centre of the ancient Greek city. It was an urban element that was guided in its form by the development of democracy, in addition to those numerous functions. Generally, it represents an important gathering place for discussion and exchange of ideas (Mamford, 2006; Gallion and Eisner, 1963). The same model and role are seen in the Roman forum, which merged secular and religious spheres of urban life. Ancient Greece was also the birthplace of Plato's academy, often considered the first university in Europe. It had its space for lectures and discussions, dormitories for students, a library and gymnasium, thus representing the forerunner of university campuses. Placed outside of the Athens city walls, it was connected with the city centre and agora by road.

During the period of Hellenism, the most important educational facilities were found in Alexandria - the Institution of the Muses and the Great Library, which were centres of knowledge exchange and research (Bowen, 1972). The educational complex in which they were located was placed within the city, in close proximity to the royal residence.

Higher education in Byzantium continued the ancient tradition, while the medieval period in other parts of Europe was marked by the role of monastery clusters, which supported the links between philosophy and theology. However, the cities in North Italy represented an exception to this practice. Bologna and other urban nodes followed the model of the University in Constantinople, emphasising the secular dimension of education (faculties of philosophy and law) and its importance for civic life. In the second half of the 13th century, the first colleges sponsored by patrons were founded. Representing a city within the city, they provided education and lodging for students (e.g. in Paris, by Robert de Sorbon in 1258). The first college outside the city was established at Oxford, influencing medieval planning and defining the image and identity of the urban setting (Mamford, 2006).

The Age of Enlightenment (1620–1780) brought the establishment of first academies within the state hierarchy. The Anglo-Saxon model considered a concentration of knowledge in city centres, while university campuses

became autonomous urban entities. A good example of this practice is Boston, a city which ‘houses’ its numerous campuses in the city centre.

Contemporary cities as generators of major social, technological and economic changes (Sassen, 2012) have recognized the importance of knowledge in their development at all scales. The relationship between cities and universities has been analysed with respect to the context of urban competitiveness, the governance of economic development in the knowledge economy and regional innovation systems (Benneworth and Hospers, 2010; Moulaert, 2001; Uyarra, 2010). It has become obvious that spaces of innovation and education nowadays represent strategic places of both urban space and urban society (Figure 1 and 2).

Due to the multiplying roles of universities and research nodes, as well as their growing spatial independence based on the application of the latest ICT tools and networks, their relationship with cities has become challenging. Andersson (2012) defines several problems that are expected to influence the future positioning, (re)structuring and modelling of these areas in our cities:

- synchronisation and interlinking of R&D at the level of a city;
- defining of R&D areas and their potentials;
- evaluation and sustainability of R&D concepts;
- defining a spatial and planning framework for innovative cities.

Academy / Ancient Athens
Academy is outside the city walls. Agora is within the city walls in the center of town.



Forum / Ancient Rome
Forum is within the city walls in the center of town.



University / Middle Ages, Paris
University / one building, is within the city walls in the center of town.



The Humboldt University, Berlin / XIX c.
University / numerous buildings, is within the city walls in the center of town.



	Nature of innovation/knowledge sharing space						Position in the city		The presence of other services as functional support	Types of funding	The impact on the surrounding area	
	Open space	Closed space	Populist	Elitist	Spontaneously formed	Planned	Centrally located	Peripheral location			in terms of the development of spatial concepts	in terms of the development of functional concepts
Agora	X		X		X		X		X		X	X
Forum	X		X			X	X		X		X	X
Academy	X	X		X		X		X	private			
Museum and Great Library of Alexandria	X	X		X		X	X		X	state	X	X
University of Bologna		X		X	X	X	X		X	students	X	X
University of Paris		X		X	X	X	X		X	state	X	X
University of Oxford		X		X	X	X		X	Crown and state		X	X

Figure 1. City vs. spaces of innovation and knowledge - a comparative analysis. (Source: authors)

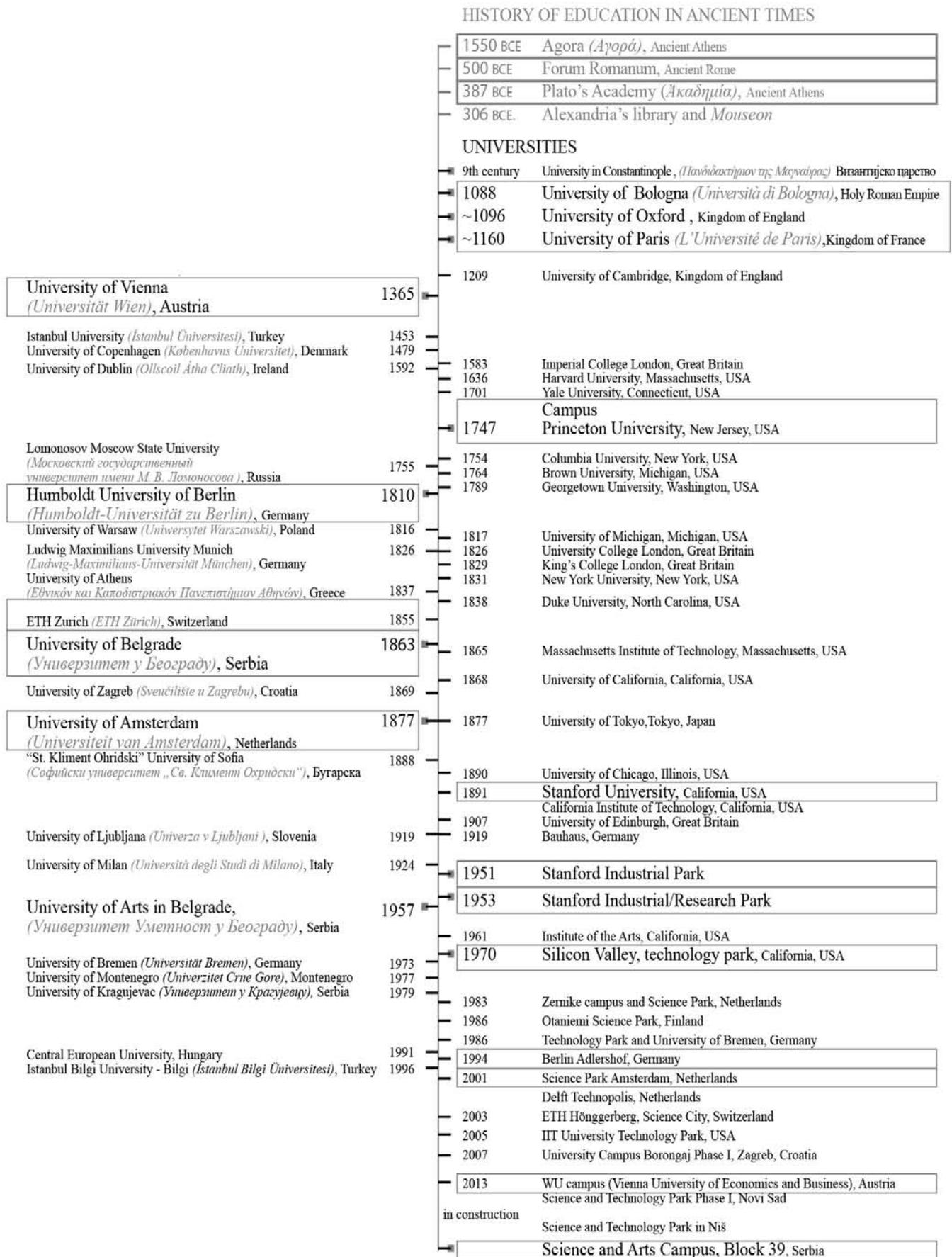


Figure 2. Timeline of the history of education– from the ancient agora to the modern science city.
(Source: authors)

Generating knowledge-based innovation and modification of urban space

Nowadays, the current role of cities as centres of innovation, economic growth and social transformations support a proactive approach to sustainability (Stupar and Đukić, 2007). This trend further demands an improvement of infrastructural systems, modification of previous spatial and functional structures, changes in planning procedures and enhancement of urban management in order to support further research activities (Höger and Christiaanse, 2007).

The innovative cities have become major nodes of economy, culture and science. The relationship between cities and innovation activities may be dependent on several factors:

- location (and its ability to attract people of various educational and interest profiles);
- accessibility and connectivity (to other urban nodes and within city);
- cultural, creative, artistic and scientific potentials;
- spatial possibilities for the development of clusters, centres of knowledge and science parks;
- highly qualified employees; and
- development of entrepreneurial activities and enterprises - from the level of conceptual models to multidisciplinary upgrading of urban economy, urban geography, urban management and urban promotion (Van Winden *et al.*, 2014).

Nowadays, innovation nodes function in different organisational and spatial formations - from productive clusters, technology districts, central-city area of services and technology parks, to university incubator campuses. The role of universities, as specific innovative nodes with a long tradition of knowledge dissemination, is especially important for both urban competitiveness and the general growth of society (Reichert, 2007). Etzkowitz (2003) underlines three basic missions of universities, which have gradually developed through history - the traditional mission of academic teaching, introduction of research (generated in the Humboltian model) and the latest mission - socio-economic development, best described by the model of 'triple helix interactions', dominant in the modern Knowledge society (Etzkowitz, 1993; Etzkowitz and Leydesdorff, 1995). This model explains the emerging triadic relationship between industry, government and universities, which enables the creation of new institutional and social forms of production, transfer and application of knowledge. The triple helix (TH) model, leads to the rise of the so-called 'entrepreneurial university' and also distinguishes four types of spaces (knowledge spaces, consensus space, innovation space and leadership space) which support an increasing proactive role for the three main factors (industry, government and universities) in regional innovation systems (Figure 3). Consequently, Lazzaroni and Piccaluga (2003) define the entrepreneurial university as 'knowledge factory, human capital factory, technology transfer factory and territorial development factory', referring to its multiple impacts on local development. The importance of the TH model was also analysed as an element of the smart-city concept (Lombardi *et al.*, 2012) and an important ingredient

of intellectual capital (Etzkowitz, 2008; Caragliu *et al.*, 2011; Leydesdorff and Deakin, 2011 etc.).

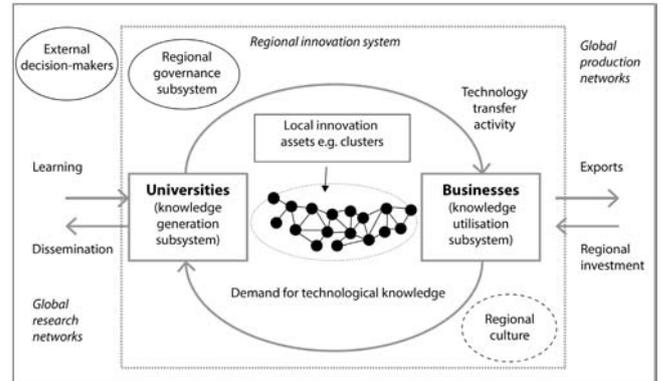


Figure 3. A regional innovation system as local network between global innovators.

(Source: after Cooke & Piccaluga (2004) in Benneworth & Hospers (2007))

Obviously, universities could be defined as 'public spaces for interpretation' in the global knowledge-based economy (Lester and Piore, 2004), thus generating a strong integrative and innovative potential while connecting research and education with management, engineering and policy-making (Goddard *et al.*, 2007). Therefore, in spite of the different regulations and funding mechanisms applied by national governments, universities act as central organizations of any innovation system (Borras and Edquist, 2014).

The TH interactions also influence the redefinition of existing and the creation of new urban spaces and networks which stimulate the relationship between universities, cities and the economy. For example, some authors (e.g. Van Winden *et al.*, 2014) identify five key elements which should be considered in this process:

- universities represent nodes of knowledge which could attract important investors and further increase employment of graduates;
- cities provide various spaces which could be used for university activities and/or for mutual investments beneficial for both sides;
- the relationship between city and university could improve the city image, adding the elements of innovativeness and knowledge to urban identity and raising its attractiveness;
- cities represent a positive environment for the incubation and establishment of start-up firms;
- specialized places of knowledge could be an excellent setting for specific fields of university education or research units.

Based on the classification made by Den Heijer (2012), which emphasizes the functional aspect of university areas, it is possible to distinguish three types of complexes - university (as an academic community); campus - as an entity which includes a residential function (residential community); and corporate/scientific complex (the business and science community). The complementary activities within each type may vary (from socio-cultural to business facilities), as well

as be based on their spatial characteristics (i.e. the general position of the complex in the urban area, the morphology of spaces, capacity, etc.).

UPGRADING THE CITY: THE CASE OF BELGRADE

The data related to the share of GDP spent for innovation reveals significant variation between the EU (below 2%), the US (2.6%) and Japan (3.4 %). Therefore, one of the main aims of 'Europe 2020: A Strategy for smart, sustainable and inclusive growth' (European Commission, 2010) is to increase the investments in research and development. In general, Europe may be observed as less competitive in terms of the percentage of its population with a university degree, the ranking of its universities and the development of a digital society to support the innovation process and dissemination of knowledge. Serbia's extremely low share of GDP directed to research (0.3%) makes the country even less competitive than the rest of Europe. According to the Human Development Report (United Nations Development Programme, 2013) Serbia occupies the 64th place (medium human development). The list of global cities created by the Globalisation and World Cities Research Network - GaWC (2012) classifies Belgrade as a 'Beta-minus' city, while the '2thinknow Innovation Cities™ Index 2014' (2014) ranks Belgrade as the 104th on the list (category 2 HUB), which is well below other major Western European cities (for example, Vienna is ranked as 6th and Amsterdam as 8th). However, it is still ahead of some cities in the Balkans (for example, Ljubljana - 199th place and Zagreb on 233rd place). Cities with the highest rank are San Francisco-San Jose, New York and London.

Considering these figures, it becomes obvious that the Republic of Serbia needs an elaborated, well-organized and high-quality development of the education system as one of pre-conditions for the overall improvement of society, based on knowledge, its diffusion and application. The Strategy of Scientific and Technological Development of Serbia (Strategija naučnog i tehnološkog razvoja Republike Srbije za period od 2010. do 2015. godine, 2012) emphasizes the importance of higher education based on research, suggesting the concept of the 'entrepreneurial university' which enables the growth of a knowledge-based economy. The Strategy also supports the establishment of business incubators at universities in order to achieve commercialization of ideas and innovations. One of the aims is to set up networks between centres of excellence (research, education and economy) which would attract foreign partners.

Following these guidelines, the Republic of Serbia and the Ministry of Science and Education have been implementing several projects oriented toward the development of the scientific/research infrastructure. Supported by the European Investment Bank, the Council of Europe Development Bank (CEB) and the EU, these projects include two major investments in Belgrade - the Centre for the Promotion of Science at Block 39 and the Science and Technology Park Zvezdara. Additionally, a number of similar projects exist in Belgrade and Serbia that target different areas and issues related to scientific development. Those that have proved the most prosperous are: the adaptation

of the UNESCO research centre IRTCUD, the housing projects for young scientists (Block 32 in New Belgrade, Niš, Kragujevac) and the establishment of the improvement of conditions in research and university facilities in Petnica, Niš, Novi Sad, Svilajnac and Kragujevac (JUP, 2011).

The origins and development

The development of university education in Serbia began in 1838, when the first school of higher education (Лицеум Књажества сербског) was founded in Kragujevac and later moved to Belgrade in 1841 (Kingdom of Serbia). In 1863, the school was transformed into 'Velika škola', which represents the actual beginning of the University of Belgrade. Its three departments - the Faculty of Philosophy, the Faculty of Law and the Technical faculty were relocated to a new building (Kapetan Mišino zdanje). The building of the Technical faculty was completed in 1931 (architect Nikola Nestorović), following the style of academism. The Faculty of Law was designed in the modernist fashion and completed in 1940 (by architect Petar Bajalović). In close proximity to the University site lay a new student residence which was erected in the style of post-academism (architect Georgij Pavlovič Kovaljevski, 1926).

After the Second World War, the improvement of education became one of the most important aims endorsed by the new ideological framework of the Socialist Federal Republic of Yugoslavia. The main idea was to provide an easily accessible and free education system, which would reflect the proclaimed values of a new progressive society, based on general openness and equality. Consequently, a number of new university and research institutions were established, demanding additional space and new equipment that could accommodate new trends in science and education. The area of New Belgrade was frequently perceived as a perfect site for these interventions. For example, the Faculty of Electrical Engineering, founded in 1951, was situated in the historical part of Belgrade, in the existing building of the Technical faculty, but additional spatial needs were obvious from the very beginning. Competition for a new building was launched in 1961 and the winning proposals were presented to the public. However, this new project never came to life (Mecanov, 2009). The faculties of arts (represented by four academies) were facing the same problem. Therefore, another competition for the design of their campus was announced (1964) reflecting the trends of spatial organization of university areas in the US and Europe. The new site was selected in the area of New Belgrade (Block 39) and the winning entry was designed by architects Božidar Janković and Aleksandar Stjepanović. The completion of the construction process was anticipated for 1985, but the Academy for theatre, film, radio and television was the only completed building (Mecanov, 2009). Meanwhile, two important university complexes were constructed in the historical part of Belgrade. The first one in the vicinity of the Main University Building and University park (near Student Square) included the Faculty of Biology, Geography, Mathematics, Physical Chemistry, Physics, Chemistry and the two science institutes (architects: Aleksandar Sekulić and Đorđe Stefanović, 1954). The second one included the Faculties of Mechanical Engineering and Technology, inserted into the existing block of the Technical faculties

(Grigorij Samojlov, Mihajlo Radovanović, 1953-1962). Their architecture follows the modernist approach, dominant in that period. Interesting enough, during the 1960s an increased demand for educational facilities influenced the appearance of smaller architectural offices, specialized in various types of buildings (Milašinović Marić, 2011), while the main financial input came from the Republic of Serbia and economic organizations that also participated in the process of urban renewal.

Today, the areas dedicated to university education and research activities are scattered across the city - both in its historical part and New Belgrade (Figure 4). There are three main areas:

- around the Main Building of the University of Belgrade (includes the Faculties of Philosophy, Philology, Mathematics and Natural Sciences, as well as the Serbian Academy of Sciences and Arts);
- in the vicinity of the Residence of Duchess Ljubica as the original nucleus of university education, consisting of the buildings of the University of Arts, its Rectorate and the Faculties of Arts and Applied Arts;
- the complex of the Technical faculties (the main building incorporating the Faculties of Architecture, Civil and Electrical Engineering, the buildings of the Faculty of Law, Mechanical Engineering and Technology, the University Library and the Student residence).

Considering the classification of innovation districts defined by Katz and Wagner (2014), which distinguishes three main models of innovation districts ('anchor plus model', 're-imagined urban areas' and 'urbanized science park'), these areas contain the characteristics of the 'anchor plus model'. They are positioned downtown, while the

mixed-use development of the surrounding supports the commercialization of innovation.

Simultaneously, there are two areas that are under extension and construction:

- Block 39 - the site which already includes the existing building of the Faculty of Dramatic arts is planned for the implementation of the Centre for the Promotion of Science and Nano Centre projects (the extended deadline is September 2017) (Figure 5). This complex is anticipated as a variation of the 'anchor plus model', with some elements of the 'urbanized science park', also targeting better interconnectivity of the existing urban tissue and the introduction of new activities;
- 'Zvezdara Forest' - the location of the existing institute 'Mihajlo Pupin' (established in 1946), is recognized at the regional and global level as a node of research and development in the field of high technologies. The area of this innovation district, which could be described as an 'urbanized science park', also includes a new Science and Technology Park Zvezdara (completed in 2014), planned as a new innovative hub and support for small research and business incubators, focused on the development of new technologies and their implementation.

Although all these areas represent knowledge-based innovation nodes comprising economic, physical and networking assets, they have not yet achieved the full potential of an innovation ecosystem/district, with the functional synergy of these three elements (Katz and Wagner, 2014).

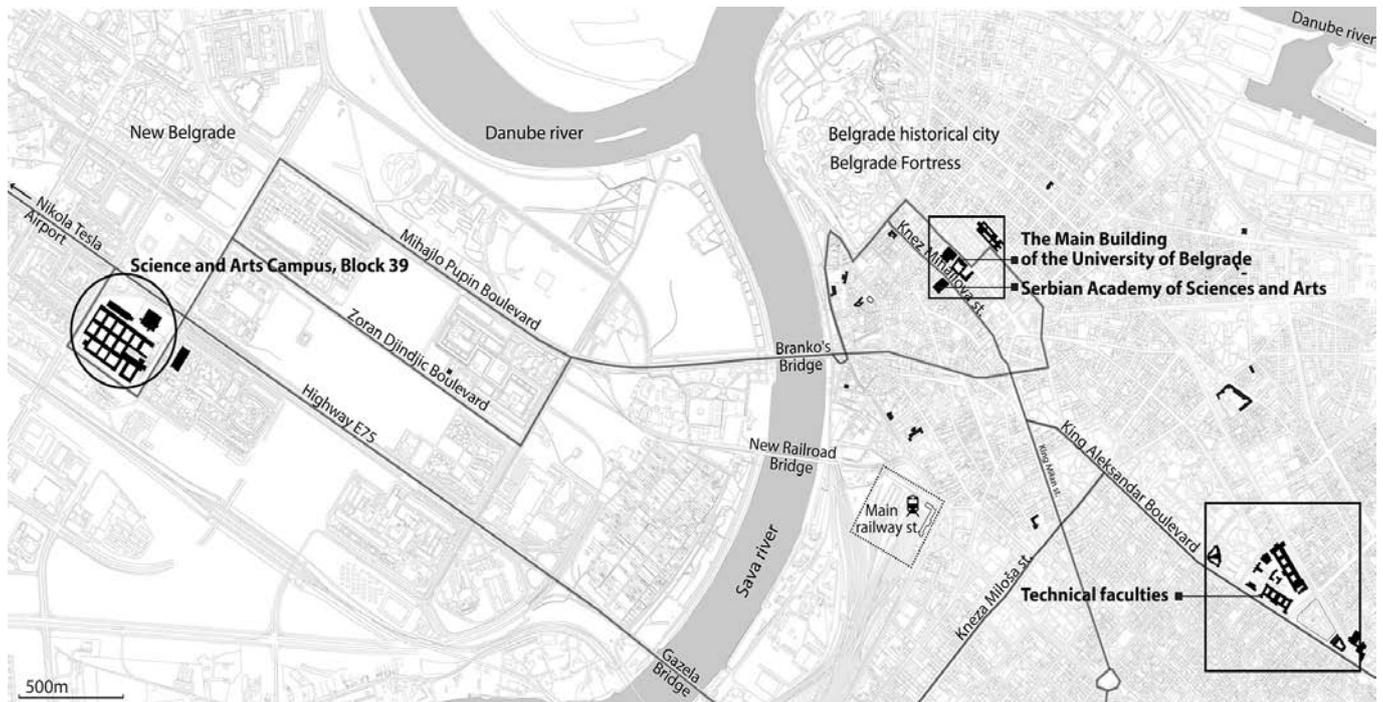


Figure 4. Science and Arts Campus (Block 39, New Belgrade): the positioning in the context of existing nodes of knowledge - the main building of the University of Belgrade and the Serbian Academy of Sciences and Arts in the historic centre of the city and the complex of the Technical faculties, Faculty of Law, the University Library and the Student Residence. (Source: authors)

Triggering change

The area of New Belgrade has always been perceived as a symbol of progress that was reflected in its modernist framework and architecture. However, the initial concept of the 1950 Master plan highlighted the development of the Central zone (1960) which was never fully implemented and later spatial and urban development plans almost completely ignored the original vision (Blagojević, 2007). The physical and functional structure of Blok 39 anticipated as a space for public activities has been re-evaluated through several urban projects during the 1980s, which proposed extensions of the building of the Academy of Dramatic Arts, as well as the clustering of new educational facilities. When it became clear that the original intentions would not be totally implemented, the Ministry of Science decided to revise previous projects and reconsider the addition of new activities (2009), which were intended to contribute to the development of a contemporary and fully functional knowledge-based innovation district.

The overall need for further efforts in this area resulted in an architectural competition for the Arts and Science Campus, supported by the initiative EU HETIP.² The Ministry initiated a competition following the guidelines of the Strategy for the scientific and technological development of the Republic of Serbia until 2015, and both the Ministry and the European Investment Bank promoted it. The competition organizers were the Association of Architects of Belgrade and the International Union of Architects and 232 international entries from 47 countries were received.

The case of Belgrade, together with the project for a new research hub, represents just one of numerous examples around the world expressing the imperatives of scientific excellence and reflecting the aspirations of the state. The national Strategy for scientific and technological development defines a favourable direction that is compatible with the EU framework and clearly demonstrates a willingness to support the economy of knowledge. Consequently, the Centre for the Promotion of Science, as the first phase of the project for the new scientific and arts campus, could be interpreted in a number of ways - as a symbol of new ideas embraced by the State, as a generator

of innovativeness and as a showpiece of innovative solutions which will be incorporated in the building. However, the slow implementation, which is a result of the current economic crises and governmental shifts, reminds us that science, education and innovativeness demand the sustainable and solid support of the State. Therefore, it is necessary to re-emphasize the benefits of research-oriented activities and education, to stimulate the general mobility of knowledge and academia, and to establish an efficient link with the entrepreneurial sector. Such interaction could enable the implementation of innovations, provide financial gain and carve a path for the further development of science and cities based on creative solutions and inventive proposals.

The outcome

The winning entry of the Austrian architect Wolfgang Tschapeller implemented the principles of re-modernism, since the author perceived New Belgrade as the 'city of our time' (Centar za promociju nauke Beograd and Društvo Arhitekata Beograda, 2011). It also represents an innovative contribution to the general typology of university and research spaces, having in mind that all buildings in this proposal are designed to be elevated from the ground floor. The jury described this project as a surprising and intelligent reinterpretation of the principles of Modern architecture linking previous history of New Belgrade and the potentials of the future architecture. The project provides high accessibility for all users, while movement and vistas are continuous, allowing simultaneous and complex activities. Parking spaces and services occupy the underground level, while the ground level is dedicated to vegetation, pedestrian movement and cycling.

The innovative typology of the proposed campus was generated from a comparative analysis of several examples (Campus Jussieu, Paris, 1959; Freie Universität Berlin, 1967; El Escorial, Madrid, 1563), which influenced the applied grid - 20x48m for buildings and approximately 48x33m for open spaces (Figures 6 and 7). The first phase of the project includes the Centre for the Promotion of Science, the Nano Centre and the Science Institute, while the second phase represents the university campus. The architecture of buildings corresponds with the geometry of the surrounding

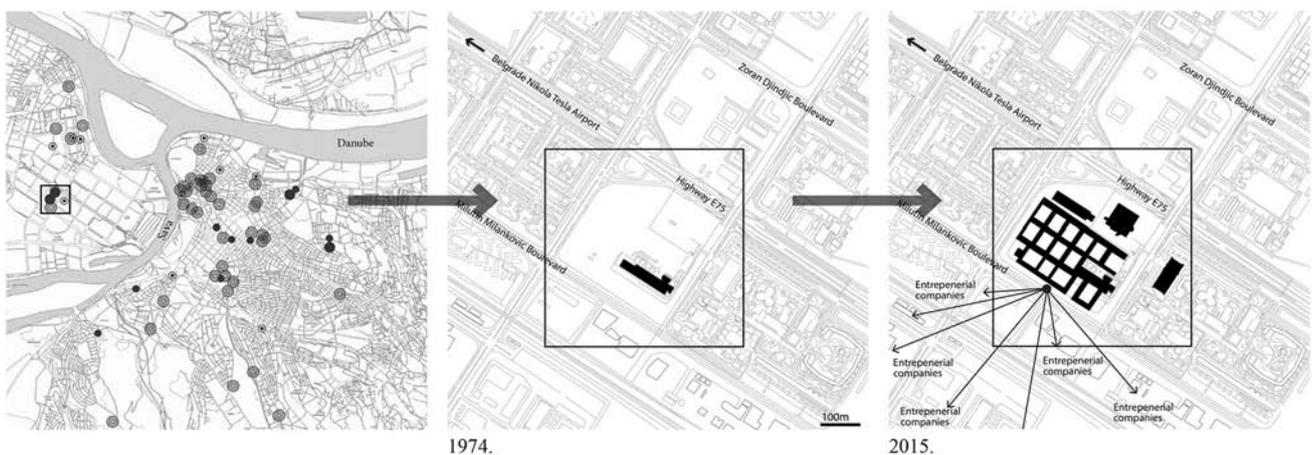


Figure 5. Block 39 - the superposing of development concepts (2014) - The Faculty of Dramatic Arts (1974, existing), Art & Science Campus and the projects for the Centre for the Promotion of Science and Nano Centre. (Source: authors)

Blocks 28 and 38, defining the identity of a contemporary agora as a new public space for the innovation hub, its neighbourhood and the city. Furthermore, the project provides an elaborated setting for the necessary synergy of economic, physical and networking assets, opening possibilities for the implementation of five strategies targeting collaborative networking, inclusive growth, talent and technology as main innovation drivers and creating better access to capital (Katz and Wagner, 2014). The proposed building of the Centre for the Promotion of Science could be interpreted as a display of innovativeness, too. Incorporating energy efficiency principles, it uses renewable energy resources (geothermal and solar power) providing high levels of environmental protection. Therefore, it represents an appropriate setting for innovative activities, connecting roles which contemporary space should fulfil. However, in spite of its numerous positive features, the project has faced challenging situations, especially related to the high technology of its construction, demanding structural solutions and encountering financial limitations.

² EU High Education Teaching Infrastructure Project (EU HETIP) is a joint project of the Ministry of Education, Science and Technological Development of the Republic of Serbia and the European Union for whose implementation the EU has secured 30 million EUR from the IPA financial instrument for Serbia ([http://: www.hetip.rs](http://www.hetip.rs), accessed 03rd July 2011).

Changes to the original project were authorised in 2012 by Tschapeller. Architect Dejan Miljković was commissioned to design the building of the Nano Centre. The second phase of the project is still on hold.

CONCLUSION

Throughout the millennia, the role of intellectual exchange, innovative ideas and their diffusion has always been the important driver for the progress of society. At the same time, the processes of education and research have directly and indirectly influenced the nature and fibre of cities, establishing multileveled links with the urban environment and its society. In general, the cities, with their natural setting for creating and channelling innovation flows and providing an experimental tissue for their implementation and evaluation, have been perceived as an important hub of knowledge that is vital for all humanity. Therefore, the technological and spatial improvement of urban innovation nodes and networks has always been considered to be an important challenge for future development. Contemporary cities have further incorporated the relationship with innovations by stimulating the economical dimension of the interaction. The typology of urban spaces has been modified and some traditional models of education/research/innovation sites have developed new features and

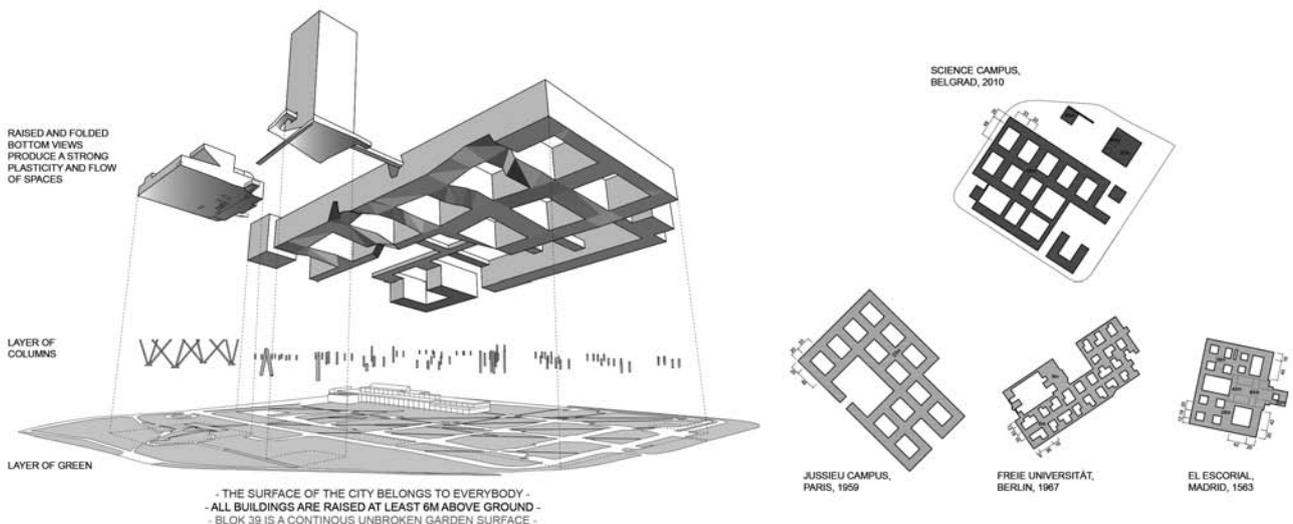


Figure 6. The winning entry of the international open competition for the Campus design by Wolfgang Tschapeller, Austria. (Source: PIU)

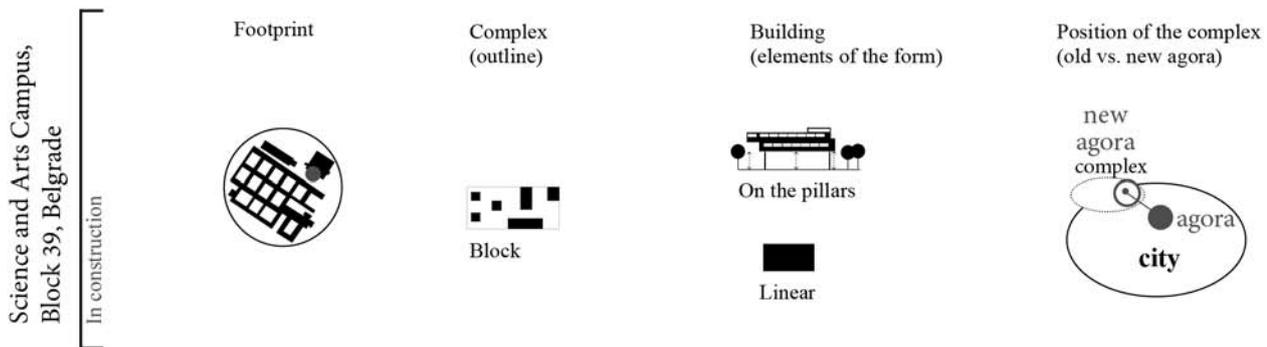


Figure 7. The elements of the winning proposal and its innovative typology. (Source: authors)

the latest technological support. Science and education are now considered as inevitable and necessary drivers of urban success and competitiveness, shifting the urban planning routines, introducing new methodologies and tools and providing a multitude of creative solutions for contemporary setbacks.

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