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# INTELLECTUAL URBAN ENVIRONMENT

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**Abstract.** Nowadays many city governance bodies struggling to understand the vast array of issues that are coming their way - climate change, global warming, poverty, real estate, education, traffic, resource depletion, etc. And they increasingly face a need for 'new thinking', realizing that governmental decisions have long-term impacts. In addition, effectiveness of cooperation in field of efficient solution transfer becomes important among cities. The aim of the article is to show the concept, features, advantages and opportunities of the intellectual city environment in order to achieve new and qualitative development. To reflect the essence of 'smart city' and 'intellectual city' concepts, authors use literature review and overview. Main research results show that the use of positive synergies strengthens existing urban components and creates new ones. They improve the quality of the processes by developing the economic potential of cities and territories. The governance of the intellectual city is organized by different city management models. Model for strategic development of urban environment can help achieve the effect of synergy. True synergy effect in the intellectual urban environment is a change-oriented system. Authors offer their view of synergy of intelligence in 'intellectual city' in 21<sup>st</sup> century, which is reflected as an interaction between human and artificial intelligence. That relates with culture, global connectedness, control, investments, technology and innovations. The results show that 'intellectual cities' are built with high intensity support from government. Support is aimed to improve prosperity and life quality of citizens. These are key indicators that reflect opinion of voter about governance in election period.

**Key words:** *intellectual city, smart city, intelligence, culture, synergy.*

**JEL code:** R11

## Introduction

Intellectual city is city management model based on highest intellect expression formats for city management to develop and then transferring decision making to unambitious, emotionless, innovative cyber environment solutions based on artificial intellect. Artificial intellect based solutions can be implemented using and increasing higher automation levels in different aspects of city to increase comfort and control levels over city environment to enhance city inhabitant comfort. Increase use of Artificial intelligence based decision model and approaches are also conveying several risks, like multiplication of unneeded and unjustified solutions, leading to inefficient use of resources. Implementing artificial intelligence systems just for their own sake would divert resources used for environment enhancement actually to degradation and increase distance between city governance and city inhabitants, thus indicating cumulative effect so called 'Munroe effect'.

Many city governance bodies struggling to understand the vast array of issues that are coming their way. Climate change, global warming, poverty, real estate, education, traffic, resource depletion, – not only does the list seem to be growing, but the items on it seem to get more complex and bewildering.

Scientific approach is base research in multidiscipline aspects on structure of city environmental development impact. This impact is realized through intellectual creativity, as main impact on any aspect is development of social space. In the same time with changes of economical, political, technological, security and other aspects more evident becomes visibility

for private/public space with social background, to enable individual to reach development path of person. That shows dual nature of this environment, what often is expressed using IT platforms. IT platforms often create new, weakly defined social culture space, which can impact existing city environment.

Following research methods are used: literature review, overview.

## 1. Intellectual urban environment

Already anthropology of 19<sup>th</sup> century in Germany, tried to define the emergence of culture space, scenarios and governing laws of development by using new term for that period - 'Culture circle' (Ratzel, F. 1882). Modern 'Culture circle' is illustrated in figure 1. Basic principle of this theory is that diffusion is main principle.

Diffusionism as an anthropological school of thought was an attempt to understand the nature of culture in terms of the origin of culture traits and their spread from one society to another. Versions of diffusionist thought included the conviction that all cultures originated from one culture center (heliocentric diffusion); the more reasonable view that cultures originated from a limited number of culture centers (culture circles); and finally the notion that each society is influenced by others but that the process of diffusion is both contingent and arbitrary (Fabian, J., 2014).



Source: author's construction based on Culturelab, 2013.

Fig. 1. 'Culture circle'

Diffusionist research originated in the middle of the nineteenth century as a means of understanding the nature of the distribution of human culture across the world. By that time scholars had begun to study not only advanced cultures, but also cultures of nonliterate people (Beals, R. L. & Hoijer H., 1959). Studying these very diverse cultures created the major issue of discerning how humans progressed from primeval conditions to superior states (Kuklick H., 1996). Among the major questions about this issue was whether human culture had evolved in a manner similar to biological evolution or whether culture spread from innovation centers by diffusion (Hugill P. J., 1996).

Basic principle for theoretical conceptions of sustainable development are determined not by access to materialistic goods, but availability of culture and level of education, what guaranty management of 'Earth', while conserving depletable resources and in same time developing renewable resource technologies and their utilization. (Stout, M. & Staton, C. M., 2011). This principle can also be attributed to city environments, as one of city management body responsibilities to understand potential of inhabitants and their intellectual capacity, as well drive for development, which

potentially, would guaranty need for elevated moral characteristics, and limiting regression of intellectual potential. It is important to understand socioeconomic traits as indicators, what can be identified as stabilizing factors for intellectual city environment; this is identifiable through academic studies. For small and medium sized cities, specific indicators should be rated to evaluate city environment development, also taking into account employment options. Authors of article highlight importance to understand employment level regeneration process, as basis using 'Human', who is driving force of intellectual city. Effectiveness of this force will be strongly linked to knowledge, skill, need and desire synergies, what is determined by individuals to achieve targets of different levels. Society should provide such educational space, where count of educational institutions is significant, but more important is the quality and competence.

The concept of 'Intellectual City' as a mean to enhance the life quality of inhabitants is gaining increasing importance in the agendas of policy makers.

Dutch-American sociologist Saskia Sassen: 'The changing role of cities has also prompted various new concepts, such as 'Global cities'' (Sassen S., 2013).

In 2009 intelligent cities (communities, clusters, districts, multi-cluster territories) outline new planning paradigm pertinent for urban-regional development and innovation management. Komninos in his article described bright example of elements of intellectual city and regional intelligence in the last forty years:

*'The same importance is attached to people and cooperation by theories on intellectual capital for communities and cities (Edvinsson and Malone, 1997; Bounfour and Edvinsson, 2005; Edvinsson, 2006). Intellectual capital is the set of intangible assets of an organisation, the collective experience and knowledge distributed among in-house employees and external experts, suppliers and customers' confidence. What makes cities more intelligent is the intellectual capital of its organisations; the system of territorial knowledge and creativity is also structured by the same capital. Within this literature, we also witness the permanent concern to build a bridge between the technological base of intelligent cities and social objectives; innovation objectives in particular. The oldest reference to the concept (Batty, 1990) makes a clear connection between intelligent cities and competitive advantage. Collective intelligence (Lévy, 1997), distributed intelligence and problem solving (Kuhlmann et al., 1999) and regional intelligence (Komninos, 2004) investigate how information technologies and virtual environments organised within communities channel individual practice into social projects addressing the complexity and challenges of modern world (Nouvel, 2004). Bridging innovation and broadband, intelligent cities create multi-level systems of innovation where the knowledge functions of innovation are deployed in physical, institutional and digital spaces. What intelligent cities offer are skills, institutions and virtual spaces of cooperation sustaining the creation of new knowledge (research), monitoring knowledge flows (intelligence), disseminating existing knowledge (technology transfer), applying knowledge (innovation), developing new activities based on knowledge (incubation) and managing knowledge remotely (e-government) (Komninos, 2002, 2008)' (Komninos, N. 2009).*

To make organizational objectives organization-wide, it is important that these are translated to employee level. For efficiency reasons in 1959, Peter Drucker used the acronym **SMART** - Specific, Measurable, Acceptable, Realistic and Time-bound (Drucker P. F., 1995). The element Acceptable is crucial in management by objectives as this is about agreement on the objectives between the employees and the organization. The management by objectives principle does not allow management to determine the objectives by themselves. According to management by objectives, objectives should be clearly recognizable at all levels and everyone should know what their responsibilities are in this. Communication is also an important item for consideration when it comes to expectations, feedback and to giving rewards for objectives that have been achieved (ToolsHero, 2018).

There is a great variety of analysis frameworks that have aimed to offer a motivation for the emergence of urban culture and agglomeration forces. Dutch economist Peter Nijkamp mentions few:

1. a market-oriented view, in which the urban rent gradient is the spatial-economic representation of the supply and demand for urban land by different categories of users, while taking into consideration density externalities (advocated inter alia by classical authors like Alonso, Muth, Henderson etc.);
2. an ecological socio-cultural view, in which a blend of sociological and organistic urban viewpoints is offered to explain the structure of urban living and working patterns (advocated in particular by the so-called Chicago School);
3. a clustering and industrial networks view, in which urban dynamics is analysed from the perspective of a multiplicity of conflicting interests of urban stakeholders (outlined by advocates of the so-called Los Angeles School, such as Scott and Storper);
4. a politico-economic power view on cities, in which in a globalizing world large city act as global command centres with centripetal and centrifugal forces all over the world (advocated inter alia by Sassen);
5. an agglomeration advantage view, in which urban agglomerations generate overwhelming advantages of scale and scope, so that cities become by necessity strong players in the space-economy (advocated inter alia by Glaeser) (Nijkamp P., 2008).

## **2. The Five Capitals Model in Urban Environment**

Many capital cities struggling to understand the vast array of issues that are coming their way. Climate change, global warming, poverty, real estate, education, traffic, resource depletion, – not only does the list seem to be growing, but the items on it seem to get more complex and bewildering. Authors recommend adapting 5-capital model for city environment strategic development to achieve effect of synergy. The essence of the model is that each of these forms of capital is capable of generating benefit or ‘flow’ in economic terms, leading to a hypothetical model of sustainable capitalism (Porritt J., 2007). The Five Capitals Model of Sustainable Development is theoretical model that extends our understanding of economic sustainability by valuing assets other than financial ones. The five assets, or ‘capitals’ are: economic capital, built capital, human capital, social capital, and natural capital (Goodwin N.R., 2003). The model feasible allows urban environment business to broaden its understanding of financial sustainability by allowing business to consider how wider environmental and social issues can affect long-term profitability. An environmental participant needs to consider the impact of its activities on each of the city capitals in an integrated way to avoid ‘trade-offs’. Using the model in this way for decision-making can lead to more sustainable outcomes. The basic concept of capital, a stock capable of generating a flow of benefits (Porritt J., 2007), has been extended to include other forms of capital that are essential to human well-being. These assets or types of capital are:

1. Economic capital - income and financial resources.
2. Built capital - physical infrastructure such as buildings, transport and communications.
3. Human capital - the skill, knowledge and good health that enables people to work and earn a living.
4. Social capital - networks and relationships of trust and reciprocity that enable people to co-operate.
5. Natural capital - access to key natural resources, such as water, land, clean air, fisheries, forests etc.

A fundamental precept of the model is that it is not acceptable to run down some forms of capital to build up others. In particular, economic growth should not be at the expense of depleting key non-renewable natural resources or destroying the social capital of communities, since by definition growth cannot be sustained under these conditions. However, some substitutability within capital categories is considered acceptable, provided the net impact is positive (or at least neutral). (Brereton D. & Pattenden C., 2007).

Ways how participants of the intellectual environment can enhance financial capital in urban environment:

1. Define (introduce) financial measures and incentives that reflect the growth of particular capital assets;
2. Effective management of risk and corporate governance issues;
3. Value intangible assets such as brand and reputation;
4. Demonstrate a positive stance on, and management of, sustainability issues to improve access to financial capital.
5. Effective management of education and science.
6. Honor relationships with citizens.

Nowadays many city environments are organized according certain political-economic scenario or certain city development strategy. Authors of article identified four main process approaches.

**First approach**, where intellect is used through IT systems and industrial automation is achieved. Transition is organized by managing different scenarios to utilize existing city environment elements and processes and to align them with technological transformations according to scientific developments. So far, several thousand different cities and territories are monitored, where industrial automation approach is either used, upgraded or analyzed for implementation (Cocchia A., 2014; Paskaleva K., Cooper I. & Concilo G., 2018; Tao M., Ota K. & Dong M., 2018; Lombardi P., Giordano S., Farouh H. & Yousef W., 2012).

In practice, intellectual city environment is developed by sites, where new intellectual products are added, reconfigured or already implemented. Mostly those changes in city environments are linked to regional changes, what can be attributed to economic stability in regions and investments in broader territories. Such approach forces subject on particular city environment to develop certain actions and targets to stimulate regional activity.

**Second approach.** Process approach, when 'Intellectual city' is built from scratch. Regarding this approach local intellect and specialists from abroad are attracted. Adaption is taking place to reflect ecological, climate, historical, individual and other aspects to develop new territorial zoning and new model for infrastructure. Example: '*New Songdo – Songdo is already 50 percent built, with 30,000 residents, 33,000 jobs and 70% fewer emissions than developments its size. Positioned as the gateway to Northeast Asia, the 1,500-acre Songdo International Business District (IBD) is a model for future, sustainable city-scale developments, not only in Asia but across the globe. The Songdo IBD includes a diverse array of programmatic elements and is conceived as a pedestrian friendly city, with walkable streets, 40 percent green space and an urban density that promotes an active street life. The residential neighborhoods have large green areas and all parking is below grade. A new 100-acre recreational park is woven into the center of the city's rich urban fabric, while a network of sea canals is powered by wind turbines and refreshed every 24 hours. The design sets a new standard in sustainability, with innovative approaches to building performance, green infrastructure and community planning. The Songdo program includes 45 million square feet of office space, 30 million square feet of residential space, 10 million square feet of retail, 5 million square feet of hotel facilities and 10 million square feet of public realm. Additional facilities include a K-12 International School, world-class hospital, museum and university campuses*' (Kohn Pedersen Fox, 2018). Such approach eliminates small cities and maintenance of small cities is becoming luxury, or these cities are losing competitiveness, and this leads to disappearance or integration into agglomeration. Positive moment that New Sangdo will become first global laboratory of intellectual city environment development, where developments would be researchable and evident to analyze impact on intellectual synergies, and impact on growth of economies.

**Third approach** – 'shock method', when city environment is subject of massive and wide innovation and technological integration. This approach requires larger involvement and more stresses city inhabitants, as more risks are to be faced. So far there are no publications found on use of 'shock approach', but there are examples that actual improvements in city environments have happened much faster than were planned in development or city modernization plans. A vivid example is: '*One of the most characteristic infrastructure-oriented smart city models is IBM' solution for the 'Smarter*

*City'. According to IBM, traditionally city infrastructures and services are created and managed by independent departments or organizations. City domains are focused on their own operations and only on a limited basis share information with other interested parties and the overall city. In a smarter city, however, information in the form of metrics, events, and processes must be shared across organizations in real-time manner. With the support of analytics programs, city-wide operational processes using data from any number of domains can continuously predict and react to events and trends that are affecting the city. In 2010 IBM employed their first integrated operations center in Rio de Janeiro, pooling generous investments in sensor networks after signing a contract with the city of Rio de Janeiro. Rio had recently experienced devastating landslides that killed over 250 people and it faced the forthcoming challenges of hosting the Olympics in 2016 and the World Cup in 2014. It was thus agreed that there was a need for the development of an Emergency Response System, with real-time automated command-and-control of emergency responses. The citywide system integrates data from about 30 agencies, serving primarily safety and transport functions and uses integrated business analytics and intelligence with predictive trend analysis. Administrative authorities can make more informed and prompt decisions now, as they can view information from City services - such as the police, traffic management and energy grid - concurrently' (Angelidou M., 2015).*

**Fourth approach** – intellectual city environment is not only futuristic environment, which is largely transitioned from family, school, universities and integrated in larger territorial body with influence on city. Basis is individual intellectual contribution to society, what is realized through decision-making, assessment of future needs and wishes of society. Usually this approach is used with upgrade of city infrastructure to assure safety and contingency for social safety. Large proportion of cities is progressing to intellectual city environment in high speeds, as this reflects processes between politics, business and science.

Intellectual cities are making economy more effective. Naturally, in long-term inhabitants of intellectual cities are in beneficial roles, but such long-term investments can afford only those countries, which are interested in development of nation, because businesses, even global companies, are more inclined for short-term gains with time span around 5 years. Many investors are reluctant to invest for more than 7 years. 'Intellectual city' is built gradually and in long period, as many challenges are to be overcome for technology, business process and necessity to implement needed changes in legal regulations.

### **3. Base of Intellectual city**

City environment in 21<sup>st</sup> century is determined not only with availability of infrastructure of material resources. Intellectual city is requiring smart solutions to achieve new and qualitative development. Intellectual city environment is based on improvement of modern lifestyle, use of modern technologies, which assures economically feasible and environmentally friendly use. Intelligent management, smart living, intellectual people, who are capable to create smart environment, knowledge based economics, smart and safe mobility. Intelligent environment assures that processes are optimized and technologies are only methods and tools, what shortens effort for individual to achieve set targets.

According to United Nation data: *'In 2014 increasingly global and interconnected world, over half of the world's population (54 percent) lives in urban areas although there is still substantial variability in the levels of urbanization across countries. The coming decades will bring further profound changes to the size and spatial distribution of the global population. The continuing urbanization and overall growth of the world's population is projected to add 2.5 billion people to the urban population by 2050, with nearly 90 percent of the increase concentrated in Asia and Africa. At the same time, the proportion of the world's population living in urban areas is expected to increase, reaching 66 percent by 2050. There is great diversity in the characteristics of the world's urban environs: close to half of urban dwellers reside in relatively small settlements of less than 500,000 inhabitants, while nearly one in eight live in the 28 mega-cities of 10*

*million inhabitants or more. The number of mega-cities has nearly tripled since 1990; and by 2030, 41 urban agglomerations are projected to house at least 10 million inhabitants each. Whereas several decades ago most of the world's largest urban agglomerations were found in the more developed regions, today's large cities are concentrated in the global South, and the fastest-growing agglomerations are medium sized cities and cities with 500,000 to 1 million inhabitants located in Asia and Africa* ' (United Nations, 2014).

'Munroe effect' can influence these city environment layers and areas:

1. **Technological developments and innovations.** New process based approach is implemented which focuses on upgrade of existing infrastructure and automation in wide activity sphere.

2. **Centralization and decentralization.** Unified management center is utilized, which centralizes management function, but decentralization is used as safety, control and management instrument. An example is starting implementation of blockchain technology in government and municipality processes, especially in IT processes.

3. **Sizing and support approach.** Special basis or fundaments are developed to initialize additional capital sourcing options to use existing or expand running projects in place to increase their capacity. Special activity in this field often can be linked with municipality election period and can be recognized as a potential springboard to strengthen position for particular political force, or as method to express gratitude to voters or lobbies.

4. **Investments** are important and actual component for city development, which mainly is linked to additional financial, human capital and technology attraction to city environment.

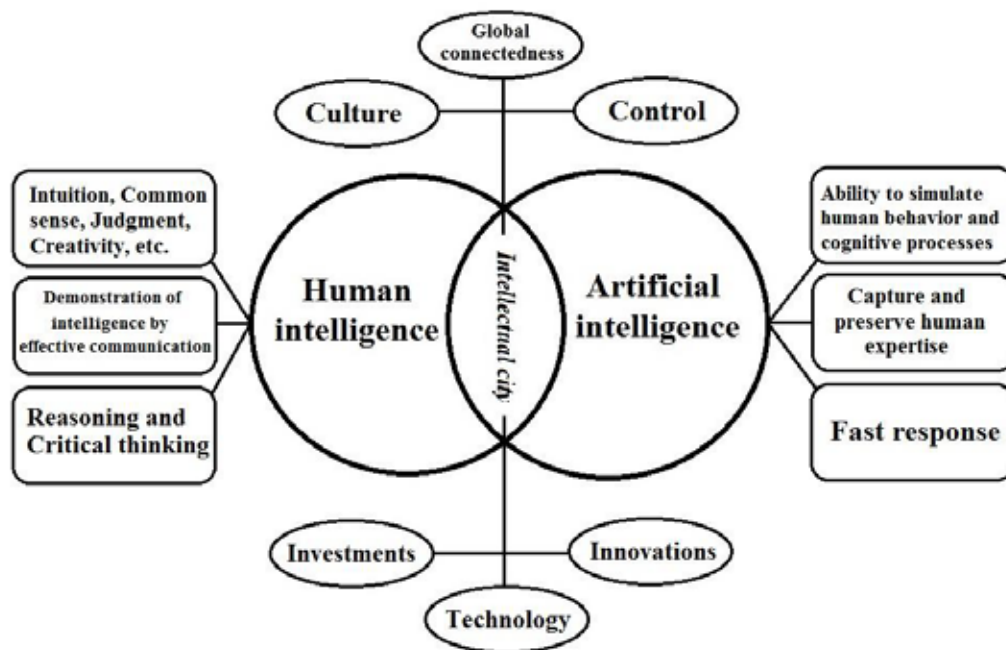
5. **Budgeting.** Reducing budget expenses and achieving additional profits. One of widely recognized problems for cities are slums, what have high impact on functionality of city, its economics, ecosystem, crime level etc.

6. **Human intellect replacement with 'Artificial Intelligence' (AI).** This replacement is becoming unprecedented giving up privacy for benefit of society. In marginal situation, a death of individual can be theoretically considered as a result of competition between reality and 'virtual reality'. With development of AI systems more safety issues are analyzed in society.

7. **Control** over all city environment functions with primary focus on financial control to assure transparency and eliminate capital wasting in poor decisions, not according to needs of society or against it.

The combination of Human and Artificial Intelligence in city increases the synergy for different processes. The capability to drive decisions while meeting short-term operational needs and advancing with longer-term strategic plans. Critical success factor is the motivation to drive progress in urban environment in 21<sup>st</sup> century and to move away from keeping status quo. The authors of the article offer their view of collaboration segments between Human intelligence and Artificial intelligence in order to increase the development potential of 'Intellectual city' in 21<sup>st</sup> century illustrated in figure 2.





Source: author's construction based on Human and Artificial intelligence features, Harnham, 2018.

Fig. 2. Synergy of Intelligence in 'Intellectual city' in 21<sup>st</sup> century

Mutual synergy effect is achieved, when several interrelated factors are in place – culture, global connectedness, control, investments, technology and innovations. All factors of 'Intellectual city' are forming cluster with 'neighbourhood' effect. Synergy is achieved in cities which provides necessary background, production environment and service space to develop and provision intellectual and creative product. 'Intellectual city' concept is future of city development, where human intelligence and artificial intelligence create synergy effect.

### Conclusions, proposals, recommendations

The authors of the article have made following conclusions:

1. 'Intellectual cities' are built with high intensity support from government.
2. Largest role for government and municipality – to improve prosperity and life quality of citizens.
3. Nowadays city often represents itself as finance and employment center with main purpose to assure activities for inhabitants. Such environment is only conglomeration of living and working space with lost intellectuality.
4. Intelligence may also be substituted by historical aspects, such as religion, beliefs, family roots etc.
5. The city should be a center of intelligence with an intense urban environment to support production and the development of businesses.
6. Development potential of the 'Intellectual city' in 21<sup>st</sup> century can be increased using collaboration between Human intelligence and Artificial intelligence.
7. The business environment becomes more intelligent, what contributes to faster cycles of the intellectual environment. This environment generates innovations based on collaboration between Human intelligence and Artificial intelligence with possible deviations.
8. Synergy effect in the intellectual urban environment is a change-oriented system.

9. Intellectual urban environment affects the behavior, perception, culture and other senses of city residents forming a co-responsible society.

10. Analysis and evaluation of approaches and factors for intellectual cities in the studies of other authors can be concluded that presented approaches are different and certain adoptions would be suggested for implementation in different cities to reflect best development strategy for particular city.

Considering the mentioned conclusions following may be recommended:

1. It would be advisable to develop classification criteria, based on functional, normative, historical and existing potential to identify best model for implementation of intellectual city development strategy.

2. Intellectual urban environment should be highly supported by human activities.

The further research regarding the synergy effect between Human intelligence and Artificial intelligence in 'Intellectual city' would be useful and should be continued.

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