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NEW PARADIGM OF THE EUROPEAN URBAN AREA DUE TO ECONOMIC GLOBALIZATION AND TECHNOLOGICAL REVOLUTION

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Abstract

The paper concerns what influences possess rapid growing significance of technological information on a global scale. The focus is on the role of urban structures in Europe. Economic globalization declares the increasing interdependence of world economies and is largely based on the accelerated development of science and information technologies. Therein, IT development is investigated as a strong technological driving force for economic globalization and reduction of global connection barriers. The conceptual bases for the development of strategic global cities in international trade are examined. The impact of technology on the transformation of modern society are examined as well. The application of modern mechanisms innovation development of the economy is justified. Nevertheless, this process can pose certain risks and have some limitations. Preconditions for the urban development of national economies in European urban areas are highlighted. The main conclusion is that the transition to modern and economically connected European urban areas can lead to new era supported by a technological revolution.

Keywords: *Economic Globalization, Urban Area, Global City, Informational City, Technological Revolution*

1. INTRODUCTION

It is commonly accepted that changes in field of emerging technologies supported by improved development of science and information technologies had an important influence on societies living conditions. The way to use new technologies seems obvious for us, and most of the population can't imagine life without them. They can be useful in many key areas like medical, aviation, agriculture, construction, transport, energy, military, space, robotics, IT and communications. In general, smart technologies in smart cities are improving housing quality, cultural facilities, health conditions, learning outcomes and environmental awareness. In addition, they can provide possibilities for the organization of cities in the future. Cities can be therefore more efficient and convertible. New technologies have enabled innovations and have changed the way we think and behave according to our expanding degree of digital knowledge. Unfortunately, there is a discrepancy in distribution of access to information that is causing differences in regions of the world. The biggest differences appear clearly in urban and rural areas. Urban areas with overall possibilities of absorption of emerging technologies are creating integrated space for ongoing digital transformation and development in science. We can observe rapid growth in urbanization and a future of cities depends on quality of technology development. While most progressive urban areas are continuing in their technological expansion, other rural areas have become marginalized (Vysluzilova, 2016). These rural areas

have been weakened by gaps in global scale and opening to international market. However, the boom in the Internet and telecommunication industry in the 1990's reduces the differences and revolutionized the way we exchanged information without physical barriers. Rural-urban disparities in highly-connected world can be taken as a factor of decreasing differences. The world is getting more connected in social and economic areas.

2. ECONOMIC GLOBALIZATION SUPPORTED BY NEW TECHNOLOGY DEVELOPMENT

A significant phenomenon, which describes situation in which we are more connected than ever, represent globalization. New technologies in global perspective create a space for economic development and are driving force of globalization. According to a definition of United Nations economic globalization "refers to the increasing interdependence of world economies as a result of the growing scale of cross-border trade of commodities and services, flow of international capital and wide and rapid spread of technologies" (Shanquan, 2000). Das (2010) supported the economic point of view where globalization respects a process of increasing international division of labour and growing functional integration of national economies. Shanquan (2000) also outlined that globalization is an irreversible trend for the economic development all over the world at the turn of the millennium.

Not long ago we could observed observe fast globalization of the world's economies affected by professional development on science and technology. Technological change affects not only today but has played the central role in the growth of globalization from the 19th century with railway and telecommunication innovations to the further innovations in transport, logistics, information technology, and the 20th century internet repercussions (Bannock – Baxter, 2010). According to Das (2010) the wide-spread of information and communications technology has become a major supporter of financial globalization and contribute to reduction in cost of transactions in financial businesses continued to both domestic and global markets. Globalization generates diverse constructive outcomes in financial segment. The importance of global economic development is a mission which needs to highlight. From macroeconomics evaluation points the GDP growth is strengthen with higher access to the private global capital markets. Impact on the macroeconomy is characterized by reduction in fixed costs with outsourcing trends.

Globalization can create several economic benefits. Erixon (2018) present the main economic benefits of globalization. Globalization has helped to lower high inflation rates in Western economies. Globalization has spurred the spread of new technology, contributing to greener and more productive economies. Globalization has improved businesses, living standards and the performance of the entire economy. Globalization increases productivity and accelerates the spread of new ideas, technology and production methodologies. On the other hand, companies with low productivity are not much part of the globalization process (Erixon, 2018).

Major corporations worldwide are annually classified and surveyed in rankings as the Fortune Global 500. These corporations are measured by revenue and their size is globally demonstrated on the world map. Since 2001 to present, the geographical distribution of companies in the Fortune Global 500 reached a considerable change in the number of concentrated corporations in different parts of world. The share of Asian-based companies increased rapidly certainly caused by rapid increase in the number of Chines Fortune Global 500 companies (from only 10 to 120). The share of North-American and European-based companies also reduces over the same period.

Guyford Stever and Muroyama (1988) found that while Europe's reputation for quality products is being maintained increasingly through the variation of new technologies, there is a

need to focus on cohesion in many emergent sectors, infrastructures, and a dispersed and fragmented market. Nowadays in Europe there has been an increasing focus on innovations in research and development. The European Union has created several policies and programs to outline the meaning of innovation and taking advantages of it. Guyford Stever and Muroyama (1988) pointed out that many European companies are at serious risk of being left behind in process of competition. These gaps in economic competition can be filled in with a rapid growth of innovation technologies in driving force urban areas that are following the highest interests and options to support development of science and emerging technologies.

In Figure 1, there can be observed a correlation between the biggest European corporations and discontinuous corridor of urbanization known as European Megalopolis. This spatial settlement unit is networking urban areas consist of megalopolis Randstat or Zwischenstadt. Major European metropolises are linked with major communication axis that are connected also to two European global cities, which are London and Paris. Advanced economies of global cities and major European metropolises have undergone significant changes over the centuries.

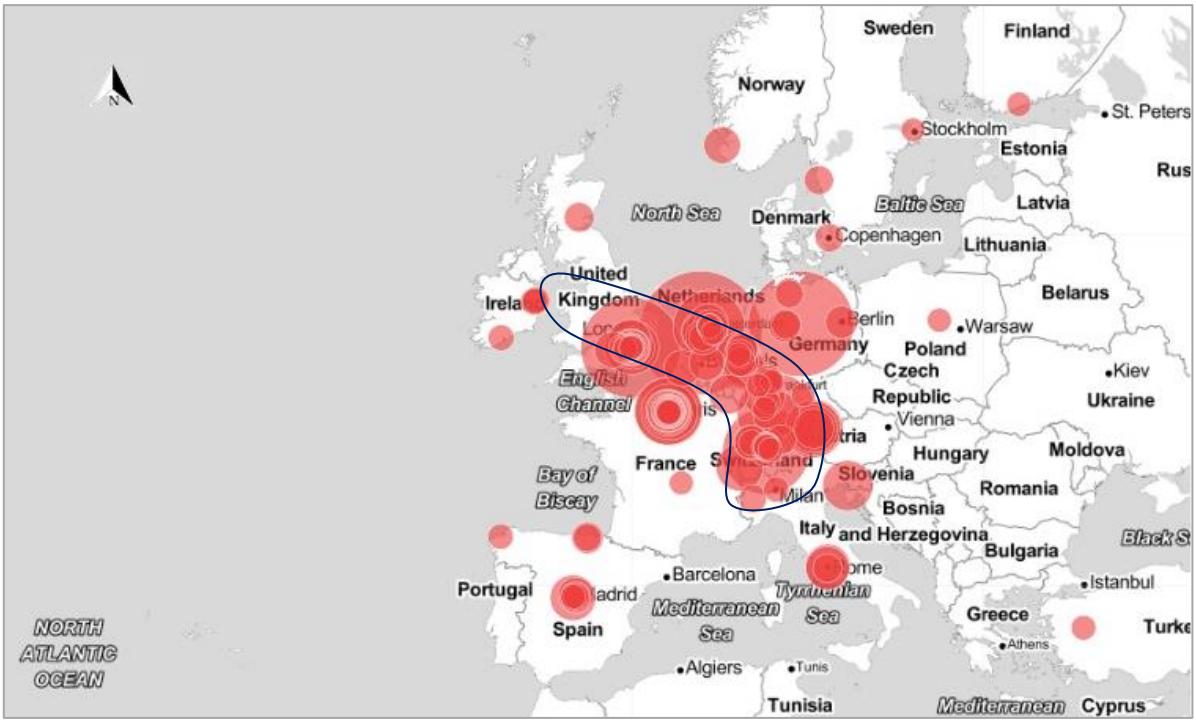

Figure 1. Fortune Global 500 Companies in Europe in 2018 (Rapp, 2019, modified by the author).

Sassen (2005) introduced a global city model based on several hypotheses focused on geographic dispersal of economic activities, central functions, agglomeration economies, headquarters outsource or economic fortunes of these cities. She reasonably noted, that global markets and corporate headquarters are all pointed to the existence of a series of transnational networks of cities strengthening cross border networks by formation of "transnational urban systems". The principal approach of global cities can lead to the significant attention on the "networked economy" due to the industries location with the similar branch specializations or services (multimedia, telecommunications, finance and specialized services) (Sassen, 2005). Therefore, the emphasis on new technologies in more and more globalized world can have positive results on economic dynamism and development in urban areas.

3. GROUNDS OF THE TECHNOLOGICAL REVOLUTION

As it was mentioned before globalization has spurred the spread of new technologies, but the question is: What formed the basis for today's technological revolution? The first point to be noted is that the term technology is a combination of the Greek *technē*, "art, craft" with *logos*, "word, speech."

Industrial Revolution in modern history is the process of transitioning from an agrarian and handicraft economy to one dominated by manufacturing of machinery. This revolution process began in the 18th century in Britain, and further spread to other parts of the world. The time before the Industrial Revolution was characterized fundamentally by poverty in Europe. Cipolla (1994) analysed demographical data in distribution of wealth in medieval and renaissance epoch. He found that the poverty of preindustrial societies was largely present, and the unequal distribution of wealth and income were reflected in the presence of significant number of "poor". In addition, he went further where people of preindustrial times were inured to radical fluctuations in the number of beggars mostly in cities.

To see the progress of technological development and to find the key access to prosperity it was necessary to go through long-term changes that were reflected in the change of society. Pre-industrial society occurred from 1750 to 1850. In Figure 2, we can see the major grounds of the technological revolution.

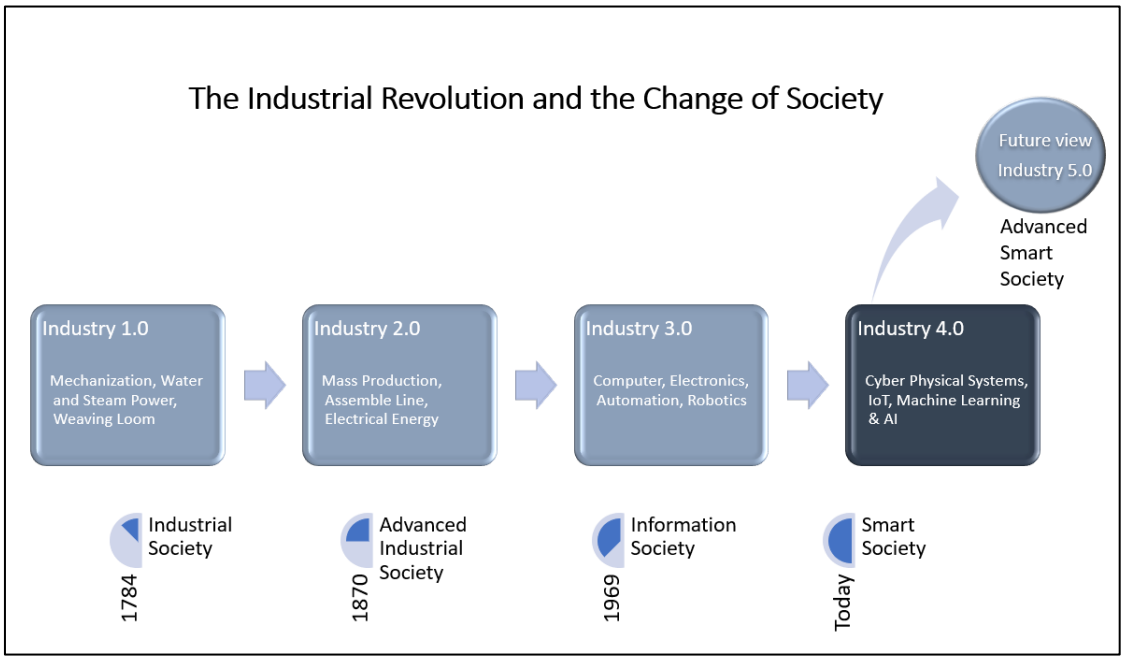

Figure 2. Scheme of Industrial Revolution and the Change of Society (author).

Today's situation is highlighted where we've entered a new era for manufacturing, called Industry 4.0, and which is characterized by widespread digitalization. At the national and European level in the field of digital revolution in broadcasting Levy (2001) looked at the processes of policy changes. Prior to this fourth major transformation in modern manufacturing, there was at the beginning **Industry 1.0**. Mechanical production facilities were introduced to the world in the late 18th century. Agrawal et al. (2018) pointed out that it was the first time that machines started to support humans in manufacturing and production. The first weaving loom was popularized in 1784. The first industrial revolution was beneficial in terms of manufacturing a larger number of various goods and expansion into society. This revolution also created a better standard of living for a part of society. A rise and basic patterns

of industrial society was in contrast of agrarian society. An industrial society has the primary means of subsistence based on industry. Mass production of goods using assembly line became a standard process during **Industry 2.0**. Bijker et al. (1987) were concerned with identifying patterns of revolution that were affected by, in those times, modern technological systems. Developing machines running on electrical energy has a large impact on this revolution. This revolution in the history of electric light and power was dated between 1870 and 1940. Social aspect, to some degree, can acquire some positive effects. The degree of freedom exercised by society in a system depends on the maturity and size, or the autonomy, of a technological system (Bijker et al. 1987). The primary means of subsistence in a post-industrial society is determined by service-oriented work. A significant expansion of rail and telegraph line was recorded after 1870. Continuously the entire industry was automated with IT and electronics during **Industry 3.0**. The pressure to reduce costs further forced many producers to move to low-cost countries. Agrawal et al. (2018) emphasized that core competency and core value proposition were decoupled from manufacturing. For example, they noted that Nike, Zara, General Motors, Apple, and Dell globally renowned for their products without need to own the manufacturing part. Their products are known as products of original equipment manufacturer (OEM). Companies were more and more globally linked. Huwart and Verdier (2013) reflected on a new political and technological paradigm that has turned the world into the "global village" (predicted by philosopher Marshal McLuhan). In contrast to this concept, Huwart and Verdier (2013) argued that some analysts are even introducing to semi-globalization. The socio-economic aspects have changed over time. Colombo (1988) point out a new trend of dematerialization which also includes the emergence of what has been called an "information society". Visible access to information comes to the centre of the action of society and a crucial moment of this change came in 1989 when Berners-Lee invented World Wide Web. The financial world is more globalized with the outsourcing trend at the start of **Industry 4.0** in 1990. In the 1990's the Internet and telecommunication expansion remodelled the way we connected and exchanged information. It also led to paradigm changes in the manufacturing industry and traditional production operations combining the boundaries of the physical and the virtual world. Cyber Physical Systems include autonomous automobile systems, medical monitoring, robotics systems and automatic pilot avionics. These systems allow machines with almost no physical or geographical barriers to communicate more intelligently with each other. The wide spread of these systems is expected synchronously with further development of settlements which can be seen in new context, especially in development so called of "smart society". Development of employment in high technology industries especially in urban areas is progressing very fast and therefore it is necessary to acquire access to profound learning in new technologies for more wider society. This goal could be filled in the future by new industrial epoch with upcoming **Industry 5.0** with advanced smart society.

4. TECHNOPOLIS PHENOMENON IN EUROPEAN URBAN AREA

One of the most important attributes for urban innovation, is an understanding and implementation of processes that occurs with new usage of new technologies. New technologies well adapted in urban space and distributed further additional results are more closely linked to accelerate the development of multinational companies and global production networks. The impact of these processes on urban development has become an emerging field of research with progressively integrated globalized economy.

Fujita (1988) see the term Technopolis as a high technology-oriented city. This term is a union of words *technology* and the suffix *-polis*, which is etymologically derived from Greek word meaning "city". In other words, the Technopolis phenomenon is merging technology

commercialization with powerful private and public sector initiatives. These initiatives support growth of economy, global competitiveness and smart networking ideas. The implementation of important initiatives in daily life can lead to enrichment of the quality of our life in cities largely impacted with fast changing technologies. Castells (1989) proposed a new term of an ongoing transformation "Informational City". He strongly promotes that especially advanced societies in European cities are in a transition which cannot be separated from the deeper structural transformation that could affect urban forms.

In recent years the impact of high technology industries on growth economic rates was recorded in specific metropolitan regions of Europe. The fastest growth rates were recorded in the Baltic Member States in the regions of Riga, Vilnius, Kaunas and Tallinn. Otherwise, high growth rates were also registered by the German region of Ingolstadt (headquarters of a major car manufacturer), the Swedish region of Uppsala (which specializes in medical research and biotechnology), and the British regions of Aberdeen (oil industry) and Derby (automobile industry). These regions may be identified as engines of economic growth, explicitly as leading producers of technological innovation (Kotzeva et al., 2016).

Economic growth in urban areas should not take a place without sustainable urban development. Major benefits of this development on smart society should not be excluded. There was created a development of extensive urban spaces for the creation and implementation of several projects or strategies, e.g. URBACT III which is a European Territorial Cooperation programme. URBACT formed ESIMeC which was created to develop innovative economic strategies of medium sized cities. Other example of meaningful urban conception is the creation of new towns like Marne-la-Vallée in France which has been gradually built up since the first plans in 1965 and now includes 26 communes. It shows how decentralization and conception of new towns can lead to results. EU's strategy for smart, sustainable and inclusive growth represents Europe 2020.

Nowadays everything tends to be related to smart technologies in "Smart Cities". Smart cities are great example how Internet of Things has been integrated into our daily life. A smart city is an urban development precondition to have an integrate information and communication technology and Internet of Things technology included in city facilities. Within urban areas it is important to have these facilities to build a strong financial system for societies. The fundamental question is raised, "What makes a smart city smart?" First, it is a Smart Society which creates new solutions for the improvement of life and work for citizens by using digital data and new technologies. Smart People should have access to appropriate education in use of new technologies. More often, it is heard about development Smart Living with improved housing quality, cultural and leisure facilities, health conditions and individual security. Regulation of new technologies should be led by Smart Governance with public and social services in eco-friendly urban areas. The technological development should be in equilibrium with Smart Environment offering better air quality and ecological awareness.

A smart city can also include applications of Internet of things in Environmental monitoring. For example, environmental protection, water safety, extreme weather monitoring, species protection and smart farming applications. Smart cities are for example Singapore, San Francisco, Barcelona, Paris, London, Vienna, Amsterdam, Oslo, etc. Singapore is well known as leader for innovation. In Europe Barcelona is a great example of innovative city which has made an extensive user of sensors to help monitor and manage traffic. The city has installed smart street lights, smart parking technology and sensors for monitoring air quality and noise. New ideas can provide smart transportation system as well expanding system of free Wi-Fi in public spaces. Use of these technologies have turned the Barcelona into leading cities in the worldwide smart city phenomenon. J.-R. Ferrer (2017) has noticed that the current revolution that Barcelona is experiencing can lead to further formation "Barcelona 5.0" (see Figure 3).

In area of solving environmental issues caused by human activity on the biophysical environment it is important to support their reductions. Among others, important is also Smart Mobility covering sustainability of the transport system. Development of automobile science went further with development of flying cars that may no longer be part of the realm of science-fiction. For example, Uber plans Paris flying-car laboratory. Changes of the transport system will have significant impact on the future perspective of developing cities. Smart cities are just a part of technology trends of today, but it is important so see also the social aspect of humans in technological world.

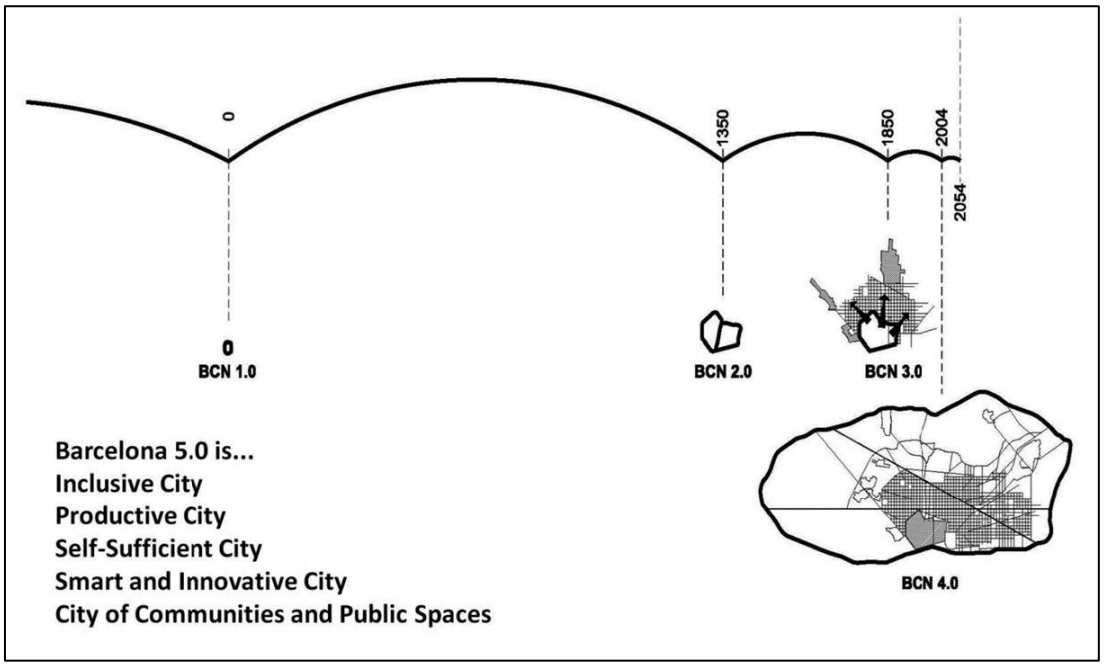

Figure 3. Schematic evolution of "Barcelona 5.0" (Ferrer, 2017).

5. IMPACT OF TECHNOLOGICAL REVOLUTION ON SOCIETY

The evolution of the human species cannot be compared with evolution of the machines according to absence of basic intellect even if there is an effort to encourage development by imitating the human behaviour. As French philosopher Henri Bergson stated, "Unlike non-living objects, living organism retain its past in the present" (Edwards, P. 1967). Human machine interaction, interpreting non-verbal face gestures is used in a wide range of application. Dornaika and Raducanu (2009) have proposed a facial expression recognition method that is based on the time-series representation of the tracked facial actions. They stated that knowledge of the emotional state of the users allows machine to communicate and interact with humans in a natural way.

With the speed of new technological developments, the Internet changed the way people live, work and operate today. Distribution of information is not limited by time and space it means businesses can employ workers from virtually anywhere in the world and can trade in several countries at the same time without having to physically open branches there. Excellent progress is verified with information that can be provided in real time. What took before days or weeks nowadays can be done by a few clicks.

Huge advantage of a connection to the internet is easier access to any kind of information. The access to new technologies especially access to computers and internet connection has become an important source to achieve information. According to van Dijk (2009) Europe is

digitally divided. Author emphasized that even in the latest Eurobarometer statistics persistent large access gap between Northern and Southern or Eastern and Western countries and between people of different social classes, education, age and gender across all these countries.

The coming of a technological revolution and formation of a global economy causes to a new society, the smart society, which replaces the informational society. How we communicate continued to evolve as well. Do people remember face-to-face conversations? Today people are losing their social skills because of the ease of quick correspondence by email or instant messaging. Even in the work environment some people prefer to contact each other by telecommunication applications rather than direct communication. With daily use of computers some people can have problems with written text on paper. And communication by phone is often replaced by texting with use of plenty emoticons. We can observe very fast changes on market of new technologies. A big difference can be seen by the generation gaps in point of view to knowledge and use of information technology equipment. The youngest generations like generation Alpha or generation Z have access to the newest technologies and are affected by dematerialization, on the other hand the Millennials or generation X have experienced the technologies and devices that some of them are not even known to following generations. The older generation of Baby Boomers, which replaced the Silent generation, explored the origins of computer science. In the early 1950s were created first machines to provide an in-house data processing service. For example, a control console of the Leo One machine (see Figure 4), was built by J. Lyons & Co. to handle accounting work (Cawkell, 1987).

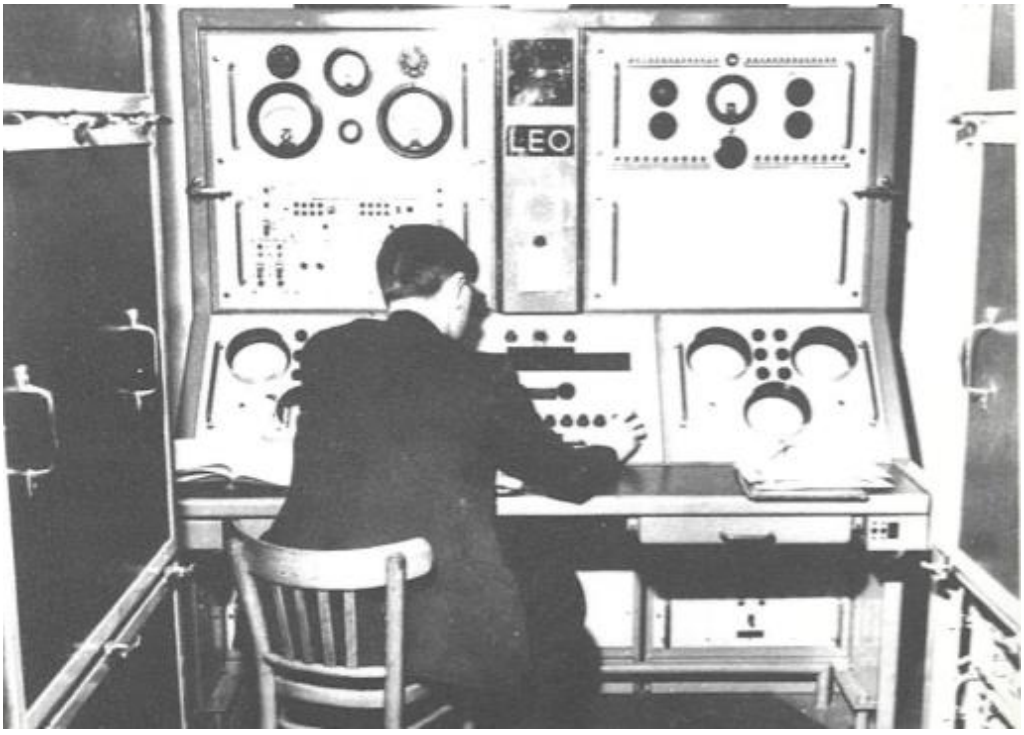

Figure 4. Control console of the Leo One machine by J. Lyons & Co. from 1951 (Cawkell, 1987).

The development of machines in computer science has passed through a long history and outcomes can be differentiated. Intelligent machines, robots have different level of skills and can be divided into three types. 1st type represent Mechanical Robots which assist with welding car parts, transporting, assembly. 2nd type represents Simple Bots using script and macro. A face recognition system is a technology capable of identifying or verifying a person from a digital image or a video frame. Software application (RPA) Robotic Process Automation is useful for pre-check analyses and can replicate the action of a human being. Benefits are for

example improved process, cost reduction, no change to systems or processes, consistency in the output and low risk. 3rd type includes AI or complex algorithm.

Artificial intelligence has exploded in the past few years with dozens of start-up companies and major AI initiatives by big name firms alike. For example, the online retail giant Amazon offers both consumer and business-oriented AI products and services. Like Lex a business version of Alexa which is the intelligent voice server at home. Apple has FaceID a facial recognition security system and Siri the virtual assistant. Facebook has 4 AI labs around the world all designed to give better understanding to how people communicate. Google's AI efforts are all oriented toward improving its services. Intel's Nervana is a deep learning processor. IBM has been a leader in the field of artificial intelligence since the 1950s. Its efforts these days are around IBM Watson (see Figure 5), which is a question-answering computer system capable of answering questions posed in natural language. Microsoft's Cortana is a digital assistant for smartphones. Salesforce Einstein is an AI service and business intelligence software. AI can be also useful in important areas like medicine. Some hospitals and health care systems are moving their data storage to cloud. Specific AI health start-up is collaborating with Google and applies deep learning techniques to the field of radiology. Current AI and IT development reveal responsibilities to consider all relevant technology information explicitly with deep investigation with positive impact on future generations. The positive outcomes of research should outbalance the negative part.

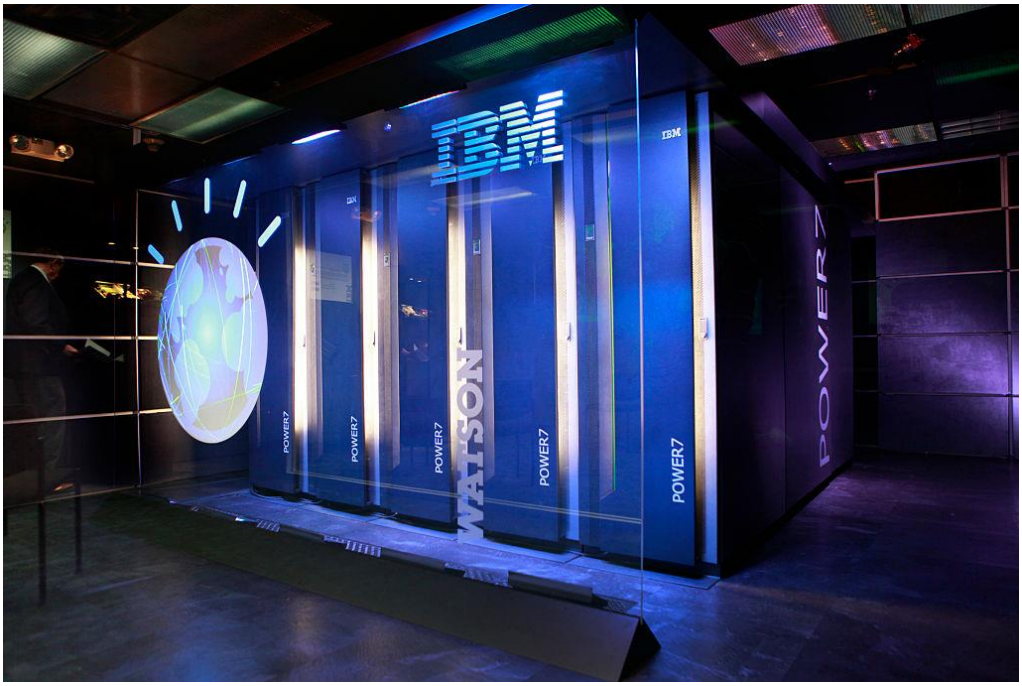

Figure 5. IBM Watson (Langhans, 2016).

There is a main question if robots can replace humans in the future. They partly already do. McKinsey Global Institute provides an estimation that robots may replace 800 million workers by 2030 (Manyika et al., 2017). In 2014, the number of mobile electronic devices surpassed the number of people and number of internet-connected devices reached 25 billion in 2015. Cisco Internet Business Solutions Group predicts there will be 50 billion devices connected to the Internet by 2020 (Evans, 2011). Advanced society should sufficiently provide solutions of problems and knowledge acquired from the history of information science that may have significant role to cover wide areas in the humanity.

6. CONCLUSIONS

The current society is involved in the new metamorphosis, which is accompanied by technological revolution, knowledge innovations, smart and sustainable cities. Including AI and new technologies in daily life can affect the change of need by humans in space especially in urban areas. Sustainable urban development brings a different approach by supporting the development of education, in addition to conservation, protection of natural and cultural heritage. The dynamics of high technology development and economic growth have shown a significant progress and cross connection in global scale. In accordance with all parts of essential components forming developed societies there is a need for consensus for the sustained urban development of the Technopolis. Urban areas with a high technological economic development are concentrating highly networked structures then rural areas according to wide spread of urbanization. We should not overlook expanding process of incorporation of human knowledge and new technologies into industrial growth causing to creation dissimilar technological paradigms. The acceleration of processes in time regarding also future is posing an important question. What should we do to have urban areas of the future? In general, fundamental requirements in advanced societies will cover a support of technological development to help a security and public safety, smart information and communication, building smart economy and financial system in eco-friendly areas. In the context of sustainable development creating new smart technologies protecting our environment. For example, a high-tech data-driven vertical farming companies which uses less water than traditional farms. Or ocean bound plastics initiative where plastic waste from ocean is used for recycling notebooks, etc. However, ecological urban systems not only require support from the use of environmentally friendly technologies, but also radical change in the behaviour of everyone. Nevertheless, at the same time, the state and local administration should retain their responsibility for creating appropriate prerequisites for this. Governments and city administration should have an ease access to knowledge of new technologies with an impact on learning how to more effectively utilize technology to improve government processes in widely covered areas. The importance of education in new technologies and modern solutions can improve living conditions of further generations that will be affected by consequences of today's decisions.

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