The Impact of Artificial Intelligence in Smart City Governance

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Abstract. Smart cities are the new relevant entities in urban planning concept that are economically, socially, ecologically, politically relevant and, of course, culturally relevant as well. A strong urban infrastructure, service management layout aims to create a digital blueprint which is a very backbone of the smart cities. AI short for Artificial intelligence has been under development since 1950´s with the availability of rapid information, and communication data collection. AI is said to be the biggest disruptor of all times; Thus, AI market has grown substantially over the last decade and it´s expected to grow 20% annually over the next few years (Liu, 2020). AI may even evoke many different opinions and science fiction images in us. Some may perceive AI as a threat, and some may fear that artificial intelligence will take their jobs in the future. Threat images may have been painted in people's minds because not enough is simply known about AI, as well as the benefits that mankind can achieve with the solution to many health, economic, and security problems in future smart cities. The variety of integration of different innovations that serve humankind in smart cities provides another level of support for its users while boosting the socio-economic development of any city into a competitive one. The smart cities of tomorrow work as a collected layers of information matrix with complex capacity of innovations controlled by main information, and communication technology known as (ICT)´s. To offer high-quality services system, smart cities aim to create sustainable, cost-efficient, and safe environments with the help of AI to augment shortages in a growing city. In this paper we will discuss AI´s role in the improvement of service system for high quality living standard and social perspective of cities that we are seeing today. This paper´s objective is to highlight how AI will impact urban planning in governmental aspect, and over all planning profession? How can AI be benefited to ensure equitable outcome for service management in smart cities? This paper explains the processes of planning, maintaining, and operating in urban infrastructure level in smart cities. Namely, first, the distinction of service system that are being provided based on performance of urban infrastructure systems. Secondly, the emerging role of the information and communication technologies known as ICT´s that has become known as digital blueprint for smart cities. Lastly, the important steps in managerial and governments consideration which are necessary to unleash the potential ability of AI in smart cities.

Keywords: Artificial Intelligence (AI), Digital Blueprint, Information, Communication Technology (ICT´S), Smart City, Space Syntax, Ubiquitous City, Urban Planning

1. Introduction

Smart City has been defined in various ways by different scholars, practitioners, and organizations. Smart cities council (SCC) has defined smart city as a city that uses information, and communication technology (ICT) to advance its liveability, workability, and sustainability (SCC council of USA, 2009). Smart city council aims to enlighten mayors, city managers, city planners and their staff to help

understand how technology will transform the cities of tomorrow offering best services in most functional way.

Smart cities council was established in early 2009 in United States as guidelines for cities help themselves by providing objective, vendor-neutral information to make confident, educated choices about the technologies that can transform a growing city into a functional one, also to ensure broad compatibility and interchangeability of businesses and in design approach as well to offer better service systems for urban users. While other scholars have adapted another approach replacing AI to ICT with digital technology, smart technology, or internet of things (IoT) and the outcome impact of these technologies is to improve quality of life for the citizens, the community involvement in the planning process, the performance of urban services, and the environmental sustainability. The word smart city is a collection of different words to identify the concept and function of it. The concept of smart city was developed over time to define a modern 21st century city different from cities existed throughout history. The term "smart" refers to many adjectives that qualify a modern city, such as Digital City, Intelligent City, Knowledge City, and much more. This interpretation could depend on the fact that it represents a vague concept in today's culture, often used to improve service systems that enhance people's lives for the better. Specifically, based on ICT point of view, the word "smart" indicates an efficient, modern, sustainable city.

Smart City arises from the need to set long-term policies for the sustainable development of the country, fortifying some very important themes for the contemporary city in technological innovations, renewable energy productions, competitiveness, using resources sustainably, and Information Communication Technologies (ICT). These functions are considered a necessary condition for growth of the smart city, in fact, in a long run the use of ICT makes infrastructures and services more interconnected, intelligent, and efficient (Washburn, 2009). The overall perspective of smart city is considered as "territories with a high capacity for learning and innovation, which are built-in with the creativity of its population, institutions of knowledge creation, and their digital infrastructure for communication management" (Komninos, 2006). A more comprehensive and generic overview of the "smart" concept includes different approaches, from the latest technology to those related to social, capital, and humanistic characteristics. Consequently, a smart city also includes different aspects, simultaneously focusing on the role of ICT infrastructure, on the role of capital, environmental, political, and social issues (Karagliu, 2011).

Collection of data has become one of the smart cities most important aspect. The most significant feature of artificial intelligence is the ability to find accurate data´s dependent on the base of large masses within the city. From intelligence-based point of view, the smartness is linked to the humanistic approaches, related to the importance of education, social capital, and sustainability for developing the smart city (Hollands, 2008). On this basis, AI will create rules for itself that will enable it to make similar decisions on its own initiative based on collected data that will help to improve a better functioned, safe, and economically competitive city for its users. Artificial intelligence can learn new rules and make more accurate decisions if people correct the mistakes it makes and feed the corrected decisions back to artificial intelligence to learn from the previous mistakes to avoid repeating it. AI (Artificial Intelligence) may even evoke a lot of different opinions and science fiction images in us. Some may perceive artificial intelligence as a threat, and some may think it is the answer to all our future problems within the needs of everyday life. Threat images may have formed in people's minds because not enough is simply known about artificial intelligence. Another aspect that is not clear enough is the benefits of AI that can achieve solutions in health, economic, and securities issues within

the smart cities of tomorrow. Intrusting the complexity of decision-making in one of the necessary steps in smart cities who are distinguished implementing innovations in cities, at multiple levels. The mechanisms underlying the creation of smart city are interaction in multi-level dynamic factors and stakeholders that contribute to processes that influence social processes, economic performance, environmental dynamics, and quality of governance at local, national, regional level (Visvizi, 2017).

The smart city essentially focuses on efficient convergence between technological elements and humanistic aspects, translates into web of matrix integrated as ICT. Active, participation of citizens, implies the need for a new type of safe governance characterized by the authentic involvement of citizens in public policy (Seisdedos, 2012). In fact, up to date technological innovation allows citizens to play a predominant role in the management in the urban context, through collection of data, and sharing information enable's citizens to become increasingly closer to the city as they become an indirect guardian for their community, influenced to become more involved in public criticism and feedbacks. To answer the multilevel aspect of a smart city, the Centre of Regional Science di Vienna developed a research in which identified six dimensions or parameters based on which an intelligent city can be identified on an operational level, the six dimensions are:

- Smart Economy
- Smart Mobility
- Smart Environment
- Smart People
- Smart Living
- Smart Governance

These six dimensions are strategical blueprints of ICT that a city should be able to put in place to improve the quality of economy, environment, mobility, living, citizens, and the governance (Cohen, 2012). Cohen analysed European cities based on smart people concept playing a key role in the promotion of human and social capital, encouraging participation in public life, the coexistence of different stakeholders, and the community interaction creates a continuous dialogue to detect concrete daily needs in efficiently and effectively in smart urbanisation. This parameter focuses on importance of people within the communities of the city, seen as indispensable element taken into consideration as an engine of smartness. Depending on the presence or absence of these six parameters, Cohen after further analysation of six dimensions, found out the following ten cities that hold a strong infrastructure classified as European smart cities: Copenhagen, Amsterdam, Vienna, Barcelona, Paris, Stockholm, London, Hamburg, Berlin, and Helsinki (Cohen, 2012).

1.2 Smart Cities Digital Blueprint

When thinking of the diversity of smart city, we must think about three layers as combination that creates an overall urban blueprint of a smart city. The combination on these three layers creates a digital blueprint in smart cities separating basic contrast between infrastructures layer, service layer and technological layer. The infrastructure layer consists of water, pipes and structures combined in one layer, and the service layer is dedicated to serve economical aspect of customers and citizens and lastly, the technological layer which bounds the infrastructure and serves layer together creates a digital blueprint in 21st century cities known as smart cities. The aspect of efficiency in smart cities then works with the merge of technological layers' role combining infrastructure and service layer together for a city to work efficiently (Naphade, 2011). Naphade identifies these three layers of smart city in which creates an overall digital blueprint for efficient and effective urban planning in a smart city. The

digital blueprint focuses as a web of matrix collecting data from urbanization, economic growth, technological progress, cultural identity, and environmental sustainability of the smart city.

Urbanization is one of the key stimulations in smart cities that poses challenges in social and economic level linked to the infrastructure and institutional settings such as the public safety, sustainability, technological innovation, the management of traffic congestion, people's movement, and energy consumption (Turok, 2013). The economic growth depends upon combined contribution of a group of people give birth to a community that stimulates creativity and entrepreneurship ideology, which, then foster the economic activity of smart cities (Naphade, 2011). Therefore, in the 19th century we have witnessed the emergence of smart communities that is a wide virtual community going from a small neighbourhood to a community at a national level. The members consist of organizations and administrative institutions work in partnership and in the name of a shared goal which is using information technologies for the benefit and safety of the community. This integration factor of collected information becomes a resource intribution in world economic and world wealth. Integration of actors and resources contributes to the increase in world economic and world wealth (Li, 2011). Through information, and communication technology it is possible to analyse, collect, and obtain large amount of data that leads to new innovations of different services in smart city. The integration of large amount of data collected in urban level from heterogeneous sources must be managed through cloud platforms. This data is useful for collaboration between organizations and citizens, and between the government and organizations. An all-pervasive computational infrastructure is an essential technological component for the construction of a competitive digital city blueprint, since it allows to create accurate and up to date data to analyse and obtain (Troisi, 2018).

Lastly, the sustainability concept is the most important factor in smart city. The growing demand for a more sustainable city can be intended both the development of sustainable urban infrastructures for environment protection and reduction of CO_2 emissions (Marshall, 2005). In terms of cultural identity, a smart city also allows for cultural identity to flourish while sustaining local practices. Undoubtedly, technological development has caused dramatic changes in many aspects of our lives and needs, including the idea of our interaction with space (Star, 2021). In terms of environmental sustainability, the required challenges of the smart cities are to focus on the correct use of energy and water resources, sufficient waste disposal and the reduction of greenhouse gas emissions (Naphade, 2011). In terms of social sustainability, a smart city is pushed to work towards the liveability and improvement in terms of human rights, social justice, corruption, social and health equity, cultural competence, social responsibility, stakeholders, and governments participation in the following matters: (Lozano, 2008). Lozano describes cities as large, complex, and dynamic. These aspects depend upon natural artifacts that represents living environment for increasing of population worldwide. A smart city, collects, processes and analyses data to allow urban system to learn, adapt and strategically self-optimize towards long term visions for coming generation. A smart city can also contribute towards a desired urban planning by framing sustainability in terms of environmental, economic, social diversity with the participation of governance for better quality of services and live. Having a digital blueprint without clear vision is meaningless. Likewise, a vision without strategy for how to achieve it will only become a wish list. Thus, to have a sufficient smart city its essential to combine visionary aspects and technical means to create a functional urban blueprint.

2. Understanding Artificial Intelligence

Artificial intelligence originally is a branch of computer science, it's a discipline dedicated to exploring a scientific field that empowers machines with human intelligence. Although AI has been

accomplished popularity in smart cities, a considerable progress has been made in disciplines especially in innovative applications which play an increasingly important role in urban governance. Mankind has invented complex labour tools throughout evolution and growth of civilisation. In 2016, Artificial Intelligence awakened worldwide controversy and was in forefront of the spotlight when Google AI program called AlphaGo defeated South Korean chess player Lee Sedol. Again in 2017, Google AlphaGo defeated Chinese chess player Ke Jie, the world champion, and the discussion above the future of AI was once again pushed into the spotlight. The urban governors and scholars as well as entrepreneurs have shown great interest in innovation technologies such as intelligent robots, autonomous driving, and face recognition applications (Li, 2011).
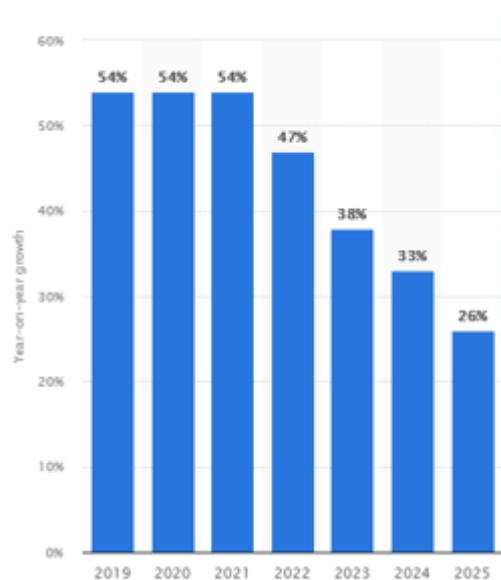

Figure 1: Artificial intelligence software market growth forecast worldwide 2019-2025: Global AI software market growth 2019-2025 (Liu, 2020)

Nowadays AI remains in the stimulation stage of basic human-like intelligence for example, in the field of language recognition it aims to promote the use of machine´s to process and analyse. Face and image recognition is based on human-like vision as a model to realize machine intelligence. Large digital companies such as Apple, Facebook, Google, and Microsoft are actively deploying AI to increase their company's assets. In the past ten years' information collection, storage and transition has improved computer capacity to collect greater data. For example, optical fibre communication has been increased by 100 times, and the mobile communication rate increased by 1000 times. AI has achieved breakthroughs and opened the prelude to a new artificial intelligence era that we have never seen before based on deep learning algorithms (Wu, 2020). In 2015, Steven Hawking was among 1,000 experts to sign a letter to ban AI warfare. The list consisted of leaders, world-renowned robotics and cognitive researchers, and Silicon Valley pioneers to legally prohibit autonomous weapons artificially intelligent war machines that select and engage targets without human intervention. The official letter described autonomous weapons as the third revolution in warfare, after gunpowder and nuclear arms, describing enormous potential for devastation, should a new arms race occur (Gibbs, 2017).

Artificial intelligence is often compared with new scientific fields such as space technology, nanoscience, genetic engineering, and energy technology due to its long vision, radical changes, and innovative characteristics. In the past 20 years, with the rapid development of computer

communication technology, science, and sensor technology, AI has made considerable progress. Elon Musk the founder, CEO and chief engineer at SpaceX has preached many times about the dangers as well as benefits of AI publicly arguing the arms race to banish AI from the earth forever rather use AI for the benefit of occupying planets (Wadhwa, 2016). Understanding AI is multi-dimensional, AI refers to a new technical science that develops theories and methods to simulate and extend human intelligence from the learning branch. AI has become a separated field from computer science, it has become classified into different fields in computer science, cybernetics, information neurology, physiology, psychology, linguistics, and many other branches. When it comes to the technical field, it refers to equip machines with more human-like functions through technologies such as human-computer interaction, replacing humans in specifically given actions and tasks.

2.1 The Role of Urban Planners in Smart Cities

The role of urban planners is usually not technologically related but due to the development of smart applications machine can form the necessary rules for itself with the help of data. A person does not have to separately program reasoning chains for every possible decision that the machine is hoped to be able to. The role of artificial intelligence in process automation is emphasized in making individual but complex decisions. Most urban planning issues are poverty, sustainability, equality, and quality improvement in cities, these issues are called wicked problems that are complex to define and solve. Any complicated problems require planning, rather than quick technology fix to address. It is fed with as many human decisions as possible, as well as the input data based on which the individual has made individual decisions. In this way, artificial intelligence is taught to make similar decisions about the available input data that people would probably have made from similar input data.

Urban planner role in smart cities is to define the issues, understand the relationship between the government and stake holders. Main role of urban planner is to avoid siloed approaches to have more comprehensive solutions that can respond to the different needs. Planners can also play significant role to engage citizens with decision making process and help make better decision I for the future city. Artificial intelligence is an emerging part of the digital economy. Since McCarthy first proposed artificial intelligence (AI) at the Dartmouth college conference in 1956, AI technology has developed rapidly and has profoundly impacted the world's technology, industry, and lifestyle (McCarthy, 1989). Cities are essential carriers of economic and social development. The development of artificial intelligence technology, industry, and its role in production and life is primarily reflected in urban governance. Therefore, in nowadays world, various countries and city governments attach great importance to the cultivation of artificial intelligence technology and industries. As the carrier of technology, industry, and lifestyle, artificial intelligence has been widely written into the government plans of various countries and regions, and it has also been listed as a critical development content by many cities in China. From the late 70 s last century, especially the reform and opening, China's economy and technology have improved dramatically. In recent years, China has also attached importance to the development of artificial intelligence. In May 2016, the National Development and Reform Commission issued the "Three-Year Action Implementation Plan of Internet plus Artificial Intelligence" and pointed out to make breakthroughs in several key AI technologies, focus on strengthening AI application innovation in areas of the national economy and society, and cultivate and expand the AI industry. In July 2016, the "Guiding Opinions of the State Council on Actively Promoting the Internet plus Action" stated to foster emerging AI industries and strengthen the construction of innovative platforms such as AI resources and public services. These policies have

created a good atmosphere and guidance for developing both the AI industry and urban governance driven by AI technology.

Artificial intelligence is a new round of technological revolution considered a disruptive innovation after steam engines, industrial production, and information technology. AI will significantly change human production and lifestyles by creating new business models, driving new consumption, and increasing labour productivity. It is of great significance to realize the changing of quality, efficiency, and driving force in the high-quality development of China's economy and other developing countries worldwide. At the end of 2019, the COVID-19 pandemic has been raging around the world so far. Digital technologies such as artificial intelligence have been continuously integrated into urban governance and have promoted epidemic defence. Through data support and intelligent algorithms, AI technology has played an important role in real-time tracking, isolation, prevention, and control. In March 2020, Chinese President Xi investigated Hangzhou's digital technology usage in promoting epidemic prevention and control. He pointed out that the modernization of urban governance should be widely promoted through big data, cloud computing, and artificial intelligence, from which the cities can become much more intelligent.

With the development of artificial intelligence, the scholar believes that the world may become 1% of the 'god man' controlled by the algorithm and 99% of the 'useless masses' controlled by the algorithm (Harari, 2014). Human society will have unprecedented inequality on political, economic, social, and cultural. The complexity of cities brings many challenges to urban governance. The development of information technology, especially AI technology, brings more challenges to urban governance. With the AI development, the concept of urban artificial intelligence was proposed, capturing AI's main manifestations in cities (Cugurullo, 2020). As the city is still intertwined in various forms into a tight network through information technology (Audirac, 2002), the urban pattern in which virtual space and physical space coexist has increased urban governance's difficulty. This background provides a direction for our research above AI and urban governance.

Therefore, based on the discussion of the development of the AI industry and urban governance, this paper posed the value logic of AI with urban governance and put forward some of the risks and challenges that urban governance will face in the AI era. According to the three main objects in urban governance, the respective strategic recommendations are proposed toward the government, enterprises, and people.

2.1.1 The Impact of AI in Urban Governance

To create a smart city layout, the role of privet sectors come to play largely especially in tech companies that have the knowledge and capacity to implement information, and communication system in the city. It is also important that the role of the state and local government is to bring these tech companies together to combine the services they provide to the citizens. Citizen's role is the use of these technologies efficiently which is critical for the smart city. In United States, many governmental offices especially American Planning Association APA has introduced AI related policies and bills at the state and local level. For example, in California the state senate passed a resolution related to principles of AI which consisted of 23 guidelines for safe use and beneficial development of AI in August 2018. California also passed another bill following the publishing of principles disclosure law that makes it unlawful to use AI without disclosing that it is not human if the intent of the AI is to encourage a commercial transaction or to influence election voting. The consumer privacy act was another big step in limiting the use of AI on collecting information about people and

the user to have the right to opt-out to eliminate their data to be sold to a third party. There have been many other bills introduced throughout the United States, United Kingdom and Europe including a ban on facial recognition technology used by city agencies and governmental offices (Carter, 2018). The goal of any city is to use AI to improve the lives of its citizens and make better decisions in the level of urban planning. Urban planning is the first step of urban governance (Wang, 2014). Although concepts such as smart city, digital city, network city, and smart city emerged more than ten years ago, and most of them are based on information technology to upgrade cities digitally, the proposed application of AI technology to urban planning has been accompanied by the past two years—the result of the development of artificial intelligence. In China, scholars proposed artificial intelligence to assist in urban planning (Huang, 2018). State Council PRC (2017) issued the "Development Plan for New Generation Artificial Intelligence," proposing to build an intelligent urban infrastructure, a city-wide big data platform, and a city operation management system that integrates multiple heterogeneous data and comprehensive perception. It manifests that China's concentration on AI has entered the level of urban infrastructure and management. It has also proposed new development ideas for the modernization of urban governance systems and governance capabilities.

For example, the urban brain technology currently actively promoted in cities and regions such as Hangzhou, Shenzhen, Shanghai, and Xiongan new district is a typical AI technology application in urban governance. Liu believes that the core of the urban brain takes the city as an organism and embeds cloud computing, Internet of Things, edge computing, and other technologies into the urban organism's system through the urban neuron network, such as the central nervous system, sensory system, nerve endings, realizing the interaction between people and things, and promote various urban organisms' organic integration (Liu, 2020). This urban brain system directly applies AI technology in urban governance, effectively improving urban governance's informatization and intelligence.

3. The Race against the Machines

In their book The Race against the Machine, Brynjolfsson and McAfee raised the prospect that contemporary society will no longer be able to maintain anything such as full-time employment due to ever-increasing automation from rapid advances in artificial intelligence (AI) and machine learning. Virtually considering, in the beginning of the industrial revolution, automation has not led to large unemployment not withstanding a succession of predictions to the contrary but this time, it may be different. The idea behind AI generally has been defined as a thread, but the image that Brynjolfsson and McAfee paint, is rather convincing in what AI advocates which is human abilities to plan the precise organizational structures – enterprise woefully inadequate with regards to innovating strategies to cope with speedy automation and robotics. One must believe in personal interfaces that are constantly foisted upon us to enable us to interact with new digital technology to realize that developing approaches of interaction in daily services with new technologies constitutes a first-rate venture. Arguably the decline in productiveness that now appears to plague western evolved nations is probably due to the ever-increasing amount of time we are spending interacting with machines daily which are alleged to boom our productivity in a positive or negative aspect. Reputedly in a study based on American teens showed that the teens are checking their smart phones and social media at least five times a day (Eadicicco, 2015). This behaviour of addictiveness is affecting productiveness and effects wider learning talents wager among the youth. In fact, Brynjolfsson and McAfee's argument is that instead of a race 'against' the machine, how about wanting to increase appropriate responses to a race 'with' the gadget, and the task to become

aware of AI isn't always that we're incapable of responding but that the price with AI is such that we've very little time left to increase the proper responses to get used to it.

A well-known example of exponential growth that became utilized by Kurzweil, among others is to argue that we can soon be triumph over AI by information boom. The instance is likewise repeated in Brynjolfsson and McAfee's book. Starting with Moore's law, for the last 50 years, the average pace of computation has been doubling each 18 months with costs of production halving the equal cycle. This shows little signal of slowing down, notwithstanding bodily limits which might be now being bypassed by using higher layout. To look at the charge of trade, one handiest desire to study the once-a-year improvements in clever phones over the past 5 years, in phrases of memory, pace of get admission to consumer interface layouts, availability of Apps has made easy for buyers to interact with online markets more than ever before. Improvements are being made all the time, in large cities depending on the increases in velocity and decreases in price that come from advances in incomplete computations. The use of Kurzweil's example about trading a new type of exchange such as bitcoins, this kind of growth can be pictured within the following way. He tells the story of the sage who invented the sport of chess after which delivered the sport to his King. The ruler become so fascinated by the invention that he told the inventor to name his price. The inventor requested the King to region a grain of rice on the first rectangular of the chessboard after which double this on the subsequent, doubling it once more on the third square and so forth until the chessboard turned into a mess including the rice. This pile of rice might be his price. The King readily consented to this as he took into consideration to be a small reward for his situation. He positioned that one grain on the first rectangular, and two on the second, four on the third, eight at the fourth and so forth. It is straightforward to see what happens. By the point, he had reached the 64th square, the pile on that square had reached almost a quadrillion (one thousand trillion) grains, more than the scale of Mount Everest. You get the message. This is the equal old problem of duration doubling which dominates every exponential. However, it isn't always the final variety of grains of rice this is the punch line. When you cowl 1/2 of the chess board, there are about 2 billion grains of rice and despite the fact of this large number, it is not that massive, in phrases of the contemporary definitions of massive facts in our virtual age. What Brynjolfsson and McAfee argue is that in phrases of Moore's regulation and the present day will increase in incomplete computational speeds and reminiscence, we are just about to enter the second half of the chessboard. Shortly, it's miles further than very disruptive exponential growth will genuinely start: that we will start to see very dramatic changes in computational strength, and the real race against AI will kick in the stages of what we will do to this huge amount of collected information? And perhaps the most crucial and most dangerous question is to whom will this large amount of data goes to? Will the government use be to control its citizens or serve its citizens?

Why we want new organizational systems to address these questions especially in urban planner's point of view, it is to start to tame AI and to establish the right forms of regulatory structure protecting each citizen right to be free individuals while AI being the only purpose to serve humankind rather to control. The questions presented in this paper are to invoke extreme moral ideas before it's too late for AI to cater individual's rights and to create a layout to increase polarizing results of facts for technologies and know how to deal with AI no other way around. The approach to apply AI as planning city regulations awakens many questions that are organizational, no longer technological, however in smart cities the regulation laid out by the AI with daily services have to be dominated with future automations. The belief of the clever streets and routes conjures lift our sci-fi images in

such level of automated density divisions that divides the population equally taking note of the PEST analysis which stands for political, economic, social and technological data collection within district, sector and neighbourhood level in all our cities and towns around the world.

It may sound somewhat as a metaverse if considering these automated density data collections in masterplan divisions, inside the greater popular press, the whole thing would have started from the state-of-the-art Apps from our computers to mobile phones to driverless vehicles whilst extremely deeper issues are approximity performance which can profit many businesses because of the automation of services starting from transit to the delivery of goods to your doorstep. There may be no doubt that recurring and repetitive procedures – algorithms if you like – are enhancing at an exponential fee in phrases of the facts based on human staffs within governmental city planning municipalities they could process and speed up executions, faithfully following Moore's law. Pattern recognition techniques based on space syntax that lie at the basis of gadget learning mental maps are relatively routinized, iterative schemes where the pattern in query – be it a signature, a face, the surroundings around driverless buses and so on – is computed as an complicated averaging method which takes a chain of factors of the sample and weights them in one of these way that the space syntax pattern may be reproduced flawlessly by the mixtures of elements of the original pattern and the weight of it, that is in essence the way neutral networks may work in the future.

Whilst AI 'study' and that the modern-day consciousness of the AI is on 'deep gaining knowledge, all that is supposed is that with complex styles and environments, many layers of patterns (factors of the sample) are described, and the iterative techniques are run till there may be a convergence with the pattern that is most defined for the users within the smart city. Such processes are iterative, additive, and no longer an awful lot extra than state-of-the-art averaging however the usage of machines which could perform truly at the rate of light and accordingly can collect large volumes of massive statistics. Whilst those forms of algorithm can be run in real time and controlled by humans, then there is the possibility of many kinds of habitual behaviours being displaced. It is on this feel that AI may usher in an era of truly disruptive human based procedures by eliminating all errors that we humans do in data collecting process. This in keeping with Brynjolfsson and McAfee theory somewhat relative that is starting to appear slowly as we reach our conclusion.

The real difficulty in phrases of AI includes issues which can be specifically solved by humans. An awful lot of our city masterplans is distinctly routinized and a lot of our daily actions and decisions are primarily based on quite honest patterns of city edges and responses based on our mental maps. The large questions involve the volume to which those of our behaviours aren't trustworthy, can it be computerized? In truth, even though machines can beat human's actions within city regulations, there is now the prospect of machines beating more intelligent machines that had been at the beginning designed to serve the people, the real strength of AI may nicely come from collaborative of guy and gadget, operating collectively, inplace.

Ever extra powerful machines operating via themselves. Within the last 10 years, several editorials have tracked what's occurring within the real-time metropolis–the smart town as it's miles popularly known–which has emerged as key to many new initiatives in towns.In truth, towns – particularly massive cities, global cities if you may– have grow to be the real ground field of AI´s impact but the recognition has now not been on their long-time period evolution however on how we use them on a minute by minute rather week by means of week basis. Several the patterns that outline the smart city on those quick-time evolution cycle can

be predicted based on usage of AI in large part due to the fact they're exceedingly routinized however even for highly ordinary configurations, there are limits on the extent to which we will explain and put them into action. Plenty advancement in AI inside the smart city will come from automation of the habitual, such as the usage of electricity, the delivery of vicinity-based online shopping's, transits: the use of data being fed to our vehicles and travellers in real time and so on. Assuming, we will see a few mind-blowing advances in these regions within the next decade and beyond. However, the key issue in city making plans isn't always just this brief time period but the long term and it's far here that the possibilities of developed AI will move into the next level, urban making plans for the reason that nineteenth century has been based totally on attempting to arrange the metropolis in such a way that the first-rate of lifestyles for all is accelerated in phrases of the way the city features economically and the way the city is organized in phrases of social equity.

There are a few tough selections concerned in producing any plan for the lengthy-term development of the city to fulfil these varieties of purpose and its miles hard to refine the type of layout and choice-making concerned in such planning being changed by the way of AI´s core function. The sheer variety of development and the uncertainties concerned cannot be computerized the usage of any AI generation although it is viable that some restrained styles of AI might be generated that cope with uncertainties in creating a layer of regulation in city planning based of the manner that the intelligence is superior rather a layer of information collected by humans. Planning layout combined with space syntax with the reality that even can function with habitual procedures which includes improvement of driverless vehicles connection with the street routs. Such sudden activities outline human behaviour and when those activities occur, they may be every now and then even unpredictable to the individual producing such equal behaviour as AI. Possibly, the development of AI in the shape of device mastering smart streets could be useful in extending our understanding of ways to solve busy hours and removing loads of traffic frequency in particular hours of the day. The capabilities of metropolitan cities are much difficult to investigate, on how such methods will ever dominate in the level of plan-making and design making. Besides, what is likely to happen is AI will tell the plan-making manager in a great deal the same manner laptop equipment functions when using a 3D-program. The AI will correct the ideas of making errorless masterplans and structure designs. In terms of city making plans, there are hardly ever any gear that have been developed yet demonstrating how AI can be used to increase the state of our artwork. In their book The Race against the Machine, by Brynjolfsson and McAfee, there was a discussion with expert structure engineer that stated: the AI already exists within engineering programs calculating loads and bearings making easy the process of BIM to be much more cost effective and sustainable competed to the age where computer did not enter the market´s yet. The approach of AI may be simplistic and obvious without any consideration several the tools that are now in each daily use that emerged and used in our design programs (Batty, 1991). In fact, introducing the 21st anniversary of the Geo-computation conference, Stan Openshaw stated a quest for thinking towns in phrases of models that embodied AI as their creator, however those thoughts had been still untimely. What we need now in urban planner's point of view is positioning ourselves inside the forefront of developing an AI program that gives an actual push for demonstrating how AI can be utilized in urban evaluation for metropolitan cities, which face large volumes of issues every day. In urban making plans and layout quest, we need a concerted attempt to explore the limits of AI in our expertise of building better cities. How we will invent new ways of automating functions within cities, and in the wider context how AI can be benefited in making unmistakable plans.

4. Ubiquitous City as New Smart City

The Ubiquitous City (U-City) is a city that applies a substructure of ubiquitous computing for its urban system functionality. A ubiquitous city is an updated version of a smart city that is contextualized as the integration of information system with its social services. The U- city functions as layers of information about needed data, added no stop, and updated by each second then it is added into the information bank including citizen's health history, criminal records, fines, and other social statues. The urban information AI is useful to evaluate the space syntax layers since it will be updated regularly, and automatically holding endless data for the municipalities to analyse and evaluate the site before adding a new project in the masterplan. In ubiquitous city every device, service, and component are linked to an information network channel. Thus, all information systems would be interconnected with residential, school, medical, business, and the government. Another characteristic of ubiquitous city is the integration of information system with social system that links every device, and services linked to a core information network the core representing an AI brain. Thus, city planners and government officials micro-manage numerous aspects of the city such as energy consumption, land value and traffic. The core function in any ubiquitous city is collection and processing the data, and communicating, and analysing data driven decision making process step by step as seen in the (Fig. 2).

Figure 2: Artificial intelligence data collection process. From the book: The Race against the Machine, Brynjolfsson and McAfee, 2011

4.1 AI as Service System

Based on what has been discussed in the previous paragraphs, it can be inferred that cities are not considered only as an object of innovation based on collected data, but also as sustainable ecosystems (Zygiaris, 2013) that collectively enables intelligence and capacity of co-creation of citizen communities to create innovative lifestyles and work scenarios. Moreover, the application of the service system for the smart city confirms long term future vision, highlighting common aspects between the U-city and the service system. These aspects allow configuring a set of service systems starting from the first aspect which is linked to the regard toward the human factor and the collaborative features among the elements of the city, linked to a reticular view of the relationships among stakeholders, in which everyone is a bearer of knowledge, including citizens who are becoming more and more powerful and important influencing the sets of layers that function with each other within service systems of the city. The overcoming of the internal verticalization of the administration, is functioning in favour of layout masterplans towards a horizontal dimension of government set policies that allows understanding in a unitary and harmonized way the different vertical functions for example the sectors of smart energy, smart house, smart building, etc. on the market. The overcoming of old management logics allows all the actors of the system to have equal rights (Huang, 2018).

The second aspect in smart service system is common between the two systems which is organic and holistic approach to the reorganization of the territory and the context in which a company operates in

general that allows to integrate, enhance and direct towards common objectives, solutions and interventions. Both the objectives of the service system in U-city are:

- Effectiveness
- Efficiency
- Sustainability

To make this integration happen and to co-create a stable layout, it is necessary that all the resources within the city that use the service system enjoy equal rights and power and that the policies are placed on the same level. The resources exchanged by citizens take on the same role as those exchanged by organizations, for this reason, it can talk about democratize the role of such service systems for each citizen. Lastly, the third aspect in common is the interacting between human and technological components. Specifically, while the human component is linked to the creation of knowledge and innovation, the AI technology is the mean by which knowledge is exchanged faster (Zygiaris, 2013). The main role of AI is indispensable in-service systems, generating a concept called e-government that stands for connecting point between the users in the city and artificial intelligence-based service offerings. From the moment the whole city becomes an integrated system, its core being the AI brain, which is the source of data source, then it will interconnect with each layers of masterplan to co-create value, then the smart city can be seen in all respects as a complete AI service system. Finally, this can affirm that AI integration of data sources can be used in benefit as collaboration of the citizens themselves, it is possible to frame the whole city as a huge service system that adds public value in which citizens become central actors contributing to improve AI based service systems as seen in (Fig. 3).
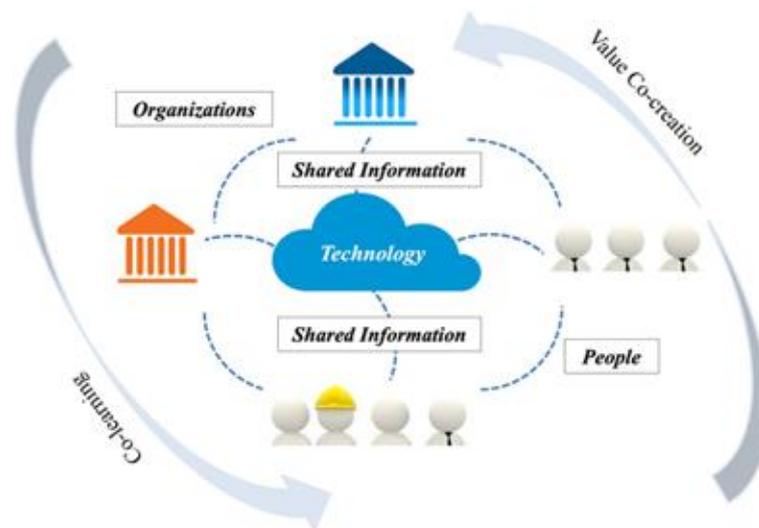

Figure 3: Representation of the cycle service system summarizes the process, defining the key elements and qualifying each of them based on the types of resources exchanged, and used.

5. Proposition of Information and Communication Technology (ICT) in Smart City Governance

The most sizable impact of facts related to information and communication technology is technology (ICT)´s is the change of traditional way transportation has been laid out for city masterplan in relation with urban form and urban existence. Regarding ICT´s, it can be assumed that

the gradual improvement can contribute to managerial component in city planners' point of view as the version embracing a holistic and systemic imaginative long-term vision for the masterplan of the city. For many decades' automobile´s added convenience accessibility to services and facilities at the same time the result is the increase in greenhouse gasoline emissions, congestion, and concrete sprawl, so it's far sensible to adapt any new vision of concept that has a concrete solution for coming generation with more careful steps. The desire to apply the model of AI based service system to the smart metropolis, leads the authorities to trace each single element of service device within the smart metropolis. More especially, the styles of human beings, corporations, technology, and shared facts are identified in the clever city in such obvious ways as a city that does not apply technological approaches to the city's infrastructure.

In Smart city "people" in service system are intended as all the actors involved in the service supply process, then in a smart city people are all the actors of a city, both service providers, citizen, and other stakeholders (Maglio, 2006). There is no doubt that the most essential ingredient of any city is its settlers and the community that they form, the citizens that use daily services. They are a key factor for the development of the network and for the introduction of value and innovation, their feedback of improving the use of daily services shows the progress of governance within the smart metropolis. The citizens are an essential part of a growing city, and their approach to improvement in the city has changed over time throughout history. It is even more interesting to test how some of these temporary installations could add a more effective futuristic plan for the site and how it may encourage more opportunities to the planning and management of better built cities of tomorrow (Star, 2021). In the past the governance of city planning office has played a marginal role for its citizens to send invitations to any areas settlers before a new project starts to take place. Public bodies in the ministry of planning office set a questioner of adding or removing project based on the opinion of that area, increasingly including them in the decision-making and management processes. This is perhaps being an approach of the past, rather including AI and ICT based programs that focus on a subjective based decision making rather than based on objective based decision making to minimize errors in the city masterplan. Although, an elderly Citizens engagement in such questioners prepared by the city planning governance bodies creates value to improve in service systems, as they are in line with systemic thinking of using these services daily, they are seen as valuable observers in carriers of resources, informational resources or operant resources beyond they have played a role in a marginal position in comparison to public bodies inside the building that they hardly has walked on the area that they create a regulation to (Curugullo, 2020).
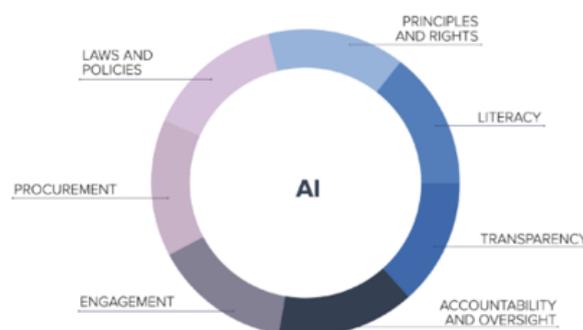

Figure 4: Proposition of Artificial Intelligence based program for city planning governance (by the author)

Citizen's engagement creates priceless value for all elements of existing system within the city, while information and communication technology create a new layer of information that was not existing previously in city planning municipalities. The proposition of ICT based layer which AI is a backbone, consists of:

- Developing Common Principles,
- Engaging with Citizens, Local Universities, and other stakeholders,
- Providing for AI Literacy programs among officials and the public,
- Drafting dedicated Laws, Bans, and Policies,
- Providing for Accountability and Oversight,
- Assuring Transparency of profits,
- Leveraging Procurement toward Responsible AI.

These layers highlight that cities have become laboratories of innovation in AI governance. Such proposition for smart city governance turns it into a mapping tool to responsibly improve city technology and regulation of AI. By developing common principles for the cities, a suitable example would be Montreal city of Barcelona that have already produces an AI based principle and guideline to offer more responsible developments protecting the environment, thus decreasing toxicity that effects the Ozone layer. The international treaty called The Montreal Protocol on Substances that Deplete the Ozone Layer is gradually eliminating the production and consumption of ozone depleting substances to limit their damage to the earth's ozone layer. The Montreal Protocol is signed by 197 countries – the first treaty in the history of the United Nations to achieve universal ratification – and is considered by many the most successful environmental global action. Engagement of (Citizens & Universities), such example is based on data assembly in NYC that can engage citizens toward understanding expectations and co-creating solutions. Engaging with universities and programs, like the Montreal AI ethics institute can enable cities to tap into local expertise. AI Ethicist is expected to draw on moral principles to help decipher what is right and wrong within an AI context before applying their deduction to concrete examples. The application then needs to be presented in an empathetic manner not to receive defensive responses. AI Literacy´s aim is to establish ethics and algorithm toolkit that can be developed and offered to establish AI Literacy across cities within public and official settings. While law and policies, an example would be the Portland facial recognition ban that was proposed in NYX employment AI regulation which was set to be unethical technology and unfear for individuals who were members of witness protection programs. In accountability and oversight, some cities have experimented with various oversight bodies such as the NYC Automated Decision Systems in task force to perform various decision-making processes and hold responsibility and/or accountability. Transparency layer´s example is Amsterdam and Helsinki AI registration that adapted several created tools, to promote transparency of algorithms used in the city´s public governmental buildings.

6. Conclusion

To provide an errorless AI application principle regarding service system for the context of smart cities, that offers a functional city planning governance, one must approach as re-conceptualizing the existing service systems considering the relationship between the users and the organizations which is by gathering data through AI based blueprint through collecting, processing, communicating, and analysing to conclude errorless decision making. Such process helps public managers to understand that a smart city should be managed as a service system by sharing information and knowledge,

allowing valuable co-creation cycle. Knowledge exchange represents the main element of exchange in the system. A direct line with the citizens reduces the strategical ambiguity desired by the public decision-makers, while on the other hand, citizens can use ICT´s to communicate in case of natural disasters, thus contributing to the co-creation of value in the public sphere.

In a smart city sharing information is also linked to environmental sustainability as it allows a diffusion of knowledge and awareness of the risks to the environment, therefore the Montreal AI ethics institute is perhaps the perfect example on creating laws and regulations for AI based tools to lead AI rather than it is controlling us. AI based service system is made indispensable by its users which are the citizens (the people), therefore citizen engagement in such settings when it comes to installing any AI based service system in the city should be not only seen as a mean but rather an open channel of discussion that adds communities voice to the account as well. Citizen's engagement brings mutual resources and knowledge exchange that led to valuable aspects on how to use AI as the servers of its people rather than a thread. Thus, in the long run, foster new innovations at the same time exchange co-learning processes. It is necessary that the governance aims at the training of the staff, especially the communication skills to favour the communication exchange with the citizens. These exchange processes are made more efficient through technology, which should be used as an accelerator of the co-learning processes between administrators, decision makers and citizens to offer most transparent way to create better masterplans for future smart cities.

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