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Industry 4.0, Smart Cities, and Urban Transformation

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ABSTRACT

We are experiencing the effects of the fourth industrial revolution (Industry 4.0) on our daily life to a greater extent everyday as getting involved in the digital technologies by using internet from different devices (e.g. smart phones, tablet PCs, smart watches). It is not only the people make use of these technologies, cities are also meeting with the advanced technologies and striving for providing better services to their habitants. Moreover, automation is getting widely used in technology-intense sectors as the digitization increases and the automation supersedes the labor force. This situation could destroy the economies of the countries, especially that are based on labor-intensive commodities and services. On the other hand, the adaptation and implementation of technological advancements is an important factor affecting the competitiveness of the cities. Smart city concept came in to the picture as a consequence of the fourth industrial revolution. The number of cities employing smart solutions has shown an increase in the past few years so that they can manage their resources more effectively and improve their service quality. It is inevitable now to imagine an urban transformation, no matter it is a renewal, redevelopment, etc., without making use of digital technologies.

1. INTRODUCTION

The fourth industrial revolution (Industry 4.0) is prone to generate essential changes in daily life of human beings, types of their works, and human interactions. Industry 4.0 gives rise to some technologies, which are getting popularity nowadays, such as artificial intelligence (AI), robotics, 3-D printing, autonomous vehicles, nano and bio technologies, materials science, energy storage and quantum computing etc. Deploying digital technologies for better waste recycling, less energy consumption, improving transportation will make the cities more habitable and enticing. (Schwab 2016).

The population living in the cities is steadily rising around the globe and as of 2010 more than 52% of the world population was living in urban areas (Mutunga et al. 2012). The increasing population poses new challenges to the cities and eventually to their governments since the resources need to be managed in a prudent way. At this point, the notion of smart city comes into play as a consequence of Industry 4.0. The number of cities, that have the intention to be smart, is

increasing and it is estimated that the size of the smart city industry will be more than \$1 trillion by 2025 (Anthopoulos 2017). While the term 'smart city' brings to mind the cities employing digital technologies, it also means better governance, providing better services, better public contribution to the municipal decisions, better resource usage etc.

By the accrued advances in information and communication technologies (ICTs), the governments have had the chance to utilize innovative solutions to different services. Haidine et al. (2016) give smart city application in different realms such as energy (e.g. smart metering, network monitoring and management) buildings (e.g. light and heating control, energy efficiency), transportation (e.g. monitoring and management of traffic, services for drivers and passengers depending on real/near real time information), water (e.g. smart metering, efficient usage, conservation), waste (e.g. management, treatment, tracking), safety/security (e.g. video surveillance, disaster monitoring), health care (e.g. smart hospitals, decent hygiene, controlling diseases), and education (e.g.

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learning environments for adjustable and interactive learning, online courses).

Smart city is one of the concepts developed with the rise of Industry 4.0 and it is characterized as a city that contains six factors: smart economy, smart mobility, smart environment, smart living, smart people, and smart governance (Roblek et al. 2016).

Smart city is a new form of urban design that makes use of digital technologies in an efficient way and it is a shift from the conventional urbanization to technology-driven one. Urban transformation projects, which can be referred by different names such as renewal, regeneration, rejuvenation, redevelopment, revitalization, recovery etc., are important government decisions that shape the social, economic, and cultural lives, and physical structure. Urban transformation is now moving forward and taking a new form by means of digital technologies. Smart city applications are being embedded into the urban transformation projects in order to manage the limited resources, whereas the urban populations have a tendency to increase steadily.

2. SMART CITY GOVERNMENTS

Eden Strategy Institute and OXD consultancy firm published a joint report on smart cities in the world defining the basic characteristics of the cities to be considered as smart. In this report, ten factors were also introduced to rank the city governments (Eden Strategy Institute and OXD 2018). These factors are as follows:

- Vision
- Leadership
- Budget
- Financial incentives
- Support programs
- Talent-readiness
- People-centricity
- Innovation ecosystems
- Smart policies
- Track record

In this report, 50 cities were selected among 140 cities and they were rated on a scale of one to five for each of the ten factors, where five is the best score. Then, these cities were put in an order based on the total score they had from all ten factors. The resulting ranking for the top 10 cities is given in Table 1.

Table 1. Top 10 smart city governments

Rank	City	Total Score
1	London	33.5
2	Singapore	32.3
3	Seoul	31.4
4	New York	31.3
5	Helsinki	31.2
6	Montreal	30.1
7	Boston	29.6
8	Melbourne	29.5
9	Barcelona	29.4
10	Shanghai	29.2

Some of the conspicuous features of the smart city governments derived from the top 10 smart cities are:

- Making it possible for the city residents to access to the ICTs and providing them with the talents required to use these technologies,
- Appointing committees within the body of the governments to develop smart cities and direct the process,
- Promoting the small and medium-sized enterprises that are executing researches on smart cities and taking advantages of these studies,
- Enabling the citizens to contribute the on-going activities and taking the advantage of ICTs while doing this,
- Experience exchange with different smart city exemplars,
- Ensuring cooperation among the institutions and groups that can make contribution such as city administration, citizens, private sector, academia.

3. GOVERNMENT POLICIES REGARDING SMART CITIES IN TURKIYE

National Smart Cities Strategy and Action Plan was published by the Presidency on 24 December 2019 (Official Gazette 2019). Some of the prominent issues stated in this document are:

- Increasing the service quality in the cities,
- Developing human-centric solutions,
- Benefiting from the technology at best level,
- Boosting the welfare of the society,
- Improving the contribution of the citizens to the city governance,
- Using the resources efficiently,
- Increasing the gratification of the citizens concerning the provided services.

In addition, in the 11th Development Plan published by the Directorate of Strategy and Budget of the Republic of Turkiye, goals related to urban transformation and smart cities have been set. Some of these goals are as follows (Directorate of Strategy and Budget 2019):

- Making it possible for every citizen to utilize from urban services and doing this in a fair way,
- Establishing urban transportation system with high accessibility,
- Considering women, children, elderly people, and handicapped people during urban design,
- Performing needs analysis and improving the service quality for the vulnerable groups,
- Increasing the amount of green areas in the cities,
- Promoting local governments in preparation of smart city strategies and supporting domestic production about smart city applications,

- Adopting a participatory approach while performing urban transformation projects and conducting the process in cooperation,
- Designing the transportation systems as accessible, safe, time & cost-effective, and sustainable,
- Provoking bicycle use in cities and constructing bicycle routes.

4. DISCUSSION AND CONCLUSION

There are still many countries without access to the information and communication technologies (ICT) in the world, which hinders them from the benefits of the fourth industrial revolution. Therefore, governments should try to construct the basic infrastructure for the ICT in order to form cooperation with the rest of the world.

Many beneficial influences are expected from smart cities such as using resources more efficiently, increased productivity, better quality of life, lower crime rates, raise in mobility, decreased air and noise pollution, better access to education. In spite of many positive influences of smart cities, negative effects should be considered wisely. Some of these unfavorable effects are related to surveillance, privacy, risk of breakdown in case of failure in the energy system, threats of cyber-attacks, changes in social life (Schwab 2016). Furthermore, less-demanding jobs could be replaced by smart technologies (e.g. robotics, automation of production).

Turkiye has many regions being threatened by earthquakes and is expected to hit by earthquakes in near future, which has been occurred in Izmir recently. It is believed that a significant number of the existing buildings, especially those built before 2000, are not resistant enough to earthquakes or other natural hazards due to their construction conditions. Therefore, after 2010 Turkiye took initiative and expedited the urban transformation projects that are estimated to cost hundreds of billions USD. While performing these urban transformations projects, it is very important to benefit from smart technologies to use resources efficiently and build livable spaces. It is time to shift from the conventional urban transformation to the “smart” urban transformation.

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