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# Smart City Applications in Historical Environment: Comparison of Istanbul and European Cities

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**Abstract**
Historical cities have difficulties in integrating to infrastructure problems, rapid population growth and smart technological solutions. Smart cities are suggested as solutions for these cities to be liveable and sustainable. The solutions offered to these problems in today's technology yield better results than expected. Smart solutions in the historical environment make great contributions to the cultural and historical sustainability of the city. Studies have been carried out in this context in Istanbul since 1995 and many European countries form strategies within the framework of similar historical circles. Like these cities, İstanbul has actualized similar problems with technological solutions within the scope of "Smart City". In order to provide a holistic view for smart cities in the historical environment, it is aimed to make an assessment of smart city solution in Istanbul.
**Keywords:** Smart City; Historical Environment; İstanbul; Smart Solution; Livability.

## 1. Introduction

There isn't exact and clear definition about smart city conception. (Albino et al., 2015) The common definition of a smart city in literature is defined as a city having up to date and innovative possibilities within the framework of that day's possibilities. Smart cities aim to make future cities more sustainable, livable and durable.(Karvonen et al., n.d.) . İt is also addresses fundamental issues such as improving the quality of life safety and health (Borda & Bowen, 2017).

There are standards that both internationally (Union of International Associations, 2005) and some countries have established through their local communities to define the smart city framework. Across these standards and strategies is a shared vision to position communities at all scales to have equitable access to connected smart services that can enhance the sustainability and quality of life, improved health and safety, and economic prosperity (Borda & Bowen, 2011).

There are three vital steps of getting smart cities; technology base initiative, innovative applications and adaptation of locals. In historical regions, the built environment from the past is adapted to the smart city vision with various new applications. Historical regions have different problems and opportunities in the city compared to other regions (Woetzel *et al.*, 2018). In historical regions, the built environment from the past is adapted to the smart city vision with various new applications. Historical regions have different problems and opportunities in the city compared to other regions.

In the "architecture" discipline, solutions are produced under the sub-headings of smart environment, smart buildings, smart space management and smart infrastructure (Giffinger *et al.*, 2007). In addition to these titles, ''Smart solutions in the historical environment'' makes a great contribution to the cultural and historical sustainability of the city as another subtitle. Through the creation and transition phases, historic environments are created by the interrelationships between tangible and intangible values. The historic environment is treated as a body of tangible and intangible cultural assets. Tangible elements, such as the physical structure made up of constructed and natural structures, and intangible values, such as cultural events or behaviours and cultural expressions inside built environments, make up a historical urban fabric (Karakul, 2011) . Due to the inseparable connection between location and identity, the cultural heritage sector has been operating within smart requirements for many years (Chianese & Piccialli, 2015). The historic environment is treated as a body of tangible and intangible cultural assets. Tangible elements, such as the physical structure made up of constructed and natural structures, and intangible values, such as cultural events or behaviours and cultural expressions inside built environments, make up a historical urban fabric (Karakul, 2011) . Due to the inseparable connection between location and identity, the cultural heritage sector has been operating within smart requirements for many years (Chianese & Piccialli, 2015).

## 2. Material and Methods

In this study firstly, a conceptual basis was created within the framework of smart urbanization and historical environments. In the second stage, a comprehensive literature study was carried out by examining the annual reports, conference outputs, websites of cities municipality, and similar organizations in the city of Istanbul under the name of smart urbanization or that could be included in the scope of smart urbanization. In the third stage, projects that have

been or are planned to be realized in European cities were scanned using many academic search engines, especially Scopus and Wiley. At the last stage of the research, a comparative perspective was presented over the initiatives made in the context of smart urbanization in these cities.

**3. Smart City Applications in Historical Environment**

Historical environments, as complex living entities, consist of tangible and intangible values. Tangible values are natural structure and built environments, and intangible values are cultural practices and cultural expressions in built environments. Understanding the relationships between tangible and intangible values is important for the integrated systems to be implemented.

Various methods are used to document the cultural heritage in the context of the historical place and to ensure that it is passed on to future generations. Today many digital programs such as photogrammetry and laser scanning are used to inventory cultural heritage. Obtaining 3D data and aerial photographs of historical buildings, improving the visuals and their use for scientific research, advertisement, tourism, promotion and educational purposes can be evaluated in this context(Kippes and Balak, 2007).

Digital photogrammetry method obtains numerical results which are producing automatic measurement processes, 3D vector data, digital orthophoto, digital surface and terrain models. Thus, 3D modeling enables 3D data to be visualized, managed and presented with GIS (Wolf *et al.*, 2014). BIM is a process that can share building information by creating, storing, managing and modifying a 3D object-based data system(Vanlande, Nicolle and Cruz, 2008).

**4. Smart City applications in İstanbul**

Istanbul has hosted some of the most important architectural works in the world with its historical and cultural values. Sultanahmet Archaeological Park, Suleymaniye Mosque, Zeyrek Mosque(Pantocrator Church) and their Conservation Area, and Land Walls of Istanbul regions which are included in UNESCO'S world heritage lists are some examples of historical environment(UNESCO World Heritage Centre, 1985). As a result, it is critical for İstanbul's economic, historical, cultural and long-term viability to conserve historical regions using modern technologies.

Istanbul's smart city studies are carried out in cooperation with IMM, Isbak *(Url 1)*, Istanbul IT and the private sector. Living labs have been established in Istanbul on this subject. These laboratories, which have examples in the world, take on a role where the local people in that region receive training and participate in organizations. Thanks to these laboratories, new generation skills such as coding, animation, and entrepreneurship are provided to the public. One of these living labs is Zemin Istanbul, which is located at the entrance of Şişhane metro, located in a historical area such as Taksim *(Url 2).*

It is seen that there are areas closed to traffic in some of the historical regions, although there is no study to improve air quality in the city, attempts have been made to measure the air quality. Two air quality monitoring stations located in the historical peninsula region are the points that collect air quality data in this region (*Url 3*.). One of the independent initiatives, Salt Archive documents the past social roles of the historical buildings of many local institutions. It also provides a platform where the memories of Istanbul are archived thematically *(Url 4)*

With a population of 16 million, Istanbul is one of the most populous and most important metropolises in Turkey. Most of the studies were conducted with a short-term and dispersed system. For this reason, the data must be processed systematically.

**5. Smart City Applications in Europe**

Many smart urbanization attempts have been made in the European continent from past to present. Approximately 240 medium and large sized Europe cities attempt to smart city initiatives (EURACTIV, 2017). İtaly, Spain and UK countries smart city numbers are more than other Europe countries. Slovenia, Norway, İtaly, Estonia, Austria, Sweden, and Denmark's smart city proportion higher than rest of the Europe countries. (Catriona MANVILLE at all, 2014) .

In recent years, many open data platforms have been established in European cities to document and accumulate cultural heritage**.** With the Amsterdam *(Url 5)* platform, historical maps of Amsterdam were visualized in 3D and presented to the public as open access. Amsterdam has reduced urban carbon emissions by encouraging the use of electric vehicles in the city. Thereby reducing the depreciation of the surrounding buildings from CO2 gases.Many Europe countries didn't change much thing about inverting gas to electric vehicles except Denmark and Netherlands (De Groote, Volt and Bean, 2017).

**6. Conclusion**

There are common steps taken by Istanbul and many European cities towards smart urbanization. Efforts were made in the areas of mobilization, infrastructure, security, health and economic growth. These steps were in the direction of mobilization, infrastructure, security, health and economic developments. First of all, smart urbanization studies that progress through mobilization in almost all cities are gradually helping the city to transform. Projects carried out through mobilization are similar in several cities. Platforms where the public can express their opinions, interactive maps, creation of 2d and 3d themed maps and presenting them to the public can be given as examples of these similarities.

If we look at the infrastructure works, especially in the transportation infrastructure, pedestrianization and transportation to historical regions is provided by motor less vehicles. One of the most important parts of smart city applications in historical places is user participation. For this reason, it is not enough to make smart historical places and buildings in order to achieve an innovative and sustainable result, more comprehensive projects should be developed.

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**Conflict of Interests**
The Authors declare no conflict of interest.

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