*Research Article*

# Recoding The Characteristics of Public Spaces: The Case of İstanbul

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## Abstract

This study proposes a quantitative assessment method to ascertain urban square potential at 12 gates of the historic city wall where different typologies, characteristics and periodic features are observed in Fatih district of Istanbul. The quantitative assessment method is based upon a series of indexes including 7 factors in total consisting of 35 indicators. The proposed method developed an "urban square potential index", making use of "transport and accessibility", "convex size", "built-up environment", "purpose of use and density", "morphology", "landscaping character" and "identity" factors. This index enables assessment of a square according to a) historical-cultural heritage richness and identity, b) functional diversity, c) accessibility, and d) vitality and spatial quality. This paper presents a base for "decision-support system" for decision-makers in determination of the most suitable square with a limited budget, time, labor and equipment during urban square development, design and improvement activities. Furthermore, it allows determination and implementation of the necessary interventions/improvements in order for the available undefined urban spaces to gain urban square functions.

## INTRODUCTION

Etymologically, 'sharing' means partition or communization of things. For human beings, this concept refers to emotional and physical sharing and thus, constitutes a critical cornerstone in their lifetime. In the context of the cities where people carry through their daily dynamics, the concept of an urban square comes to the fore as the definition of sharing. Urban squares have great significance for the cities in that they are among the most important sub-components of public spaces experienced in cities (Zeka, 2011). To provide a definition, urban squares are the focal points for activities in the heart of the intense urban pattern, having direct relations with the surrounding structures and streets. In this regard, urban squares have the characteristics to attract attention of people – main users of the city – and facilitate gathering of people.

Urban squares have always existed, from past to present, as areas which reflect identities of cities and common histories of cultures, and where people can experience common activities. The fact that urban squares are experienced by all urban residents for different purposes and in different ways also increases the importance of them. According to Madanipour, urban squares are the public spaces where groups of people with different class and ethnicity, sex and age find the opportunity to come together, interact and communicate (Madanipour, 1996). On the other hand, Carr, Francis, Rivlin and Stone construe the squares as a stage upon which the idea of communal life is exhibited for both ordinary daily routines or periodic rituals of people (Carr, Stephen, Francis, Rivlin, & Stone, 1992). According to Walzer, urban squares are the peaceful communal areas that we share with people we do not know, or with our friends, relatives and colleagues and that we can experience for many daily activities (Walzer, 1986).

Satisfying the common needs of the urban residents, urban squares go beyond the concept of a mere location and become a place, and thus form a spatial cornerstone feeding socio-cultural character of the cities to an important extent. In other words, urban squares are the areas strategically located at the nodes of public space, laying common ground for economic and social relations and thus, playing a key role in self-expression of the communities ("Development Type – Urban Squares," 2009). When urban squares are examined from a historical perspective, periodic differences stand evident in the dynamics and characters of the urban squares. Considering the changing/transforming/ evolving concept of urban square throughout the 6000-year urban history, they were initially located at the intersection of the

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important trade routes. Having first emerged as "agora" in Greece, with the closest meaning to the present, urban squares were seen as urban spaces where political, economic and social activities were experienced. Mostly in square or rectangular, agoras used to host many urban activities from arts to politics. Similarly, "Roman forums" were the open spaces where social, political and economic activities took place and daily discussions were held among people. Roman forums were more like a combination of Agora and Acropolis in that they included more activites presented in more integrated manner (Xing & Siu, 2010).

Following collapse of the Roman Empire in Middle Age, basilicas were converted into churches, and thus churches and cathedrals became the center of the daily activities, which initiated concentration of all open spaces that may be called an urban square around religious structures. Therefore, urban squares and urban spaces were mostly used to host religious ceremonies at that time. Even some important squares located in Europe were shaped at this period (İlkay, 2007). Renaissance and Baroque periods reveal remarkable changes in the context of urban morphology. Renaissance period witnessed a paradigm shift in urban design and planning as a result of the changes of social, economic and political perspectives.

Secular and individual values which emerged as a social impact of Renaissance and Enlightenment period were also effective in the design of urban open spaces and squares. Urban squares of that era were settled near the housing areas and in a way to appeal them (Carmona, De Magalhaes, & Hammond, 2008; Carr et al., 1992; Crouch, 1981). Formal design principles prevailed in the design of the cities and urban squares at the time, and symmetry and order stood out as the most effective concepts in the design of squares. In particular, the Italian piazzas that demonstrate aesthetic concerns are the most important urban squares of that period. As to the Baroque Period which concentrated on spatial balance and axis-based development and provides a clear observation of spatial hierarchy, the basic motivation of square design was to provide visual harmony and produce an effect. At this point, it shares some similarities with the Renaissance period.

In the 19th century, the Industrial Revolution, the most important thing to happen in that era without doubt, had also implications for the cities and urban planning. Development of the railways caused a population boom and overcrowding in cities, which was followed by the emergence of the bourgeoisie class with the establishment of industrial areas around the cities, and increase of the economic efficiency of the residents therein. Therefore,

urban squares were shaped in line with the dynamics of use of this class. The areas hosting shopping centers, shopping streets or markets started to transform into a square. In the following period, especially by the end of the 19th century, cities could not meet the needs of the ever-increasing population, and stucked with such problems as over pollution and weak infrastructure, which brought about sudden shifts in the perception of urban squares. As a result, large open/green areas met the need of public space instead of urban squares and streets. Although having continued partially until the 20th century, the situation witnessed a change as the car ownership increased in the 20th century and cities became car-dominant, which, in return, restricted the movements and freedom of walkers, and eventually led to emergence of the squares as the areas at the intersection of the important roads rather that the spaces with a specific character.

Urban squares, one of the main experience/communal areas of the city, have existed with different characteristics throughout the history, and such dynamics have directly affected the forms of utilization of the squares (Krier, 1979). Sometimes located at the intersection of the important trade routes and sometimes reflecting a common history, urban squares have gained significance for the cities and now become the most frequented spaces for the growing urban population. In this regard, many theories are put forth for the urban squares that have become a primary study area of the urban design and planning disciplines, and strategies are developed to create functional urban squares. For instance Carr et al. state that all the public spaces should have following criteria in order to be successful urban squares;(Carr et al., 1992)

*1. Responsive:* A public place should have an ability to meet the needs of the community; it should provide spaces that could be useful for multipurpose activities such as relaxation, discovery, and active and passive engagement.

*2. Democratic:* Public spaces should be accessible for all user groups.

*3. Meaningful:* Public place should have characteristics that help people to make connections between the place, their lives and the world (Memluk, 2013).  PPS, an organization working on public spaces, has found that successful open spaces generally include four components: accessibility, uses & activities, comfort & image, and sociability. PPS has developed the Place Diagram tool to help people judge any place as good or bad (Project for Public Spaces,

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2005). According to PPS, there are certain principles in order to create better functional urban squares;

*1) Image and identity, 2) Attractions and destinations, 3) Amenities, 4) Flexible Design, 5) Seasonal Strategy 6) Access, 7) The inner square & the outer square, 8) Reaching out like an Octopus, 9) Central Role of Management, 10) Diverse funding sources*

Different studies recently conducted on urban squares and public spaces also indicate effective use of these strategies. It is essentially important to create sustainable public spaces and thus, design the urban squares within a sustainable framework. However, creation of sustainable and lively urban squares is based on certain abstract and concrete elements. Strategies laid down by PPS, at this point, shape the characteristics of the urban squares and define which parameters may be used to reveal the specific character of the square (Sepe, 2017). Dynamics of use of people in urban squares and patterns of behaviors in public spaces can also be determined through such strategies and consequently establishes a defined framework for creation of functional urban use areas. Determination of behaviors of pedestrians through different analysis methods and design of the urban squares accordingly and making use of the relevant strategies during designing are considerably important for creation of the more actively used urban squares (Nasution, Zahrah, & Ginting, 2018; Vroman & Lagrange, 2017).

On the other hand, it is also a requirement for the urban squares to be experienced by all user groups. The strategies mentioned above provide this through their integrated approach and ensure design of the multi-layer structure of urban squares in a way to appeal to each user group. Thus, it becomes possible to create urban squares where daily cultural dynamics are experienced and strong social relations are established, and hence owned by urban residents (Peacock, Anderson, & Crivellaro, 2018).

History of the urban squares, one of their characteristics revealing specific sides of them, can also be evaluated in line with these strategies, and physical quality of the urban squares can be verified based on the strategies pur forth by PPS. Thus, urban squares with historical value can be used actively by urban residents while characteristics of the same are preserved (Omar, Ramlee, Yunus, & Samadi, 2018). Although these strategies basically set forth sub-characters of the urban squares, they actually prepare a basis, in an analytical framework, to provide a comprehensive response to the question of how to create a functional urban square. This body of strategies, which covers

"public space design" by explaining physical components of the squares and "public space management" by revealing relations of the said components with one another, includes all necessary and adequate units for designing an urban square.

Exposing character of the urban square is of critical importance for development of design and control strategies for squares. Well-establishment of the properties that turn an urban open space into a square will clearly shape the subsequent design and inspection interventions, which requires handling of such properties in a way to guide the process (Carmona et al., 2008). At this point, building spatial analysis upon the correct framework, examining the space in line with the pre-determined criteria and determining the spatial design & control strategies should form the parts of a fully coherent and integrated process. This is the only possible way to ensure the due functioning of "public space design & management" concept.

With reference to the conceptual and theoretical framework that has drawn so far, it would be possible to argue that public spaces have some specific features that reflect its inherent characteristics. In this context analyze of such characteristics is becoming increasingly important to understand the real potentials of public spaces better. There are different studies that analyze the characteristics of the public space regarding with different dimensions. In this manner, when the literature of urbanism and urban design is examined, it is seen that there are studies examining the physical properties of the squares over morphological relations and indicators (Erten, Torun, Gurleyen, Akbas, & Zunbiloglu, 2016), and these studies are mostly revealed by making inferences from the analysis of structural relations on the second and third dimensions (Kang, 2005; Yang & Kang, 2005). On the other hand, there are several studies on the internal and external accessibility of public space, and those that the determination of the effect of the internal features of the area on the access of the area is investigated (Brambilla, Maffei, Di Gabriele, & Gallo, 2013; Kubat, Ozer, & Ozbil, 2013). In addition, the landscape characteristics of the public space have been analyzed and its effects on the use of the public space has been also evaluated (Bemanian, Ghasemi, Saremi, & Sattarpour, 2016; Liang, Hu, & Sun, 2013; Nowak et al., 1996; Rašković & Decker, 2015). Brambilla et al., (2013) uses certain indicators together to analyze the features of urban squares. However, it is seen that more comprehensive approach is required to reveal the main characteristics of urban squares-as a form of public space based on qualitative and quantitative methods. This research reveals a very operational analysis technique with its comprehensive

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components and indicators set. The method used in this paper demonstrates the spatial characteristics of urban squares quantitatively and presents different indices on specific topics related to the square potentials. In particular, it provides decision-makers with the opportunity to develop quantifiable, objective solutions for the implementation of redesign, improvement and development strategies for selected urban squares. In this way, it allows both the improvement of the quality of the existing urban squares and re-functionalizing and redesigning the spatial patterns of undefined urban spaces as urban squares.

This study aims to develop a series of indices to measure urban square potentials at 12 Gates of the City Wall of Istanbul bearing the traces of different historical and cultural heritage, and, making use of these indices, put forward strengths and weaknesses of each square based on certain factors. Urban Square Potential Index (USPI) was developed as the main index of the study, and then Historical-cultural heritage richness and identity, Diversity, Accessibility, Vitality and Spatial Quality indices were developed as the sub-components of the main index for more specific subjects.

This method is expected to provide inputs for design, improvement and development strategies for the application studies regarding the urban squares chosen as samples. These indices were used to discuss design and control interventions to increase dynamics of use of these urban squares.

## CASE STUDY: BACKGROUND INFORMATION ON SELECTED URBAN SQUARES IN ISTANBUL

Having hosted various urban life activities of people since the early ages, urban squares are the most important public spaces reflecting identity of the cities and revealing socio-cultural structure and characteristics of communities. These public spaces have embodied reflections of urban and socio-cultural characteristics throughout the history with the inherent architectural design elements and spatial character, and thus they contribute to image and prestige of the city.

Walls constructed to protect/defend a city in the past are called "city walls", and doors on the city walls providing connection with the outside world are called "gates". Istanbul is known to have the most powerful city wall system, consisting of three sections; namely Land, Sea and Golden Horn Walls (Dilbaz, 2018). Limiting the peninsula on which the city is established and extending from the Golden Horn to Yedikule, some of the Land Walls still subsist and form "Suriçi" (walled city) known as Historical Peninsula.

**Figure 1.** 12 Gates located on the Land Walls surrounding the Historical Peninsula and Walled City (Satellite Map source:Esri, 2019)

Walled City, a multicultural and multilayer historical center having gone through the periods of Byzantine (Eastern Roman) Empire and Ottoman Empire, has still an essential function in tourism with its commercial and cultural heritage. It is highly preferred for urban activities, and forms the pioneer area of Istanbul for representation of urban identity on the architectural and socio-cultural level. Therefore, the gates and their surroundings are considered creating the public spaces with characteristics to contribute to image and prestige of the city. Before indicating urban square potentials of these public spaces, it would be suitable to review their basic functions from past to present, functional transitions between the periods, forms of spatial uses, and their socio-cultural background as well as their spatial characters.

There are a total of 12 gates on the Land Walls surrounding the Historical Peninsula and Walled City: Ayvansaray Gate, Eğrikapı, Edirnekapı, Sulukule Gate, Topkapı, Fourth Military Gate, Mevlanakapı, Third Military Gate, Silivrikapı, Belgradkapı, Yedikule Gate and Altınkapı. Ayvansaray Gate that could not reach the present is the last gate of the historical walls on the north while Yedikule Gate and Altınkapı are the last gates on the south (Figure 1).

Each gate presents potential urban squares together with the surrounding public spaces, and serves to the city and residents with a different function and spatial character. Generally named after the neighbourhoods in which they are located or socio-cultural and/or socio-economic characters of their

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neighbourhoods, gates were either used for military purposes during historical periods or open to public use (Dilbaz, 2018). Both in the previous periods and today, they are especially important and valuable in that they host special day and official ceremonies, bear the characteristics of a religious center, constitute the trade axis of the city and they are located on the main arterial roads.

For example, it is mentioned that Altınkapı, which was used as a ceremonial gate in the Byzantine Empire and adorned with gold gilding and named after these decorations, was the gate where soldiers and emperors, who triumphed in the war, entered the city flamboyant and various victory celebrations took place at the entrance area (Dilbaz, 2018). Also known as the most important victory gate/empire gate of the Byzantine Period, Altınkapı and its surroundings are understood to be used as a prestigious gathering area for ceremonies. Altınkapı lost that character as of the Ottoman Period and started to be used for different purposes, mainly presenting a transportation-oriented urban potential laying at the center of crossroads. The still-existing gate forms an urban symbol with the historical remnants and architectural elements nearby and also undertakes cultural and recreational functions.

Edirnekapı replaced Altınkapı during the Ottomon period, and the former was used for all official entrances and exits, including those of sultans (Dilbaz, 2018). Accepted as the beginning of the road to Edirne and thus named, and used for entrance of goods and passengers to Istanbul during the Ottoman period, Edirnekapı was also considered as the customs gate of the city (Yavuztürk, as referred to in 2013a). The gate and its surroundings have reached the present day from the Byzantine and Ottoman periods, and even if they have lost the official significance and no longer used as the ceremonial area, this place is still used for transportation purposes, located on one of the important crossroads of the city. Furthermore, location of such architectural elements as historical church, holy spring, monastery, baths and theater adds a symbolic value to the urban square arising from its historical and cultural importance, and increases the potential of use for cultural and recreational purposes across the city. From a comprehensive perspective, organic street patterns, and mansions and palaces implying a settlement of wealthy people in the region indicate unique values for settlement pattern of the area. However, it is observed that as of the 1970s, the wooden buildings were replaced with reinforced-concrete structures in line with the needs, the number of floors increased and certain shifts occurred

in the settlement pattern of the region (Yavuztürk, as referred to in 2013).

Similar to Edirnekapı and its surroundings, Silivrikapı stands out as the place hosting official festival celebrations in the historical periods, and Topkapı and its surroundings as a military gate opened to the area where cannonballs were stocked (Dilbaz, 2018; Gözeller, 2013).

Apart from the official and military functions, gates and their surroundings can have various forms of uses for daily life activities, and sustaining similar functions today, create potential urban squares with cultural, commercial and recreational facets. For example, Silivrikapı and its surroundings are known to host grain trading in the previous periods, and it is called gate of trade by local people (Dilbaz, 2018). Similarly, the gate holding the water tower providing a flow of the out-coming water through the city walls was named as Sulukule Gate, and the gate nearby opened to the Mevlevi Lodge and having sufistic significance was named as Mevlâna Gate. Even though Sulukule Gate has not reached the present day, the surrounding area is said to be densely populated by the Romans who played a key role in fulfilling the need of labor for trading activities during the Ottoman period (Güncüoğlu & Yavuztürk, as referred to in 2013). Although there were large vegetable gardens and limited settlements during the historical periods, this area mostly hosts, for the time being, basic urban functions such as houses, municipal services buildings and dormitories. In similar, Mevlanakapı was called Russian Gate during the Byzantine period because of the Russian-origin population settled in the region (Hayrullah, 2013). Mevlanakapı and its surroundings share also similarity in terms of spatial development and change in that there were vegetable gardens, green spaces and picnic areas before the 1950s, but now it has transformed into a densely built-up areas.

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Ayvansaray Gate which was not open to public during the Byzantine period but rather used by high-level authorities to reach Blachernae Palace was officially important at that time; however, it assumed a functionality for daily life as it was transformed, during the Ottomon period, into a region with animal shelters, resulting in a change of both use, and character and meaning (The Mayorship of Fatih, 2013). The name of the neighbourhood "Ayvansaray" has the traces of the Byzantine period and also refers to 'hayvan sarayı' (*in eng.* animal palace) in Turkish (Eyice, 1991; The Mayorship of Fatih, 2013). This neighbourhood has hosted, from past to present, various

communities with different beliefs and means of living such as a seafaring and industry. Although Ayvansaray Gate and the surrounding area bore the historical and cultural stamp of the past until the 1980s, it has lost many of its characteristics (The Mayorship of Fatih, 2013).

Ayvansaray Gate still has a worshipping and culture-centered position on urban-scale as a result of the combination of different beliefs during historical periods, a reflection of this socio-cultural structure to the space and concentration of the architectural elements symbolizing many religious beliefs. Therefore, it can be said that gates and their surroundings reflect the social structure they have previously hosted besides their spatial values and forms of uses. As a matter of fact, this is also the case for Mevlanakapı and Sulukule Gate and their surroundings. Similarly, the names of Eğrikapı and Belgradkapı come from the settlement of families, in particular artisans, respectively from Eğirdir and Belgrade, and they went through spatial development reflecting their socio-cultural structures (Turnbull, 2004; Yavuztürk, as referred to in 2013a, 2013b).

Having social, economic and cultural similarities with Ayvansaray neighbourhood and being among the first settlement areas, Eğrisaray and its surroundings are known for the local palaces and churches, but very few of the architectural structures such as small mosques, mosques, lodges, tombs, fountains and baths could reach the present day. Upon settlement of the Muslims in the region, churches were transformed into mosques, and water cisterns into vegetable gardens and residential area (Yavuztürk, 2013b). Consequently, it can be said that Eğrikapı, with its surrounding area, is a focal point for worshipping and culture, and has recreational potential.

While some of the urban squares are still used as in the past, some of them are now used for different purposes. Topkapı and Silivrikapı have transportation-oriented character but at the same time provide culture, trade and recreation space across the city. However, Altınkapı has completely lost its importance, and has turned into an urban symbol focused on transportation. Some other gates such as Third Military Gate serve as worshipping-oriented urban squares for location of many actively used religious facilities in their immediate vicinities.

In addition to their forms of use, and historical and cultural values, characters of the gates and the surrounding areas have a decisive role for urban potential. At this point, it can be said that these squares generally have a monocentric urban character, driving

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the users to gather in the same space. Ayvansaray Gate, Edirnekapı, Fourth Military Gate, Third Military Gate, Belgradkapı, Yedikule Gate and Altınkapı reveal such character while Eğrikapı, Sulukule Gate and Mevlanakapı have amorphous square character, and Topkapı and Silivri have multicentric urban square character. Due to its multicentric structure, Topkapı Urban Square allows entrances from the highest number points.

City walls, gates and their surroundings have long lost their past forms of use and become an urban symbol only reflecting historical and cultural background. In the areas having undergone functional transformation, the newly developed forms of uses have brought dynamism, mobility and a new focal point for the region. The growth of population in the region which is still defined as the heart of the city for trade and service sector, has also increased the need for public spaces where urban life activities will take place. The urban squares covering these gates and their surrounding areas are essentially important for preservation of the historical identity, creation of cultural consciousness and interaction of people from different socio-cultural background.
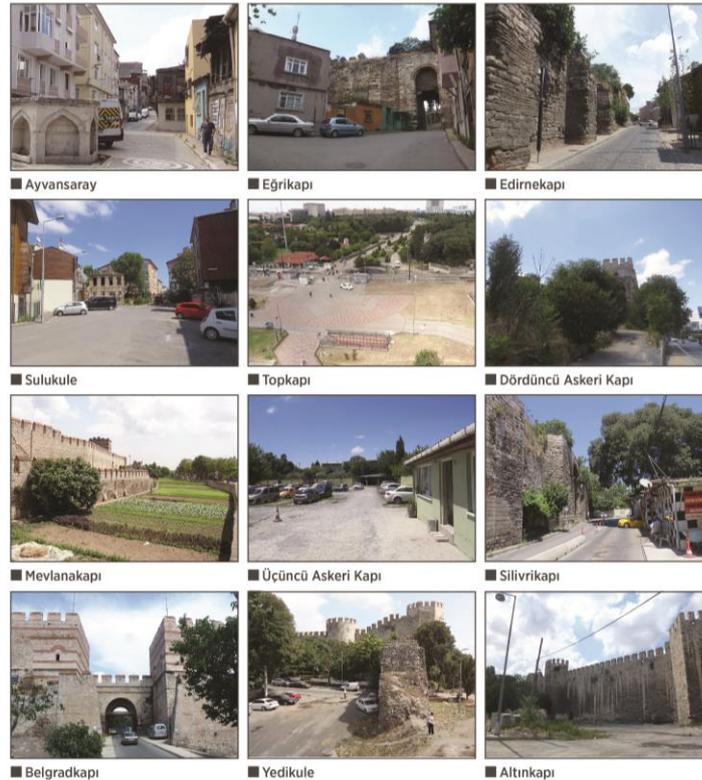
**Figure 2.** Photographs from the 12 Wall Gates  (Photographs by author)

## DATA AND METHODOLOGY

In order to measure urban square potentials of the 12 Gates of the City Wall with multivariate quantitative method, a main index -

Urban Square Potential Index (USPI) – and five sub-indices - Historical-cultural heritage richness and identity, Diversity, Accessibility, Vitality and Spatial Quality indices - were developed. Degree of influence of the indicators used for each index was scored based on the opinions of the experts and converted into a numeric value. Scores of the indicators converted into numeric values were added together based on the relevant index, and total index value was obtained after the standardization (Terzi et al., 2017)(Terzi et al., 2016).

**Data**

In this study, existing maps, historical maps, satellite images and GIS (Geographical Information System) based building data were taken from the Directorate of Cultural Heritage Preservation of Istanbul Metropolitan Municipality. The other observational data-vehicle counting, pedestrian counting, identification of a characteristic object/structure etc. were collected by the project team through field study. All the data were standardized and combined in the GIS-based database. All analytical studies were produced as thematic analyzes in the GIS environment and statistical calculations in SPSS.

**An Index for Urban Square Potential: Recoding the Characteristics**

Urban squares are the most important image elements of cities and urban areas where the interaction of individuals is at the highest level. In this context, urban squares should have certain qualities. The higher these qualities, the greater the success and functionality of the urban squares. In this study, an index is proposed to demonstrate how the potential of an urban square can be calculated under certain components and sub-indexes are developed as to how the features of urban squares can be defined. The indices proposed in this study helps to develop the design strategies for urban squares.

In this study, a "multivariate quantitative method" is proposed, which identifies the characteristic features of an urban square by seven components and measures these seven components with 39 indicators. The seven components are *"accessibility", "size", "characteristics of building", "density", "morpohology", "landscape"* and *"identity".* A total of 39 indicators developed to measure each of the aforementioned components were scored by experts on a scale ranging from 1 to 10 (Table 1), upon which an "urban square potential index" was calculated.

Urban square potential index is calculated as follows:

$$\sum USP = \sum a + \sum s + \sum cb + \sum d + \sum m + \sum l + \sum i$$

Where,

*USP: Urban square potential index*
*a: accessibility*
*s: size*
*cb: characteristics of building*
*d: density*
*m: morpoholgy*
*l: landscape*
*i: identity*

Following the calculation of USP, the seven components in the urban square potential index were configured with different combinations and new sub-indexes were calculated to better explain the features of urban squares. Thus, it is possible to understand what different characteristics are dominant and which features need to be improved for each urban square. The sub-indexes and their calculations are explained as follows:

Historical-cultural heritage richness and identity index (HCI): This index is developed to ascertain the level of historical and cultural heritage located in an urban square, whether it hosts historical works that can form a reference and to reveal structural conditions of the existing historical works in the square. Inclusion of these components in any urban square is really meaningful for reflecting historical and cultural characteristics of a community and bridging the past with the present. It gains importance to develop strategies for preserving and maintaining the historical environment in the squares with a low index value – unless it is a recently built urban square.

In this index, harmony level of the urban square with the past texture (current condition, compared with the oldest map of the urban square – pervitich, German blue maps, etc.), the number of historical works per unit area, the number of basic elements contributing to the character of the urban square per unit area (clock tower, fountain, monumental tree, wall) are taken into consideration as a representation of the identity, and indicators of the characteristics of building associated with HCI index are included in the calculations and defined as cb'. Those indicators are the number of registered civilian architectural works, the number of monumental architectural works, and the ratio of registered lost and ruined works to total registered works. Historical-cultural heritage richness and identity index is calculated as follows:

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$$\sum HCI = \sum i + \sum cb'$$

**Equation 1.** Historical-cultural heritage richness and identity index

Diversity index (D): This index aims to demonstrate different uses of buildings (house, commercial, office, etc.), urban services, recreational opportunities and density of use. Those parameters help to measure the level of activities and vitality in any urban square and refers to individual impacts and activity level of individuals in the urban life. This index uses all of the charateristics of building indicators mentioned above as well as the purpose of visiting the urban square as a related indicator from density component displayed as $d'$.

$$\sum D = \sum d' + \sum cb$$

**Equation 2**. Diversity index

Accessibility index (A) measures the accessibility performance of urban square, depending on transportation options, mode and ease of access to the urban square. The coefficient of average distance to the stops or stations, the number of two-way people passing through the unit section, the number of two-way vehicles passing through the unit section, the number of observation-based intense pedestrian routes in the urban square, the global and local integration ratio and the number of axles opened to the urban square are used in the calculation of this index. As an additional component, pedestrian and vehicle density indicators of the density component are taken into account in order to determine the level of use of the urban square, and displayed as d''.

$$\sum A = \sum a + \sum d''$$

**Equation 3.** Accessibility index

Vitality (V) measures, the vitality of the place, the pedestrian mobility and the level of effective and attractive pedestrian environments in urban square. This index uses all of the landscape indicators mentioned above as well as the purpose of visiting to the urban square as a related indicator from density component displayed as $d'$ , and pedestrian and vehicle density indicators of the density component are taken into account in order to determine the level of use of the urban square, and displayed as d''.

$$\sum V = \sum l + \sum d' + \sum d''$$

**Equation 4.** Vitality index

Spatial Quality (SQ) measures the form, comfort, aesthetics of an urban square focusing on the size of urban square, pedestrian area, convex area and visible area with spatial enclosure rate, geometry of the square as well as topography, current plant material, distribution of urban furniture and lighting performance. This index uses all of size, morphology and landscape component indicators.

$$\sum SQ = \sum s + \sum m + \sum l$$

**Equation 5.** Spatial quality index

**Table 1.** The indicators, definitions and scores of multivariate quantitative assessment method (Terzi et al., 2017)(Terzi et al., 2016)

| | INDICATORS | DEFINITIONS | SCORE[1] | | | | |
|---|---|---|---|---|---|---|---|
| **A. Accessibility** | A1. Distance to public transport stops | Coefficient of air distance to the stops as of the convex area border [(Number of Stops x Distance to Stop)/Total Distance] | 10 | 6 | 4 | 2 | 0 |
| | A2. Pedestrian counts | The number of two-way people passing through the unit section (person/hour) | 10 | 8 | 6 | 4 | 2 |
| | A3. Vehicle counts | The number of two-way vehicles passing through the unit section (vehicle/hour) | 10 | 8 | 6 | 4 | 2 |
| | A4. Intense pedestrian movement axis | The number of observation-based intense pedestrian movement routes in the square | 10 | 8 | 6 | 4 | 2 |
| | A5.1. Global Integration | Topological integration ratio with the entire area | 10 | 8 | 6 | 4 | 2 |
| | A5.2. Local Integration | Topological integration ratio up to 8 axis (step) (approx. 500 m) | 10 | 8 | 6 | 4 | 2 |
| | A6. Entrances and exits of squares | The number of axis opened to the square | 10 | 6 | 4 | 2 | 0 |
| **B. Size** | B1. Area | Area of the square (x10.000 m2)[2] | 10 | 8 | 6 | 4 | 2 |
| | B2. Size of the pedestrian area | Size of the pedestrian area per unit convex area (m2) | 10 | 8 | 6 | 4 | 2 |
| | B3. Size of the convex area | Size of the convex area (m2) | 10 | 8 | 6 | 4 | 2 |
| | B4. Size of the visible area | Visibility rate of the square-limiting elements in the two dimension | 10 | 8 | 6 | 4 | 2 |
| **C. Characteristics of the building** | C1.1. Building usage types | The number of residential usage type per unit area (x0.0001 m2)[2] | 10 | 8 | 6 | 4 | 2 |
| | C1.2. Building usage types | Area of residential usages per unit area (x0.01 m2)[2] | 10 | 6 | 4 | 2 | 0 |
| | C1.3. Building usage types | The number of non-residential usage type per unit area (x0.0001 m2)[2] | 10 | 8 | 6 | 4 | 2 |
| | C1.4. Building usage types | Area of non-residential usage type per unit area (x0.1 m2)[2] | 10 | 8 | 6 | 4 | 2 |
| | C2. Registered civil architecture works | The number of different registered civil architectural works per unit area (x0.0001 m2)[2] | 10 | 6 | 4 | 2 | 0 |
| | C3. Registered monumental architecture works | The number of different monumental architectural works per unit area (x0.00001 m2)[2] | 10 | 6 | 4 | 2 | 0 |
| | C4.1. Pattern of property | The number of public property per unit area (x0.00001 m2)[2] | 10 | 8 | 6 | 4 | 2 |
| | C4.2. Pattern of property | Area of public property per unit area (x0.01 m2)[2] | 10 | 8 | 6 | 4 | 2 |
| | C5.1. Distribution of public facilities | The number of public facilities per unit area (x0.0001 m2)[2] | 10 | 6 | 4 | 2 | 0 |
| | C5.2. Distribution of public facilities | Area of public facilities per unit area (x0.01 m2)[2] | 10 | 6 | 4 | 2 | 0 |
| | C6. Restoration condition of the historical buildings | Ratio of registered lost, demolished and ruined works to total registered works (x0.01 m2)[2] | 2 | 4 | 6 | 10 | 0 |
| **D. Density** | D1. Pedestrian density | The number of pedestrians per unit convex area (x0.1 m2)[2] | 10 | 6 | 4 | 2 | 0 |
| | D2. Vehicle density | The number of vehicles per unit area (x0.01 m2)[2] | 10 | 8 | 6 | 4 | 2 |
| | D3. Main usage aim of the square | The number of dominant usages | 10 | 8 | 4 | 2 | 0 |
| **E. Morphology** | E1. Enclosure /3D Enclosure ratio | Ratio of building height to width of open space | 6 | 10 | 8 | 2 | 0 |
| | E2. Geometry Singular/Plural/Amorphous Square | Ratio of the biggest convex area to the second biggest convex area | 4 | 6 | 8 | 8 | 10 |
| | E3. Ratio of interaction with the surface of square | Ratio of the peripheral length of the square to the total area (scores increases in parallel) | 10 | 8 | 6 | 4 | 2 |
| **F. Landscape** | F1. Topography | Average rate of an inclined surface (%) | 2 | 4 | 6 | 8 | 10 |
| | F2. Existing plant material | Ratio of plant diversity per unit area (x0.0001 m2)[2] | 10 | 6 | 4 | 2 | 0 |
| | F3. Distribution of urban furniture | The number of lighting, sitting places, informative panel, efficiency of stops | 10 | 8 | 4 | 2 | 0 |
| | F4. Lighting elements | The number of lighting elements per unit area (x0.0001m2)[2] | 10 | 6 | 4 | 2 | 0 |
| **G. Identity** | G1. Dominant monumental works | The number of dominant works per unit area (x0.00001 m2)[2] | 10 | 6 | 4 | 2 | 0 |
| | G2. Usages with historical backgrounds | Rate of originality (%): Level of harmony with the pattern in the past | 10 | 6 | 4 | 2 | 0 |
| | G3. Basic components giving character | The number of basic components giving character per unit area (x0.00001 m2)[2] | 10 | 6 | 4 | 2 | 0 |

## Findings and Discussion

Considering the characteristics of each urban square based on the indices, we obtained the highest value for Ayvansaray Gate in HCI, Belgradkapı in diversity index, Edirnekapı-Mihrimah Sultan Mosque in accessibility index, Topkapı and Edirnekapı-Mihrimah Sultan Mosque in vitality index, Topkapı in spatial quality index and again Topkapı in urban square potential index (Table 2).

**Table 2.** Calculated values of the indicators (Terzi et al., 2017)(Terzi et al., 2016)

| | INDICATORS | CALCULATED VALUES | | | | |
|---|---|---|---|---|---|---|
| **A. Accessibility** | A1. Distance to public transport stops | 2 | 1 | 0.5 | 0.25 | 0 |
| | A2. Pedestrian counts | 15000 | 10000 | 5000 | 1000 | 500 |
| | A3. Vehicle counts | 20000 | 10000 | 5000 | 1000 | 500 |
| | A4. Intense pedestrian movement axis | 5 | 4 | 3 | 2 | 1 |
| | A5.1. Global Integration | 0.44-0.40 | 0.39-0.35 | 0.34-0.29 | 0.28-0.24 | 0.23-0.17 |
| | A5.2. Local Integration | 1.75-1.22 | 1.21-1.12 | 1.11-1.02 | 1.01-0.88 | 0.87-0.33 |
| | A6. Entrances and exits of squares | 15 | 10 | 5 | 1 | 0 |
| **B. Size** | B1. Area | 30 | 20 | 10 | 8 | 3 |
| | B2. Size of the pedestrian area | 2 | 1 | 0.8 | 0.4 | 0.2 |
| | B3. Size of the convex area | 80000 | 40000 | 20000 | 10000 | 5000 |
| | B4. Size of the visible area | 30000 | 10000 | 4000 | 2000 | <2000 |
| **C. Characteristics of the building** | C1.1. Building usage types | 40 | 20 | 15 | 10 | 5 |
| | C1.2. Building usage types | 50 | 30 | 15 | 5 | 0 |
| | C1.3. Building usage types | 70 | 50 | 30 | 20 | 10 |
| | C1.4. Building usage types | 15 | 10 | 8 | 5 | 1 |
| | C2. Registered civil architecture works | 40 | 20 | 10 | 5 | 0 |
| | C3. Registered monumental architecture works | 150 | 50 | 10 | 5 | 0 |
| | C4.1. Pattern of property | 250 | 100 | 50 | 20 | 10 |
| | C4.2. Pattern of property | 170 | 100 | 50 | 30 | 5 |
| | C5.1. Distribution of public facilities | 10 | 8 | 5 | 1 | 0 |
| | C5.2. Distribution of public facilities | 120 | 50 | 20 | 5 | 0 |
| | C6. Restoration condition of the historical buildings | 100 | 60 | 30 | 15 | 0 |
| **D. Density** | D1. Pedestrian density | 180 | 100 | 20 | 5 | 0 |
| | D2. Vehicle density | 40 | 20 | 10 | 5 | 1 |
| | D3. Main usage aim of the square | 4 | 3 | 2 | 1 | 0 |
| **E. Morphology** | E1. Enclosure /3D Enclosure ratio | <1/5 | 1/5 | 1/3 | 3/7 | >1/1 |
| | E2. Geometry Singular/Plural/Amorphous Square | >10 | 10 | 5 | 3 | 2 |
| | E3. Ratio of interaction with the surface of square | 40 | 30 | 20 | 10 | 5 |
| **F. Landscape** | F1. Topography | 15+% | 15% | 10% | 8% | 5% |
| | F2. Existing plant material | 6 | 4 | 2 | 1 | 0 |
| | F3. Distribution of urban furniture | 5 | 4 | 2 | 1 | |
| | F4. Lighting elements | 20 | 10 | 5 | 2 | 0 |
| **G. Identity** | G1. Dominant monumental works | 20 | 15 | 10 | 5 | 0 |
| | G2. Usages with historical backgrounds | 100 | 75 | 50 | 25 | 0 |
| | G3. Basic components giving character | 20 | 15 | 10 | 5 | 0 |

**Table 3.** Distribution of index values over sample areas (Terzi et al., 2017)(Terzi et al., 2016)

| Name | HCI | Diversity | Accessibility | Vitality | Spatial Quality | Potential |
|---|---|---|---|---|---|---|
| **Ayvansaray Gate** | 70 | 42 | 33 | 31 | 47 | 44 |
| **Eğrikapı** | 63 | 57 | 47 | 40 | 36 | 46 |
| **Topkapı** | 53 | 47 | 62 | 57 | 64 | 57 |
| **Belgradkapı** | 47 | 60 | 40 | 43 | 58 | 53 |
| **Yedikule Gate** | 37 | 55 | 40 | 43 | 56 | 51 |
| **Altınkapı** | 37 | 55 | 27 | 37 | 40 | 42 |
| **Mevlanakapı** | 37 | 53 | 44 | 51 | 42 | 46 |
| **Edirnekapı-Mihrimah Mosque** | 37 | 47 | 62 | 57 | 58 | 53 |
| **Silivrikapı** | 37 | 38 | 49 | 43 | 45 | 44 |
| **Third Military Gate** | 37 | 38 | 31 | 34 | 44 | 39 |
| **Fourth Military Gate** | 33 | 35 | 31 | 26 | 45 | 38 |
| **Sulukule Gate** | 10 | 27 | 38 | 34 | 55 | 38 |

In the scope of this study, 12 different urban squares located at the Historical Peninsula preserving the historical background of

Istanbul are examined according to certain indexes that reveal the spatial, social and physical characteristics of urban squares. As a result of this evaluation, the outstanding and inadequate aspects of the urban squares were determined based on the indicis (Figure 3).

In HCI index, it is observed that the average value of the urban squares included in the study is 41.7. The Ayvansaray Gate has the highest value, which is 70, among all these urban squares while Sulukule Gate has the lowest. The fact that only 3 of the urban squares examined are above the average gives important references on the historical characters of the urban squares and it should be taken into consideration in the strategies to be developed for these areas. At this point, it is important to develop strategies for the protection and development of the historical environment for these urban squares.

Diversity index of that urban squares have values relatively close to each other and the average value of the urban squares examined for this index is 46.1. When the locations of the urban squares are examined, it is significant that the urban squares with values above the average are not gathered in a specific area but spread along the walls. This also indicates that the district where the urban squares are located has a homogenous character in terms of urban usages. As in the HCI index, the Sulukule Gate has the lowest value under this index while Belgradkapı has the highest which is 60. Moreover, approximately 60% of the urban squares - 7 urban squares- examined in this study are above the average in this index and have the highest percentage among all indexes.

The accessibility index, which examines the level of accessibility of the urban squares in different extends, is another important index in the analysis of urban squares. While the average value of the urban squares included in the study is 42 in accessibility analysis, Topkapı and Edirnekapı have the highest score with 62 among these urban squares. When the indicators included in the index are examined, it is quite clear that the urban squares which have higher score than average value have easy access to urban usages and have a very lively and vivid urban life. In the seven urban squares below the average, on the other hand, making improvements according to the indicators of the accessibility index are very important in terms of developing the dynamics of use of these urban squares in a future-oriented context.

The vitality index, which has the lowest average value of 41.3 among all indexes, demonstrates the extent to which pedestrian

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urban squares can be experienced by the pedestrians. In this context, Topkapı and Edirnekapı again have the highest score in this index as in the accessibility index. In addition, Belgradkapı, Yedikule Gate, Altınkapı, Mevlanakapı, Edirnekapı-Mihrimah Mosque and Silivrikapı stand out with their above average scores. The examination of the urban squares in line with the evaluation criteria of the vitality index, which directly demonstrates the dynamics of pedestrian use, the elimination of the physical deficiencies within this scope and taking the planning-design decisions in this context are very important both for the residents of the urban square as well as for the socio-spatial development of the area.

The spatial quality index, on the other hand, has the highest average score with 49.2 among all indexes. In this index, it is seen that 60% of the urban squares with a score above the average value are located in the northern part of the area. Topkapı has the highest score also in this index with 64, while Eğrikapı has the lowest score which is 36. This index, which provides the chance to examine the physical characteristics of the urban squares in depth, is also very important in terms of developing new strategies for urban squares. Thus, while creating future scenarios for urban squares, the results of spatial quality index should be used effectively in every stages and considered as a guide in the decision-making processes.
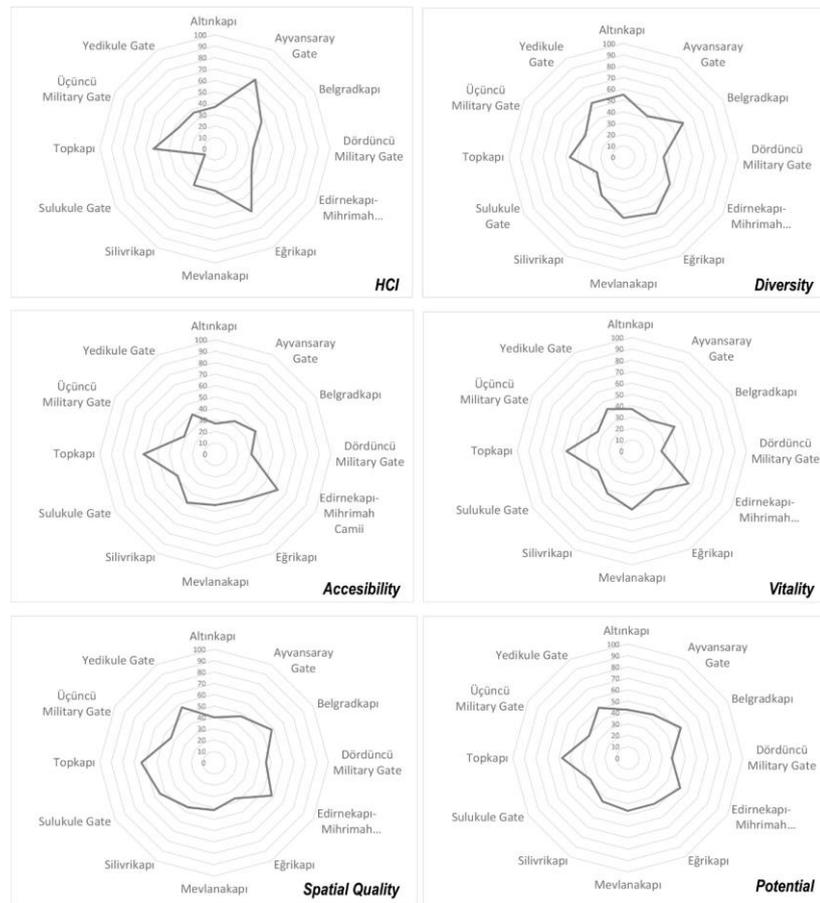
**Figure 3**. Index values of the Gates of the City Wall

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Considering the indicators of the assessment indexes herein and their effects on the urban squares, it is concluded that there are indexes yet to be developed. In this regard, it is required to decide primary intervention scenarios based on the performance scores of 12 urban squares examined in terms of different scales for planning and design. For determination of the interventions which will differentiate according to the index to be developed and shift from urban scale to urban square scale, the indexes should firstly be examined thoroughly. At this point, the accessibility index stands as the one including different components in both urban scale and urban square scale, and directly affecting the dynamics of use of the urban square. Including assessment criteria which reveal urban relation of the area such as distance to public transport stations in addition to the indicators directly analyzing the situation in urban square scale such as pedestrian counting and the number of urban square entrances, the accessibility index has the second lowest score which is 42. Therefore, accessibility index is the one to require first action in order to render the urban squares under the study more accessible, enable them to be experienced more and constitute a reference for the field-related design studies. On the other hand, HCI index, spatial quality index, vitality index and diversity index mostly function on urban square scale and

demonstrate physical, social, historical and cultural character of the urban square. Having a large coverage ranging from urban furniture in the urban squares to landscape, pedestrian movements, density and types of urban usages, these indexes both contribute to use and development of existing potential of the urban square and promote establishment and improvement of the failing aspects of the urban squares. Vitality index which has the lowest average score among the indexes above needs to be developed through the studies in parallel with accessibility. Moreover, even though spatial quality index has the highest value with the score of 49.2, it remains below the average in the general assessment criteria (out of 100). Therefore, it is essential to define a comprehensive process for the relevant urban squares and describe a systematic and operational framework divided into short, medium and long-term stages. In this context, it is required to develop this process over the scores of the indexes and the scales affected by the indexes. The fact that this method can analyze very broadly the hybrid characters of the urban squares and thus enable determination of the current problems through detailed analysis paves the way for effective use of this method. Involvement of the institutions in charge of the detected problems in the staging process above and thus creation of a coherent and effective process would contribute to transformation of the method into a strategic planning tool. Through the operational base it presents, this method provides a coordinated working environment between different institutions, generates concrete inputs for planning and design process and also has the potential to form the basic reference point of the future strategies for development of urban squares.

**CONCLUSION**

Istanbul, which has hosted many civilizations in the past, has very valuable structures and squares surrounded by these buildings in terms of architecture and art history. When it is evaluated in terms of urban image, functionality and socio-cultural characteristics, an extremely rigorous, sensitive and holistic approach should be developed in all kinds of improvement, design and development works for these squares. The fact that these unique cultural heritage values owned by Istanbul can be brought to the city with appropriate application tools (design, restoration, rehabilitation, revitalization, management, organization, etc.) and meticulously carried out, is extremely important and necessary in order to maximize the potential value.

The proposed quantitative assessment method provides a measure of the urban square in terms of the historical-cultural

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heritage richness and identity, diversity, accessibility, vitality and spatial quality. In addition, it evaluates all squares as a whole and reveals the potential of public open space. With this method, the strengths and weaknesses of each urban square can be revealed in the context of the above themes. Thus, it is possible to determine what kind of planning and design strategies are needed to maximize the potential of a urban square.

It is expected that the proposed method will contribute to planning and design practices and academic studies as:

- Proposing a decision support system to city managers,
- Providing an opportunity to use as a guide for the most appropriate and efficient solution alternatives within the framework of limited budget, time, labor and equipment factors during the implementation phase (city square design, rehabilitation etc.), and
- Demonstrating a way of combination of many qualitative and quantitative indicators (35 indicators) that are effective in the design of an urban square.

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