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Editorial

Aliye Ahu AKGÜN • *Editor*

Welcome spring! Please bring us joy and health!

For the last couple of years what we experienced reminded us the importance of health, our families and community life. But when the new experiences turned into habits we forgot the time, our values and we remained stuck in our jobs.

We lost our loved ones, people who bring us joy simply with a smile. Most recently we lost an icon, our dearest professor Cem Altun. He was a legend, much appreciated and admired by his students with his ways of sharing his knowledge. He was a legend for academics with his wisdom. He was a legend as a friend. His silence was his wisdom and he left us silently and unexpectedly. He was a most valued reviewer and a contributor to this journal in the field of building technology. Thank you Cem. It was an honour to work with you and it was a great chance to know you.

Experience is important not only to learn but also to survive. But sometimes it is difficult to read what has been done so far. According to Suárez, experience is everything that appears to consciousness during the encounter of a human being with an environment. His article "An enabling technique for describing experiences in architectural environments" offers an environmental description survey technique to discover the more relevant aspects of a place related to environmental preferences. It exploits that architectural and landscape design may result in generating positive human experiences.

We are observing different experiences from history to today. But most are leading to environmental characteristics of the built environment. Külekçi and Saner in their article entitled "Questioning a grid-planned settlement structure at ancient Larisa (Buruncuk)" discover new experiences in analysing the results of Larisa excavations from an architectural perspective. They observe a certain regularity and re-evaluate the urban features of Larisa with its unique landscape components.

Landscape allows humans to experience different opportunities and offers a spectrum for classical solutions for urban sprawl and growth. Alay, by her paper entitled "A landscape scenario development to enhance ecological integrity in landscape planning" enriches the classical methods of understanding landscape patterns under urban pressure. She presents a method to develop an ecological landscape planning strategy.

Hand in hand with Alay's work, Çiftçi and Erdem Kaya with their article "Landscape strategies for abandoned airports in the context of landscape urbanism: Case of Atatürk Airport" bring into discussion the landscape urbanism via the case of Atatürk Airport in Istanbul. They contribute to the contemporary landscape and urban design agenda by presenting key strategies and principles of Landscape Urbanism.

Topography among landscape characteristics hand in hand with spatial organisation had a great role in the publicness of a city. Kahraman and Türkoğlu, in their paper entitled "Evolution of city squares and transformation of publicness" bring to discussion the relation of publicness and public space by the historical evolution of city squares. They explore the historical evolution of city squares via spatial, functional, topographical and procedural approaches.

Experiencing publicness in a city is not limited to city squares but also stadiums and shopping areas. Shopping streets play an important role to bring together a high number of people.

Arslan and Gürer in their article entitled "Spatial planning of stadiums according to international regulations in Turkey" compare eight stadiums in Turkey by national and international standards to ensure the comfort and safety of users to guide future stadiums.

Moreover, Çağlar and Gedik in their article "A field study on thermal comfort in the shopping malls in a temperate humid climate" compare the indoor thermal comfort conditions according to standards. The standards are to create a comfortable and safe experience for users. Users should experience a healthy environment in order to spend their time.

Komala and his colleagues, in their article "The characteristics of halal and non-halal food territories in multilayered mapping of Jakarta's Chinatown urban foodscape" demonstrate food as the element to gather and segregate people. They aim to explore whether there is a territorial distinction based on halal and non-halal food. They conclude that the presence of

halal and non-halal food territories creates a specific urban foodscape without strict spatial segregation. It also contributes to the inclusive urban space and spatial integration between people from varied backgrounds.

Open space experience is intense in university campuses, Özkan and her colleagues in their article "Measuring place satisfaction by university campus open space attributes" determine the impact of functional, social and perceptual attributes of campus open spaces on place satisfaction via Karadeniz Technical University-Kanuni Campus.

For both the individual and the public, the experience of a city depends on government policies and also location choices. Mendis and his colleagues in their article "Implementation of government policies in the construction industry: The case of Sri Lanka" explore government construction related policies in order to facilitate the development in Sri Lanka.

The location choice of economic activities, especially the ones based on more creative or artistic production, usually depends on the culture of the place. Köse and Berköz, in their article "Evaluation of the location choice of software industry in Istanbul based on the types of economy" explore the clustering pattern of Istanbul's software industry and the choice of location from a spatial perspective, based on the types of economy. They prove that the creative economy growth in Istanbul shows a polycentric cluster pattern in the axis of the historical city center, the technological parks of particularly prestigious universities in the center, and a location in the town center to benefit from the artistic industry.

The experience of the space and of the actors in the place is crucial for a healthy future. But it is not easy to find documentation of experiences or even to understand them especially the eldest ones. Sarıbekiroğlu and Kul in their article "Builders and building tradition of Barbaros as intangible cultural heritage" documented the traditional builders and their know-how in the rural settlement of Barbaros in Urla, İzmir, Turkey. The results of the study, remain specific to Barbaros but are also remarkable in terms of revealing the importance of oral history in documentation studies.

Knowing the know-how on the original built environment ease the futuristic point of view. Tunay and Uz in their article "Deconstructing "original-copy" in architectural manifestos from 20th century to present" aim to reveal the essential values of "original-copy" to architectural thought, and unravel its layers of meaning. In the study, it has been noted how the words are modified in a way that leads to the formation of a neologism such as "original-copy," and the meaning of the "original" and the "copy" today is opened up to discussion by recombining the data collected through discourse analysis.

An implemented example of a deconstructive way of architecture is given by Czechowicz in the paper entitled "The influence of architecture of the surroundings on the form of the new building - on the example of a chapel from the beginning of the 20th century". Czechowicz aims to analyse the principles of shaping the form of a chapel built in direct contact with the existing structure. Based on the archival materials including 3D reconstruction of the original form of the chapel, the research has shown that the chapel's architecture is the result of efforts to formally coherent with the historic architecture of the surroundings, but expressed in an innovative Romanesque Revival style.

Present evaluations and practices create new experiences that technological advancements offer an environment to multiply and evaluate alternatively these experiences. Durmazoğlu and Gül, in their article entitled "Exploring usability tests to evaluate designers' interaction with mobile augmented reality application for conceptual architectural design" offer an AR application and explore the experience of architects within the architectural design process in which the information about various aspects of a design object is produced at different stages, then shared between relevant stakeholders by the application MimAR. Their preliminary results show that the comprehensibility of the MimAR application still needs improvement.

Enjoy our March 2022 issue!

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An enabling technique for describing experiences in architectural environments

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Abstract

Experience is everything that appears to consciousness during the encounter of a human being with an environment. A survey that helps people introspect about their place experience and capture that experience through words will be presented. The Environmental Description Survey is an enabling technique in which participants first comment about their experiences by completing a series of sentences, e.g., related to their liking for some architectural element (qualitative part of the survey), and then they are asked to rate their experiences in a 1–10 scale; e.g., How much do you like that architectural element? (quantitative part). The survey is answered after the participants have made an exploratory itinerary in the environment but still being in that environment. The most frequent experiences presented to 35 participants who visited an architecturally relevant area of the Santa Lucía Riverwalk in Monterrey, Mexico, were discovered through the survey. In addition to the frequency of the commented experiences, the quantitative data obtained correspond to the intensity of the experiences, the personal importance they had for the participants, and the chronological order in which they were presented during the visit to the place. The results obtained through the survey reveal the possibilities of experience that an architectural environment can generate in people. The hybrid technique presented also allows to discover the more relevant aspects of a place related to environmental preferences. Considering the data obtained through this technique during an architectural or landscape design may result in places capable of generating positive human experiences.

Keywords
Architecture, Data collection techniques, Description, Experience, Introspection.

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1. Introduction: Introspection and the description of experiences

The term experience has been used in broad and imprecise ways, as Hurlburt and Heavey remark (2015, 149). In order to specify what is understood as experience, several definitions of it will be exposed in the following lines. Lived experience has been described by Boden, Larkin & Iyer (2019, 219) as: "… our encounters with everything within our lifeworld — the world as it appears to us and is salient for us." Hurlburt (2011, 2) indicates that experience is what is "apprehended directly before the footlights of consciousness." Experience is everything of which a human being can be aware, and it encompasses from the perceivable objects of the world to the experiences of the body, according to Jackendoff (1987, 3).

In line with the previous definitions of experience, it has been stated by de la Fuente Suárez (2012, 2013, 2019) and by other authors (Holl, 1994a; Malnar & Vodvarka, 2004; Rasmussen, 1959; Tuan, 1977), that multiple types of experiences are possible to be produced in a human encounter with a place or an architectural environment. Tactile sensory experiences, enjoyable or unpleasant emotional experiences, interactive experiences in which the user notices how he or she transforms the environment, depth and shape perception, experiences related to the meaning of a place, and many others, can be phenomena of which a human being may be aware during his or her stay in an architectural environment. Extending the concept of affordance by Gibson (1986), Tweed (2000, 6) indicates that buildings may afford experiences in the same manner as they afford activities.

A human being is occupied at a particular moment with specific experiences out of a welter of multiple possibilities of experience (Hurlburt, 2011; Hurlburt & Heavey, 2006; Hurlburt & Heavey, 2015). Following the previous statement, it can be asserted that only certain experiences appear to the consciousness of a human being while being in a specific place and that some experiences are generated in people with more frequency and more intensity than others in that place. A technique that allows discovering the experiences presented to human beings in an environment and the frequency of occurrence of such experiences will be proposed.

In a direct and spontaneous manner, people experience the environment and the objects around them, and they also experience themselves. However, only in certain situations people focus their attention on the act of experiencing itself, an operation that has been called introspection, which means "… explicit self-consciousness, whereby we attend, either casually or attentively, to our own mental states, or to ourselves having those mental states, or simply to ourselves." (Janzen, 2008, 22). In its simplest terms, introspection has been considered as "looking inward", in contrast to extrospection or "looking outward", which is the common experience of attending to the external environment (Gould, 2006, 190; Kean, 2016, 128). Therefore, to obtain in-depth descriptions of the environment, the survey to be presented (the Environmental Description Survey) incites the participants to extrospect, i.e., to observe their surroundings, and it also incites them to introspect, making them focus on their inner experience with those surroundings.

A description of an object and its qualities is considered a description of an experience in the present study. Noticing and emphasizing some qualities of the object while neglecting others, recognizing it as an object of a particular category, and finding its shape pleasurable, are all experiences. In the words of Hurlburt (2011, 2): "A thought, a feeling, a tickle, a seeing, a hearing, and so on count as experience (…) seeing the orange-and-gold of a real sunset is an experience." Describing an object in absolute objective terms is humanly impossible. Furthermore, when describing experiences with the environment, its buildings and objects, the inner aspects of the experiences obtained through introspection are inseparable from the objects and qualities described through extrospection.

The importance of introspection lies in the fact that it is a necessary act for a person who wants to describe his or her experiences (Zahavi, 2005, 223). Nevertheless, it should be noted that introspection is not the same as making

judgments and rationalizations about one's experiences, but the: "enlargement of the field of attention and contact with re-enacted experience", as Bitbol and Petitmengin put it (2013, 269–270).

According to Giorgi (2012, 6): "Description is the use of language to articulate the intentional objects of experience." Due to the focus of the present article on description and experience, it is relevant to define the branch of philosophy known as Phenomenology, which in words of Moran (2011, 4), is "the descriptive science of consciously lived experiences and the objects of those experiences, described precisely in the manner in which they are experienced."

One of the first theorists to point out the need for a phenomenology of architecture was Norberg-Schulz (1980, 8). Nevertheless, Rasmussen (1959) approached earlier the theme of the experience of architecture, but without adhering to the phenomenological approach. The latter author describes multiple examples of the visual and acoustic impressions produced in an encounter with architecture. The present study is in line with how Rasmussen (1959, 36) understood the subjectivity of experience: "There is no objectively correct idea of a thing's appearance, only an infinite number of subjective impressions of it."

Several architects and theorists as Holl (1994a, 1994b) and Pallasmaa (1994, 2005), had exposed their interpretations of how phenomenology may be implemented in architecture. For example, Pallasmaa (2005, 70) emphasizes the multisensory character of an architectural experience. Meanwhile, Holl (1994b, 40) incites people to increase their introspection and sensibility while experiencing space: "An awareness of one's unique existence in space is essential in developing a consciousness of perception."

The great majority of the texts on phenomenology of architecture are theoretical, and therefore not based on empirical research in which people comment on their experiences with particular works of architecture. There resides the first point in which the present study and its methods depart from the existing phenomenological approaches to architecture. Contrary to the theoretical phenomenology of architecture, empirical methods have been employed in phenomenological psychology (Langdridge, 2007). As the main data collection technique in qualitative research, the interview has also been used in phenomenological studies (Englander, 2012; Maurel, 2009; Pollio, Henley & Thompson, 1997). A study with a phenomenological approach focused on architectural experiences was realized by Jumsai na Ayudhya (2015). The research methods of the latter included photo-elicitation and interviewing in real architectural and urban environments that the participants selected.

In addition to interviews, written accounts are another technique used in phenomenological research to gain insight into how people experience distinct lived situations (Langdridge, 2007; Turner & Turner, 2004). Both techniques help conduct third-person phenomenological research since they are interested in "… the specific experiences of individuals and groups involved in actual situations and places…" (Seamon & Gill, 2016).

In other respects, asking people to verbalize their inner speech or think aloud while making an explorative itinerary in an architectural environment is a technique used to discover people's experiences with an environment (de la Fuente Suárez, 2019, 2020). As Ericsson and Simon remark (1984, 60), Think Aloud Protocols (TAP) have certain qualities in common with phenomenological methods; nevertheless, while the latter rely on the introspection of the participants, thinking aloud elicits the direct expression of thoughts. Thus, on the one hand, during a concurrent TAP, the participants are not asked to retrieve information from their memories (as may happen in interviews). Nevertheless, on the other, the process of thinking aloud or concurrent verbalization interferes with the experience itself, a situation of interference that does not occur in phenomenological interviewing (Petitmengin, 2006).

The Environmental Description Survey (ENVIDES) to be presented in the following section was created based on the findings of the Think

Aloud Protocols carried out in distinct architectural environments. The survey, which relies on introspection, represents a very different alternative to TAP, interviewing, and written accounts for obtaining descriptions of experiences with built environments. ENVIDES has in common with the phenomenological written accounts the intention to obtain from the participants a detailed description of their experiences; in this case, experiences with an environment. Nevertheless, the survey is not only a qualitative technique but also a quantitative one. The mixed-methods technique proposed is based on the fact that the quantitative techniques or the qualitative ones are insufficient in isolation to comprehend architectural experiences, but they may complement and strengthen each other.

The quantitative component of the survey is related to the questionnaires used in Environmental Psychology and Empirical Aesthetics in which respondents use a scale to rate, e.g., their preference for an urban or architectural space, the spaciousness, complexity, or coherence of the scene, and the intensity of the emotions they feel (Coburn et al., 2020; Herzog, 1992; İmamoğlu, 1986; Negami, 2016). In the latter studies, the participants are not located in real places, but they rate the scenes through photographs of them.

According to Gibson (1986, 43): "The essence of an environment is that it surrounds an individual." The importance of the immersion and direct experience of the participants with real environments and buildings has been stressed in de la Fuente Suárez (2020). Studies in which participants rate the qualities of places in situ are less common (de la Fuente Suárez, 2019, 2020; Ayataç et al., 2020; Moorapun & Bunyarittikit, 2018; Nasar, 1987; Russell, Ward & Pratt, 1981).

Before presenting the ENVIDES, it is worth mentioning another approach for studying human experience: phenomenography, which was initially employed in teaching and learning research (Dall'Alba, 2000, 84; Prosser, 2000, 34). The most important data collection technique in phenomenographical studies is the interview (Marton, 1986, 42). Meanwhile, phenomenological research pretends to find the universal or essence that a lived experience has for people (van Manen, 1990, 10), phenomenography looks for the different modes of experiencing that may be presented to people in a specific situation: "What are the qualitatively different ways in which this particular phenomenon might be seen?" (Marton, 2015, 114). Thus, phenomenography does not aim in unveiling the manner of experiencing a phenomenon by human beings in general, neither the particular manner in which each person experiences the phenomenon. Instead, a midpoint is looked for in phenomenography: "In between the common and the idiosyncratic there seems, thus, to exist a level; a level of modes of experience, forms of thought, worthwile studying." (Marton, 1981, 181).

A limited amount of categories represent the ways of experiencing a phenomenon in phenomenographic studies, e.g., the different ways of understanding design that designers may have (Daly, Adams, & Bodner, 2012), or the students' ways of sketching during architectural design (Rice, 2008). In phenomenographical studies: "The first result is a qualitative one ("What are the conceptions held? "), and the second is quantitative ("How many people hold these different conceptions? ")." (Marton, 1981, 195). The conjunction of the qualitative and the quantitative represents an essential point in common of the present study with phenomenography.

Another relevant characteristic of phenomenography is that it pretends to include in its descriptions not only the basic aspects of lived experience but also the conceptual and the culturally learned aspects which are discarded in phenomenology (Marton, 1981, 181). Nevertheless, the conceptual part is prioritized in phenomenography, and the obtained descriptions are the manners in which people understand and opine about phenomena. The latter explains why phenomenography would not help uncover the affective experiences with spaces, according to De Matteis et al. (2019, 7).

With the intention of surpassing the deficiencies of existing methods for describing experiences, the boundaries

between the qualitative and the quantitative, and between the introspective and the extrospective, are blurred in the present hybrid study. Even though it is related to existing approaches and methods, the technique to be introduced here inquiries human experiences with places without aligning to them.

1.1. Objectives

The article aims to present a survey which objectives are as follows:

a) Help people introspect and extrospect about their experiences with the environment.

b) Overcome the difficulties of capturing those experiences through words.

c) Allow participants to quantify several aspects of the experiences they commented on.

d) Reveal the experiences that an architectural environment can generate in people through an easy to perform analysis of the data.

e) Unveil the aspects or qualities of a place related to environmental preferences.

f) Render visible how the multiple experiences with a place relate to each other.

2. The environmental description survey: Studying how the environment and its elements are experienced

The technique to be presented was created based on the Think Aloud Protocol, the phenomenological written accounts, and the environmental psychology scales described above. Several TAPs were carried out in distinct buildings and places, in which the participants were asked to express all that went through their minds while walking in the place (de la Fuente Suárez, 2019, 2020). After carrying out those TAPs, it was noticed that, regardless of the building or place, it was common that the participants expressed what they liked or disliked, what attracted their attention, they also talked about something that produced doubts in them, about something they did not expect to be in a certain way, etc.

Based on these frequent types of comments, a series of incomplete phrases (known as stems) was created, e.g., "I like…", "It was unexpected…", and "It looks like…". These stems conform the Environmental Description Survey (ENVIDES), a sentence completion technique aiming to elicit detailed comments about the experiences presented to people in a specific place. It is important to note that the task of freely writing about an experience may be difficult for most people, and it does not allow long texts (van Manen, 1990, 64). Overcoming these difficulties is the main objective of the ENVIDES incomplete phrases.

Sentence completion is a type of enabling technique: "a device which allows the individual respondent to find a means of expressing feelings, thoughts and so on which they find hard to articulate." (Chandler & Owen, 2002, 98). Sentence completion techniques have been used in psychology, marketing, and user experience research and have the advantage of allowing to obtain structured qualitative data about users that requires less time to analyze than results from interviews (Kujala, Walsh, Nurkka & Crisan, 2014).

ENVIDES asks the participants to create a series of statements or declarative sentences, i.e., expressions about something (Calway & Skyes, 1996, 13), referring to their direct observation of the environment, its elements, and qualities. The survey elicits the participants to describe what surrounds them but also what is going on inside them. Through the stems, the participants create sentences in which the "what of the experience" (the object, building, or place being experienced) is connected with the "how of the experience", i.e., the specific manner in which the object is experienced, e.g., how the object is perceived, or the emotions it causes. As shown in Table 1, some stems specify a type of experience (experience stems), while other stems specify the object of experience (element stems). The stems have as few words as possible, which prevents directing the participants towards some aspects or elements of the environment. Four pilot versions of the survey were applied in different architectural environments (building's interiors, exteriors, and public spaces), previous to the survey of the present study. In this manner, the comprehensibility of the instructions and the expressions

Table 1. *Incomplete phrases or stems included in the Environmental Description Survey.*

ENVIRONMENTAL DESCRIPTION SURVEY (ENVIDES)

EXPERIENCE STEMS				ELEMENT STEMS	
Saliency, attention and interest	**Liking, pleasure and preference**	**Intentions and desires**	**Other experiences**	**Place in general and fixed-feature elements**	**Semifixed and nonfixed-feature elements**
It stands out…	I like…	I would like to… I wished to…	It looks like… It seems…	This place…	This object… These things…
I attentively observed… I stared at…	I dislike…		It was unexpected…	This building… These buildings…	The people…
			It makes me think… It makes me doubt…	This building element… These building elements…	

used in the stems was improved. Owing to the openness of the stems, ENVIDES is a technique capable of being used to study a multiplicity of environments.

2.1. Experience stems

These stems are to be completed with the elements of the environment producing the experiences, e.g., "I like… the textures of the buildings around the canal." or "It was unexpected… to walk around the place from various heights."

2.1.1. Saliency, attention, and interest

The intention of the "It stands out…" stem is to discover what elements of the environment have the highest perceived saliency for the participants; understanding saliency as the quality of an object to be conspicuous, e.g., in contrast to its surroundings (Borji, Sihite & Itti, 2013). Meanwhile, the stems "I attentively observed… / I stared at…." Intend to elicit responses in the participants related to what caught their attention, and presumably what elements or qualities of the environment they considered the most interesting. For a deeper explanation of the relation between attention and interest, see Ade la Fuente Suárez (2020).

2.1.2. Preference and aesthetic pleasure

The "I like…" stem is used to construct statements about positive aspects, preferences, or liking for the environment or the specific objects within it. The "I like…" stem may allow the participants to indicate what elements or qualities of the environment produce in them experiences related to aesthetic pleasure (beauty), which is: "… a pleasurable subjective experience that is directed toward an object and not mediated by intervening reasoning." (Reber, Schwarz & Winkielman, 2004, 365). On the other hand, the "I dislike…" stem is useful in detecting what the participants noticed as something negative in the environment. The "I like…" and "I dislike…" stems may be completed with aspects of the environment that go beyond the visual ones. Other sensory qualities may be playing a role in the experience of a place, and ENVIDES can be used to discover them.

2.1.3. Intentions and desires

Since the activities that the participants are asked to carry out in the environment are walking around and answering the ENVIDES, some intentions of actions and desires that may be generated in the participants during their encounter with the place may be unaccomplished. The stems "I would like to… / I wished to…" were created to discover these unfulfilled intentions of the participants. These stems also allow the participants to indicate what changes they would like to have done in the environment.

2.1.4. Other experiences with the environment

The "It looks like… / it seems" stems allow the participants to describe their impressions of the appearance of a place. The "It looks like…" stem incites the participants to describe experiences in which they compare the environment or its elements with other known

objects and places. The latter stem may also invite the participants to include illusory experiences in their description, those experiences in which the observers' perceptions do not coincide with the reality of the object (de la Fuente Suárez & Millán Gómez, 2012). Meanwhile, the stem: "It was unexpected…" allows knowing the participants' expectations that were contradicted during their visit to the place. Furthermore, to discover what elements or qualities of the environment provoked thoughtful experiences in the participants, the following stems were included in the ENVIDES: "It makes me think… / It makes me doubt…"

2.2. Element stems

These stems are intended to be completed with the experiences produced by the elements of the environment, and a description of those specific elements, e.g., "This building element… is different from what is commonly seen" (the glass bridge).

2.2.1. Place in general and fixed-feature elements

The stem: "This place…" is very useful as it enables the participants to use adjectives to describe the place as a whole. In addition to the last stem, if the ENVIDES is to be applied in a built environment, the following stems should be included: "This building… / These buildings…" and "This building element… / These building elements…", which allow the participants to describe the fixed-feature elements, "…those that are basically fixed, or those that change rarely and slowly." (Rapoport, 1990).

2.2.2. Semifixed and nonfixed-feature elements

The stems "This object… / These things…" incites the participants to describe the small-scale elements of the environment, which are commonly movable (semifixed). Finally, the stem "The people…" enables the participants to include the human occupants or inhabitants and their activities in their description of the environment, i.e., the nonfixed-feature elements (Rapoport, 1990).

It is remarkable that since the participants are asked about their experiences of the place while they are still in that place, some ENVIDES stems induce a concurrent or real-time introspection in the participants (I like…), while other stems induce a retrospective introspection (I attentively observed…).

After completing the stems or phrases, the participants are asked to give distinct values to their comments, i.e., to give numerical quantities to the experiences according to how intensely they experienced them (how liked, how unexpected, etc.). Through the ENVIDES, four dimensions of the experiences with the environment are obtained: intensity, importance, immediacy, and occurrence; they will be explained in detail in the methods section. By combining a qualitative and a quantitative part, ENVIDES allows participants to describe and give a significant amount of information about their experience of an environment that could not be obtained through an interview, a TAP, or a quantitative survey. An explanation of the instructions given to the participants will be exposed later.

Studies that are composed of a first qualitative part (interview) and a second quantitative part (survey) have been used in inquiring people's experiences with built environments (e.g., Kusumowidagdo, Sachari & Widodo, 2016). Nevertheless, the qualitative and the quantitative are fused in a single instrument in the proposed technique.

2.3. Positive experience statements

In order to know the participants' affective responses to the place visited, a series of statements is presented to them after they answer the ENVIDES (table 2). Beyond obtaining an overall evaluation of the preference for the environment, the presented statements allow differentiating several types of positive experiences with a place. It is important to remark that, since the participants are located in a real place, it is possible to ask them to rate aspects that go beyond the visual qualities of the environment, and that are not possible to rate with photographs: e.g., "I really like being in this place", or "It feels very comfortable to be in this place."

Some of the statements are focused on positive experiences that participants may have during their itinerary;

meanwhile, other statements are related to the intention of spending free time in the place in the future. Participants indicate how much they agree with each statement through a 0-10 scale. The data obtained through these predefined statements complement the strengths of the open answers obtained with the ENVIDES.

3. Methods

3.1. Participants and case study selection

Forty-three persons participated in this study. Thirty-five participants completed the survey, following all the instructions correctly (18 men, 17 women, ages 16 to 27, average of 20). Nineteen participants were architecture students (second to fourth semesters), and the other 16 participants were from 14 different careers or occupations. The surveys were conducted from 9:30 am to 12:30 pm, during mostly sunny days with average temperatures of 30° C (86° F).

The case study is an artificial canal with pedestrian walkways: the Santa Lucía Riverwalk (2007) in the Mexican city of Monterrey by the architect Enrique Abaroa (Landa, 2019, 102). The specific place where the survey was conducted is the Riverwalk area between the Museum of Mexican History (MHM) and the Northeastern Museum (MUNE; Figure 1). The Museum of Mexican History (1994) was designed by the architects Augusto Álvarez and Óscar Bulnes. Meanwhile, the Northeastern Museum (2007), dedicated to exhibitions of more regional character, was designed by Salinas Lasheras Architects (Landa, 2019, 51). The Riverwalk was selected as a case study due to its combination of built and natural elements, the multiple views that it allows to the visitors, and its variety of materials and shapes.

3.2. Environmental description survey (ENVIDES)

The following paragraphs correspond to a synthesis of the survey instructions given to the participants in the Riverwalk.

0.- Please walk around this place while observing whatever you want; take the time you need (all participants began their itinerary in the starting point marked in Figure 2, where the limits of the walkable area are signaled). Please do not walk outside the established limits (this instruction prevents the participants from visiting other neighboring places that could distract them). Return to this point when you finish your itinerary (the survey and the written instructions are turned in to the participants at that moment).

1.- Based on the route you took and what you observed, try to create phrases using the incomplete sentences that appear in the rectangles of the answer sheet (1 in Figure 3).

1.1.- Describe as much as possible each aspect you want to comment. Ensure to be clear in what you are describing or what you are referring to (1.1 in Figure 3). Use a rectangle for each comment you write, and if you do not know what to comment spontaneously, leave the rectangle blank. In the rectangles with two sentences, only give one answer, completing any of the two sentences. While answering each section of this survey, keep moving within the established area without going out of that area.

2.- Continue with the following question: Which of the things I commented on did I notice FIRST, just when I arrived at the place? Write a letter "F" in the upper right corner of the corresponding rectangles (2 in Figure 3).

3.- Now, ask yourself the following question: What things did I notice when I was already answering the SURVEY? Write a letter "S" in the upper right corner of the corresponding rectangles (3 in Figure 3).

4.- The following section consists of answering the question: Which comments are IMPORTANT to me? Read

Table 2. *Positive experience statements used together with the Environmental Description Survey.*

I really like being in this place.
I enjoy exploring this place.
It feels very comfortable to be in this place.
I like the appearance of this place.
I would like to spend my free time in this place.
I really like the architecture of this place.
I would like to spend time with other people in this place.
I enjoy contemplating this place.

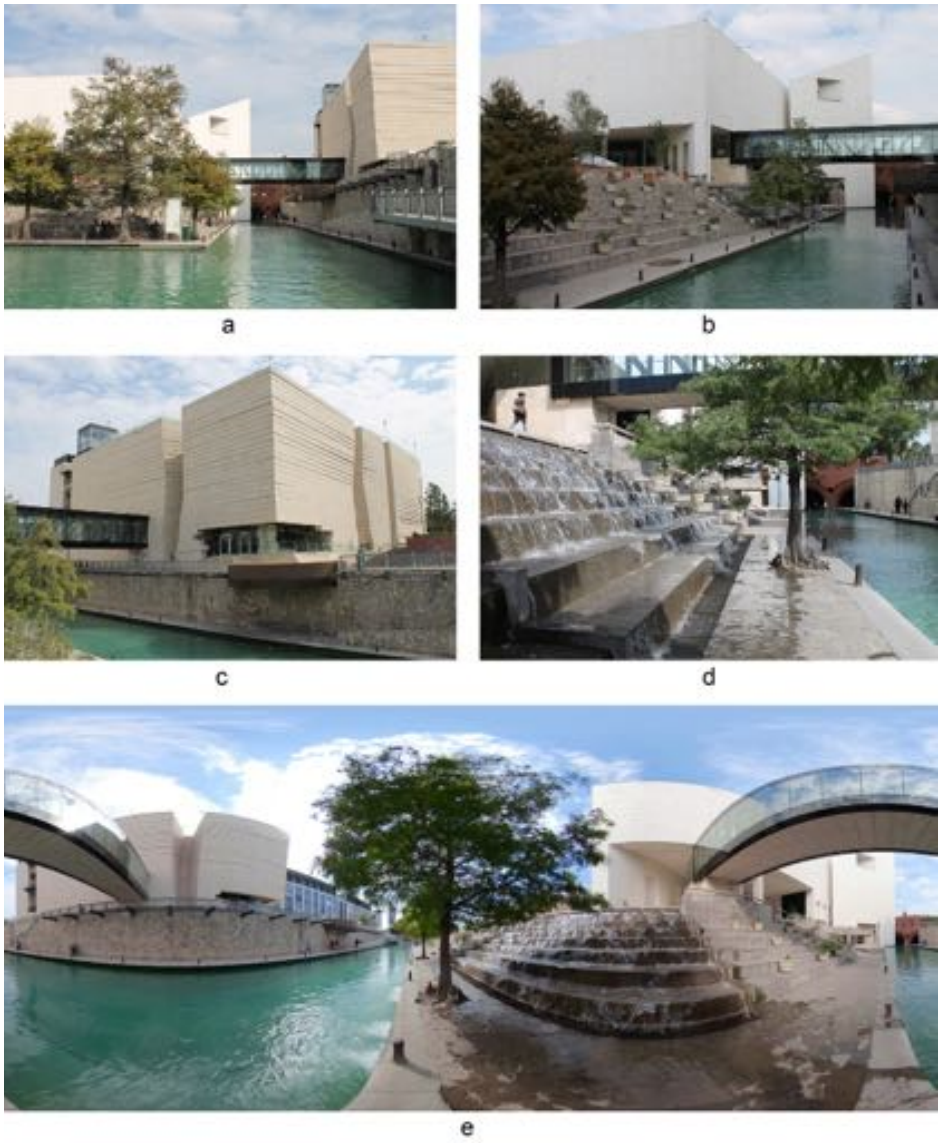

Figure 1. *Views of the Santa Lucía Riverwalk, Monterrey, Mexico:*
a) The canal, the museums, and the walkable area of the participants of the study (below the trees on the left).
b) Museum of Mexican History (MHM, Álvarez and Bulnes 1994), the glass bridge connecting the museums, and the step seats in the participants' walkable area).
c) Northeastern Museum (MUNE, Salinas Lasheras Architects 2007).
d) Stepped fountain of the Riverwalk.
e) 360° panoramic photograph of the Riverwalk, taken in front of the stepped fountain.

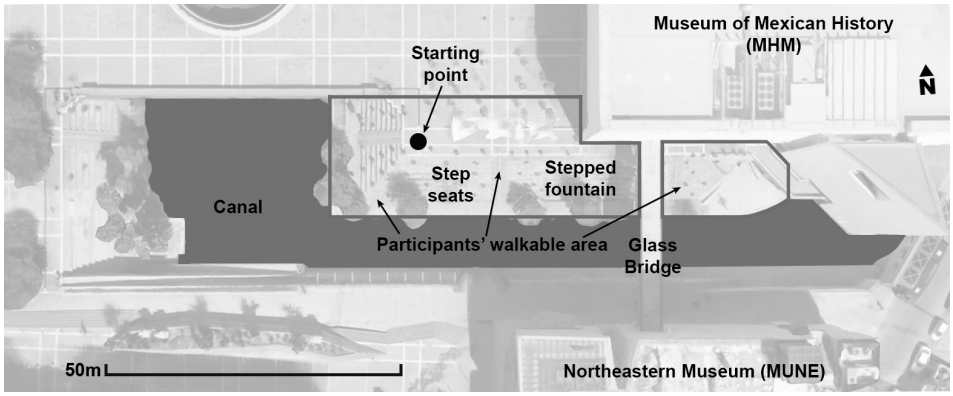

Figure 2. *Santa Lucía Riverwalk aerial view showing the area where the survey was conducted (participants' walkable area), the museums' buildings, and the glass bridge. Based on an image from Google Earth.*

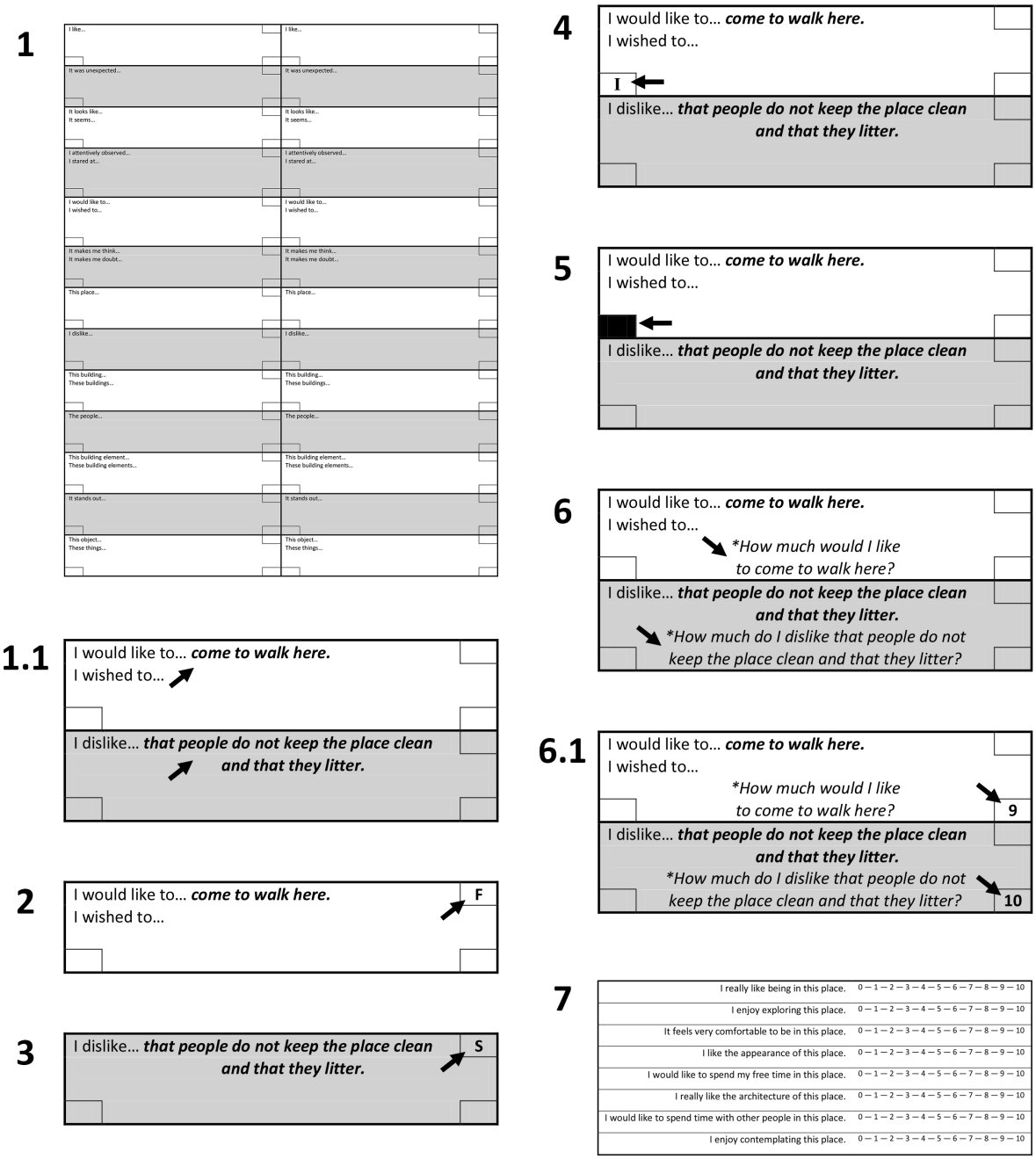

Figure 3. *Survey instructions given to the participants (see text for details).*

all the comments you made, including the part printed on the sheet, and select the ones that are important to you. Place a letter "I" in the left corner inside the rectangle where you wrote the comments that are important to you. (4 in Figure 3). While selecting them, consider your experience of the place in general, everything you see, and everything that happens through your mind. Focus on what is important to you and not what you think is important to others.

5.- Answer the following: Which of all the comments are THE MOST IMPORTANT to me? Read all the sentences you marked with the letter "I", and from all those sentences, select the ones you consider as your most important experiences with the place. Then, fill in the boxes with an "I" that correspond to the most important comments to you (5 in Figure 3).

6.- The next activity consists of mentally transforming each comment that you wrote into a question including

Table 3. *Operationalization of the dimensions of experience that ENVIDES allows to measure.*

Dimensions of Experience	Definition	Indicators
IMMEDIACY	Instantaneity with which the experience is produced.	Participants' ratings (1 to 3 ordinal scale) for what they noticed or experienced first just arriving at the place ("F" = 3); what they experienced once they were answering the survey ("S" = 1); and the experiences that were produced in between the other two points in time (empty boxes = 2).
IMPORTANCE	Personal relevance given to an experience in relation to all the experiences produced in the environment.	Participants' ratings (1 to 3 ordinal scale) for the most important experiences (the filled boxes = 3); the important experiences (boxes marked with an "I" = 2); and the not important experiences (empty boxes = 1).
INTENSITY	Strength of the experience that is produced, or degree to which something is experienced as possessing a quality.	Participants' ratings using a 1 to 10 continuous scale; 1 meaning: very little; and 10: a lot.
OCCURRENCE	Degree in which a phenomenon is manifested or experienced by people in a place; or capability of the environment to present the experience to people.	Percentage of the participants who commented about an experience.

the expression: How much ...? (A list of the stems transformed into questions is presented to the participants in order to help them in the formulation of the questions; e.g., How much does it stand out…?, How much do I like… ?, or How much does this place… ?) (6 in Figure 3).

6.1.- While you are mentally creating the questions for each comment, answer each question with a number from 1 to 10, where: 1 is VERY LITTLE, and 10 is A LOT. Place each number in the bottom corner. (6.1 in Figure 3).

7.- Finally, read carefully the following phrases (the Positive Experiences Statements), and based on your experience with the place, ask yourself: how much do I agree with this comment? (7 in Figure 3). Answer by giving a number from 0 to 10, where: 10 is COMPLETELY AGREE, and 0 is COMPLETELY DISAGREE.

In this case study, the average time that the participants took to explore the place was 15 minutes, and the whole activity (including the Survey) lasted 1 hour.

3.2.1. Quantitative dimensions of the experiences in the ENVIDES

As indicated above, each experience described with words by the participants is also rated numerically. In this manner, three dimensions are obtained for each comment: immediacy, importance, and intensity (Table 3).

Immediacy allows knowing the temporal order of occurrence of the participants' experiences and the order in which they discovered the different aspects of the environment through their movement.

Importance ratings given by the participants seem related to what makes a place special for each of them. Similarly, Cele (2006, 119), while referring to place experiences of children, comments: "Even the tiniest thing, such as a crack in the pavement, can become important and valuable for the sake of the memories and dreams it causes…"

The last dimension of experience rated by the participants is intensity, and it indicates, e.g., how unexpected, how liked or disliked each experience was for the participants. The intensity of architectural experiences has been studied in de la Fuente Suárez (2019, 2020).

3.2.2. Coding the comments into categories of experiences

Thanks to the stems, the phrases created by the participants are pre-codified, and it is a simple task to categorize the commented experiences; e.g., the comments given to an experience stem such as "I like…" are categorized according to the distinct elements or characteristics of the place that are liked. On the contrary, the comments of an element stem such as "This place…" are coded according to the different experiences or qualities of the place as described by the participants.

After the comments are coded into categories of experiences, the occurrence of each category is calculated (Table 3). Therefore, contrary to immediacy, importance, and intensity, occur-

Table 4. *Examples of comments made by the participants (ENVIDES) classified into elements of the environment and experience categories (only 14 out of 51 categories are shown).*

Elements of the Environment	Experience Categories	Occurrence of the experience categories	Example Comments of the participants	Immediacy of the example comment	Importance of the example comment	Intensity of the example comment
VEGETATION	I like nature and the combination of the natural and built.	23 %	I like… the harmony that exists between the constructions and nature.	10	10	10
			I like… the contrast of the neutral colors of the buildings with the color of the plants.	3.3	6.6	9
	It looks like a natural environment.	26 %	It seems… as if you were leaving the city because you go down and find the "river" and the trees.	3.3	3.3	8
WATER AND FOUNTAINS	I like the sound of water.	26 %	I like… the noise of the water descending from the stepped fountain.	10	6.6	10
	The canal and the water stand out.	26 %	The color of the canal water …stands out.	3.3	3.3	9
	I would like to get in the water / to touch it.	23 %	I would like… to get in the water, even though I know it isn't right.	6.6	3.3	4
RELAXING PLACE	This place is relaxing / makes one feel good.	54 %	This place… can cause pleasant moments.	3.3	6.6	10
			This place… is to be calm, without any distractions.	6.6	3.3	10
	Water and fountains are relaxing.	31 %	I like… the calm ambiance that the sound of the water generates.	10	3.3	10
GLASS BRIDGE	I attentively observed the glass bridge.	17 %	I attentively observed… the beams of the bridge that crosses the river (structure).	10	10	10
MUSEUMS' BUILDINGS	The Northeastern Museum (MUNE) has movement.	26 %	These building elements… are disordered, causing in me a strange sensation.	3.3	3.3	7
			This building… has an interesting movement.	10	6.6	10
	Experiences with the buildings' materials.	26 %	These building elements… the finishes, and materials of the building (MHM) give more seriousness to the place.	3.3	6.6	5
	Experiences about the places' or buildings' age.	17 %	The arch… makes me think… about whether it is there because of its history or it has been built with an intention.	6.6	10	9
OTHER	I dislike the Sun / the hot weather.	20 %	I dislike… Monterrey's hot climate.	3.3	3.3	10
	Experiences of the different views that may be observed from different points.	14 %	It was unexpected… to find so many points of view from which the place looked different.	6.6	3.3	7
			These building elements… give different landscapes [sights] depending on the point of view from where they are observed.	6.6	3.3	9
	People enjoy this place.	20 %	The people… enjoy the view while they walk in the Santa Lucía Riverwalk.	10	6.6	8

** The immediacy, importance, and intensity values correspond to the ratings given by the participant for the comment used as an example. The immediacy and importance dimensions, ranging from 1 to 3, are shown on a 1 to 10 scale, as in intensity ratings. All comments have been translated from Spanish.*

rence is not rated by the participants. The categories with higher occurrence may inform about the experiences that a place is most able to generate.

3.3. Data analysis

Descriptive statistics will be used to show the means of the immediacy, importance, and intensity of the experiences as evaluated by the participants. A Mann-Whitney U test will be performed to discover if the architecture students´ experiences with the place are significatively different from those of the other participants. Spearman rho test will be used in order to find correlations between the intensities of the experiences. Considering the non-normal distribution of the data (Shapiro-Wilk test), the nonparametric tests Mann-Whitney U and Spearman rho were selected.

Lastly, a Multidimensional Scaling (MDS) will be realized to group the experiences based on their correlations. As an exploratory data analysis, MDS allows researchers to find structure in

amorphous data sets (Borg & Groenen, 2005, 4). In a MDS, the different items, stimuli, attributes, or persons, are represented as points, commonly in a bidimensional space (Ding, 2018, 4; Groenen & Borg, 2013, 3). The closer the points in the MDS space, the more similar they are (Groenen & Borg, 2013, 1). The name of the MDS analysis realized in SPSS is PROXSCAL, in which the correlations between the experiences were taken as similarities.

4. Results

After analyzing the comments, 51 categories of experiences were found. These categories were classified into six more general elements of the environment: vegetation, water and fountains, relaxing place, glass bridge, museums' buildings, and others. Some examples of the categories and the participants' comments are shown in table 4.

The Mann–Whitney U test was performed to know if a significant difference existed between the experiences reported by the architecture students and those given by the other group of participants with different professions. Each experience category was commented on by some participants, but not by all of them. Therefore, when a participant did not comment about an experience category (e.g., when he or she did not write about liking the sound of water), the intensity rating for the participant to that experience is considered zero (Table 5). Of all 51 categories of experiences, only one category presented a significant difference between groups: "I like the appearance of the buildings" (Table 5); since more architecture students reported to have liked both museum's buildings than the participants of the other group. Owing to this lack of differences, the data will be presented in this section without making distinctions between groups.

Table 5. *Numerical intensities given by the participants for three experience categories. Architecture students appear in the upper grey zone of the table. Meanwhile, the other participants are located in the lower zone.*

	Intensities of the experiences for the participants		
Participant	I like the sound of water.	I like the appearance of the buildings.	This place is relaxing/ makes one feel good.
1	10	0	10
2	0	10	10
3	0	0	10
4	0	8.5	0
5	0	0	10
6	8	0	10
7	0	8	0
8	10	0	0
9	0	10	0
10	0	10	0
11	0	7	10
12	10	10	0
13	0	7	10
14	10	0	0
15	0	0	9
16	0	9	0
17	0	7	0
18	0	8	9
19	10	0	10
20	0	0	9
21	0	10	10
22	0	0	10
23	0	8	0
24	9	0	0
25	0	0	10
26	10	0	0
27	10	0	9
28	0	0	10
29	0	0	3
30	0	0	9
31	0	0	0
32	0	0	0
33	0	0	0
34	0	0	8
35	0	0	0

The categories of experiences are shown in the scatterplot in Figure 4. The importance, immediacy, and intensity values of the categories in the figure are calculated considering the ratings given by the participants who did comment on that experience category (i.e., the averages do not include zero values). Therefore, the diagram should be read as follows: how intense/important/immediate was this specific experience for those who commented about it. As can be seen in the figure, the experiences with the highest occurrence in the Santa Lucía Riverwalk (biggest circles) are related to the relaxing character of the place and the presence of water and fountains.

In other respects, the first experiences to be presented to the participants (highest immediacy) are related to the liking for the sound of water and the liking for the calmness of the place (left side in Figure 4). The first architectural experiences to take place are all related to the glass bridge, which according to the participants, stands out due to its contrasting dark color. The experiences related to the museums' buildings tended to occur later.

Despite its minor occurrence, the experiences related to vegetation were the ones that received the highest ratings of importance by the participants who experienced them. The water and

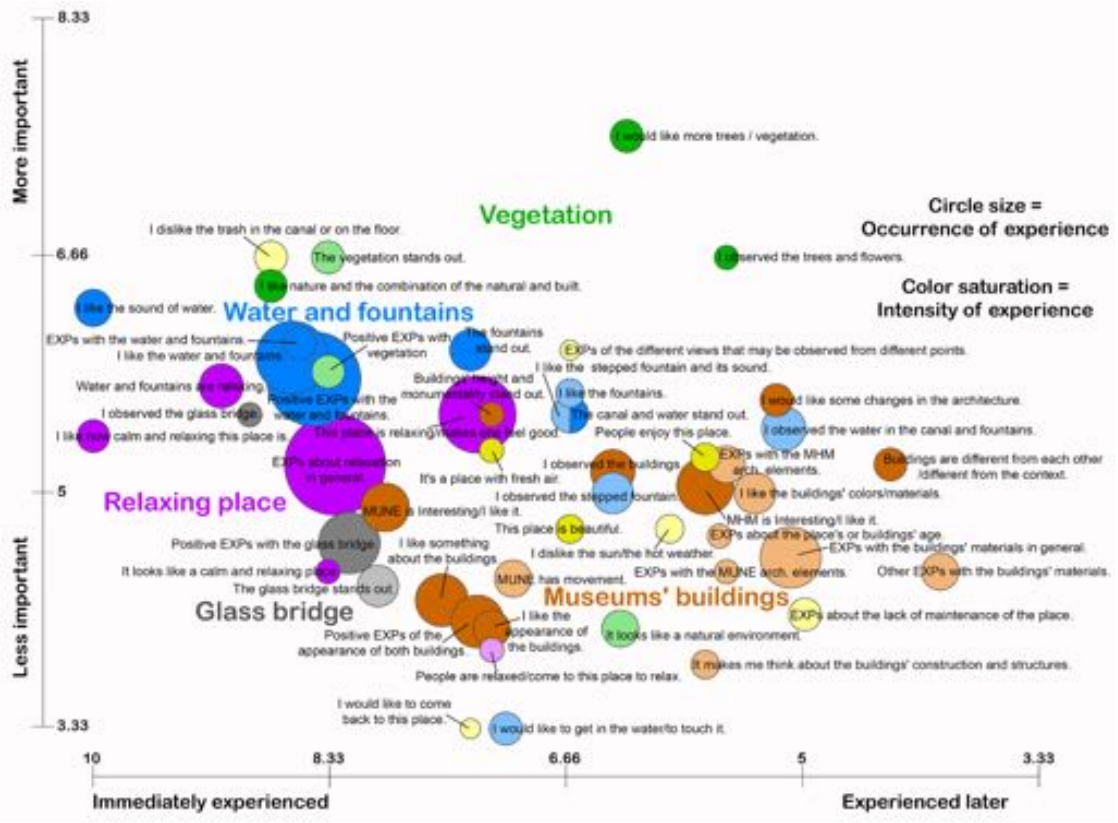

Figure 4. *Experience Scatterplot (Immediacy/Importance) of the Santa Lucía Riverwalk ENVIDES, in which the 51 categories of experiences (EXPs) are shown in circles.*
** The x-axis corresponds to the temporal dimension of immediacy, from the more immediately experienced (left) to the less immediately experienced (right). The y-axis corresponds to the importance. The sizes of the circles show the occurrence of the experience between the participants; the biggest circle has 71 % of occurrence, while the smallest one has 14 %. Finally, the different colors (hues) of the circles indicate the elements of the environment to which the categories of experiences belong, and the two saturation levels of the colors indicate whether the experience has a high intensity (8.5–10) or a moderate intensity (7.0–8.4).*

fountains' experiences were second in importance. Meanwhile, the architecture related experiences, those with the museums' buildings and the glass bridge, were not of high personal importance. Finally, the experiences with the highest intensities in the Riverwalk were: "I would like more trees / vegetation" (9.75) and "I Like the sound of water" (9.67).

Because ENVIDES was designed to help in the description of experiences with the environment and its elements, it is understandable that other experiences such as those related to bodily sensations, the actions carried out in the environment, and other emotions besides pleasure and displeasure, are seldom commented through this technique (see de la Fuente Suárez, 2012, 2013, 2016 and 2019 for a deeper description of these other experiences).

4.1. Correlations between the categories of experiences and the Positive Experience Statements

The mean values of the Positive Experience Statements for the Santa Lucía Riverwalk were all high, ranging from 8.15 (I would like to spend my free time in this place) to 9.18 (I enjoy contemplating this place).

From the data obtained through ENVIDES, 110 moderate correlations (Spearman's rho) were found between all the intensity ratings given by the participants for their experiences and the ratings of the Positive Experience Statements (significance at $p < 0.05$). Some examples of the intensity ratings used to calculate the correlations were previously shown in table 5.

The diagram in Figure 5 shows a selection of the 94 correlations that were considered the most insightful. Correlations between experience categories in which one of the categories was more

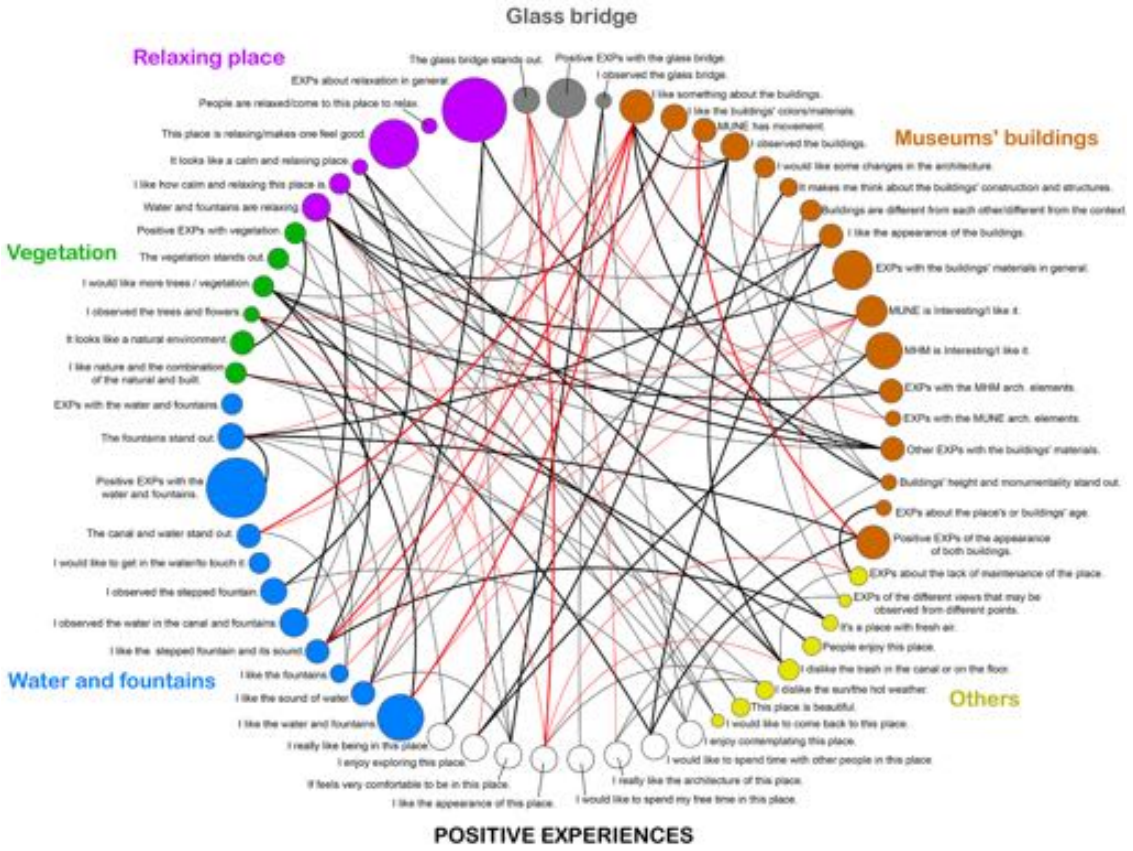

Figure 5. *Experience Correlation Network of the Santa Lucía Riverwalk ENVIDES, showing the correlations between the 51 categories of experiences and the 8 Positive Experience Statements.*
** Correlations with coefficients between ±0.4 and ±0.56 are shown with thick lines, and those between ±0.33 and ±0.39 are shown with thin lines. Positive correlations are represented with black lines, while negative correlations lines are in red. The multiple correlations between the Positive Experience Statements are not included.*

general and included the other, a more specific one, are not shown in the figure. The average absolute value of the significant correlations found is 0.39. In order to give an abridged correlations description, only some correlations with coefficients higher than the average (shown with thick lines in Figure 5) will be commented on in this section.

Even though several experiences related to water, nature, and relaxation were commented on by the participants, the highest correlation of "I really like being in this place" is with "I attentively observed the museum's buildings". This architecturally centered attitude of the participants is also noticed in the correlation that indicates that the more they enjoyed exploring the place, the more they attentively observed the buildings, and the more they found the Museum of Mexican History as interesting.

In other respects, some participants commented that the black color of the bridge was seen as highly contrasting with the environment. In general, the more the participants saw the bridge as standing out, the less they liked the appearance of the place. The last relation was not pointed out directly by any participant; nevertheless, it was discovered through the correlation.

Regarding the positive statement: "I would like to spend time with other people in this place", it is also related to the architecture of the place (the liking for the appearance of the museums' buildings). The fact that the experience categories that correlate with the Positive Statements are mainly related to architecture may be due to the lack of vegetation found by the participants, since the more the participants would like to spend time with other people in the Riverwalk, the more they wished there were more trees.

Concerning the correlations between the categories of experiences only, it is important to highlight the correlations of the experience category with the

highest occurrence (71 %), corresponding to: "Experiences about relaxation in general". The more the participants liked the sound of water, the more intense were their experiences related to relaxation. Furthermore, 31 percent of the participants commented on a cause-effect relationship in which they experienced water as generating relaxation in the place.

The subtle textures and colors of the stone panels (MHM) and the granite panels (MUNE) may also be involved in the relaxation of the people in this place, since "Other experiences with the buildings materials" presents correlations with "Experiences about relaxation in general", and more specifically with "I like how calm and relaxing this place is".

It seems that in this place, the participants liked either the buildings, or the water and fountains, since there is a negative correlation between "I like something about the buildings" (a specific quality of them) and "I like the water and fountains". The quality of the buildings that may have been experienced as attractive by the participants could be their prominent scale, as shown by the correlation between: "I like something about the buildings" and "Buildings' height and monumentality stand out".

Lastly, a specific perception of the Northeastern Museum noticed by the participants: "it seems as if MUNE had movement", is an effect found interesting for some but strange for others that may have reduced the "Positive experiences of the appearance of both buildings", as is shown in the negative correlation between those experience categories.

4.2. Multidimensional scaling analysis of the experiences with the environment

The MDS Analysis was realized based on the correlations between the intensities of all the experiences and the values given by the participants to the Positive Experience Statements (PES). The higher the correlations between the experiences, the closer they appear in the MDS Scatterplot shown in Figure 6.

In the MDS scatterplot, the experiences tend to segregate into two extremes: the Architectural Experiences and the Environmental Experiences. The architectural experiences comprise the experiences had with the museum's buildings and the glass bridge. Meanwhile, the Environmental experiences correspond to the categories of water and fountains, vegetation, and relaxing place. The experiences in the category of others are dispersed on both sides of the diagram.

The experiences related to relaxation, to water and fountains, and those related to the museum's buildings, have high occurrences. These three elements of the environment are what mostly characterize the studied zone in the Riverwalk. Nevertheless, the fact that the PES are more related to the architecture in the Riverwalk is again evidenced in Figure 6. The polygon comprising the PES is mostly surrounded by the architectural experiences.

Behind the architecture of the place, the relaxation that the place generates tends to appear close to the Positive Experiences in the MDS Scatterplot. The enmeshed relation between the relaxation experiences with those of water and fountains and the experiences with the buildings materials is also noticeable in Figure 6.

Another aspect to pinpoint about the MDS Scatterplot is that the more specific experiences are located in the upper right part. Some of these specific experiences are keen and thoughtful observations (e.g., it makes me think about the building's construction and structures, I like nature and the combination of the natural and built, and experiences about the place's or building's age). Other specific experiences that also tend to appear in the upper right half are the critique comments about the place (e.g., I dislike the trash in the canal or on the floor, experiences about the lack of maintenance, and I would like more trees/vegetation).

5. Discussion

Through the proposed technique, experiences of different types, such as those with the buildings materials and the relaxation in the place, are found to be correlated. Therefore, ENVIDES can reveal hidden connections between experiences that are rarely commented directly by the participants and have been little studied so far, e.g., between the architec-

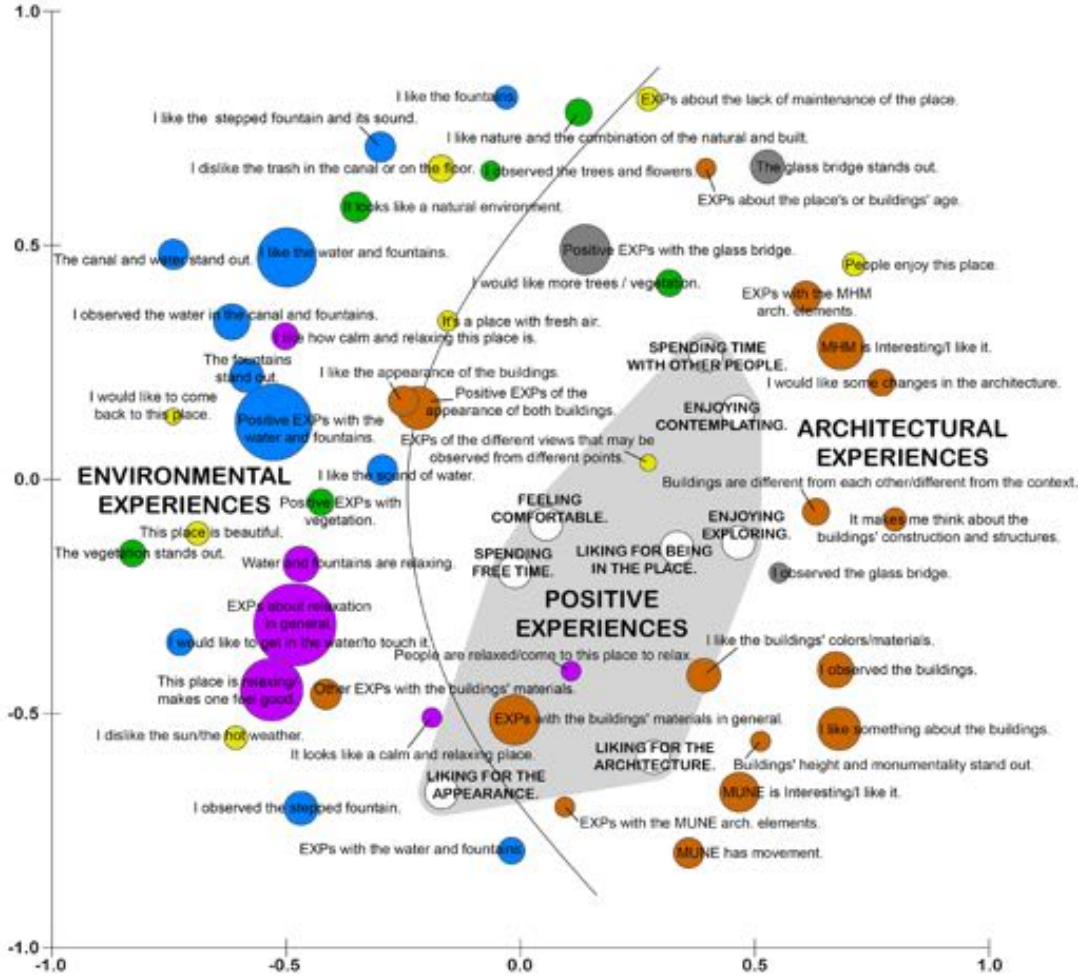

Figure 6. *Scatterplot of the Multidimensional Scaling (MDS) created with the correlations between the categories of experiences and the Positive Experience Statements (PES).*
** The Positive Experiences in the scatterplot correspond to the PES items and are enclosed within a gray figure. The curved line separates the mostly Environmental EXPs on the left side and the mostly Architectural EXPs on the right side. Circles size represents the occurrence of the experience categories as in previous figures.*

tural and the environmental experiences generated in a place, between experiences obtained through different sensory channels, and between preferences and specific qualities of the place. There are multiple examples of descriptions of experiences made by architecture theorists that blur the limits between physical qualities, sensory experiences, and emotions: "In the Great Peristyle at Karnak time has petrified into an immobile and timeless present. Time and space are eternally locked into each other in the silent spaces between these immense columns; matter, space and time fuse into one singular elemental experience, the sense of being." Pallasmaa (2005, 52). Those deep connections between experiences may be revealing the very nature of human encounters with places. Through the presented technique, those connections can be explored.

The findings of this study indicate that the experiences with a place may be understood as a network of perceptions, meanings, actions, and emotions. The scatterplot in Figure 6 is a map of the possibilities of experiencing an environment created with multiple tiny pieces of descriptive statements about that environment. Besides intending to find a single essence of the experience with a place, the survey presented intends to discover the multiple experiences presented to people in the environment and allow for the visualization of how they are related. Any experience with a place involves the contradiction of being composed of a multiplicity of particular experiences, while at the same time, it is a whole that depends on the interrelation of the parts. The latter is an important fact to take into

account in architectural design. In the words of Holl (1994a, 45): "We must consider space, light, color, geometry, detail, and material as an experiential continuum. Though we can disassemble these elements and study them individually during the design process, they merge in the final condition, and ultimately we cannot readily break perception into a simple collection of geometries, activities and sensations."

It is also noticeable from the results of this study that the architectural elements present in a place may play a dominant role in the environmental preferences of people. Architectural elements are more than simply a background for human existence. Therefore, they should be carefully designed by considering the aesthetic and functional aspects in conjunction with the evidence regarding promoting well-being through built spaces.

6. Conclusions

The Environmental Description Survey (ENVIDES) proposed in this article intends to obtain from the participants a description of their experiences with an environment. ENVIDES lies in the middle point between the open phenomenological written accounts, in which experiences may be described in detail without restrictions, and the closed psychological instruments with preestablished statements or questions. ENVIDES is a data collection technique in which, by completing a series of sentences, the participants create and answer their own questionnaires based on their specific experiences with the environment. Since it has both a quantitative and a qualitative part, ENVIDES prevents the utilization of two separate research techniques in order to discover people's experiences with places.

The experience with an environment is a complex network of related aspects. ENVIDES helps disentangle and find a structure in that experiential network since it allows discovering the occurrence, immediacy, intensity, and importance of the experiences found in a place and the correlations between those experiences. Future research with ENVIDES will be oriented to discover the experiential networks that other places may generate.

The personal importance ratings given to the experiences with the place were found noticeably distinct from the ratings of intensity and immediacy. Therefore, the nature of the experiences that people consider of high personal importance should be studied further.

The results obtained through the ENVIDES may allow architects to expand their understanding of how the environmental and architectural elements of a place generate particular experiences in people and how these experiences relate to each other. The positive and the negative aspects of a place, and the qualities or elements related to them, are easily pinpointed; there resides the practical use of the descriptions and data obtained through the survey. Applying this technique in successful and unsuccessful existing spaces, or before and after performing an architectural or landscape intervention, would be illuminating and serve as an input for creating places that generate positive experiences in human beings.

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Questioning a grid-planned settlement structure at ancient Larisa (Buruncuk)

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Abstract

Following the excavations at the beginning of the 20th century, recent architectural survey at the ancient city of Larisa (Buruncuk) has re-drawn the layout of the site, especially beyond the acropolis. The remains of the ancient city are spread over the two hills of the Buruncuk ridge: "Larisa East" is the higher hill with a strong fortress on the hilltop and a modest-size settlement below; "Larisa West" represents the acropolis furnished with monumental buildings, along with an extensive necropolis and urban areas. Besides, the lower area between the two hills is included to the city, offering agricultural facilities. Although the 20th century research was concentrated mostly on the acropolis, a few trial trenches were dug in the urban area of Larisa West. The revealed wall fragments led the archaeologists to suggest a grid-planned layout, which was widespread in the ancient Greek cities of 5th and 4th centuries BCE. As part of the ongoing survey this suggestion has been reviewed, and the urban area has been analyzed in detail considering the different architectural characteristics of the wall fragments and the topography. The existing data at Larisa is not enough to confirm the existence of a grid layout. However, the repeated orientations of the walls, a possible road line and the layout of some terrace walls allow to discuss a certain regularity and re-evaluate the urban features of Larisa with its unique context.

Keywords
Aeolis, Ancient cities, Ancient urban planning, Grid, Larisa.

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1. Introduction

Larisa (Buruncuk) is an ancient city located on the fertile valley of River Hermos, to the north of modern İzmir. Archaeological finds indicate that the earliest settlement at Larisa dates back to the Neolithic period, and the earliest architectural finds are from the Bronze Age. However visible remains are predominantly from the timespan between 6th and 4th centuries BCE, which shows that Larisa was an operating city in the late Archaic and Classical periods, most probably under Persian rule. No subsequent layers exist after the beginning of the 3rd century BCE, and thus surveys carried out at the site clearly give results for an Aeolian settlement of 6-4th centuries BCE.

The first archaeological studies at site was realized as a joint expedition of Swedish and German archaeologists in 1902, which was followed by three campaigns in 1932, 1933 and 1934[1]. The publication entitled *Larisa am Hermos* in three volumes, respectively on architecture, architectural terracottas and small finds, covers the results of the research[2]. Due to the tight schedule of the archaeologists, the excavations were only restricted to the acropolis, and supported with minor soundings in the necropolis. No other studies or excavations had been carried out until 2010. From 2010 onwards, an architectural survey conducted by Prof. Turgut Saner has been proceeding with a team from Istanbul Technical University[3]. The survey is not supported by excavations, but focuses on the visible architectural remains spread on the Buruncuk ridge and on the topographical characteristics of the site. As an addition to the *Larisa am Hermos* publication, it aims to complete a detailed architectural documentation and to investigate the areas beyond the acropolis, hence reveal the settlement expansion with its diverse components. One of the research questions put forward by the 20th century archaeologists, is the suggestion of a grid-planned settlement structure. The grid plan is a spatial form, long debated with its origin and diffusion along with its advantages versus disadvantages. In this paper, departing from the recently updated documentation, the possibility of an orthogonal layout at Larisa will be discussed in comparison with the ancient Greek poleis.

2. The settlement layout of Larisa

Larisa is situated in the ancient region of Aeolis, on the Buruncuk ridge (north of Menemen) projecting from ancient Mount Sardene (Dumanlı Dağ) and overlooks the large Hermos (Gediz) valley (Figure 1). The location is strategic and covers the necessities of an ancient city quite well: the mountainous backdrop secures the site, the plain offers a variety of agricultural products, and River Hermos (today running 580m south of Buruncuk) provides well-watered areas for agriculture and grazing, as well as facilitating the communication in east-west direction. Larisa is connected to inland Lydia via Menemen gorge in the east, and around 20km to the west is the Aegean Sea. Hermos plain also offers natural passages on the north to Kyme (today Aliağa) and on the south to old Smyrna. As the most recent study by Kayan and Öner shows, the coastline never reached the outskirts of Buruncuk neither in the Bronze Age, nor in the Classical period (2016, 26).

Larisa was an inland city settled on and around the two hills of the Buruncuk ridge (Figure 2). The higher hill on the east, "Larisa East", is dominated by a monumental fort. The south-eastern slopes of the hill are naturally terraced and are suitable for the habitation units. A settlement area was organized on three main terraces and the dwell-

Figure 1. *Buruncuk ridge on Hermos Plain, view from south.*

Figure 2. *Greater settlement plan of Larisa (Buruncuk).*

ings were mostly organized around the large rocks. Contrasting the strength of the fort, the settlement area is of modest size and there are neither monumental buildings, nor a precise structured boundary. The rock cliffs shape the boundary of the settlement area. On the other hand, the lower hill on the west, "Larisa West", consists of an acropolis, settlement areas on its northern and southern slopes, and an extensive necropolis on north-eastern and eastern slopes. The acropolis is fortified with monumental defensive walls, and reserved for rulers as evident with palaces, a temple, and various representative buildings. The gentle southern slopes of the hill offer efficient areas to enlarge the habitation and the city walls around it indicate a secured urban area immediately neighbouring the acropolis (Figure 3). In contrast, the northern slopes are quite steep and do not allow a dense expansion. The recent survey here unveiled traces of a theater building, and thus it is added to the urban entity. The large necropolis extends from the northeast of the acropolis along the ridge of the old Buruncuk village, and reaches as far as the agricultural area. The grave units are mostly tumuli with ring-walls varying in diameters of 3-7m. Above the abandoned Buruncuk village there also exist monumental tumuli with diameters of 11-14m, replaced by windmills most probably in 19th-20th century (Saner&Külekçi, 2017). A fifth monumental tumulus is on the same line, but larger than the wind-mill tumuli and in a stepped form. The largest one is "Great Tumulus" situated on the south-eastern extension of the necropolis. With its diameter of 54,6m (200 ancient feet) it addresses the Hermos River and extra-urban posts. The area between the two hills is defined as an agricultural area, following the ancient cultivation terraces and buildings for agriculture. Briefly, the greater settlement concept is evident with a ruling area as an administrative centre and related urban areas on the west, and a stronghold with a smaller settlement area on the east. Larisa West and Larisa East are connected by the necropolis and the agricultural area. According to the urban constellation, the eastern settlement is considered as an "outer town". The architectural characteristics allow an interpretation for the two settlement areas used by residents from different social groups. The western residents were in more direct relation with the palatial area, whereas the eastern residents were neighbouring the agricultural area and must have been engaged for the greater urban operation.

Spread over the traces of the Neolithic period, the early "Greek" layers of Larisa are dated from 7th-6th century BCE. The area around the temple represents the nucleus of the settlement. Fragments of Aeolic capitals, wall bases, wall profiles and architectural terracottas reveal the prosperity of the city in the Archaic period. The stoa and the Old Palace are also among the constructions of this period. However, two major architectural phases

dominate the site. The first one is the early 5th century BCE, when the monumental acropolis walls and Megaron were erected. The structures of the Archaic and late Archaic period can be identified with Lesbian masonry, for which the blocks with curved edges are the primary indicator. The other phase is the restoration of 4th century BCE, differentiated with rectangular blocks. In this period the acropolis was extended to the south and east, New Palace was constructed on the acropolis, Outer Ward was arranged on the east of the acropolis, and finally the outer fortification line and the North Wall represent the military investment. Following the architectural details, it is obvious that Larisa East and Larisa West were furnished together in both periods. This helps us to conceive the overall settlement as a large entity with multiple elements.

3. Southern urban area of Larisa West

The southern urban area, which is the actual focus of this paper, extends downwards from the southern course of the acropolis walls. Topographical changes designate the expansion of the urban area and city walls of around 1km long trace the boundary of the area. 69 wall fragments have been documented in the southern urban area which show different architectural characteristics.

From the southern course of the acropolis walls at +98m to +80m, the topography displays mild slopes (with a slope changing between 8-15%) and offers quasi plain areas for settlement (Figure 4). The wall remains are mostly concentrated on this "upper part" near the acropolis. This part is naturally terraced around +85-90m, smoothening the slope. Around +80m the rocky formations become dense in all directions and point out a larger difference in the topography. On the east it marks the eastern city walls, and to the south this drastic change divides the urban area in different parts. Because of the sudden 35% ascend of the slope the urban area below +80m can be called the "lower part", and it blocks the visual connection with the acropolis and the "upper part" (Figure 5). The south-eastern corner of the area is interrupted by a stone quarry, which obstructs the survey works and the original tracking of the city walls. This area was also used as a stone quarry in the ancient peri-

Figure 3. *Acropolis with southern and northern urban areas, drone photography by Sinan Kolay.*

Figure 4. *Wall remains in the trial trenches at the "upper part".*

Figure 5. *Wall remains on the steeper "lower part".*

ods, as documented by the traces referring to stone extraction processes. The "lower part" extends until +45m, where a small fragment of the city walls is evident. Most of the wall fragments on the lower part are terrace walls running parallel to the topographical contour lines. Generally the topography slopes downwards to the southeast and southwest and the contour lines lay almost perpendicular to each other. This feature must have been advantageous to indwell an ordered urban layout.

20th century research at Larisa focused mostly on the acropolis, and the palatial buildings have been unveiled. The excavations in the urban area were limited to some trial trenches and the wall remains were only demonstrated on the general plan of the city in small scale. The trial trenches roughly cover 1ha area on the "upper part". Among the wall remains only two are described relatively in more detail. A dating for the two walls is offered as well: one is dated to 480/70 BCE according to a sima fragment, and the other to the 4th century BCE, following the rectangular shape and constructional details of its blocks. Therefore it is possible to mention that the urban area was furnished together within the major construction activities at the acropolis. Following the two dominant orientations of the walls, perpendicular to each other, the researchers expected an orthogonal layout (Boehlau&Schefold, 1940, p.107). Although the street network and the orientation of each wall could not be revealed, the grid plan, known also as the "Hippodamic" plan, was a trending practice for poleis in the 5th and 4th centuries BCE and such an impression led the researchers to suggest a similar system.

As part of the ongoing survey the wall remains in the southern urban area have been documented concerning their position and constructional features drawing the stone plans in detail. Having an architectural perspective, the archaeological finds have not been reported, but a few in the close vicinity to the walls have been photographed. The archaeological finds include fragments of terracotta tiles, wall claddings, mortars and Olynthus mills[4]. These finds also confirm a residential pattern and the household activities. Among the 69 documented wall fragments, 21 are situated in the trial trenches and 48 on the ground (Figure 6). 6 of them are classified as part of the city walls.

The orientation of the walls follows basically the topographical contour lines, namely northeast-southwest on the eastern part of the area and northwest-southeast on the western part. The walls in the trial trenches approach each other in perpendicular angles, and have minor differences in orientation. Accordingly, the northwest-southeast orientation is around 39-43°, the northeast-southwest orientation is around 42-58°. The walls outside the trenches repeat approximately the main orientations, which are also coherent with the topography. The walls have been catalogued following the location in the urban area, the dimensions of the blocks and masonry details. Thus they could be classified as terrace walls, walls of monumental architecture and standard walls for dwellings. The terrace walls generally mark a topographical change and are made of larger blocks. They can be examplified with the long D36 on the east, D48-49

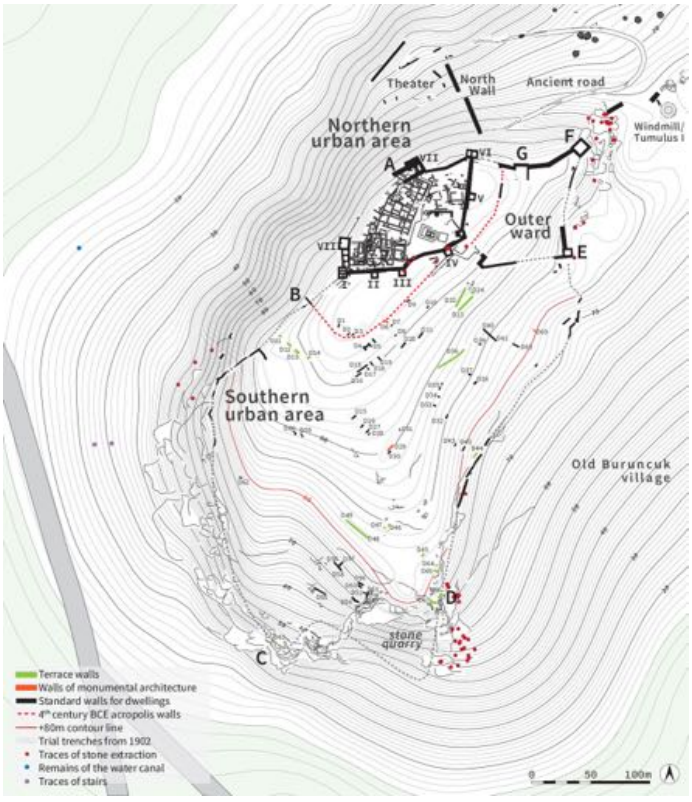

Figure 6. *Plan of Larisa West.*

remarking the +80m between the upper and the lower part, D54-55 attached to large rocks on the lower part, D64-67 making bastion-like intersections close to the city walls on the southeastern corner of the upper part. On the other hand D22-24 on the north do not underline a change in the topography, but the thickness of the blocks exceeds 1m. A similar line can be found on D11-14 perpendicular to the western city walls. Although most of the walls are only preserved with one single shell, it is possible to estimate that the thickness of the terrace walls exceeded 75cm, or even 1m in some cases. Only three of the wall fragments seem to belong to examples of monumental architecture, with their fine masonry and clean cut blocks. D6 in the north and D29 in the southernmost trench are the two wall fragments which drew the attention of the archaeologists. The sima fragment revealed nearby D6 has been dated to 480/70, and D29 had similar features with 4th century BCE constructions. During the survey only the outer shells of these walls could be documented, however the drawings in the 1940 dated publication also show that their thickness were around 1m. In addition to the above mentioned examples, D69 is another fragment on the Northeast, recognized with its two long blocks. The blocks are embedded in the ground, so the masonry and the surface of the blocks cannot be evaluated. The walls which do not present a certain characteristic are classified as standard walls for dwellings. The wall thickness varies between 45-73cm, and a uniform dimension cannot be observed, even intersecting walls may have different thicknesses in some examples (D4). The most coherent remains are situated in one trial trench on the south, the four parallel walls there (D25-28) are 56-57cm thick. The walls in the lower part are around 70cm, which is possibly due to the increasing slope.

In addition, the wall masonry has been documented for the walls exhibiting an elevation. At 11 wall fragments Lesbian masonry has been detected, and this leads to an interpretation that they are similar to the 5th century BCE constructions. Without archaeological finds, it is not possible to set a secure date for the buildings. However, the repeating of a similar construction technique in the urban area verifies its occupation from the 5th century BCE.

The scattered wall remains with varying characteristics show that the urban area was developed by improving the partially plain southern slopes, and reinforcing the rocky areas as part of the city walls. The +80m altitude appears as a natural partition, whereas the lines at +94m (D11-14 and D22-24) indicate an artificial track within the urban arrangement. In this context, the southern urban area is coherently organized with the topography, including private and public buildings in a defined boundary.

4. The grid plan

The grid system is a continuously used spatial form in various fields including urban planning, architecture and industrial design. Although the discussion about its origin and its idealization has been abandoned to avoid the diffusionist point of view, it challenges the given symbolic value of an egalitarian "universal democratic ethos" (Rose-Redwood, 2008, p.51). Thus from the 3rd millennium BCE until modern times the grid has been applied to a variety of urban areas. Among the first examples of the grid plan, settlements in Egypt, Mesopotamia and Minoan palaces can be cited, and Kahun, a village founded in 1897-1879 BCE to shelter the workers of the pyramids and some areas in Tell-el-Amarna in 1396-1354 BCE have a special emphasis with their well-organized plans (Castagnoli, 1971, 56-57). This range also brings along distinguished forms in later periods, such as closed and open gridiron differentiated related to pre-capitalist city and capitalist urbanism (Marcuse, 1987, 290-291)[5]. Interpreting the urban plan in relation to the political and social circumstances is frequent and logical when the attempt of creating a higher order and controlling a population in a regularly designed system becomes easier. Yet for the ancient Greek cities, especially the Ionian cities, the grid plan symbolizes egalitarianism and the idealized democracy at first glance (Hoepfner&Schwander, 1986, p.248). By the Archaic period, the concept of the polis started to gain value and its dual aspect, as concrete city and as social communi-

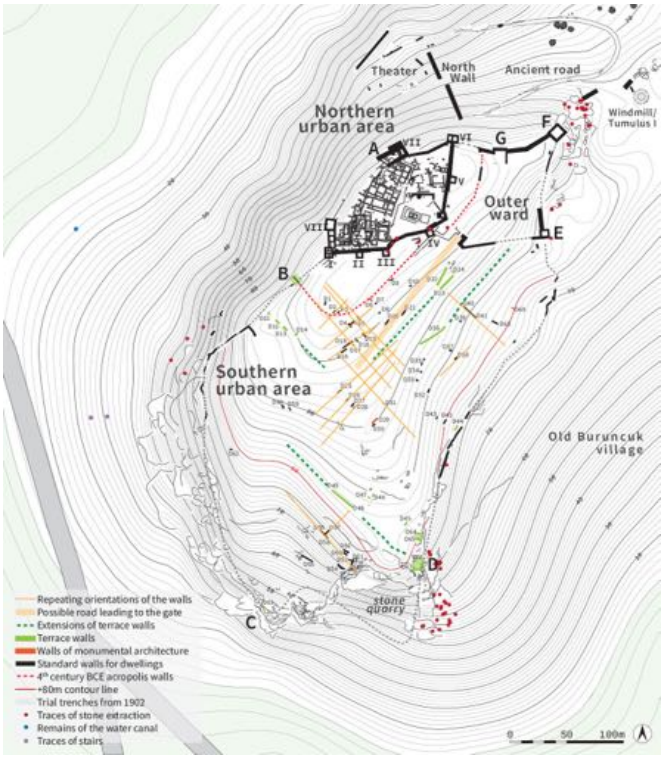

Figure 7. *Plan of Larisa West, highlighted with the architectural remains referring to a grid layout.*

ty was shaped around philosophical and moral ideals (Cahill, 2001, 2). In order to regulate and equalize the property of the citizens, especially Phaleas of Chalcedon, Aristotle and Plato discuss the economic, social and political motives (Cahill, 2001, 7-8). Following the archaeologically confirmed examples, the equal divisioning was better applicable in newly founded cities, such as colonies or re-founded cities after having been totally ruined.

The orthogonal plan is defined with rectangular insulae, repeating orientations of the walls, and uniform housing blocks divided by main and subsidiary arteries (Castagnoli, 1971, 56). The grid plan became widespread in the Classical Greek period and is labelled as "Hippodamic", however it has long been clarified that Hippodamos of Miletos was not the founder of this system, but the one who "invented the division of cities" (Burns, 1976, 414-425). The long history of the orthogonal city plans goes back to the 3rd millenium BCE in early Babylonia, Egypt and Mesopotamia, and to the Bronze Age in Thermi, Troy and the Minoan palaces (Castagnoli, 1971, 56; Stanislawski, 1946, 107-108). As for the Archaic Greek cities, it is widely used in western lands, especially in southern Italy. These cities, founded as colonies on unoccupied fields, were laid out after establishing the main axes between the city and the outer agricultural areas. Before the division of the city area, the agricultural lands were aimed to be divided in regular geometrical pieces and the roads leading to the chora were built beforehand (Mertens&Greco, 1996, 248-252). This system is called per strigas and was developed in order to allocate the land as efficiently as possible. Therefore, the grid plan cannot be generalized as a system repeating an older layout or a knowledge, but an independent installation (Castagnoli, 1971, pp.10-12). For the ancient Greek cities in western Anatolia, too, in the Archaic period the orthogonal insulae are found in Miletos and old Smyrna. Instead of the well-known "Hippodamic" plan dating to 478 BCE, the grid in Miletos is attributed to Milesian Thales from 575-550 BCE, and old Smyrna is recognised as the oldest grid-planned city dating to the 7th century BCE (Her¬da, 2019, 97; Akurgal, 1997, 40). Stanislawski argues that the diffusion of such planning in the Classical Greek period was a result of the power of the tyrants and the expanded trade through eastern cities, since it eases a centralized control to found a brand new city, and the knowledge of the grid was available from the East (1946, 114-115). However, regarding the historical record and the applications, a direct influence or an overall inspiration cannot be imagined. On the other hand, the physical advantages of the grid logically fit the urban requirements for this period. The equal distribution of the property avoids inner strife; the facility of determining main axes helps to sketch and then furnish the land more rapidly; the given space can be used more efficiently; and a controlled urban area can also be better defended under a military attack. The grid plans following the 5th century BCE examples of Pireus, Rhodes and Miletos are much more evolved in the 4th century BCE, such as in Priene, Halikarnassos and Knidos. This later period of extensive urbanism after the turbulent years of Greco-Persian wars is known as the Ionian Rennaissance and it includes a cultural shift. The attempt of an ur-

ban monumentalization was achieved through orthogonal planned settlement areas and large terraces (Pedersen, 2003, p.112; Pedersen, 2011, p.380).

The given data at Larisa is not enough toThe given data at Larisa is not enough to prove the existence of a grid layout. Furthermore, the Old Palace and the New Palace show that the city was ruled with tyranny in the Archaic period and the 4th century BCE, in contrast to well-known grid planned cities Pireus, Miletos or Rhodes. However, with a detailed architectural analysis, some features support a possible grid system in several parts of the southern urban area. These are the repeated orientations of the walls, the possible road line directed to a gate and the layout of the southern course of the 4th century BCE acropolis walls and the terrace walls in the "upper part" (Figure 7).

The two main perpendicular orientations of the walls revealed in the trial trenches are partially supported by other walls documented within the survey. The walls in the trial trenches exhibit a more coherent layout, although not too rigid. The walls in the "lower area" (D54, D56, D58, D63) and another fragment on the northeast (D40-41) repeat closely the main orientation of northwest-southeast. The main topographical contour lines in the area are also almost perpendicular to each other, preventing a certain assumption. The majority of the walls follow the topography; this is why it is confusing to interpret them as being dependant on the topography or on an overall orthogonality.

Another requirement for determining the existence of the grid is a defined road network. A direct identification for Larisa is missing, yet there exist two wall fragments, the directions of which match with the gate of the Outer Ward. As part of the 4th century BCE arrangements, this gate is the only opening connected to the southern urban area. The eastern extensions of D20 and D21 on the north reach the gate and give the impression of a directed way. These walls differ from the rest of the walls with their thickness around 77cm and their orientation is similar with around 13 other wall fragments. The large blocks exceeding 60cm are only seen among terrace walls, however the location of D20 and D21 defines neither a sloping area, nor a possible boundary, since its western extensions pass between two trial trenches, which reveal an occupied housing area.

The main orientations are also in accordance with the southern course of the 4th century BCE acropolis walls. Even though the southern course cannot be entirely followed, the western and eastern ends, attached to the city walls and the gate of the Outer Ward, are visible. The walls D11-14 and D22-24 which are classified as terrace walls identifying an artificial boundary have the exact same orientation and are offset to 37m (125 ancient feet) south from the southern course of the 4th century BCE acropolis walls. The Lesbian masonry identified at D22 and D23 refers to the 5th century BCE constructions at Larisa, hence these fragments might point out an earlier set arranged within the urban layout. Further 9 wall remains also exemplify Lesbian masonry. They can be found both on the south and north of this set (the possible track of D11-14 and D22-24). Regarding their regular orientations, it is plausible to imagine an orthogonal layout in the 5th century BCE. Besides, with the securely dated monumental wall fragment (D6) to 478 BCE a significant building close to the acropolis is added to this layout. Therefore, the dating of the grid system, if there is one, must have been related to the 5th century BCE. The identification of the 4th century BCE constructions, evident with rectangular blocks at the fortifications and buildings at the acropolis, cannot be realized due to the condition of the walls mostly embedded in the ground and the question of its regular usage for housing walls. However the 20th century research has resulted that the other monumental wall D29 might date to 4th century BCE (Boehlau&Schefold, 1940, p.107-108). Consequently the southern urban area was built up in both centuries in accordance with the major construction activities, and a moderate number of population was resided close to the acropolis.

The area between the early 5th century BCE acropolis walls and the city walls covers around 8,3 ha, which is approximately 10 times bigger than the acropolis area. After the enlargement of the

acropolis and the insertion of the Outer Ward in the 4th century BCE, the fortified settlement must have been diminished to 7,2 ha. As part of the 4th century BCE fortifications the North Wall was constructed on the northern slopes of the acropolis and the most recent revelation of the survey is the remains of theatre immediately on the west of the North Wall. This area can be considered as a northern urban area bearing the theatre as a monumental assembling area. The steep topography does not allow a dense settlement and must have been developed secondarily compared to the wide mild slopes on the south. The examination of the theatre is still in process. No other wall fragments have been documented on the west of the theatre, and the entire usage of the area remains obscure. Another arrangement of the 4th century BCE is the outer fortification line on the east of the acropolis, following the ridge over the abandoned Buruncuk village. This line ends with the large rocks on the east, yet its connection to the city walls is unknown. The area of the old Buruncuk village has the potential of having been used as another settlement area, although there is no data to support this theory. The only remain immediately south of the windmill/tumuli 2 and 3 is a large building of about 33x43m, and in the preliminary evaluation it is considered as a military building. All in all the southern and northern urban areas of Larisa covers around 9ha in total, and the unclear area of the old Buruncuk village cannot be included to the settlement expansion. With this capacity Larisa is a modest small-sized city. The well-known cities with a grid-plan are much larger: Miletos covers 100ha, Priene 28ha, Neandria 35ha and Burgaz 20ha. The dimensions of the area are not seen as a precondition for such an organization, and at Larisa the orthogonality could have been established as an attempt for monumentalization. Around 100 housing units can be fitted into the southern urban area, if the whole was made use of. The terrace walls may point to the boundaries of hypothetic insulae. The area between the southern acropolis walls and +92-94m where the terrace walls D11-13 and D22-24 are situated can be imagined as a more monumental area due to its proximity to the acropolis. Through southeast D36 smoothly steps the topography at +88-90m, and to the south D48-49 highlights the topographical difference between the upper and lower areas. The mentioned walls might refer to the outer limits of the insulae. Having minor differences in orientations, a potential grid at Larisa can be compared to old Smyrna and Burgaz, which allow minor differences in the orientations of the walls. In Larisa in order to provide access to the area the dimensions of the insulae should have been smaller as well, compared to Miletos or Priene. On the other hand, the larger dimensions of the insulae in Neandria and Klazomenai also show that the dimensions of the insulae might not point out a proportional relation with the size of the settlement.

5. Concluding remarks

There is very little knowledge about the methods of organization and the urbanization process of ancient cities. A city is primarily built for the citizens and early Greek planners must have tailored the physical environment to fit the needs of the community (Cahill, 2001, p.22). The idealization of the grid derives from the equal distribution of property, however regarding the archaeological evidence, ancient theoretical discussions go beyond the practice and it might be misleading to attribute the practice a pure symbolic value ignoring the environmental, social and political aspects.

The study of the southern urban area of Larisa demonstrates that the topography played a major role in the urban design. Firstly, the boundaries, then the inner terrace walls follow the topography, and the orientations of almost all the wall remains are laid out coherently with the natural contour lines. The rigid orthogonality neglegting the topographical conditions (as seen in Priene) cannot be found at Larisa. Although the density of the settlement cannot be exposed, right-angled insulae can be imagined in limited areas with several building groups on the “upper part” of the area. Besides, despite the steepness of the southernmost slopes, the remains documented on the “lower part” show

that the housing units reached the southern boundaries and the site was intensely used. In addition, the overall urban arrangement gives the impression of a regularity, since the area was organized properly and fits the topography. The terrace walls control the sloping areas and support a part of the settlement or the building complex they belong to, or divide the area in different parts.

Another characteristic of Larisa is its urban area directly attached to the acropolis from the same altitude. In the well-known grid planned cities, such as Miletos, Pireus and Priene, the acropolis is away from the city area and all the public and sacred buildings are situated within the same grid. On the contrary, at Larisa the neighbouring acropolis includes the temple and palaces along with many other prestigious buildings. In this context Larisa is more comparable to cities such as Neandria, Pergamon or Kolophon, which extend below an acropolis[6]. It also allows for another discussion relating to the Bronze Age model consisting of defined upper and lower towns, with a special emphasis on central power.

From a larger scale, Larisa West represents the domestic district of the urban elite, having a large necropolis on the north and the east, and supported by the settlement area at Larisa East. Spread on two hills this constellation draws attention and remarks the settlement expansion with an outer control. Following the different architectural characteristics of the habitation areas with their neighbouring functions, the orthogonal layout of Larisa West might be evaluated as an attempt for monumentalization with a special care for the urban landscape.

Regarding the diverse examples of Western Anatolian city-states, it is almost impossible to ask for a general description of a settlement type. Since the settlement areas are less preserved compared to the monumental buildings, the survey of smaller cities is lacking of dwellings' layout and comparisons with larger settlements might be misleading. Each individual case is of utmost importance in unveiling the tendencies of urban dynamics. In this context, with regards to the extent of the construction activities, Larisa shows the ambitions of its rulers in architectural details on the acropolis. So, having this constructional care and significance, a similar attention would have also been paid to the urban furnishing. Larisa West is not large enough to house large numbers of insulae, however, the character of the surviving remains sufficiently indicates a well-organized planning for its population. Further archaeological investigation of this area may help to understand a modest sized settlement structure and reveal the inner urban relations with its unique context.

Endnotes

[1] For an overview of the history of research in Larisa, see Mater 2016, 41-60.

[2] Boehlau-Schefold 1940; Åkerström-Kjellberg 1940; Boehlau-Schefold 1942.

[3] The ITU survey started in 2010 with the permission of the Turkish Ministry of Culture and Tourism - General Directory of Cultural Assets and Museums; and with the financial support of ITU (Project numbers 37267 and 33992). Besides the fieldwork, research carried out by ITU graduate students help create a solid picture of Larisa: Research history of Larisa based on archival documents (G. Mater, 2013), stone pieces of architecture kept in Istanbul (M. Arseven, 2013) and Izmir museums (F. Öztürk, 2016), the architecture of the Northeast building (O. Yıldırım, 2018) and of the Propylon (E. Kapulu, 2018), and the agricultural area close to Larisa East (S. Kolay, 2020) have been completed as master's theses. Remains of ancient quarrying activities (G. Mater), the acropolis circuit (E. Denktaş), the so-called New Palace (D. Göçmen), the settlement structures (I. Külekçi), the "Athena Temple" (F. Öztürk), and the necropolis (O. Yıldırım) are currently being studied as doctoral theses.

[4] Olynthus mill is a hand mill, operated by means of a lever. Mostly the upper stone, rectangular or square in shape, is documented as an archaeological find, which is also the case in Larisa. For the functioning of this milling system, see Frankel 2003, 1-21.

[5] The closed grids define the complete areas enclosed by the city walls, whereas

the open grids are unlimited and foresee an expansion in many directions.

[6] Regarding the city plan, the acropoleis of Neandria, Pergamon and Kolophon neighbour the urban areas. However, they show different topographical and architectural characteristics, and an exact similarity with Larisa cannot be found. The major difference of Larisa is its smaller size, and the acropolis and the urban areas have been developed concurrently over the active periods.

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A landscape scenario development to enhance ecological integrity in landscape planning

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Abstract

In urban areas, land-use changes and urban form are often influenced by the compulsory demands of immediate population changes. With rapidly growing populations, cities often experience negative impacts on urban landscapes, such as in slums and during the growth of urban sprawl. However, the sustainability of cities can be managed by paying attention to the ecological integrity of both the built and natural environments. The present study aims to present a landscape scenario development to enhance ecological integrity in landscape planning via the patch-corridor-matrix model. The research deals with the Sariyer district of Istanbul and its immediate surroundings.

A detailed investigation of landscape structure and the function of the fundamental landscape components were defined via GIS applications, while landscape metrics of these components were interpreted through the FRAGSTATS program. The method of the study relies on a combination of ecological principles, policies, regulations, and the approach of the actors involved in urban planning and development processes.

The study enabled structuring a cultural and ecological landscape planning strategy, and the results point out how to define the valuable landscape components that should be protected during urban growth development. Eventually, the research enriches the classical methods of understanding landscape patterns under urban pressure and presents a method to develop an ecological landscape planning strategy to be integrated with a variety of urban growth and land use – land cover change studies.

Keywords

Landscape ecology, Urban growth, Ecological integrity, Landscape change, Scenario development.

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1. Introduction

Maintaining ecological integrity in urban landscapes is an imperative goal for urban resilience and sustainability. When Aldo Leopold first mentioned integrity in his essay on land ethics, he described the notion as "A thing is right when it tends to preserve the integrity, stability, and beauty of the biotic community." This description was further elaborated on by Kay et.al., (1999): "If a system can maintain its organization in the face of changing environmental conditions, it is then said to have integrity." Noss (2003) saw ecological integrity as an umbrella concept embracing all that is good and right in ecosystems, however, it should be recognized that establishing the near-natural levels of biodiversity, naturalness, and ecological resilience of pristine wilderness areas is challenging in urban areas. Noss suggested developing gradients spanning from the standard landscape condition in the wilderness to the most degraded urban condition. Reducing fragmentation, maintaining naturalness, and improving adjacent land use compatibility with open space patches enhances the ecological integrity of urban open space patches (Noss, 2003; Esbah et al., 2009). The existence of ecological processes and minimum human influence ensures high integrity (Angermeier & Karr, 1994; Parrish et al., 2003). Generally, as human disturbance increases, ecological integrity decreases. Thus, ecological patterns, processes, and human impacts can be used as parameters to measure ecological integrity in urban landscapes.

Ecological integrity and sustainability is a challenging but imperative goal to improve the health of the built and natural environments for urban areas. Urban sustainability is a place-specific, evolutionary process, which seeks to provide a high quality of life that is democratic, socially equitable, sound and comprehensive, economically vibrant, biologically rich, ecologically functional, and aesthetically pleasing. As Ibes (2013) stated: "these concerns are related to the ecological concepts of carrying capacity (the ability to meet the needs of citizens and the environment), fitness (the suitability of the built environment to both human and nonhuman inhabitants), resilience (the ability of the urban ecosystem to resist or recover from disturbances), diversity (including the harmonious co-existence of human and nonhuman inhabitants in cities), and balance (between the various needs and preferences of urban inhabitants and the natural environment)."

Environmentalism, and landscape planning are highly influenced by Ian McHarg's studies and practices. His Potomac River Basin Study was a clear example of the reciprocal relation between planning and natural landscape determinants. He devoted one chapter of "Design with Nature" (McHarg, 1969) to investigate the natural, sustainable environment in Barrier Island and revealed a holistic approach to elaborate multiple parameters in the landscape. Within his studies, he underlined the importance of conducting an "ecological inventory" to be able to read the biological, physical, and cultural landscapes and bridged the gap between decision-makers and scientists. Along with Ian McHarg, Phill Lewis is credited for the development of the natural resource inventory. Lewis's "environmental corridor" and "map overlay" approach promoted the landscape design process and guided planning efforts (Lewis, 1996).

With the lessons learned from these fundamental studies, this paper elaborates on the environmental parameters of the landscape and presents, by using the patch-corridor-matrix model, a landscape scenario development to guide the planning decisions to enhance ecological integrity.

The landscape planning, often referred to as environmentally responsive land use planning, is not new paradigm. Julius Fabos, one of the early advocates of this notion, proposed in his book published in 1979 illuminative strategies for planning the total landscape. He studied landscape planning in the metropolitan landscape and presented emerging system models (Fabos, 1979). Following his studies, the concept of landscape integration into planning has become a powerful strategy for increasing the quality of urban life and urban sustainability. In the last few decades, some new theories and practices have also emerged, such as Green Urbanism, Ecological Urbanism, New Urbanism,

Integral Urbanism, Critical Regionalism, Bioregionalism, Biophilic Urbanism, Smart Growth, and Landscape Urbanism. These are some of the theories and practices that have emerged to tackle contemporary urban problems in more inclusive ways by understanding the landscape with all of its dimensions (Erdem & Yildirim, 2014; Adhya et al., 2010).

It is the utmost responsibility of landscape architects to design urban environments that restore, maintain, and improve urban ecological integrity. A variety of methods are beign used to detect the changes in landscape patterns and inform possible environmental risks. Here, we elaborate on how landscape dynamics can be captured to understand the possible effects of land use scenarios on urban ecological integrity. In this study, we demonstrate the implementation of a landscape ecology-based approach, combined with the development strategies of policymakers and actors by utilizing the Patch-Corridor-Matrix model, in the town of Sariyer in Istanbul, Turkey. This model proposes a framework to understand the reciprocal relationships between the structure and functioning of this complex mosaic.

To analyze the landscape structure, one should observe the landscape as a whole and examine its composition, configuration, and change by looking at the shapes, sizes, numbers, locations of its components, and their role in the landscape function. These analyses guide the development of future landscape scenarios. In his *Upper San Pedro River Basin Project* (Steinitz et al., 2003), Carl Steinitz emphasized the role of developing alternative scenarios and concepts for the future and revealed the effects of various development policies on the landscape. His studies contributed significantly to the research field by developing a collaborative approach to landscape planning.

A well-structured scenario development involves four necessary steps: 1- Definition of scope and question to be addressed. 2- Perception analysis: Identifying primary actors and the perception, binding policies, actions, and decision-making power of primary actors. This step can be conducted in a workshop setting with relevant organizations or during interviews with the key administrators in the organization. Also, it should be supported by scrutinizing the policies and determining the degree of decision-making power. 3- Trend analysis: Explaining the underlying trends, critical driving forces, and their ranking based on their importance and potential impact, hence identifying a baseline condition. This step can involve analyzing master plans and future visions. 4- The "scenario building step" is an expert-led approach describing different future states of the world. The final step involves generating narratives. These narratives reflect different assumptions about various land-use policies and decisions as well as economic and regulatory conditions.

All these growth scenarios describe how the future may unfold, and they encourage users to think "beyond the conventional wisdom" (Bohunovsky et al., 2011; Jäger et al., 2008; Houet et al., 2016). Scenario development may rely on different aspects and intents. Scenario-based planning is neither for predicting the future nor developing a set of land-use recommendations; rather, it is for describing what is possible in the future (Xiang & Clarke, 2003). Exploring these alternative future scenarios can be a puzzling task while dealing with complex global challenges when working on geographic scales. Fisher et al. (2020) revealed a planning and design approach to bring a variety of disciplines together for collaboration and provided methods to explore alternative future scenarios around the world.

Scenarios can combine multiple disciplines and decision-makers while exploring the potential future consequences of land-use choices and policies. Therefore, the urban growth strategies of this study include not only the physical environmental components but also the socio-cultural actors, such as decision-makers, governmental institutions, and organizations.

2. Study area

The pilot model was developed for Sariyer, a rapidly growing town in Istanbul, Turkey. Sariyer is located at the entrance point to the northeastern areas of the European part of Istanbul

at the Black Sea end on the Bosporus strait (Figure 1). The town, covering an area of 151 km², is unique with its cultural landscapes, historical monuments, and fishing villages (Aksoy et al., 2017). Also, the town includes some high-quality natural landscapes. Sariyer contains the majority of the northern forests of Istanbul and hosts important historical water resources in the city (Kaptanoğlu & Bilgi, 2019; Ayaslıgil, 2011).

The topography of the area determines microclimatic conditions and vegetation typologies in the landscape, which also results in ecologically rich valleys and plains. The town consists of many water reservoirs, dams, streams, wetlands, and riparian landscapes (Sarıyer Rehberi, 1998). The northern parts of the forest lands are under protection, and some parts are under natural park status.

Accessibility makes the town an attractive destination for both locals and visitors. In recent years, Sariyer has experienced dynamic urbanization and landscape changes. Especially after the establishment of the "Bosporus Bridge" in 1973 and the "Fatih Sultan Mehmet Bridge" in 1988, rapid transportation developments have pushed urban growth to the northern part of Istanbul, towards Sariyer. Yet, a third bridge was constructed in 2014. The increasing demand for land resources and urban development has put the town under pressure for urban growth and land-use change. Specifically, new projects such as the third bridge on Bosporus and a major northern highway connecting Anatolia and the Middle East with Europe will possibly affect a variety of ecosystem services in the town.

This new infrastructure will most likely act as a magnet for real estate development in the northern part of the city. Therefore, the promotion of sustainable land-use decisions over the next few years is vitally important to preserve Sariyer's, and eventually Istanbul's, ecological integrity under the increased urban pressure. Hence, the method applied here is representative not only of the whole city but also of many other fast-developing metropolitan areas around the world.

Figure 1. *Study Area (ArcGIS base map, 2020).*

3. Methodology

Materials of the study include satellite images, aerial photos, environmental plans, and development plans retrieved from Istanbul Metropolitan Municipality, Sariyer Municipality, and Space Research Center of Istanbul Technical University. Satellite images (2013 dated, SPOT 5) were used to produce a land-use classification map. 1/100,000 scaled Environmental Plan (2009) and 1/5,000 scaled Development Plan were used for the interpretation of regulations and execution of their spatial reflections on the urban landscape matrix.

As the first step of the study, a detailed literature review of relevant publications provided the theoretical background of the research (Figure 2). The rest of the study relies on the case study applied to Sariyer. Geographic Information Systems (GIS) and Remote Sensing Technology (ArcGIS 10.2, and ENVI) enabled landscape assessments, spatial analysis, and image processing to understand the landscape structure and function. The supervised classification method was used for the production and elaboration of the land-use classification map (2013) that made it possible to understand the spatial patterns of the landscape structure. Five classes from CORINE, namely, (1) artificial surfaces, (2) forest and semi-natural areas, (3) agricultural areas, (4) wetlands, and (5) water bodies constitute the land-use classes of the case study. Areas of each class were calculated by multiplying the pixel area of the main image and the pixel number of each class in the attribute table of

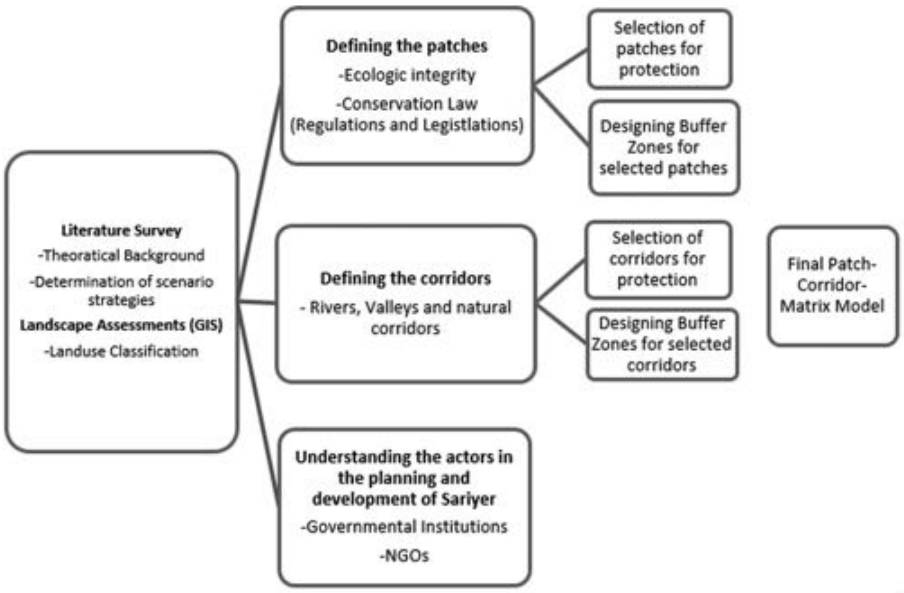

Figure 2. *Ecological Landscape Planning Scenario Development method.*

classification data. An area of 48,404.48 hectares was calculated in total, and Sariyer District covers 15,421.5 hectares of the study area.

In the second step of the methodology, landscape patches and corridors were revealed to understand the current condition of the landscape structure. Landscape ecology principles constitute the basis of this elaboration; therefore, the study adopted the following strategies to protect the landscape structure and function (Forman, 1995; Dramstat, 2006):

- Preservation of ecologically sensitive habitat patches.
- Protecting the corridors that provide opportunities for habitat and energy flow while strengthening the landscape connectivity.
- Providing the habitat with stepping stones to support wildlife in cities and contribute to connectivity.
- Proposing buffer areas around valuable patches and corridors to make these areas more efficient.

3.1. Determination of patches, corridors, and matrix of the landscape

Ecologic integrity and current regulations and legislation guided the determination of patches in the landscape mosaic while spatial analysis defined the rivers, valleys, and natural corridors. This process also guided the development of the ecological structure that is essential to maintain in the site. Landscape configuration and composition metrics decoded the patches and corridors in the landscape pattern.

Landscape patches are classified under five main classes (Dramstad, 1996). These are environmental patches, remnant patches, introduced patches, regenerated patches, and disturbance patches.

Linear landscape components that are isolated from their environments in the landscape matrix are classified as corridors. These corridors mostly contain ecologically rich valleys, stream beds, hedgerows, while roads and highways are also considered artificial corridors. The function of these corridors in the landscape matrix varies according to their location in the landscape composition. Similar to Dramstad's classification of corridor functions (2006), the corridor pattern revealed different functions in Sariyer. Ecological corridors are classified as habitats, canals, resources, and filters, while some roads function as a barrier or a swamp. This study categorized the corridors, based on their role in land-use patterns, as remnant corridors, regenerated corridors, vegetated corridors, disturbance corridors, and natural corridors (Odum & Barrett, 2008).

This study categorized the continuous vegetations (preferably native plants), especially between a natural system component and changing land

use, as a buffer area. The primary objective of these buffers is to protect valuable landscapes from their changing environment. Eventually, proposals are developed for buffers in the landscape structure of Sariyer.

3.2. Actors involved in the planning and development of Sariyer

The study employed environmental plans and strategic plans retrieved from Istanbul Metropolitan Municipality, and the statistical information and demographic data were provided by the Statistics Institution of Turkey (TUIK) to understand different actors involved in urban planning and their actions.

Two major groups of actors are involved in the planning process of Sariyer: local administrations (municipalities) and non-governmental organizations (NGOs). Each group was investigated considering relevant laws, regulations, and organizational structures. Also, current plans, reports of the Town council or executive committee meetings, and relevant media coverages were examined.

3.3. Utilizing landscape metrics to determine patches and corridors in the landscape

The composition and configuration are interpreted via the FRAGSTATS program (McGarigal & Marks, 1994). The program provided an opportunity to analyze the landscape components through metrics (Leitao, 2006). Class Area (CA) and Class Area Proportion (CAP) metrics were used to analyze landscape composition, and Patch Number (PN), Patch Area (PA), and SHAPE metrics were used to analyze the configuration of the landscape matrix.

Class Area Proportion

The Class Area Proportion (CAP) metric is the area proportion of a land-use class to the entire landscape. CAP is a composition metric that analyzes the class distribution and changes in their sizes instead of their locational distributions. This metric is capable of comparing different landscapes and revealing similarities and differences.

$$CAP_i = \frac{\sum_{j=1}^{n} a_{ij}}{A}$$

CAPi= i land-use class proportion to the total study area
aij=the area of j patch in i land-use class (m²).
A: Total landscape area (m²).
Value Range: 0<CAP≤ 1

Patch Number

The patch number (PN) metric represents the total number of patches in the whole landscape or in a specified land-use class. It solely deals with the spatial fragmentation of the landscape. When used in a historical data set, this metric can give information about fragmentation in the configuration of the landscape mosaic. Since this metric is related to the entire landscape, there is no value range limitation. The larger the landscape, the more likely it is that it has a higher number of patches. Therefore, applying this metric in different landscape sizes may be misleading.

Patch Area (PA)

Mean patch size is useful in understanding the landscape structure. The change in the mean patch size of each class represents the fragmentation through the years.

$$MPS = \frac{\sum_{j=1}^{n} a_{ij}}{ni}$$

MPS= Mean Patch Size

Patch Shape (SHAPE)

The shape metric measures the geometric complexity of a patch while revealing the spatial character of the patch and helping to understand the configuration of the landscape. This index is related to the maximum area and minimum perimeter. Therefore, it is related to compactness. If the value is 1.0, the patch reveals a more compact statue, which means it is resistant to fragmentation. On the other hand, complex,

$$\text{Patch Shape (SHAPE)} = \frac{Pij}{minPij}$$

$$\text{SHAPE\_MN(mean)} = \frac{\sum_{j=1}^{n} \frac{P\,ji}{min_{pji}}}{n_i}$$

Pij = ij Perimeter of Patch ij
MinPij = Minimum perimeter of patch ij according to the cell number at the edges
ni= number of patches in the i land-use class
Range Value: 1, unlimited

geometric shapes reveal values greater than 1.0. The shape metric is highly affected by adjacent land-use classes.

4. Results

4.1. Landscape assessments

Urban growth is inevitable in fast-growing cities like Istanbul. The land-use classification map (2013) shows that landscape resources are surrounded by urban areas, and new extensions of the transportation network divide critical landscape resources (forests and wetlands), which cause fragmentation in the future (Figure 3). Considering their role in landscape ecology, wetlands provide living spaces for birds and many other animals in and around the city. Therefore the pressure on wetlands may lead to a retrogressing landscape structure. Planning a tampon zone around these water resources and wetlands emerges as a landscape strategy in the study area.

Yet, urban landscapes are dynamic and complex organisms, and they should be analyzed in terms of not only configuration but also composition. Rapid urban growth such as breeding new centers or diffusive growth, as in Istanbul's case, may result in fragmentation or disturbance in the landscape structure in the future.

Subsequently, the land-use classification map shows that the forest area is more compact and not fragmented by urban development yet, the environmental patch size is larger, and the natural connections between the patches are viable (Table 1).

The existence of large natural areas and corridors favors recreation opportunities, indicates livability, and ensures urban ecological integrity. Moreover, wetlands provide great habitat for wildlife in the urban context, yet they should be protected from agricultural expansion.

The on-screen digitizing technique provided an accurate determination of rivers, water dams, lakes, and other water bodies.

4.1.1. Hydrology

The study area presents a valuable hydrology potential with its lakes, streams, and dams, which supports not only the vegetation cover and soil structure but also the wildlife in the surrounding landscape. The area hosts seven water dams, with an area of 36-38 ha (Avg.) and a height of 13.5-17 m (Avg.) (Ayaşlıgil, 2011; MHT, 2001). The hydrology analysis shows all water bodies and their relationship with surrounding land uses (Figure 4).

Alibey and Elmalı Dam are important water resources that provide clean water to the city. Also, a wide network of stream and river corridors (Alibeyköy Stream, Kağıthane Stream, and Göksu Streams) surrounds the

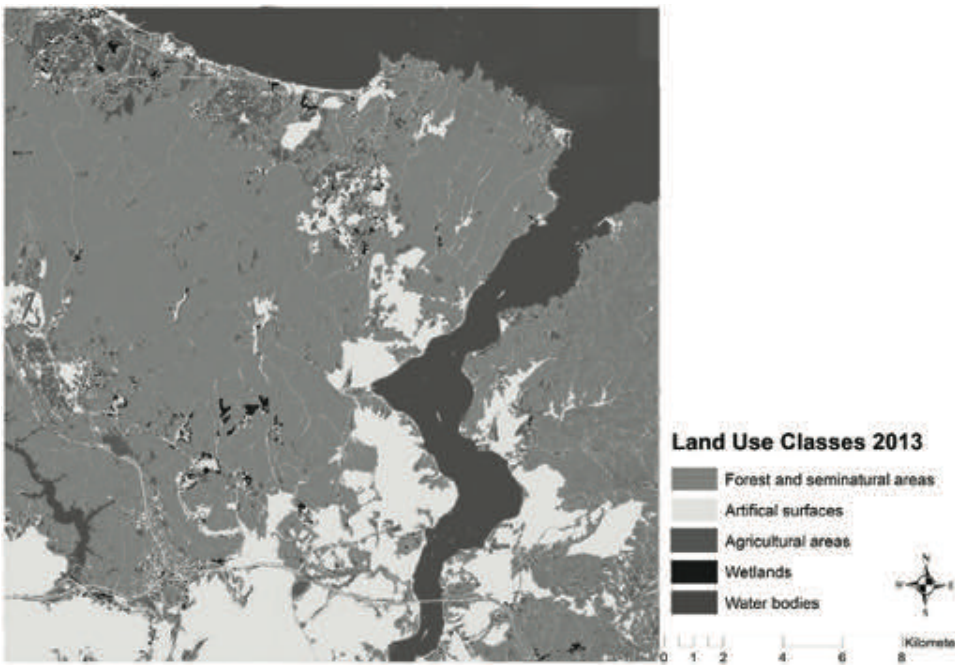

Figure 3. *Land Use Classification of Sariyer, Istanbul-2013 (Akyol, 2016).*

entire urban landscape (Figure 4). Considering its role in the landscape mosaic, this hydrological infrastructure creates habitat and constitutes ecological corridors, providing many interests for living environments.

Water bodies contribute significantly to urban biodiversity. They provide living spaces for shelter, nutrition, etc. for many species. Therefore, understanding the potentials and problems of landscape hydrology has a vital role in landscape function.

The hydrology network provides suitable habitat for the native flora and supports the wetland ecosystems in the surrounding landscape. This reciprocal relationship between water and biotic components is an indicator of a functioning landscape structure, which should be preserved against urban pressure.

4.1.2. Flora and fauna assessments and mapping

The topographic character of the study area is influential on climatic conditions and vegetation cover, and forest, maqui, and pseudo-maqui are three dominant plant formations in the area (Ayaşlıgil, 2011). Mixed forests generally host Castanea sp, Quercus sp, Ulmus sp., Carpinus sp., Tilia sp., Acacia sp., and Fraxinus sp. species (Çolak, 2013). Plant diversity in the area is a result of the existence of large water dams and forests. Belgrad Forest is the largest vegetation patch of the entire landscape. Quercus sp. covers 75% of all species in these mixed forests, while 25% of the plants include Fagus orientalis, Carpinus betulus, Castanea sativa, Alnus glutinosa, Populus tremula, Tilia tomentosa, Acer campestre, Acer pseudoplatanus, and Ulmus campestre (Yaltırık,1963).

These mixed forests provide opportunities for sequent vegetation, especially in the peri-urban parts of the landscape where the urban pressure is less obvious. *Hedera helix*, *Daphne pontica, Hypericum calycinum, Primula acualis, Latyrus hirsutus, Campanula percicifolia, Viola adorata,* and *Salvia forskahlei* are common plant species in these forests. *Hedera helix, Ruscus hirsus, Festuca arundinaceae, Carex slyvatica, Euphorbia amygdaloides, Geum urbanum,* and *Ajuga reptans* species generally spread themselves near damp and humid soils near *Acer campestre, Corylus avellana,* and *Ligustrum vulgare* trees or bushes (Tokuş, 2012).

The vegetation of the study area has an interconnected relationship with the fauna diversity. The study area provides living spaces for a very diverse fauna community including 14 mammal species, 16 bird species, 12 reptile species, and many butterfly species (OAP, 2002).

The landscape model in this study adopts not only the physical factors but also the social indicators of urban growth. Therefore, as a major decision-maker, Istanbul Metropolitan Municipality is considered an actor involved in urban growth. The study uses

Table 1. *Landuse classifications for 2013 and landscape metrics.*

Land use classes	CA (ha)	CAP	PN	PS (Mean)	SHAPE
Forest and Semi-natural Areas Forests, meadows, grasslands, and open green spaces in the urban and peri-urban	10.097	49%	101041	18.26	1.3189
Urban Area Settlements, commercial areas, quarries, roads, ports, and	23.760,5	21%	237499	4.32	1.1592
Agricultural Lands Vegetative production fields and	4.227,4	3%	42323	0.90	1.1552
Wetlands Marsh and wetlands	1.489,5	9%	15045	0.45	1.1779
Water Surfaces Bosporus strait, lakes, dams,	8.825,4	18%	88089	10.25	1.0396
Total Area	48.404,48				

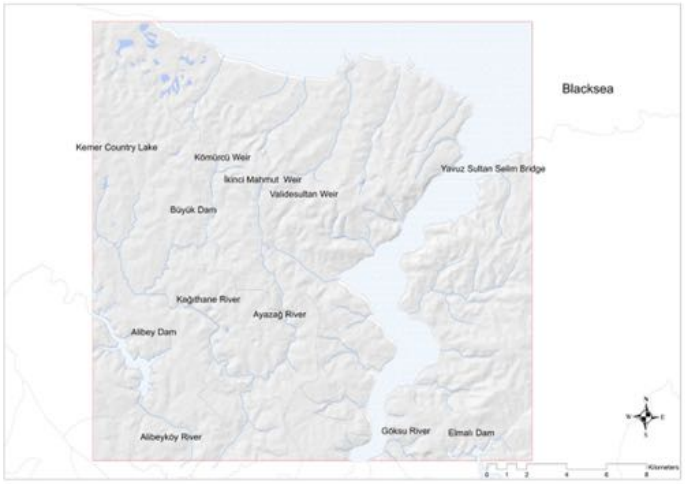

Figure 4. *Hydrology network of the study area.*

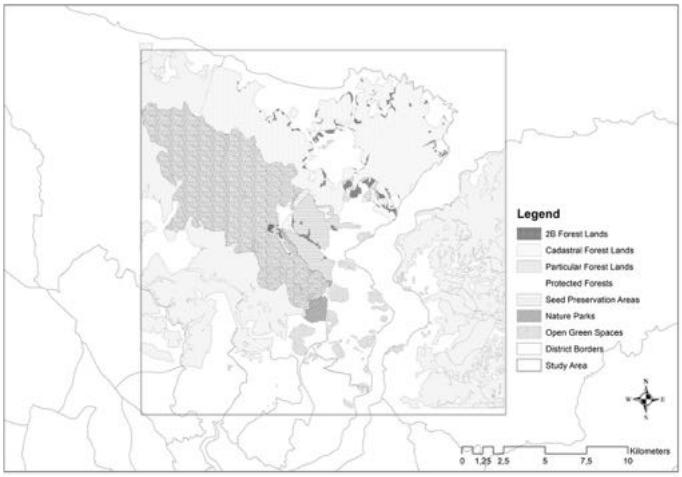

Figure 5. *Vegetation classes in the study area.*

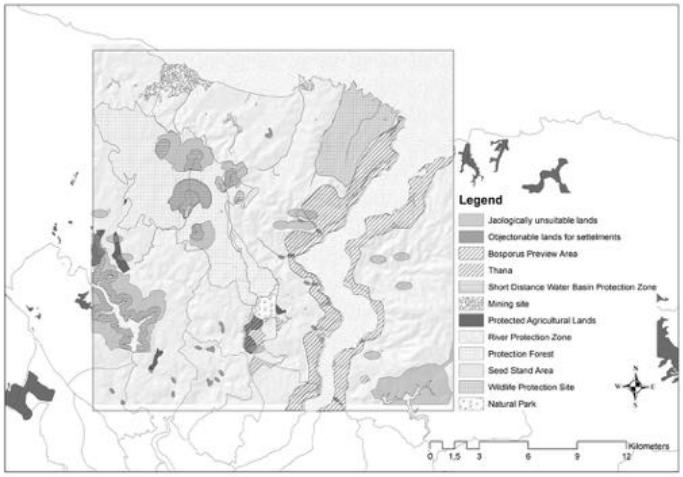

Figure 6. *The development restrictions by law.*

current legislation, regulations, and development plans as a base to develop a protection strategy.

4.2. Interconnected policies and regulations

The urban growth limitations and preservation decisions are made based on the following regulations and laws (Figure 6).

- ISKI-Drinking Water Basins Control and Protection Regulations, 1981 (water basin protection bends distances),
- 6831 numbered, Forest Law, 1956 (protected forests, wildlife improvement sites, seed stand sites, natural parks),
- TKB, Regulation related to Protection and Function of Agricultural Lands, 1991 (protected agricultural lands),
- 1983 dated, 2863 numbered, Protection of Cultural and Natural Assets Law (natural protected areas),
- 6301 numbered Bosporus Law (1/5000 scale Bosporus land use plan,1983)

Istanbul Metropolitan Municipality revised the land use plan with a preservation approach in 2004, and the Environmental Plan (1/100,000) issued in 2010 has put urban pressure over valuable water resources and forests in Sariyer.

Throughout history, the urban pattern on Bosporus Strait has been changed by different civilizations and cultures. Urbanization policies have been shaped by the urgent needs of citizens. Recent major projects, such as Yavuz Sultan Selim Bridge, Northern Highway, and Istanbul Airport have been discussed by a variety of NGOs and governmental agencies (Union of Chambers of Turkish Engineers and Architects Report) in Sariyer. Landscape resources have been trying to find value through economic priorities and demographic needs. This study aims to provide a holistic approach that values both nature and human requirements. Evaluation of landscape structure, function, and connectivity is critical to interpreting all these aspects with a holistic approach.

4.2.1. Actors involved in the development and planning of Sariyer

Municipality: Istanbul Metropolitan Municipality is the main institution that manages the collaboration between all municipalities in Istanbul at the metropolitan scale. The Municipality of Sariyer is a member of the Metropolitan Council and is the main planner agent making land-use decisions in the town. The Municipality of Sariyer is in charge of making 1/10,000, 1/5,000, and 1/1,000 scaled urban master plans, based on the 1/25,000 Environmental Plan, which was developed and approved by the Ministry of Environment and Urbanization. The Municipality has adopted Agenda 21, and thus, supports increasing quality of life and ecosystem services. Also, the municipality has re-established a new participatory management system (instead of the traditional hierarchical system). Therefore, a Town Council was established in 2007. The council consists of the mayor and the mayor's

representatives, representatives of the Metropolitan Council, provincial assembly members, public institutions, universities, neighborhood leaders, and representatives of political parties, professional associations, trade unions, associations, foundations, as well as women, retirees, youth, and neighborhood council representatives. Including all these shareholders, land-use decisions are taken through a participatory process. The Municipality of Sariyer is aware of the urban pressure on natural resources (forests, wetlands, water bodies, etc.); yet, the municipality encourages residential and commercial development close to these important ecological features to boost land values and hence maximize tax revenues. In the 1/25,000 Environmental Plan, most forests in Sariyer were dedicated as areas of absolute protection, as the northern forests were providing many ecosystem services to the larger city system. As these ecologically vital features are subject to in-situ protection, the larger landscape context is, most of the time, overlooked. Moreover, the decisions of the Metropolitan Council (with regards to planning the third bridge and a major transportation route passing through the northern forests) did not comply with the land-use strategies in the Environmental Plans, making the plans obsolete.

Non-Governmental Organizations: NGOs are voluntary, non-profit groups organized at a local, national, or international level. These groups mostly consist of voluntary citizens and individuals with similar intents and interests. Funding comes from membership fees, donations, and also from local municipalities based on the type of their projects. In the case of Sariyer, active non-profit organizations aim to protect the environmental quality of the northern forests, raise awareness, and organize various outdoor education activities to raise a voice against any irregular use of forests and natural resources. They value sustainability more in an ecological sense while opposing residential and commercial development trends taking place close to ecological features.

The physical constraints and the actions and attitudes of the main planning actors constructed a development approach for the future growth scenario. Considering all their actions, the patch–corridor–matrix model proposes protection of valuable landscape areas that are under threat.

4.3. Developing the Patch-Corridor-Matrix model

4.3.1. Determination and selection of patches via landscape metrics

The results of landscape assessments and analyses revealed four classifications of patches in the study area landscape mosaic. Environmental patches include forests, lakes, dams, and large water resources while remnant patches cover green spaces surrounded by urban areas, small urban parks, and open green spaces. Introduced patches include agricultural lands, plant nurseries, and fields in operation. Finally, disturbance patches include mining fields, vacant lots, and worksites in the landscape (Figure 7).

The assessments revealed 2,173 patches in the whole landscape mosaic (PN=2,173). Metrics provided minimum, maximum, mean, and standard deviation values. The patches that are larger than the mean size are selected for protection (Table 2). Also, previous cultural and demographic assessments shaped the preservation decisions.

Water bodies, vegetation clusters, or wetlands in the study area provide resources for many ecosystem services. Therefore, the ecological land-

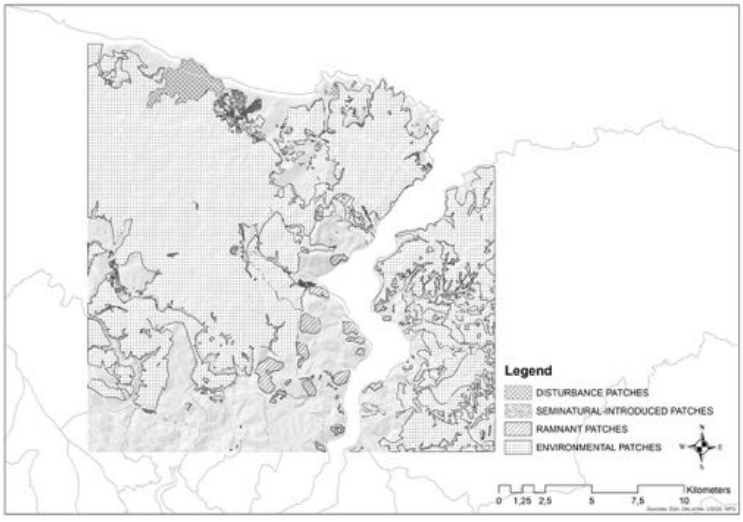

Figure 7. *Patches in the study area.*

scape scenario proposed 30m buffer zones surrounding these patches. These buffers avoid any threat from surrounding land uses while forbidding any urbanization in these zones.

There are 59 water patches in the landscape mosaic (Water PN=59), while Alibeyköy Dam, in the southeastern part of the area, is the largest one with an area of 284.2 ha (PA=284.2).

Results and interpretations revealed that agricultural lands, as introduced patches, also constitute an important component for the landscape function and structure in the study area. Especially the changes in the regulations (2B forest lands law) have enabled urbanization on these valuable productive landscapes, which also work as transition landscapes.

The PN metric revealed 1,754 agricultural land patches in the total landscape (Table 2). These agricultural lands cover 432.5 ha in total, with a mean area of 2,466.2 ha. The largest of these patches is located on the extensions of Alibeyköy Dam in the east. These agricultural patches are relatively distributed towards the coastal areas in the north and in the inner lands in the east. The lack of any productive land through the Bosporus Strait and in the urban context is apparent in the resulting maps. Due to the urban pressure on these sensitive ecological patches, 15m buffer zones are proposed (Fischer & Fischenich, 2000).

The results of landscape assessments and the land-use map show that the environmental patches (forest lands) constitute the dominant patch class, with 370 patches in the whole landscape mosaic. These environmental patches are intensely visible in the peripheries of urban areas, and they mostly host landscape resources such as lakes or rivers inside and create valuable habitats for many wildlife species and ecosystem services.

Only 14 of the patches are larger than the mean patch size (17.2 ha), and Belgrad Forest is the largest one with an area of 15,065 ha. The proposed landscape scenario protects these valuable environmental patches with a 100m buffer zone (Council, 2004), avoiding the neighboring urban pressure.

4.3.2. Ecological corridors

Landscape assessments and the land-use classification map show that valleys, rivers, and vegetated corridors, even under protection by law (300m protection band), are disturbed especially in the southern parts of the study area, where a fast urban growth occurs (Figure 8). However, valleys, rivers, and streams create wide corridors connecting major landscape resources and provide opportunities for energy, nutrition, and habitat flow in the landscape structure. Therefore, these landscape elements are considered the major ecological corridors in the landscape mosaic.

Table 2. *The metrics for landscape patches and corridors.*

METRICS	Environmental Patches	Introduced patches	Remnant Patches	Disturbance Patches	Rivers	Valleys	Stepping Stones
Min.AREA (ha)	83,9	0, 09	0,3	30	0,5	377	0,003
Max. Alan (ha)	15065	42,5	154	511	3,5	1322, 9	58
Total Area (ha)	25690	432,5	721	573	16, 5	2444, 7	236,8
Mean Area (ha)	17,42	0,2	15,6	191	0,3	814,9	2,4
Standard Deviation	3833	0,3	27	266	0,5	389,3	6,3

The mapping also reveals that in the suburbs, a natural vegetation cover surrounds the water bodies and creates a riparian corridor reaching up to urban areas. While entering the urban fabric, the natural riverbank transforms into a concrete canal, and it is rare to see vegetation around the water bodies.

The average length of the water network in the study area is 4,713 meters. The width and length of the rivers are larger and longer in the peripheries of the urban fabric. Therefore, the rivers in the northern part and the rivers that meet the Alibey Dam in the south are the longest and the most consistent corridors of the landscape structure, with the three largest valleys in the landscape. Therefore 30m buffer zones (Council, 2004) are proposed to protect these critical landscape corridors in the study area.

Small urban parks and green spaces in the urban areas can work as stepping stones that can bound habitat centers and create ecological corridors. In this context, 16 habitat corridors larger than the mean size (2.4 ha) are selected within 99 patches. The protection of these stepping stones with buffer zones is a critical strategy to avoid surrounding urban pressure.

The ecological landscape scenario proposes 100m buffer zones for natural, 15m buffer zones for semi-natural patches, and 30m buffer zones for rivers and valleys. The width of these zones is determined with a relevant literature survey (Bennett, 1994; Council, 2004).

Results of landscape assessments underlined the urgent restoration and protection needs of the urban green network. The land-use classification analysis shows the urban pressure over core environmental patches, while the current patch-corridor-matrix of the landscape presented a vulnerable mosaic due to the lack of connecting or conserving landscape components. The absence of any transitional land use between forests and intense residential areas may result in shrinkage and attrition, causing habitat loss and isolation (Forman, 2008; Forman, 1995). Yet, the construction of new transportation arteries and the introduction of new residential and commercial projects to the city are the initiators of a potential fragmentation in the landscape. In the case of Sariyer, the vulnerability of forest lands, wetlands, productive landscapes, and the habitats of many wildlife species constitutes a possible threat to the urban ecological integrity. Therefore, the ecological landscape planning scenario aims at developing a landscape structure that is resilient against urban growth.

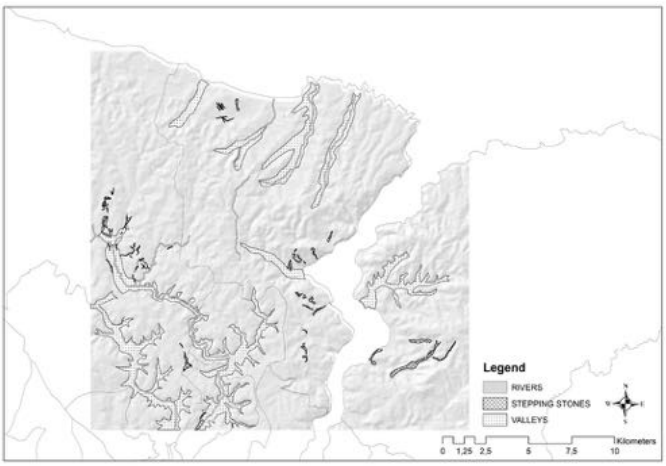

Figure 8. *Ecological corridors in the study area.*

5. Discussion and conclusions

Fast urban growth, due to the development of industrial and residential areas, results in the fragmentation of vulnerable habitats and a decline in biodiversity (Volker et al., 2010). Thus, a site-specific ecological landscape planning scenario is essential to understand the threats and potentials in the landscape mosaic and can enable urban growth policies to support the ecological integrity of the fast-changing urban context.

The sustainability of urban green spaces and their contribution to overall urban ecological integrity relies on geographic, built, social, and historical contexts (Byrne & Wolch, 2009; Harnik & Welle, 2009), and how complex socioecological systems communicate with this context. Urban landscapes are highly complex, dynamic, and multifunctional. Therefore, there is a need for improved methods of measurement and assessments of the effects of urban land-use change on urban ecological integrity. In landscape architecture research, quantifying the cost of highly incompatible land-use problems can be a puzzling task. Thus, landscape architecture research faces the challenge

of describing landscape composition, configuration, and connectivity before and after the land-use change, whilst explaining the underlying social, economic, and environmental issues and mechanisms that affect the ecological integrity of the landscape.

Landscape metrics, used for the determination of patches and corridors, provided an opportunity to develop a landscape planning scenario to see the possible compositional and configurational alternatives. Since landscape ecology uses a variety of parameters, there are many approaches to tracking the changes in complex urban systems (Yin et al., 2016). This study enriches this existing research by including actors' strategies and visions in urban development, policies, and regulations into landscape ecology principles. With the collaborative method presented in this study, landscape ecologists and urban planners can be integrated into the urban growth development process with a landscape conservative approach.

The study shows the effective power of actors involved in planning and how they influence the social pattern and encourage urbanization while ignoring the vulnerability of valuable landscapes. The ecological landscape planning scenario can be a clear framework to explore the potential collaborations and to design solutions, and it should be considered an important tool for spatial policy and design implementations. Future studies, regarding the integration of landscape scenario development, CA-based urban growth models, and Agent-Based Modeling, can create great opportunities to predict future challenges and advantages.

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Landscape strategies for abandoned airports in the context of landscape urbanism: Case of Atatürk Airport

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Abstract

There are emerging discussions about two important airports when considering airport and landscape design in Istanbul, Turkey, recently. The opening of Istanbul Airport let the transformation of the function of Ataturk Airport to a "Nation's Garden" with the claim of the being the third largest park in the world. Although this proposal brings about a lot of debates it also opens a new field to investigate and discuss issues about infrastructure, landscape and contemporary urban conditions. Besides the conventional landscape planning and design approaches, Atatürk Airport urge to apply novel design strategies due its size and complex infrastructure setting. The theory of Landscape Urbanism with its focus on landscape as a part of infrastructural system propose suitable ground for large scale transformation projects. This research has two aims; to present principles and novel strategies by investigation of airport transformation projects in the context of Landscape Urbanism and to discuss the applicability of presented strategies for Atatürk Airport in its own locality from ecological, socio-cultural and socio-economic perspectives. For these aims, design research was structured by utilizing extensive literature review about 29 cases to develop a comparative matrix. Then field studies were conducted to reveal the existing conditions, potentials and limitations of the Atatürk Airport. This research contributes to the contemporary landscape and urban design agenda by presenting key strategies and principles that were introduced by Landscape Urbanism and highlights the viability of the theory into the local conditions of İstanbul and open the issue into discussion over Atatürk Airport Case.

Keywords
Landscape urbanism, Airport landscape, Atatürk Airport.

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1. Introduction

Landscape urbanism is a multi-scale and multi-layered urbanism theory that focuses on complex problems, not only related to urban form, but also interlaces cultural, social, political, economic, infrastructure and ecological issues (Lister, 2010). In the twenty-first century, landscape urbanism, with its contemporary ideas, offers a new functional image to the city. In parallel, a debate about the construction of the new Istanbul Airport with its vast size and potential harms on the contiguous ecosystem, and the destiny of the existing Ataturk Airport, has emerged recently.

In this context, two ideas regarding Atatürk Airport have been put on focus. The first one evokes the expansion of the airport. The second one evaluates its potential function as a green-open space, due to insufficient service capacity in the future. Additionally, its situation within the city has been questioned, and the focus directed to the construction of a new airport in another location with a larger capacity. However, this second idea arose fear about the use of the Ataturk Airport land as a real estate index in the future, but not as a public open space.

Simultaneously, after the official opening of The Istanbul Airport, the government announced that Atatürk Airport, named as a "Nation's Garden" would be functioning as a green open space. However, no landscape design and planning proposal have been explained in detail for the new "Nation's Garden". While Atatürk Airport claims the capacity of being one of the largest parks in the world with its scale and content, the area's intensive infrastructure, should be considered within contemporary theories that result in highly beneficial ecological, sociocultural and economic design and planning approaches. One of the most important of these contemporary theories is based on the theory of landscape urbanism. In the mid-1990s, James Corner introduced the concept of "landscape as urbanism" in series of conferences, particularly concerned with "building landscapes" and "reconstructing landscapes" (Waldheim, 2002; Gray, 2006). Landscape urbanism was introduced as a disciplinary realignment, in which landscape replaces architecture as the basic building block of contemporary urbanism (Waldheim, 2006). Apart from the conventional approaches to landscape, in the 21st century landscape has gained a vital role as a "lens through which the contemporary city is represented and a medium through which it is constructed" (Waldheim, 2006; Waldheim, 2016).

Landscape approaches urbanism problems with recent design culture rather than the regional and urban planning tradition. Although landscape urbanism prioritizes landscape in urban design, it advocates an interdisciplinary approach with other occupational fields by addressing especially undefined and city hybrid areas. One of these hybrid areas are the airports. Airports, with their operating systems and exceeding dimensions, are considered as logistic landscape areas by many scholars. As landscaping areas, whether functioning or not, there are numerous examples of successful landscape airport design projects worldwide. The main factor in the prominence of these projects is the metamorphosis of cities over time. With the expansion of domestic and international air travel provided by new technologies, global markets and airline deregulation, many cities have built new international airports outside urban areas and retired old commercial airports (Dümpelmann, 2014).

Usually in operating airport landscape projects, the future programmatic and political changes of the airport positions landscape as a strategic partner in the complex airport planning process, rather than addressing it as a simple unfortunate victim. The abandoned airport landscape projects are interpreted as a performance tool related to the rehabilitation of old industrial zones that have remained as a legacy behind the collapse of the Fordist economy, and new urban life potentials of these areas are revealed by the synthesis of ecological performances and new design culture.

The aim of this article is to reveal the different principles that have come to the fore by examining the airport projects in different parts of the world, that are re-considered as urban parks in the

context of landscape urbanism, and to discuss guiding landscape-based strategies in the planning and design process for Atatürk Airport.

2.Methodology

The methodology of the research is structured upon case study investigations at two different levels. Firstly, high profile international airport transformation projects were investigated to reveal common attributes, different aspects and landscape strategies that were introduced under 9 different categories. Secondly, field and desk survey were conducted to determine the ecological, socio-cultural and socio-economic structure of Atatürk Airport, thus to indicate its potentials to transform into urban park. Thematic maps, produced in Arcmap, highlight the environmental correlations, potentials and landscape design objectives, based on the strategies derived from the investigated case studies.

2.1 Abandoned airport landscape projects and principles within the scope of landscape urbanism

Investigation and the sample set of abandoned airport landscape projects

Table 1. *Comparative Matrix - Abandoned airport landscape projects (Dümpelmann and Waldheim, 2016; Czerniak, 2001; Northern Architecture, 2019; Visit Berlin, n.d.; Presidio, n.d; Lee 2019; City of Irvine, n.d.; Reinventing Cities, n.d.; Military Airfiel Directory, n.d.; Hohnholz, 2011; Philippart, 2004; Naturvation, n.d.; Discoverquincy, n.d.; Stapletondenver, n.d.; Graememassiearchitects, n.d.).*

conduct data about 29 international projects, based on printed books, reports, magazines, web sites of design offices and articles (Table 1).

All projects were evaluated in the context of landscape urbanism and a comparative matrix were developed according to the parameters the theory emphasized (Table 1). These parameters include the before/after name of the airport, location, size, year of construction, project aim, plans, project programs after transformed into urban park. In addition, as stated by Waldheim (2016), in the landscape urbanism projects "*the landscape architect re-evaluates the urban area by making economic, ecological, social and cultural arrangements in a cultural product service*". With reference to this discourse, these 29 abandoned airport landscape projects, have been examined in the context of the ecological, sociocultural and economic strategies they refer (Table 1). By this way 29 airport projects were comparatively and systematically analysed.

Projects were selected to reflect wide range of typologies of transformation projects from different geographies; 16 projects from America, 10 from Europe, 2 from Asia and 1 from Africa. Although most of the projects are located in America, the first "from airport to urban park transformation project" is Munich Riem Landscape Park in Germany which was designed in 1995. 14 airport landscape projects

are named according to their original airport names. Apart from their location, another important finding is their size. As Dümpelman (2014) emphasizes the size of the abandoned airports, "*some of the largest urban parks that have been recently created or under construction are located in the old airport and airbase sites. These areas are distinguished from many other urban parks not only with their peripheral location and starting dates, but especially with their size*". The size of the investigated projects varies from 19 ha to 1300 ha and considered as large scale projects.

Most of the transformation projects have ecological and sustainability objectives such as enhancing local ecosystems, supporting sustainable water management, adapting new technologies to utilize alternative energy resource, environmental remediation and restoration. With this respect some projects transformed into self-sustaining energy parks, provide open public space for citizens, minimize heat, humidity, noise and air pollution, host commercial and residential buildings, and social and cultural activities for the city, provide agriculture areas, meet recreation needs and host nature protected areas. While possible contributing to one of these objectives, most of these parks have multi-functional purposes. For example, Oldenburg Airbase Solar Farm contains only solar panels, The Hamilton Wetland Restoration Park and Crissy Field Park host more wildlife, parks such as Taichung Gateway Park, Orange County Great Park and Landscape Park Munich Riem have many different multifunctional objectives.

Considering the scale of the projects most of them has magnitude that have an impact both at the metropolitan and city level. The parks that were transformed as a metropolitan park such as Hellenicon Metropoliten Park include diverse program ranging from housing, commercial, cultural and recreational. On the other hand, some projects such as Downsview Park, Toronto, Crissy Field, Johannisthal Air Field, have intensive remediation strategies to transform the site into a nature reserve in order to enhance ecosystem and public health and provide opportunity for nature education. By this way they raise awareness on public about local ecologies.

Public-private stewardship is another important aspects of the project such as Hellenicon Metropoliten Park, Orange County Great Park. These projects include strategies that encourage participation of different stakeholders and public into decision making process. Most of the projects were achieved as a result of design competitions. Therefore, design competitions can be evaluated as an important tool to achieve the best alternatives about these complex sites.

The design strategies reflect different spatial settings along the peripheries of these large parks. Especially, to support physical and contextual integration of these large parks with the urban pattern, most of them offer alternative transportation systems. In order to support integration with the city, most of the projects diminished its existing boundaries and create new connections and edge conditions at the perimeter by including public usages.

Productive systems are another integral part of the projects as they include, small community gardens and agricultural fields. Most of the projects have an attempt to keep the memory of the site by applying adaptive reuse strategies. Here the existing infrastructure and buildings are adapted to new public usages or protected as an iconic element symbolizing the history of the project area.

In line with the interpretation of the strategies, goals and programs of the projects, the principles drawn from the cases were defined as;

resilience, connectivity, sustainability, succession, adaptive usage, multi-functionality, restoration, reclamation, memory and identity.

The principles drawn from the investigation of airport transformation projects are summarized as follows:

Resilience

In the context of parks, Czerniak (2007) argues that resilience depends on the ability of parks to accommodate changing social, cultural, technological and political requests while maintaining their own identity. Most of the projects, listed in the table, have

adopted the resilience principle. The Downsview Park, being one of the most important examples, emphasizes a modern ecology, resilience, resolving the nature-culture dichotomy, proving that a long-term strategy can improve a contaminated site (Assargard, 2011). Further, referring to social resilience, Czerniak (2007) suggests that a project integrated within participatory processes and feedbacks is more resistant. In the Tempelhof project, for instance, collective management of green spaces contributed to resilience by increasing citizens' learning and adaptation capacity, strengthening their interest and participation in urban planning and decision-making (Urban Biodiversity and Ecosystem Services, 2014).

Connectivity

After losing their functions as important infrastructure systems, airports can take on a different role through landscape and create new interconnections. Within a new network frame, they circulate goods, people, energy and information in different ways, as well as enhance the ecological connectivity. Ecological connectivity refers to the spatial and temporal scope, in which animals or plants and related ecosystem functions, can circulate between different habitat patches (Huber et al., 2018). Ecological corridors, green roads or patches facilitate individuals' connectivity (Chester & Hilty, 2010). The airports, turned into parks, are also considered as part of this ecological network. For example, the Mariscal Sucre International Airport in Ecuador transformed into Parque Bicentenario, provides a design and planning strategy that aims to rebuild a humid forest, a prairie and a transition zone (three unique ecologies that previously united in this region), to establish ecological connectivity. In the same project, the surrounding parking areas converted to pedestrian paths, and the dead-end streets were eliminated in order to provide pedestrian and vehicle accessibility.

Sustainability

Mostly the transformed parks rely on site-specific plants, sustainable construction, maintenance and management practices, as shown in the table 1. They contribute to the wildlife habitats and provide sustainable spaces for social participation, including urban gardening and agriculture. Moreover, the process-oriented development and design focuses on the prediction of future ecological and social changes. Some old airports, such as Oldenburg in Germany, have been transformed into solar parks. In Iceland, thermal energy is considered in the design proposal for the Reykjavik Airport, as a large dispensing system beneath the old runway heats the greenhouses above, local fruits and vegetables are being grown. Evidently, the sustainability of the projects is also sought with renewable energy systems (Dümpelmann & Waldheim, 2016).

Process-oriented development / Succession

Secondary succession in areas that have lost their functions often refers to old field succession (Osbornova et al., 1990). Construction of airports result in serious damages to the flora and fauna of their surrounding environment. Referring to abandoned airports, these damaged areas are usually exposed to a secondary succession stage within new projects, which provide strategies to re-establish an ecological cycle. In Berlin's Tempelhof Airport Project (2011) development process, leading species were the first to colonize the fallow field that were followed by other species, and a balanced vegetation arose over time" (Dümpelmann, 2014). For instance, Johannisthal Park maintains grassland succession by providing sheep grazing (Dümpelmann, 2014).

Adaptive usage

The gaps in the urban textures, resulted from the recovery of abandoned airports, are catalyst for social life and urban development (Dümpelmann & Waldheim, 2016). Berlin's former Tempelhof Airport encourages citizens to shape the future city landscape and offers them predetermined temporary areas to use on the site (Dümpelmann & Waldheim, 2016). The former international airport in Munich, has been transformed into a new neighborhood with a large park that attracts people from various parts of the city. In New York, Floyd Bennett Field Airport has a

campground, hobby garden and training programs (Dümpelmann & Waldheim, 2016). Another important factor that emphasizes the adaptive principle is the adaptation of runways, buildings or towers, thus converting them to recreational, office or commercial zones. Apparently, additional investments for new buildings are avoided and the elements of memory and identity preserved.

Multi-functionality

Landscape urbanism, rather than aesthetic qualities, is inspired by the functions and operational aspects of the landscape (Thompson, 2012; Lyster, 2006; Assargard, 2011). As part of the landscape urbanism, abandoned airport projects, are considered as multi-functional projects. Johannisthal Park, for instance, offers various functions. Declared as a nature reserve in 2003, the park hosts many endangered species (Dümpelmann & Waldheim, 2016). The field is divided into four main areas, which vary in character and public allowance. The first one is the Nature Reserve and the other three are multi-functional areas, consisting of various sports, playgrounds and other entertainment fields. Mariscal Sucre International Airport, which lost Quito's function, transformed to Parque Bicentenario provides various purposes. It contributes to strengthening the local field configurations, expanding the surrounding park areas as pedestrian paths, setting up parcels where various crops for Ecuadorian agriculture, hosts museums on local and national farming, and provides walking forest and meadow areas for visitors (Dümpelmann & Waldheim, 2016).

Restoration

Airports require some degree of restoration in order to return the sites' original ecological conditions, after suspending operations. Some of the projects, are based on the primary natural and cultural heritage of the airport sites. For example, the wetland and sand dune landscape have been restored in the context of a cultural landmark at Crissy Field (Dümpelmann & Waldheim, 2016). The Orange County Great Park Design includes a wildlife corridor for various habitats, as well as a veteran memorial and other components that remind the history of the old meteorological station. Closing the airport at Chicago Northery Island allowed designers to propose a new wildlife habitat, providing spaces for recreation and cultural events. The landscape plan of Midway Island Atoll proposes to demolish runways and rebuild natural habitats for endangered species, creating research and ecotourism destinations (Dümpelmann & Waldheim, 2016).

Reclamation

Abandoned airports, like other post-industrial areas, contain a number of pollutants due to their past functions. Particularly, soil and ground waters are contaminated by benzene, trichlorethylene/CCl4, and perfluoro chemicals used in airports (Nunes et al., 2011). Although no evidence of reclamation processes in all of the projects listed in the table, the pollutants have serious harm to human and environmental health. The Stapleton International Airport, closed in 1995, has undergone reclamation, thus the largest master-planned project in the country was built on 1,900 hectares of land. The landscaping of Oslo's former international airport, and its transformation into a new urban neighborhood for 15.000 inhabitants and 6.000 housing units and working spaces, is known as one of the largest projects considering industrial zone rehabilitation. The Crissy Field area was heavily contaminated with aircraft fuels and cleaning chemicals, and the removal of toxins destroyed most of the swamp. The NPS, worked with a number of stakeholders in 2001 for the Golden Gate National Park Conservation Area to reform and prepare the area as an urban park (Dümpelmann & Waldheim, 2016).

Memory and Identity

According to the Cambridge Dictionary, memory is defined as "the part of your mind that stores what you remember". Identity - one of the components of memory, is the element that emphasizes the uniqueness of a space and includes determinant elements that have formed it within a time period. In this study, memory and identity occupy a significant place in the

examined landscape projects. In the Stapleton International Airport, for instance, the control tower of the airport was preserved as a monumental element and its correlation with the past was preserved. In the case of Tempelhof Park, the runways were protected for the functioning of various activities. Bernard Tschumi's design for Downsview Park hosted industrial military buildings, social and sporting events. In the La Carlota project, Chaguaramo palm trees, which occupy a significant area in the park, aimed to give a distinct identity. Another important element is the fact that among all, 14 airport landscape design projects have preserved their original names, as seen in the table 1. One of the most commonly used instruments in the emergence of cultural memory and transferring it to future generations is the "place name", as they refer to places where social memory is recorded as the product of social experiences (Gülbetekin & Öztürk, 2016). Adaptive strategies to maintaining a healthy and uninterrupted relationship between memory and space, make possible to protect or gain new identities from the past.

3. Case of Atatürk Airport as an abandoned airport

This part of the study focuses on site analyses including historical, ecological, sociocultural and socioeconomic determinations of İstanbul Atatürk Airport.

Atatürk Airport is located within the borders of Bakirkoy - one of the largest districts in the European side of Istanbul, and Yesilkoy district, which is bordered by the sea. On a smaller scale, it is bordered by the Marmara Sea to the south, the E-5 highway to the north, the Florya Atatürk Forest to the west and the Ayamama Creek to the east.

Historical Background

During the establishment of the Turkish aviation, the Aviation Commission conducted preliminary studies for the construction of military airports and schools in 1911 (Kurt & Korkmaz, 2018). A few kilometers north of Ayastefanos (Yeşilköy) - a flat area of about 4-5 decares, has been chosen as the most suitable place (Kline, 2002). In 1913 the airport was completed and the training department started to operate.

The new development resulted in initiatives of foreign companies to establish aviation facilities for postal and transport aviation services in Turkey. Among the companies established in Yesilköy, the CFRN (Compagnie Franco-Rouen Domaine de Navigation Aerienne) (later named as Compagnie Internationale de Navigation Aérienne CIDNA) (Yusufoğlu, 2018), made a 20 -year deal, to found Turkey's first "International Civilian" airport in 1926 (Kline, 2002). Air France, taken over CIDNA, continued its Bucharest-Istanbul flights until 1935, but upon the request of Air France to cancel the contract, Yeşilköy Airport sold its facilities to the Turkish Government in 1937 (Yusufoğlu, 2018). Yeşilköy facilities were subject to the supervision of the State Administration of the Airlines and were officially changed to State Airlines (DHY) on 3 June 1938 (Hürtürk et al., 2009). A contract was signed with two American companies (Westinghouse Electric Corp. and J. G. White Corp.) to expand and modernize airports in Yeşilköy and other provinces (Yusufoğlu, 2018). The expropriation of the required land was started in 1948 (Yusufoğlu, 2018) and in addition to the three short landing runways at the airport, only one larger and longer (2300 m.) NE / SW 'Northeast-Southwest' (06 / 24) Runway (05/23) was built according to ICAO regulations. Afterwards, Turkey's largest and first international airport was opened on August 1, 1953 (Kline, 2002).

On 26 February 1956, the management of ground handling, air traffic services and aviation communications transferred to the State Airports Authority (Kline, 2002). Upon insufficient capacity, a new runway was built. Construction started in 1968, 45 m. wide and 3 thousand m. 17/35 runway was completed in 1972 (Devlet Hava Meydanları İşletmesi Genel Müdürlüğü, n.d.). In 1971, a new master plan was planned for Yeşilköy Airport. Within the scope of the new plan, apart from the runways 05/23 and 17/35 (Devlet Hava Meydanları İşletmesi Genel Müdürlüğü, n.d.), the project included 4 terminal buildings and annexes, each with a capacity of 5 million passengers. Part of the project, prepared by Hayati Tabanlıoğlu, was

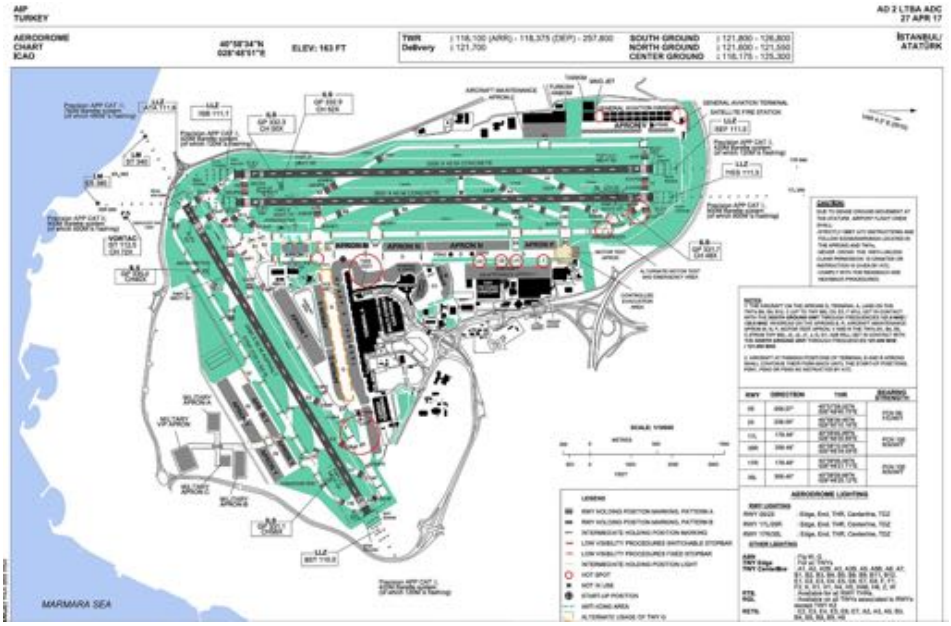

Figure 1. *Atatürk Airport Plan (Ltba Airport Charts, 2021).*

built and put into operation on 29 October 1983 (Devlet Hava Meydanları İşletmesi Genel Müdürlüğü, n.d.). Yeşilköy Airport, renamed as "Atatürk Airport" in 1985, with its modern appearance, State Airlines flights spread quickly to many regions in the country (Devlet Hava Meydanları İşletmesi Genel Müdürlüğü, n.d.). Later, construction of additional facilities to meet the demand of increasing passengers and aircraft traffic was decided (Atatürk Havalimanı Mülki İdare Amirliği, n.d.). The modern terminal building commissioned on 10 January 2000 (Atatürk Havalimanı Mülki İdare Amirliği, n.d.).

Atatürk Airport (IATA: IST, ICAO: LTBA), formerly known as Yeşilköy Airport, operated by the General Directorate of State Airports Authority (DHMİ), was used for civil and domestic flights. Covering total area of 11 million 776 thousand 961 m2, 24 km away from Istanbul's city center, the Atatürk Airport has a concrete field of runways, aprons and taxiways of 1 million 500 thousand m^2 (Figure 1). Just before closing, Atatürk, which took place among world's most important airports, consisted of a large complex with 1177 hectares and provided 20 million international lines, 7 million 500 thousand domestic passengers and 200 thousand tons / year cargo terminal capacity, and was known as Turkey's largest airport (Atatürk Havalimanı Mülki İdare Amirliği, n.d.). According to the statistics of the State Airports Authority, an increase in passenger number and flight traffic has been observed in the recent years ("İstanbul havalimanlarında, yolcu sayısı 6,5 milyon arttı", 2018). Therefore, the government stated the need for a new airport, and in May 2013 the tender for the New Airport (Istanbul Airport) was held, followed by the foundation of the project on 7 June 2014. Discussions on the fate of Atatürk Airport continued during the construction of the new Istanbul Airport. In 2018, the President stated that "Nation's Garden" would be established in some provinces and that Istanbul was among these provinces, thus indicated Atatürk Airport for its place in Istanbul ("Erdoğan: Atatürk Havalimanı millet bahçesi olacak", 2018). The official flights of Atatürk Airport ended on 6 April 2019.

Field Study

The field study was conducted to reveal the existing conditions of the Atatürk Airport and to discuss its potentials to transform to urban park, resulting in determinations based on ecological, socio-cultural and socio-economic structure. Atatürk Airport, with its natural and cultural assets, has a significant potential due to its urban location.

Ecological investigations reveal green distributions, vegetation, streams and flood areas, urban heat island and fauna and their relationship within the existing environmental settings. The

nearby Florya Atatürk Forest, which has the richest plant population near the study highlight that the existing climatic conditions contribute to various plant habitats. Subsequently, public green and open areas IMP 2017 land use data map was prepared for the European Side of Istanbul (see Figure 2a). The map shows public green and open space fragmentation on the European side of Istanbul. The data shows that the total area of public green and open spaces in the Bakirkoy District is 379ha. In comparison with its 1,177ha., Atatürk Airport's area equals 3 times the area of all public green and open spaces in the district.

The ecological determinations of the study area include the natural infrastructures of vegetation as well as the fauna. In this reference, the nearby Küçükçekmece Lake and its Basin is characterized with the bird population it hosts (see Figure 2b). Kucukcekmece Lake, which is of international importance in accordance with the Ramsar Convention, hosts a significant number of waterfowl, cormorants and silvery gulls in winter. In early winter and spring small cormorants are observed, as well. The Kucukcekmece basin, protected by the Wildlife Conservation Society, is known as one of the 97 important bird habitats. The survey shows that Atatürk Airport has the potential to contribute to various fauna habitat due to its proximity to natural resources.

The important streams in Bakırköy are Ayamama, Siyavuspaşa and Çırpıcı Creek. The length of the Ayamama Creek, located on the border of Atatürk Airport, is 3500 meters (Bakırkoy Belediyesi, n.d.). As seen in Figure 3a, the flood area of the stream is larger and widely spread compared to the other streams. The holistic perspective of landscape urbanism supports the generation of future scenarios that include ecological, social and economic estimations over time. Therefore, the future scenarios of Atatürk Airport and its environment should relate to the sensitive issue of streams and floods. In this regard, predictions for 2100 shows the areas that would be inundated and lay approximately of 6 meters below the sea, resulting from

Figure 2a. *Fragmentation of public green/open spaces (generated using IMP 2017 data).*

Figure 2b. *Bird feeding/nesting areas (generated with Birds of Istanbul datas).*

Figure 3.a. *Istanbul European Side creeks and flood areas (generated using IMP 2017 data).*

Figure 3.b. *Areas that may be inundated by the increase of sea water level in the future (generated by FloodMap data).*

global warming (see Figure 3b). The evaluation shows that Atatürk Airport is in danger in the forthcoming century. Moreover, the risk of flooding could be enhanced by the Mega Project of Canal Istanbul that link the Küçükçekmece Lake to the Marmara Sea, planned to be realized in the near future (Demircan, 2018).

In a study conducted by Şimşek Kuşçu and Şengezer (2012) (see Figure 4), the correlation between green area / vegeta-

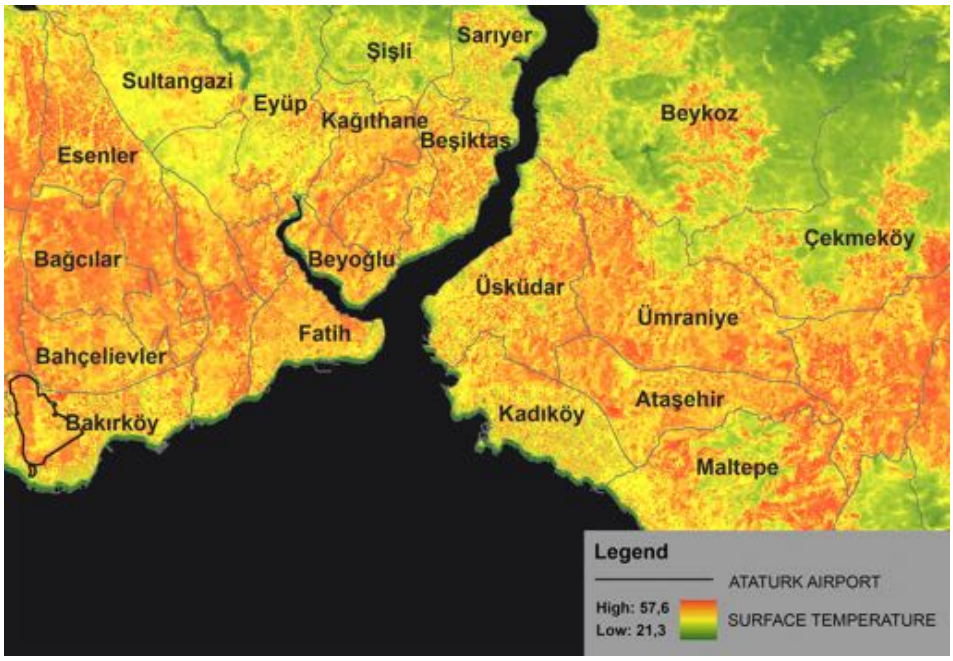

Figure 4. *Istanbul surface temperature map (Şimşek Kuşçu and Şengezer, 2012).*

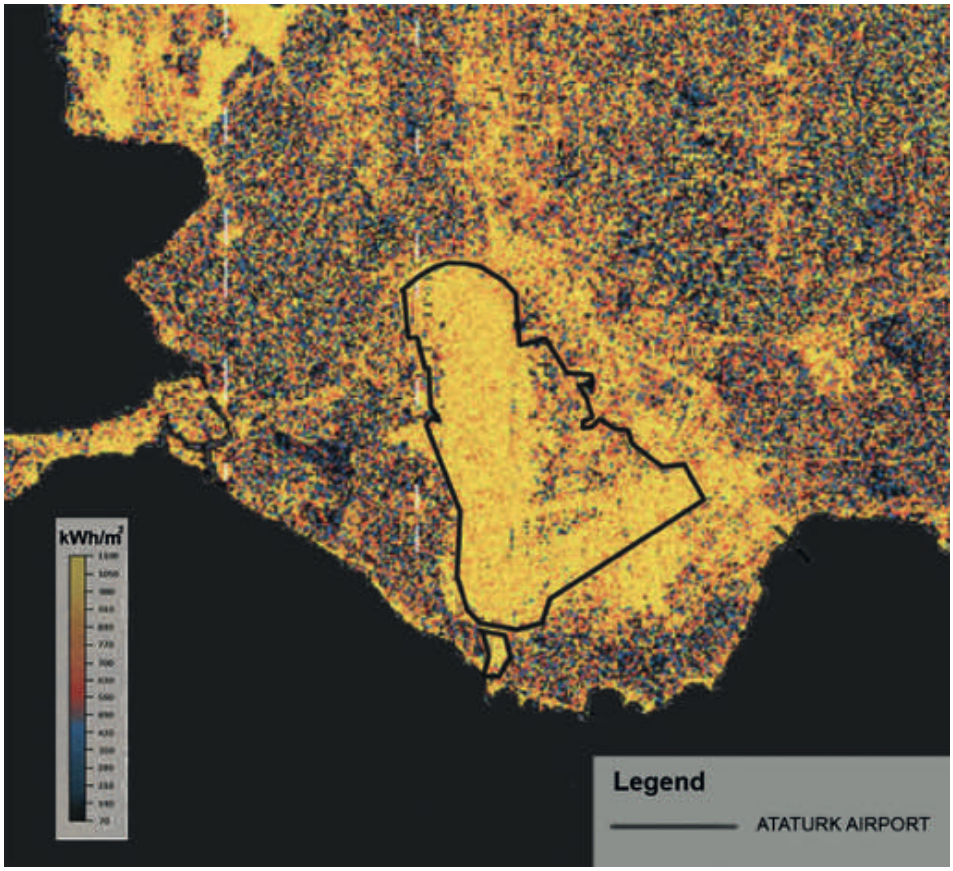

Figure 5. *Atatürk Airport solar energy potential (prepared with the data of Istanbul Metropolitan Municipality-Solar Energy Potential Map).*

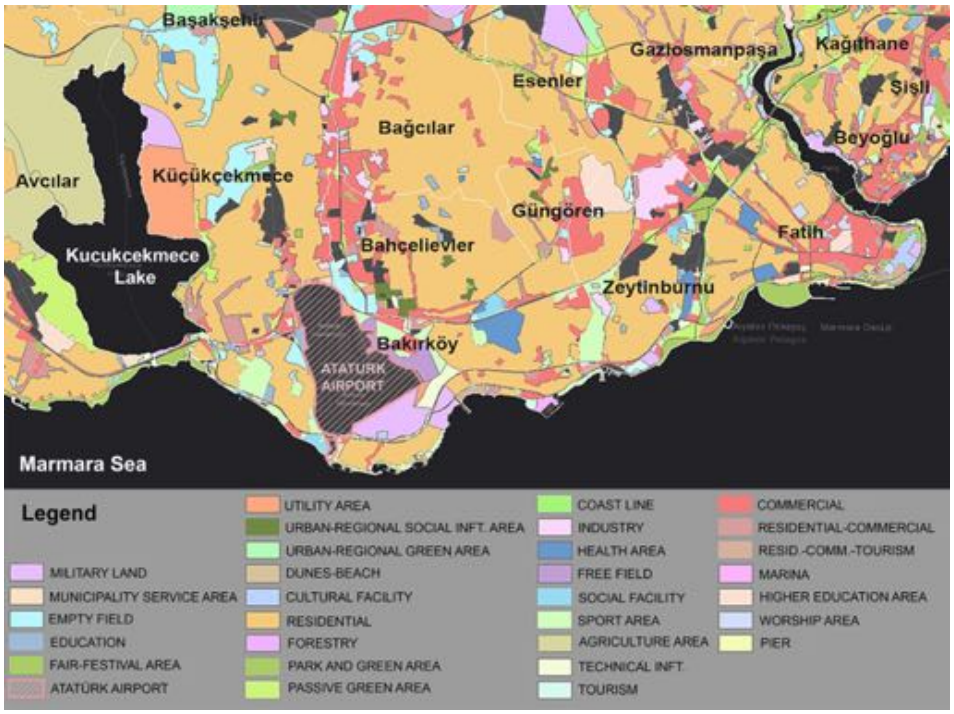

Figure 6. *Istanbul European Side land use map (generated using IMP 2017 data).*

tion and the temperature of Istanbul metropolitan area was investigated and a Surface Temperature Map was developed.

Accordingly, the Atatürk Airport region is under the influence of high heat island. Transforming Atatürk Airport into a public green space could reduce the heat effect within the whole city significantly. Nevertheless, according to the Istanbul Solar Energy Potential Map (Istanbul Metropolitan Municipality), Atatürk Airport has a high degree of solar energy potential (see Figure 5).

Istanbul's uncontrolled population growth since 1950's threatens the city's unique cultural, historical and natural landscape. Once located at the periphery of the city, the site incorporated within the city texture, as a result of spatial expansion, and became a central hub serving with more than 15 million people nationally. As shown in Figure 6, the density of residential and commercial areas, and public green-open fragmentation are prominent in the land utilization.

According to 2018 TurkStat data, Bakirkoy district with a population of 222.370, hosts significant higher residential areas compared to other land uses. Important low-density areas include educational, social and cultural facilities. Important socio-cultural and socioeconomic aspects are the central business areas. The 1 / 100.000 scale Istanbul Environmental Plan adopted by the Istanbul Metropolitan Municipality Council's decision on 14.07.2006 and approved on 22.08.2006, was used to specify the central business areas within the study case. Accordingly, the central business district extended towards TEM via Eminönü and Şişli axes. Primary centers, located in two regions, one at the intersection of Küçükçekmece, Bağcılar and Bahçelievler and the other between Bakırköy - Zeytinburnu districts, shows that Atatürk Airport has a great potential with its vicinity to the central business districts.

With a capacity of 64 million passengers in 2018, Atatürk Airport demonstrated high activity before it closed. The strong relationship with other ports, roads and rail systems, reveals it as an important logistics area. Referring to its social structure, Bakirkoy hosts mainly artisans, bureaucrats and retired citizens. In the recent years, since no significant resettlement in the region, the population and social structure has remained constant. Additionaly, Bakırköy is hosting higher density of Culture and Art centers compared to other districts of Istanbul (Bakırkoy Belediyesi, n.d.).

4. Findings and evaluation

In this study, 29 international projects were examined with the parameters emphasized by the landscape urbanism theory and, landscape based principles were introduced as resilience, connectivity, sustainability, succession, adaptive usage, multi-functionality, restoration, reclamation, memory and identity. Since their challenging conditions of degraded environmental systems and opportunities provided by existing infrastructure, airport transformation projects can be evaluated as complex projects that involve multidisciplinary approach and team composition. Their size can be evaluated as another potential to host multi-functional setting ranging from residential development to nature reserve within a park setting. Therefore, each project contributes to the environmental rehabilitation while introducing new public platform for the city. Although each project includes social and economic goals and strategies, ecological framework (storm-water management, habitat restoration, environmental reclamation, process based development, energy efficient interventions) come to forth. Based on strategies and principles drawn from the case study investigation we discuss the potential of Atatürk Airport by giving reference to the revealed strategies in the light of Landscape Urbanism.

Atatürk Airport has experienced a dynamic history since 1912, the world wars, the foundation of the Republic and the republic period. Being the largest airport in Turkey, Atatürk Airport was a fundamental infrastructure and cultural component of Istanbul. It took place among world's most important airports, consisted of a large complex with 1177 hectares and provided 20 million international lines, 7 million 500 thousand domestic passengers and 200 thousand tons / year cargo terminal capacity (Atatürk Havalimanı Mülki İdare Amirliği, n.d.).

Ecological, sociocultural and socioeconomic determinations of Atatürk Airport and its environment, suggest the necessity of multi-functional approach of landscape urbanism for the transformation process of this important structure into a city park. As a result of the analyses, it is evident that the main potentials in the field are its size, identity and location. Depending on these main potentials it has sub-potentials; contributing to reduce heat island effect, resilience, hosting various functions, solar energy, creating habitat, having a substantial past, vicinity to natural resources, easy access and proximity to central business areas. These potentials have been evaluated with the principles resulting from the tabulation of international projects and provided data for the formation strategies.

5.Landscape strategies for Atatürk Airport

The abandoned airport projects survey resulted in the following principles: resilience, connectivity, sustainability, succession, adaptive usage, multi-functionality, restoration, reclamation, memory and identity. Aligned with the Atatürk Airport potentials, a number of strategic recommendations emerged.

Divided into three categories as ecological, sociocultural and economic strategies in the context of landscape urbanism, these suggestions were presented in reference to the international projects analysed.

Ecological strategies suggest that the area should be considered as "part of the green infrastructure" in "a self-organized process-oriented program". As the area is particularly large, it could be proposed as an important large green center within an integrated green infrastructure, connected to the entire structure of the city. An open-ended landscape urbanism approach linked to green infrastructure could contribute to the resilience, as it incorporates permeable surfaces and wetlands that reduce the risk of floods within the region. Moreover, it can be used as a gathering space in case of natural disasters. As green infrastructure supports ecological resilience, Atatürk Airport's large surface area could host a diverse habitat that contributes to population prevalence and balance the ecosystem against uncertainties due to its large scale. Enhancing the green network could result in better ecological connectivity and enable the movement of animals and plants between green patches. This strategy indicates a self-organizing process-oriented transformation, which

is a basic aspect of landscape urbanism. To reduce the current damages on the soil, flora and fauna in the vicinity, as a result of the transportation services over the years, a process-oriented design proposal that includes succession dynamics within the transformation of Atatürk Airport as a city park could be adapted. As it requires limited maintenance, a process-oriented strategy could provide ecological restoration and soil reclamation. In addition, the green areas could contribute to the regulation of urban climate by reducing the urban heat island effect of the area.

Sociocultural strategies suggest that participation of the public in the project is fundamental for the protection of the identity and preserving the collective memory of the rich history of Atatürk Airport. To "ensure the participation of the public", it is necessary to include a participatory program in the project that would increase the social resilience of the area. As the public develops and the needs of the public change, the park should be able to keep up with this change. The participation of the people who are a part of the process is very important in the transformation of this area, which has been in memory with its history, size, identity and location and its important features. In order to convey the collective memory for the future generations, it is vital to correspond the name of the future park to its original "Atatürk Airport" Park. With the strategy of "linking with the past", the phenomenon of Atatürk Airport, which has been placed in the memory of the people, should be kept alive and given a feeling of trust. In this context, buildings, runways, aprons, taxiways and towers belonging to the area should be protected to a certain extent in an adaptive usage principle. As seen in the land use data of Bakırköy district, the area lacks science and cultural centers, recreation and sports areas are at a very low density. In order to protect the identity of the area, instead of building new structures that will force the budgets in the future project, it is important to evaluate the existing buildings as a part of the park program for commercial uses, congress center, cultural center or science center, runway, apron and taxi ways could be recommended for recreation functions. By using all these functions together, the proposal of "containing multifunctional fiction" is obtained from sociocultural strategies. This size of park should be evaluated not only a recreational zone of the city, but a park that can be a part of the urban life with its diverse and rich cultural program.

In *economic strategies*, production comes to the forefront in line with the principle of sustainability. As seen in the analysed abandoned airport landscape projects, site-specific plants were used in the design to achieve sustainable maintenance and management practices, and sustainable productive areas were provided through urban agriculture and renewable energy systems. Atatürk Airport could be evaluated with its production-based potentials as well. Some of the park can generate solar energy and some can be used for urban agriculture after the necessary soil rehabilitation. Another strategy that will provide economic efficiency is the "income and employment" provision. Income and employment could be provided directly or through tourism from the enterprises to be included in the park. Another strategy in relation to the economy is "rearranging the infrastructure". In the project to be established for

Figure 7. *Proposed strategies and their relationships.*

Atatürk Airport, infrastructure should be redesign within the scope of the city park and thus public access to the area should be increased.

Environmental measures taken within the principles of ecological resilience minimize the damages in case of any natural disaster in the area and relate to the economic resilience of the city. Ecological structures that produce renewable energy could be proposed in line with the principles of sustainability within an economic framework. Moreover, the adaptive usage approach in sociocultural strategies contribute economically, as new functions are given to old structures, instead of creating new buildings. Evidently, the proposed strategies are also interrelated and intertwined, as cultural and natural elements are evaluated together in the landscape urbanism theory (see Figure 7).

6. Conclusion

Situated in Istanbul, but having influence far beyond the city borders, Atatürk Airport, is a fundamental part of the national and international collective memory, as a witness to various events and associate to different community layers. As a result of the Istanbul Airport construction, the potential transformation of the Atatürk Airport into green space under the name "Nation's Garden" has emerged on the agenda, recently. The concept of "Nation's Garden" has been also subject for many open spaces in various districts of Istanbul and other cities in Turkey. Due to the timeframe limitations for the completion of these Nation's Garden projects, and management of the projects by central authority which applies standard programs and materials that restricts the designer's ability to generate innovative design solutions, these projects usually end up with a stereotypical urban park projects regardless of local circumstances. This existing practice in Turkey conflicting with the basic principles of Landscape Urbanism which focuses on process - based and participatory actions in which ecology, socio-cultural and economic goals create the backbone of projects. On the other hand, "Nation's Garden" projects can be considered as a national environmental strategy to increase green area amount in cities and can be evaluated as an opportunity to test different design methods and approaches with diverse thematic configurations. But the number of studies focusing on Landscape Urbanism and its applicability to Turkey's planning and design agenda is so limited. At this point learning from international experiences and adaptation of global urban theories and contemporary design approaches into local circumstances becomes very crucial. Especially large scale transformation projects, considered as opportunities, emerge new approaches in the field of landscape architecture and urban design as alternatives to conventional design approaches. Therefore, analyses of 29 airport urban park transformation projects, referring to the theory of landscape urbanism is used a basis to set the conceptual design framework and principles to rethink about one of the most strategic fields of Turkey, Atatürk Airport. Referring to these international practices within the goal of this article, the prominent principles in the context of landscape urbanism have been outlined and landscape-based strategies that can be guiding in the planning and design process of Atatürk Airport have been proposed.

Analogous to the examined airport transformation projects, Atatürk Airport has significant potentials in terms of its dimensions, functional structure, environmental, ecological and social settings. It is fundamental for a metropolitan city like Istanbul, with its rich historical, cultural and ecological heritage, to respect the potentials within the planning and design approaches in the process of its transformation to urban park. Transformation of Atatürk Airport is a critical issue in terms of its dimensions when considering green infrastructure integration within a continuous green system potentially interacting with the entire city network. However, it is fundamental to rely the design process on scientific axioms: ecological, sociological and economic forces should be taken into consideration.

Ecological, sociocultural and economic strategies, proposed for the transformation process of Atatürk Airport to city park are a result of

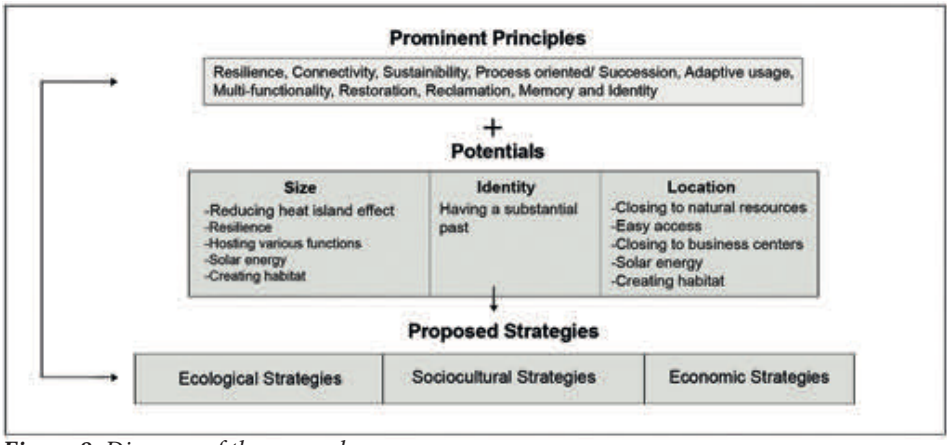

Figure 8. *Diagram of the research process.*

evaluating all the potentials of the area with the principles and field studies determined from the examination of abandoned airport landscape projects (see Figure 8).

This article, with its case study, can be used as a planning and design guide for airport-urban park transformation projects, which can be complex and challenging due to the size, location and existing infrastructure of the airports. The principles drawn from the investigation of landscape urbanism cases can be applied to analogous projects from conceptual framework to design process. Having importance on national and international scale, the Atatürk airport transformation process should lean on modern sustainable approaches that integrate culture, arts, sports and fair areas, to acquire a world-class project. In this regard, this article with its findings and case study investigations contributes to the contemporary landscape and urban design agenda by presenting key strategies and principles that are introduced by Landscape Urbanism. By this way the article highlights the viability of this global urban theory into the local conditions of İstanbul and open the issue into discussion over Atatürk Airport case by presenting alternative strategies.

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Evolution of city squares and transformation of publicness

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Abstract

Although it is still very limited, there is a rising concern on the relation between publicness and public spaces over the last two decades. On the other hand, there are significant differences in how the term "public" is discussed from mainly two perspectives that Iveson (2007) defines as "procedural and topographical" approaches. In the procedural approaches, "public" is described as "any place used for collective action and debate," whereas "public" is considered as "a specific kind of place" by the topographical approaches that are repeatedly concerned with the accessibility of "public spaces."

This study, which might also be seen as a reading of urban historiography, emphasizes the necessity of understanding the notion of "publicness" as described by the procedural approaches to reveal the public spaces' topographical evolution better. Here, we claim that squares set on a city scale with representational and historical backgrounds reflect the transformation of publicness. In this sense, this study aims to interpret this messy and dynamic structure of publicness and the spatial and functional evolution of city squares together.

Consequently, the most significant contribution of this study to urban planning and design literature is the discussion of the historical evolution of city squares from both procedural and topographical approaches.

Keywords
Publicness, City squares, Public space, Public sphere, Urban historiography.

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1. Introduction

1. 1. Procedural vs. topographical approaches to publicness

The roots of the discussion of "publicness" arose from insights of political theory. In this perspective, the aspects that reach beyond the physical limits of "publicness" is described by the term "public sphere." The term "public" was first mentioned during the Hellenistic period of Western history. Arendt (1998, 29-30) also referred to the ancient Greek polis as the origin of the "public sphere," which was to her "the sphere of freedom." Arendt (1998, 25, 179) emphasized action (praxis) and speech (lexis) for participatory democracy and considered "bios politikos" as a demonstration of individuals whom they are, which is "making their appearance" in this material world for her. In other words, since "action is never possible in isolation" (p.188), one needs the presence of others to be appeared, which is "making the public realm" (p.49-50).

However, Arendt did not criticize that only "young free male Greek citizens" were involved in political life during this period (Arendt, 1998, 160; Mitchell, 2003, 51-131; Martin, 2013, 43). Since being public was a matter of human capacity for political action, the whole polis was potentially public for her.

Also, according to Habermas (1974, 49-50), "a portion of the public sphere is composed in every conversation performed by private individuals who assemble to form a public body" which "mediates between society and state." Nevertheless, Habermas's (1991 – 1974) interest was on the transformation of the institutional character of the public sphere since the 18th century in favor of the bourgeoisie. In parallel to Habermas, Sennett (2002, 16-17) also stated that the use of the term "public" meant "a special region of sociability" by the end of the 17th century.

Indeed, the period between the end of the 17th and the mid-18th century has staged revolutionary waves of political upheavals as the result of the accumulation of increasing social and political tension and the power of literary public sphere in the creation of a critical public opinion (Habermas, 1991, 67; Merriman, 2009c). Thus, this period has been discussed as the rise of the public sphere, which would fall due to the rise of national industrial capitalism that characterised by the invasion of privileged private interests into the realm of politics and so the public sphere in the long run (Sennett, 2002, 17-19; Habermas, 1991, 141-143). On the other hand, as a significant advancement of the 20th century, booming ICTs also brought up the question of the possibility of the phenomenon of a worldwide public sphere further (Habermas, 1996, 360, 514).

Here, it appears that the terms publicness and public sphere described by the "Procedural Approaches" (Iveson, 2007, 10) indicates the ability of political representation and action regardless of any type of physical setting. Although "Procedural Approaches" do not underestimate the existence of public space, their attention is on the matter of being public and to be included in the public sphere as an act of discursive interaction and as a part of the decision-making process (Mitchell, 1995, 117).

However, according to Iveson (1998, 26), despite the legalization of free speech, press, and assembly for everyone, everyone might be included in the public sphere only in principle. According to Fraser (1990, 62-63), ignoring the social differences, the main problem here is the assumption of a socially equal world and the assumption of a single public sphere. In reality, the public is composed of different competing interest groups, which are "multiple publics" and fragmented into two as "dominant publics" and "counter publics" (Fraser, 1990, 59-67). In other words, it appears that the public sphere is chaotic and dynamic that produced by the struggles between the multiple publics as it is summarized by Kluge (1993, ix); "the public sphere is the site where struggles are decided by other means than war." In this sense, these procedural approaches struggle to reveal the spatiality of publicness.

This evolving discussion on the publicness and public sphere has been followed by numerous studies from the domain of spatial sciences (e.g., Lynch, 1981; Gehl, 1987 - 2002; Carr et al., 1992; Tibbalds, 1992; Benn & Gaus, 1983; Montgomery, 1998 and many

others) primarily focusing on physical features and definition of ideal public spaces, and the degree of publicness of a given space (Nemeth & Schmidt, 2007 – 2011; Varna, 2011; Van Melik and Langstraat, 2013), which Iveson (2007, 2-3) described as "Topographical Approaches."

The main argument of these topographical approaches is that public spaces are under the threat of becoming more exclusionary and less accessible contemporarily. On this point, Iveson (2007, 5-11) criticizes that these topographical approaches share two major problematics.

First, this main argument is based on "narratives of loss and reclamation," depending on the villains and the heroes of the story. This argument brings the acceptance that public spaces were more inclusionary once. However, there are also significant critiques raised from a realistic perspective that this nostalgia of the public space is the "false romanticization of historic public space," which is just "a phantom" (Robbins, 1993; Iveson, 2007; Madanipour, 2010; Berman, 2012). In other words, these critiques emphasize that as Kluge (1993) summarized, there have always been struggles between multiple publics, and so it is a timeless fact that public spaces have never been "open to all," yet, the idea of a public space "open to all" has always a powerful effect that triggers the struggles for inclusion (Mitchell, 1995, 117). Hence, it also appears that discussing the publicness of a given space is much more complicated than checking if it meets some criteria (Kohn, 2004, 10).

The second major problem is the reduction of being a part of the public to be just visible in "public" space. It is a problem since (1) there are other communicative forms of making-publics, and (2) visibility of one does not always make him/her a part of public merely. Briefly, as Iveson (2007, 8) notes that "topographical approaches miss the messy and dynamic urban geographies of publicness." However, this discussion also brings along a very slippery slope where public and private spaces' definitions become ambiguous.

In this study, we claim that squares set on a city scale with representational and historical backgrounds reflect the transformation of publicness. Because, although there are other representative and communicative means of making-publics, city squares have staged social transformations, ruptures, and uprisings throughout history. Therefore, this study aims to interpret this messy and dynamic structure of publicness and the spatial and functional evolution of city squares together. In the context of this theoretical discussion, our research question in this study; What is the relation of the political structure of publicness with the historical transformation of conventional and representative city squares?

The most significant contribution of this study to urban planning and design literature is discussing the historical evolution of city squares from both procedural and topographical approaches. In terms of methodology, this study is limited to examining the urbanization process that Western cities have witnessed over their historical development between the Hellenistic and modern periods. In accordance, the study offers examples from European cities based on literature research and mapping methods introducing a historical periodization scheme in six phases. Each of these six phases is discussed under two conceptual titles. First, under the conceptual title of "Socio-Economic Circumstances", the general conjuncture of the historical development process is explained together with significant breaking points. In the second conceptual title of "Use of City Squares and Representation of Power", the changing relationship between publicness and city squares is revealed. Among the examples presented in this study, the city squares that still function since the medieval period have been mapped and significant differences in the spatial texture of their respective contexts are visible. Using Open Street Map and Google Maps sources comparatively, the site plans of the city square examples were drawn. The site plans show each city square within its surroundings and main connections in the form of a figure-ground plan at the line scale. The line scale enables the reader to make a spatial reading and comparisons between squares. The site plans are also supported with

referenced photographs to present a three-dimensional spatial perception.

Following the focus of this study, the cases offered have been limited to city squares, which have traditionally been the spaces built to fulfill the conditions required for political gatherings and appearances. Such squares can be classified into sub-categories according to function, location, and volume. Nevertheless, in general, they are focal points surrounded by built elements that enable people to come together for various cultural, economic, or administrative purposes, in addition to gathering and scattering pedestrian flow. However, in terms of scale and function, countryside squares, local neighborhood squares, and squares with specialized transportation functions, such as station and quay squares, also fall outside this study's scope, as political representation historically has taken place in central city squares. Nevertheless, it should be noted that the range of city square examples presented focuses on period characteristics; many are representative of other squares of the same type.

2. Exclusive publicness and the rise of the city square

2.1. Socio-economic circumstances

The concepts "public" and "private" first appeared during the Hellenistic period. The reason why the terms emerged was to denote and strictly distinguish the two types of space. All free citizens had access to the public (koine) while only individuals had permission to enter the private (oikos). These also served to emphasize privacy and domesticity (Arendt, 1958, 24; Habermas, 1991, 3). Public life was centered around the agora as the symbol of the polis, which was an essential precondition for the emergence of democracy, including that of Athens, the first known democracy, which was developed around the 5th century BC. Although it has been considered a participatory model of democracy, it is also often criticized for its exclusion of women, slaves, the elderly, children, and foreigners from citizenship rights (Raaflaub, Ober and Wallace, 2007, 189). While agora was the center of daily life for all Athenians, it was the socio-political center of the polis for only a limited proportion of the population; hence the understanding of publicness in this period was obviously circumscribed by a limited and exclusivist expression of political representation (Carr, 1992; Mumford, 1961; Hilbersiemer, 1955 and many others). On the other hand, although there were common open spaces in every era to meet the need for gathering, it is possible to discuss neither the publicness nor the square of the prehistoric period due to the lack of the notions of democracy, citizenship, and politics.

2.2. Use of city squares and representation of power

The spatial development and meaning of the agora can only be understood through a consideration of the conditions of the archaic period (ca. 7th-5th century BC). The archaic agora was a void of irregular shape connected to the Acropolis and located in a topographical center; it was simple, small in extent, and modest in form.

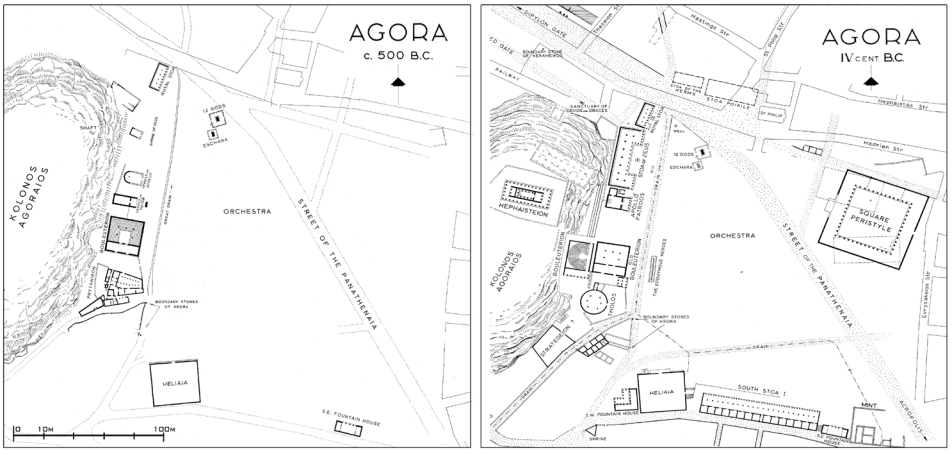

Figure 1. *The Athenian Agora in 5th BC (right) and 4th c. BC (left) (J. Travlos in Thompson & Wycherley, 1972).*

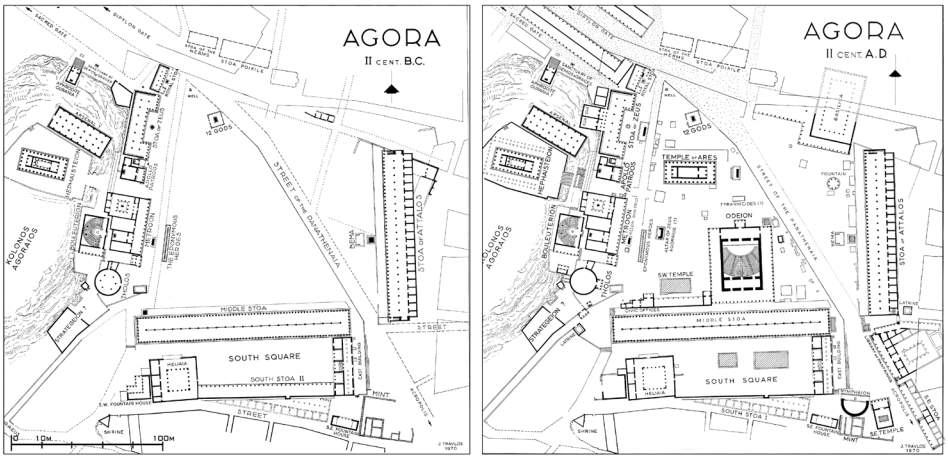

Figure 2. *The Athenian Agora in 2nd c. BC (right) and 2nd c. AD (left) (J. Travlos in Thompson & Wycherley, 1972).*

Indeed, the etymological root of the term "square" is related to Ancient Greek planning. Following Hippodamus' gridiron-schemed plans for Miletus, from the 3rd century BC on, the late classical and Hellenistic agoras took on more regular shapes and, in contrast to earlier periods, were based on the idea of an enclosed/defined space. This idea of enclosed space is represented by the peristyle agora, which is not a completely enclosed "square," resembling instead a horseshoe form in this period (Zucker, 1951, 33; Webb, 1990, 29; Wycherley, 1962, 33).

As the population grew, not one but many agoras developed in cities, so in some examples, there was one main agora along with other comparatively small ones. The location of this main agora was unchanged from that of the archaic period, principally serving as a gathering place for political assemblies and surrounded by administrative buildings over time. Shops and stores also came to be erected around it, which were rented to merchants and artisans. The agora was alive with people meeting, moving, talking, and lingering.

During the Hellenistic period, the city became the scene of luxury, ruddy with the displays of ancient Greece (Gallion & Eisner, 1963, 24; Thompson & Wycherley, 1972, 21); this period saw the beginning of the agora's use as a symbol, a representational space of the wealth and power that continued through the Roman period.

The city of Rome, founded in 753 BC and ruled by kings, grew in size and population and gradually developed into a national and political union, eventually becoming an oligarchic republic in 510 BC (Hilbersiemer, 1955, 61-66). During the regal period, the city's forum was merely a topographical and irregular center, very similar to the archaic agora.

After the establishment of the Republic, the Roman Forum gained its more traditional pattern similar to the Hellenistic agora; regularity and enclosure had become the norm in the spatial organization of cities, and the Hippodamic schemes of Greek cities especially were applied in Roman cities.

Here, the regular and crowded structure of the Republican Forum should also be considered alongside the governmental structure of the period. After the regal period came to an end and consular power emerged, there were many more famous, victorious, and important citizens to commemorate with statues and buildings. In terms of religion, there were also the many gods and goddesses of the Roman pantheon to build temples for. This traditional pattern can be seen clearly in the archaeological excavations and existing ruins of Rome, among many other cities.

The Roman Forum underwent a significant change and complete rebuilding during the period of the Roman Empire (27 BC – 476 AD) (Zucker, 1959, 51; Webb, 1990, 30). As the Republic was transformed into an absolutist imperial state with political control concentrated in the hands of one man, his power was reflected in the spatial organization of the city's forums.

Forums bearing the names of the emperors extolled just one person and his

power far above all others. Each of the Imperial forums (except for the Forum Nervea) tended to be greater in size than previous ones in an attempt to overshadow the others. Although forums remained as gathering points and sites for traditional ceremonies and displays, and although they were embellished with new structures, they lost their civic importance under the shadow of the emperors (Favro, 1988, 18-19; Webb, 1990, 31). The change in the values and the conditions of the imperial regime led all public activities to become duties for the Roman people to be participated in passively.

The Imperial Forum was radically different from the Republican Forum and the Hellenistic Agora; they appeared to be "closed, symmetrical, axial and monumental". What was remarkable in this period was the first appearance of "dominant and grouped squares".

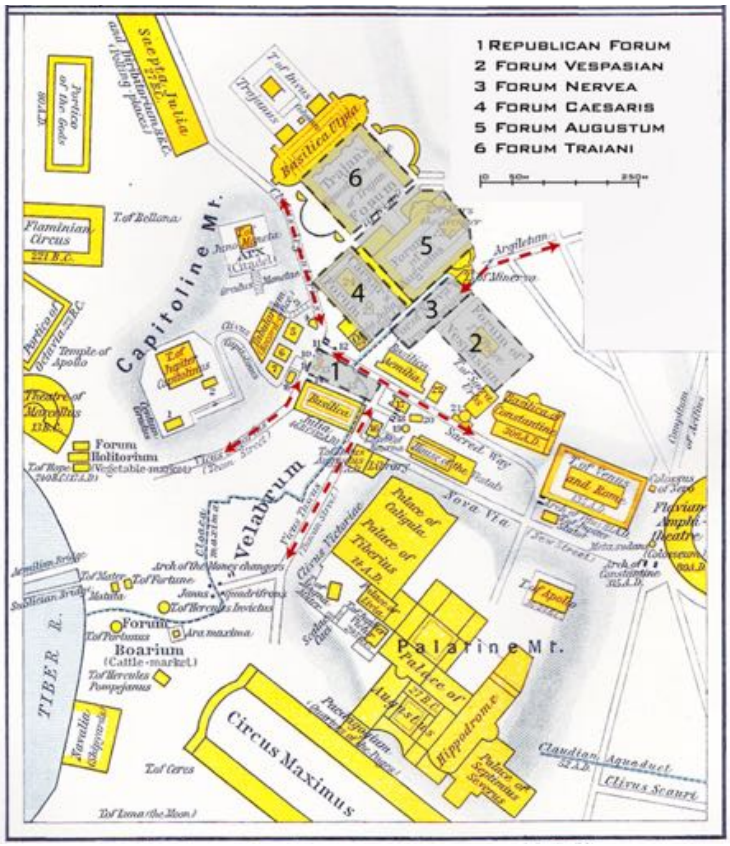

Figure 3. *Imperial Roman Forums (after Shepherd, 1911, p. 24).*

3. The emergence of representative publicness and the revival of the city square

3.1. Socio-economic circumstances

Characterized by invasions, wars, and migrations, the early middle ages were a period of tribal societies and semi-nomadic settlers; trade was dangerous, and trade routes were cut off. Large settlements were no longer administrative and commercial centers; the economy was based on landed property and agriculture, only regional markets existed, and trade with other counties was infrequent and trivial.

In the absence of central authority after the collapse of the Western Roman Empire, the emergence of feudal hierarchies heralded the collapse of the concept of publicness. It is thus not possible to discuss an organized public square in the sense of the agora or forum of old. From a broader perspective, one can assume that in the absence of stable governance and security, there was no path or reason left for representation and publicness.

In the politics of this period, monarchy held the center stage until the feudal lords shook their power, creating a feudal oligarchy institutionalized over the centuries as a social hierarchy and a political and economic system based on peasants waiving their freedom in exchange for protection. This period was defined by the absence of mobility and time for learning and leisure, when the majority lived on the lands that they could never exchange, sell or even leave, fixed in fear for their lives until the revival of commerce in the 11th century.

During this period, monasteries were small centers of civilization, becoming eventually the nuclei of some medieval cities and serving as places of refuge for peasants in times of danger. As new villages were established, the incomes of feudal lords were increased, leading to the creation of medieval cities. Increasing income made it possible to encourage the improvement of craft together with agriculture. Artisans were able to produce surpluses which could be exchanged with goods from other estates (Hilbersiemer, 1955, 84-86).

The turning point of the 11th century was the conquest of the Kingdom of Jerusalem during the First Crusade in 1096. From that point onward, the Mediterranean was opened to Western shipping, and foreign communications were established again as in the period of the Roman Empire. Eventually, by the 12th century, the West had been

completely transformed, and thus many medieval cities were either established or flourished in this century (Pirenne, 2014, 72-87).

This development favored both lords and artisans. In time, crafts became differentiated and production diversified, giving rise to a new kind of population and the creation of craft guilds whose membership offered some measure of independence. Even though nobility passed through blood, merchants showed that wealth could be earned with wisdom and cunning, sending the message that neither they nor the peasants required the patronage of feudalism (Pirenne, 2014, 96). The exchange of agricultural products and other goods shaped the spatial relationships between existing settlements and newly founded ones. The required frequency of this exchange of goods necessitated the integration of the countryside and the city and weekly markets to meet the need for a space to exchange goods (Hilbersiemer, 1955, 88-90).

3.2. Use of city squares and representation of power

Christianity and Feudalism were two critical factors that shaped the city throughout the high middle ages. Accordingly, although city squares of Western medieval cities, both those evolved from Roman settlements and those newly founded with organic or gridiron schemes, differed according to their development process, there were usually two squares; one for the church (parvis) and one for the market.

In contrast to market squares, medieval parvises were dominated and defined by their relationship to churches and cathedrals, which, together with parvises, enabled the monumentality that represented the power overshadowing a dominated space. The fundamental function of these squares was the enabling of gatherings of the faithful before and after religious meetings in the church (Zucker, 1959, 80). Absence of theatres led to the performance of mystery plays on church steps, visible from the square; executions were also major social events, and sporting competitions and games were held in these medieval squares.

Although the medieval parvis was generally more regular than contemporaneous market squares, it rarely had a purely geometric form and was never intended to compete with the market square; these spaces served two different kinds of needs: the market square to conduct business and prosper in this life, while the church, together with the parvis, was a guarantor of the next life (Webb, 1990, 65, 40). This separation

Figure 4. *San Gimignano – Church and Market Squares; Piazza del Duomo, above right (Url-1) & Piazza della Cisterna, below right (Url-2).*

Figure 5. *Todi – Church and Market Squares; Piazza del Popolo, above right (Url-3) & Piazza Garibaldi, below right (Url-4).*

of the ethereal and material worlds in squares often led to the development of grouped squares. However, the church had visual domination and superiority over the market square, even in examples where the two types of squares were not directly adjacent, as *in the Piazza del Duomo and Piazza della Cisterna in San Gimignano and the Piazza del Popolo and Piazza Garibaldi in Todi.*

The period between the 14th and 15th centuries might be defined as a transitional stage from the Medieval to the Renaissance period. At the beginning of the 14th century, agriculture was still primitive; however, as the primary source of wealth together with animal husbandry, it was rapidly developing. Nevertheless, these conditions were about to change; the Great Famine (1315-1317), together with the Black Death (1346-1351), each of which caused millions of deaths, and later the Hundred Years' War (1336-1453) brought western Europe misery, regression, and disease. The subsequent Ottoman conquest of Constantinople in 1453 is generally considered the end of the Medieval period (Hay, 2014, 11-19; Le Goff, 2006, 154).

The profound consequences of these crises on the people led to the movement that became known as the Renaissance, a gradual shift in people's thoughts and attitude toward the universe, the value of life and death, and their place in this world. This shift inflamed class conflict and triggered a loss of faith in the church, a turning to individual capabilities and powers of observation, and the emergence of scientific reason. The Hundred Years' War also gave rise to senses of national identity in England and France (Hay, 2014, 164-169) and shifted power from feudal lords to monarchs, who collected taxes to raise vast professional armies; moreover, as there had been significant advances in military technology, especially involving gunpowder (Rogers, 2010, 34; Gallion & Eisner, 1963, 42), feudal knights and castles were thoroughly less useful than before (Nelson, 2001b).

Under the dominance of the feudal mode of production, little distinction was made between public and private due to the absence of (1) any official status set out by private law licensing ordinary citizens to access public sphere, (2) landed property model for peasantry. Although this changed gradually, especially through the effects of peasants' revolts after the Black Death and the revival of commerce, the increasing political tension that introduced private ownership resulted in a shift from feudalism to capitalism (Habermas, 1991, 5).

This blurred distinction between private and public was only evident in reference to communal elements, to the extent to which they could survive under feudal modes of production. What was common for all was public; namely, the fountains, the market, and church

squares. Habermas (1991, 6) makes here a linguistic reminding that for the use of the term "common" in the sense of "ordinary". In this sense, authority itself appeared neither as something that is exclusively public, nor private; it encompassed both spheres. Nonetheless, as the authority could only be represented in public, objects that signified authority were public. In Habermas' words (1991), this evolution is "representative publicness" and feudal bodies of authority, namely the lord, the church, the prince and the nobility are those by which this representative publicness is "carried" on to the capitalist mode of production. Ordinary citizens were regarded as passive subjects, mere spectators who were to remain a reverential audience. It was not on behalf of the people, rather merely in their presence, that sovereignty and power were represented; it was not the people themselves that was represented, it was the power itself. (Demir Kahraman & Türkoğlu, 2017).

Figure 6. *Piazza San Marco – Venice (photos, Url-5; Url-6), Plaza Mayor – Madrid (photos, Url-7; Url-8), Grand Place – Brussels (photos, Url-9; Url-10).*

It was a turning point in the evolution of the city square that, as Webb (1990, 65) states, "the city square was starting to lose its universal appeal in this age since religion, politics, and commerce tightly interwoven in it."

4. Survival of representative publicness and glorification of the city square

4.1. Socio-economic circumstances

The Renaissance was the rediscovery of the Greco-Roman legacy of the past; the reinterpretation of Greek and Roman history, law, literature, art, and culture dominated this period and replaced the mysticism of the middle ages with humanism, rationalism, and clarity. Thus, the person became the normative scale of all measurements, which resulted in the application of a centric space concept to buildings, squares, and indeed the whole city (Hilbersiemer, 1955, 172).

The Renaissance also reflected the ambitions of wealthy merchant families to show off their wealth and power through urban improvements. For these wealthy merchants, the religious conventions of the middle ages held little attraction, and wielding the power of their wealth they tended to the issues of this world rather than the next. Wealthy Italian merchant families in Florence, Venice, Rome, and Lombardy desired to adorn their cities to display their power. In this period, although the basic form and general fortress characteristics of medieval cities did not change, structures were either decorated or demolished and rebuilt to alter their modest and anonymous character (Gallion & Eisner, 1963, 43).

4.2. Use of city squares and representation of power

A vital turning point of this period was the invention of the printing press around 1450 by Johannes Gutenberg, which enabled the rapid and precise copying and wide distribution of important ancient texts. Indeed, in terms of architecture and planning, the monumental, axial, symmetrical,

and functional characterization of the ancient period returned to cities during the Renaissance, symbolizing the period's growing concentration and consolidation of power (Morris, 2013, 158). City squares of this period differ from medieval examples in scale, proportion, and structural frame, as in the examples of the Piazza San Marco in Venice, the Plaza Mayor in Madrid, and the Grand Place in Brussels (Zucker, 1959, 140; Gallion & Eisner, 1963, 45; Webb, 1990, 68).

One of the two other important turning points that shaped the socio-economic conjuncture of the early modern West was the discovery of America by Christopher Columbus in 1492 (Hay, 2014, 425). Already existing maritime technology and navigation enabled these voyages; however, the development of exploration triggered further technical advances in step with political and commercial organizations. This period from 1450 to 1600 was an age of expansion; growing populations and rising prices drove men into cities and colonizing ventures overseas, giving rise to the notions of nationalism and early trade capitalism. Monarchies profited from these developments, increasing their ability to further expand their territory (Koenigsberger, 2014, 90-93).

Wealthy merchants were everywhere then and regarded as strangers. Most were born as peasants, presumably. They were not beholden to a lord far away from home and were treated as freemen according to the law; in other words, long-distance trade created free merchants out of peasants (Pirenne, 2014, 97). They were not of noble blood, but neither were they feudal peasants anymore; they were in between, the middle class, which would become the bourgeoisie and part of the representation of power.

The second important turning point were the Reformation and "Counter-Reformation"; these major religious shifts were in fact about class conflicts and the accumulation of socio-economic tension and transformed the political, societal, and cultural patterns of the Western world beginning from the mid-16th century (Dewald, 2004, 150; Cameron, 2001, 87).

It is important to note that the Protestant Reformation was embedded in broader processes of socio-economic and political shifts, including the emergence of nation-states and new relations with the outside world (Dewald, 2004, 151-156). Knowledge of the "Counter-Reformation" is also critical to any understanding of the concept of the Baroque and its physical reflections in the spatial organization of city squares. The Counter-Reformation itself was the Catholic Church's response to the challenges posed by the Protestant Reformation and a movement towards its internal renewal. The main aim of these efforts was to re-emphasize traditional Catholic dogma, to re-shape the Church's institutional character, and above all to regain the central power and the unity of the church (Wiesner-Hanks, 2013, 185; Cameron, 2001, 97; Dewald, 2004, 145).

5. Consolidation of representative publicness and the city square as the urban theatre

5.1. Socio-economic circumstances

Baroque was characterized by a more rhetorical and theatrical interpretation of Renaissance art and architecture; it was thought to be monumental, metamorphic, manipulative, melodramatic, and exaggerated. Baroque fashion was purposefully supported by the Papacy to glorify the power of the reformed Catholic Church so as to monumentalize "the divine" and "the faithful," appealing to the emotions and the senses of individuals (Wiesner-Hanks, 2013, 394; Cameron, 2001, 100; Dewald, 2004, 227).

Although the Renaissance and Baroque styles aim at different effects, they both hold the same fundamental spatial vocabulary and characteristics; they are monumental, axial, symmetrical, and functional. In contrast to relatively irregular, informal, and dispersed medieval spaces, both Renaissance and Baroque spaces reflect the desire for discipline and order, characteristics which were meant to be impressed on those within the city (Morris, 2013, 159; Bacon, 1967, 109 and many others).

5.2. Use of city squares and representation of power

Between the late 16th and 18th centuries, Baroque cities were intentional parts of the theatrical application and

reflection of the Counter-Reformation and rising absolutist monarchies. The city and thus the squares were the stages, settings for the display of the church, princes, the nobility, and the rich in which the rest were still considered as mere spectators. The pioneering examples of Baroque squares are accepted as having first appeared in Rome, e.g. the Piazza del Campidoglio, Piazza di San Pietro, Piazza Navona, Piazza di Spagna, and Piazza del Popolo.

City squares of this period were designed to be isolated and to dominate their surroundings. They were less confined than those of the Renaissance in order to recapture their surroundings by expanding into open space. This idea of expansion and openness and tendency towards the dynamic expression of space was widely adopted, especially in France. Secular rulers soon perceived that the monumental and grandiose Baroque concept of space would reflect their authority and power much like that of the Church. In such cases, they built majestic royal palaces adorned with sophisticated gardens (Wiesner-Hanks, 2013, 394; Zucker, 1959, 172; Webb, 1990, 156) Indeed, the Place de la Concorde was the largest royal square of the period and was dedicated to the king at the time as the "Place Louis XV".

The consolidation of representative publicness was then crowned by Baroque festivity. Habermas (1991, 5-9) states that this courtly representative publicness reached its ultimate and purest form at the French court in the 15th century. Emphasizing the same period, Sennett (2002, 16-17) also says that the word public / le public has now been used differently, meaning at the time "a special region of sociability." In mid-17th century France, "le public" signified a specific group of audience for plays, which was made up of elite individuals and only in small numbers.

The Baroque ideas of openness and dominance were intentional, creating an interface on which the paths of civil individuals and aristocrats intersected, whereas they never fully merged. It was in church squares and the royal palace courts, which by their overwhelming scale served as venues of show-off and display, where representative publicness manifested itself. Baroque spatial organization enabled a courtly life blocked off from the outside world of civil individuals. Worse, even secular festivities, such dances and theatre, retreated from the streets into the courts, gardens, and rooms of the palace. Eventually, the representative publicness that emerged during the middle ages not only survived but also consolidated by the end of the 18th century (Habermas, 1991, 9-11). However, this was also the Age of Enlightenment, which emerged from the Protestant reaction against the Counter-Reformation; in this period, forerunner philosophers began movements that would culminate in revolutions in France and America and reform in England (Mason, 2015, 429-552; Merriman, 2009a).

6. Rise of literary publicness and politicisation of the city square

6.1. Socio-economic circumstances

Systems of feudalism and colonialism were seriously challenged at the end of the 18th century, first by the American colonies' Declaration of Independence in 1776 and then by the French Revolution and the Declaration of the Rights of Man in 1789. The relatively short-term results of these rising revolutionary movements were the political upheavals throughout Europe in 1848 known as the "People's Spring" or "Spring of Nations." This period also set the stage for the emergence of the Industrial Revolution in Great Britain. In brief and general terms, Western nations were rising to the status of world powers, contributing to the further development of liberalism, nationalism, industrialization, capitalism, urbanization, and the proletariat, legacies which we have inherited.

To Sennett (2002, 17-19), the period from the 18th century on initially saw the rise and, then again, the disappearance of the public sphere. The rise was embedded in the intention of 18th-century cities of "becoming a world in which widely diverse groups in society were coming into contact." In his view, although any historical period has peculiarities, deviations and alternative modes of its own, the tension present between the public and private spheres can be utilized to establish understanding and cultural coherence. However, in this balance of

public and private, a shift was about to come to the advantage of the private as national industrial capitalism was on the rise.

From the 19th century onwards, this period was characterized in that the realm of politics, and therefore the public sphere was heavily occupied by privileged private interests. Habermas Habermas (1991, 141) defines this process as a kind of "re-feudalization" of society and the "downfall of the public sphere." Due to the fact that (1) the conflicts between private interests were conveyed onto the political plane and these interests assumed by the state institutions and (2) public functions were transferred to corporate bodies, there was no visible distinction public and private.

The on-going impacts of the Industrial Revolution evolved alongside rising political and social tensions; changing factory technology culminated in practices of mass production by the end of the 19th century (Trebilcock, 2000). This change in the production of goods and flourishing science triggered important developments in (1) transportation (2) communication and (3) infrastructure.

The development of mass industrial production required the transportation of raw materials and finished products. The invention of the steam engine soon saw steamboats and steam railroads in operation by the mid-19th century. After the development of electric power, steam railroads were followed by the electric trams, first on street level and then underground, by the beginning of the 20th century. Following the invention of the internal combustion engine in 1885, automobiles were ubiquitous by the middle of the 20th century (Gallion & Eisner, 1963, 63; Herbst, 2006).

The second half of the 19th century was also revolutionary in terms of the evolution of communication tools; the telegraph (1837), telephone (1876), and radio (1897) were all in common use by the end of the century. These developments preceded the invention of television (1927), whose widespread commercialization was achieved after World War II (Gallion & Eisner, 1963, 65; Huurdeman, 2003).

Moreover, the 19th century was

Figure 7. *Piazza del Campidoglio – Rome (photos, Url-11; Url-12), Piazza di San Pietro – Rome (photos, Url-13; Url-14), Piazza Navona – Rome (photos, Url-15; Url-16), Piazza di Spagna – Rome (photos, Url-17; Url-18), Piazza del Popolo – Rome (photos, Url-19; Url-20).*

Figure 8. *Place de la Concorde – Paris (photos, Url-21; Url-22), Place de la Bastille – Paris (photos, Url-23; Url-24).*

a period of phenomenal (1) urban growth and urbanization, and (2) class segregation. Urban populations were increasing due to mass migration, usually from the rural hinterland. Poor people migrated to cities to work as domestic servants and day and industrial laborers. The result of this movement was unplanned and undirected growth, the emergence of unhealthy places and chaos in which the poor suffered the most, and brutal class segregation (Gallion & Eisner, 1963, 65; Merriman, 2009c; LeGates & Stout, 1998).

6.2. Use of city squares and representation of power

Based on democratic and parliamentary principles, the idea of political equality and economic liberalism was on the rise. Moreover, public space, namely the city square, had also become politicized, acting as the stage of conflicts between multiple publics. In terms of the evolution of publicness and city squares, for example, it should be noted that the Place Louis XV evolved over the years from a stage of Baroque festivity to the stage of the French Revolution of 1789. The Place Louis XV was renamed the Place de la Revolution in 1789 and later the Place de la Concorde in 1830 (after the July Revolution). The Pont de la Concorde, the bridge across the Seine River, was built in 1791 with the stones of La Bastille, the prison destroyed during the French Revolution and turned into a city square, "Place de la Bastille," celebrating liberty in 1792 (Webb, 1990, 150; Zucker, 1959, 185).

Habermas (1991, 16-32) points to two important factors in this era that played a major role in the emergence of the public sphere. Firstly, at the end of the 17th century, coffee houses in Great Britain and salons in France functioned as new hubs of literary and political thought that enabled an interaction between the aristocracy and the intellectuals of the bourgeoisie. The second was the rise in the ubiquity of news through the development of the regular press, political newspapers, and journals. Merriman (2009b) also illustrates the effect of newspapers and political clubs on how ordinary people were politicized during this period.

7. The emergence of virtual publicness and the privatization of the city square

7.1. Socio-economic circumstances

Economic recovery and reorganization in most countries following the World War II largely followed the principles of Keynesian economics as well as the welfare state model. The development of welfare systems in health, education, housing, and the like by governments enabled some class compromise between capital and labor, the extent of which differed from place to place. By the end of the 1960s, however, disintegration brought about by various national crises had already started in these systems; by the mid-1970s, they were functioning on neither the international nor the domestic scale. In the late 1970s, the trend was a new approach to neoliberalism putting forward questions as to the required degree of state intervention and this led to the disengagement of governments from several areas relating to social benefits, giving rise to increased deregulation and privatization (Harvey, 2005).

The rising turn towards neoliberalism after the end of the 1970s overlapped with two intense phenomena: the introduction and worldwide use of

new information and communication technologies and the influence of excessive privatization policies on urban transformation processes. (Demir Kahraman & Türkoğlu, 2017).

In terms of the first phenomenon, a significant advancement of the 20th century was the accelerating development and worldwide use of information and communication technologies (ICTs) in everyday life (Huurdeman, 2003, 580, 604). Although the public sphere was assumed to be a realm limited to the domestic/local level, booming ICTs advanced the possibility of a global public sphere (Habermas, 1996, 360, 514).

On the other hand, Gehl (2010, 27) emphasizes a repetitive question that "can the function of cityscape can be taken over by electronic media such as TV, internet, and mobile technology?" Here, it is possible to say that the development and widespread use of ICTs contribute to the existence of different publics in the public sphere. In particular, being up-to-date from all over the world and sharing information and opinions through social media platforms such as Twitter, Facebook, Instagram, etc. have a crucial place in the production of the global public opinion and the public sphere. However, on the other hand, it is also possible to answer the question emphasized by Gehl (2010) that developing technology cannot replace the physical space. Although social life has changed in different ways with ICTs, face-to-face interaction and the right to assembly remain decisive. In other words, developing ICTs do not prevent public meetings but provide flexibility and convenience in many aspects.

In terms of the second phenomenon, there has been a growing discussion in the domain of the spatial sciences on the fact that public spaces have been diminishing or not extending in parallel to the increase in urban populations, and further, that their typologies and functions have been changing in favor of privatization.

7.2. Use of city squares and representation of power

To Sorkin (1992, pxiii-xv), as far as the modern cities and their public spaces are concerned, this threat of privatization includes (1) the similarization of and generic applications on spaces, (2) technological and physical surveillance for security and (3) the thematization of spaces in order to utilize architecture and urban design for the purpose of producing any simulated experience of a desired and commercially available image. When dealing with these trends, the main focus has been the shopping malls and theme parks which, as novel and privatized examples of public spaces, exhibit differences from traditional one both in terms of their ownership and operation. The benefit of the private interest, not the general public, have been the object when configuring these privatized settings; in other words, they have been intended for a particular target group instead of public in general.

From a broader perspective, Madanipour's discussion on the shifts in public spaces (2003, 2005, 11-14) relates them to the overall change the post-industrial cities have undergone. Furthermore, he asserts that historical significance of public spaces is challenged by not one but many things; "their political role limited to the periods of crisis and their social role to providing leisure; however, the most significant challenge to public space is, rather, economic". The tendency of the private investment in public space is to restrict access it for the purpose of supervising and reducing the costs of utilization and maintenance. This leads to social segregation, functional fragmentation as well as the loss of meaningful use.

This exclusionary type of production of space has led to an inward-oriented and aesthetically pleasing design approach for various types of contemporary urban functions. In short, capitalist and neoliberal modes of the production of space have undermined the notion of publicness, its physical requirements, and affordances.

In the meantime, the promotion of globalization by multi-national companies and the brutal conditions of competitive capitalism have led to the transformation of city centers in particular, and thus public spaces, which have been considered the essential components of this transformation. Many contemporary Western cities appear to direct private investment in their central and major city squares

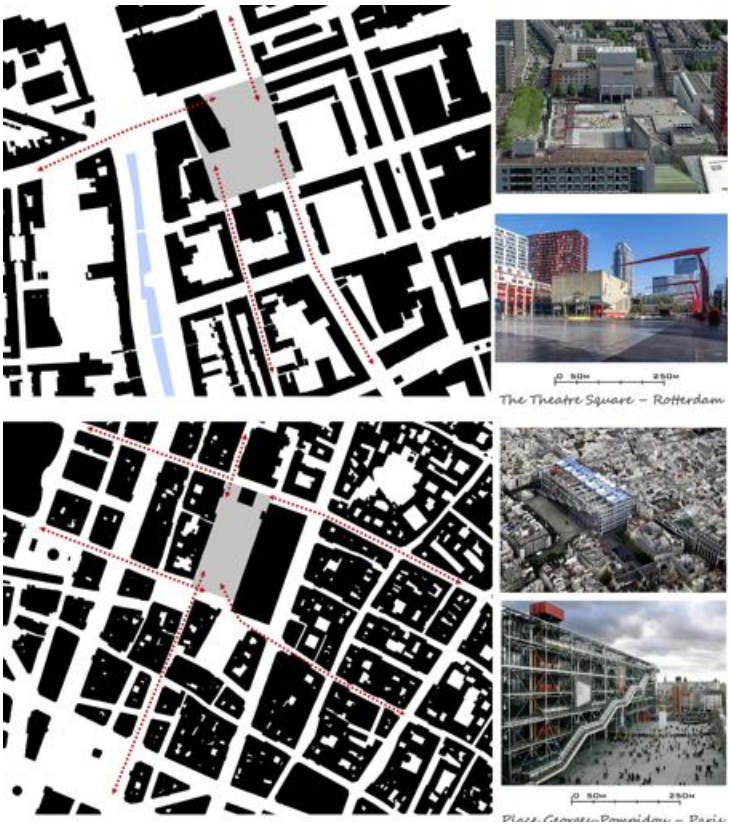

Figure 9. *The Theatre Square (Schouwburgplein) – Rotterdam (photos, Url-25; Url-26), Place Georges Pompidou – Paris (photos, Url-27; Url-28).*

toward more desirable and attractive locations for investors and tourists. The result is often touristification, museumization, and the commodification of the historic cores of cities, accompanied by consumption-oriented, uneven, and speculative urban development, the gentrification of city centers, and eventually socio-spatial segregation (Madanipour et al., 2014, 186; Madanipour, 2010, 112).

In terms of two phenomena, many city squares have been redeveloped, privatized, and commercialized during the recent decades; they have been organized to support consumption rather than communication. Also, although city squares remain open, it is possible to say that they are not accessible to everyone more than ever. This is because not all multiple publics are welcomed in terms of political representation and participation in "public" city squares; they are constantly monitored and recorded by security cameras, police, and private security, and squares are closed and evacuated when necessary. However, everyone, including the counter publics, can be present in the city squares and surrounding buildings for consumption and get together with others. Therefore, it appears that today city squares are not organized for citizens to come together to discuss a public concern.

Indeed, from the mid-20th century on, there has been a tendency to produce new "attractive" city squares, whose primary function appears to be to offer the openness in front of a single commercial structure required to provide it visibility. These new-generation city squares are named after these structures and are often embellished and thematized with distinctive design elements, as in the examples of the Theatre Square in Rotterdam, and the Place Georges Pompidou in Paris.

8. Conclusion

Both procedural and topographical approaches to publicness and what belongs to the public seem to be inadequate. However, this inadequacy becomes evident by discussing the spatial and functional evolution of historical city squares that are politically representative.

The most important conclusion of this attempt to tie together the concepts of publicness and the city square through historical exploration is that as public spaces, city squares cannot be addressed or designed only through an understanding of three-dimensional spatial relations. This urban historiography reading shows that publicness is beyond the physical access and spatial features of city squares.

City squares have evolved amid different social conditions and geographies, without exception, to reflect the power and the publics that shape them, regardless of their different spatial characteristics. However, city squares have always been the space of struggle for the political representation of the changing counter publics. In the framework of such a social reality, especially professionals from the domain of spatial sciences should be aware that any spatial and functional interventions made in squares with historical significance set on a city scale will bear different meanings to multiple publics.

Despite this exclusionary nature, major city squares have always been and will continue to be the hearts of

cities and signifiers of power, the representation of which is never possible in isolation. Power loves to display itself physically in and at city squares; however, city squares filled with a critical public hold the threat of revolution. Whatever constitutes the opposition (whether workers, women, LGBT advocates, minorities, or the poor), their grievances and claims appear in the exact space where power is represented. Major city squares have always served as the stages of the struggles between power and opposition; indeed, it seems this quality has become an essential part of their social production.

The dominant has always used city squares as a tool to realize its representation and to show-off its power. However, major city squares also evolved with the dominant discourse. Therefore, it is possible to see the traces of struggles between multiple publics that each city square has staged historically.

Indeed, it seems that even the Agora is not public for all in terms of political representation and involvement in decision-making processes. On the other hand, as emphasized by Mitchell (1995), the idea of public space open to all itself is vital for the existence of multiple publics, as well as determining the social production and spatial/functional evolution of city squares.

In short, the relationship of the dominant with the city square is paradoxical. While it needs everyone to dominate society (and the square), it must also block the counter's political visibility. Again paradoxically, everyone is obliged to struggle to appear in public, which is only principally and technically open to all.

As for the future of urban planning and design practices, another main conclusion of this study is that the future of city squares is directly related to what kind of organization societies will have. However, under any circumstances, city squares will sustain their existence and become the stages of these social transformations. Humanity's need to be seen—to be public—will always be spatialized, transforming both the public sphere and the city square.

Consequently, this historical perspective shows us that the idea of a public space open to everyone is a romantic utopia like democracy itself. However, the appearance of counter-discourse against the dominant, albeit through riots, even under conditions of autocracy or monarchy indicates the temporary heterotopic productions of "public" spaces historically.

Above, we have seen social and actual production of major city squares have always been a matter of politics rather than design. Hence, as professionals and users, we should be aware that we are also a part of the struggles between multiple publics and so we should also challenge ourselves to better understand and defend public spaces constantly.

Specifically, we offer three absolute principles to be adopted by professionals in the spatial organization of public spaces:

(1) "pluralitarian" design instead of "majoritarian" design, which means not to target a specific user profile,

(2) being not just technocrats but also activists, which indicates to defend the right to the city,

(3) using the knowledge in favor of the rights, which also means not to respond to pragmatic demands of power.

Today, the new Covid-19 Pandemic heralds a paradigm shift in the world order. The notion of publicness during and after the pandemic and the relation of public squares to this paradigm shift will be explored, and the vital importance of public spaces will come again to the fore. However, it has not been possible to restrain individuals' need to appear in public to influence public opinion on significant issues and protest societal problems even during the quarantine. Social movements such as people singing songs together from their balconies in Italy, the George Floyd Protests, which took place on a grand collective scale in the United States, and the Istanbul Convention rallies in Turkey against gender-based violence show that social solidarity can persist even in the midst of a pandemic, nor would not be wrong to assert that open public spaces are the most critical tools for meeting the need for such solidarity. How we reimagine public space and public life in a post - Covid-19 future should be the question addressed in future studies.

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Spatial planning of stadiums according to international regulations in Turkey

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Abstract

As one of the largest structures of the city, stadiums are remarkable building typologies that bring together a high number of users. In these buildings, ensuring the comfort and safety conditions of users who actively participate in venues - from the players to the spectators - is a priority. Therefore, national and international guidelines that are published by the federations contribute to the development of qualified stadium designs. They also recommend separating the users according to the spatial requirements and creating competent, qualified architectural spaces by having suitable types of equipment. Ensuring compliance with these standards is also very essential to be able to host possible international organizations. Moreover, qualified stadiums that provide these conditions contribute to increase the brand value of sports clubs.

In this study, eight stadiums built between 2000 and 2016 in Turkey are analyzed according to the technical requirements of the International Federation of Association Football. Spatial organization schemas, that FIFA introduced in guidelines to increase comfort and safety, are compared with the spatial structures of eight stadiums. In addition to that comparison outcomes are discussed whether the findings can guide future stadium designs.

Keywords
Stadium, Design, Comfort, Security, International regulations.

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1. Introduction

Nowadays, due to international sport organizations, not only the sustainability of sport activities is ensured, but also architectural value perception is developed by the way sport structures built. This process also contributes to the brand value of sports clubs which have social and technical importance.

Stadiums bring many spectators together and increase the sharing among them. By football, stadiums contribute to the transformation of the social environment as well as the physical transformation of its surroundings. Especially international organizations, such as FIFA, organize various forums under the title of "Football for Hope" and discuss the role of football in social integration. In the report titled "Football for Hope: Football's Commitment to Social Development" published in 2005, FIFA states that solid bridges between football and development are intended to be build. In the integration process, stadiums that bring fans together have an important role (Kellison, Trendafilova & McCullough, 2015).

As great buildings, covering large areas inside the city plans, the relationship with their physical environment and their design criteria is very important. In recent years, they have been designed as mixed-function buildings that can respond not only to sports activities but also to different functions, such as concerts, cinemas, shopping, and exhibitions. On match days, fans' ingress and egress, service space, socializing areas - beverage and resting - and the diversity of merchandising activities around the stadiums are the factors that increase the use of these places (Paramio, Buraimo & Campos, 2008). Therefore, stadiums could host various professional competitions and organizations as long as they are built on the standards set by national and international institutions such as FIFA, UEFA, and local federations. While these global boards are giving support for the mixed-use stadia, they also keep the safety and comfort of spectators and players at a high level. In accordance with the situation all over the world, in recent years, the construction of stadiums which are designed under international standards is also increasing rapidly in Turkey. Accordingly, in this study, the general planning principles of current stadiums built in Turkey and their compliance with the international regulations will be analyzed.

This study aims to reveal planning features that provide appropriate comfort and safety conditions by comparing the built stadium plans with the optimum schemes of the international regulations. Beyond the furnishing features of individual places, it focuses on the relationship of the spaces and circulation schemes. After keeping a short projection on the historical, cultural and structural background of the stadiums, the design criteria of the two most important international regulations that stadiums are obliged to comply with are included. Since the furnishing features of the stadiums subject to the study comply with the UEFA criteria, they have received permission to host national and international games. However, beyond the furnishing features, the plan schemes may differ while spatial relations and basic rules remain the same. Hence, it is worth investigating the compatibility of the relationship between spaces with comfort and security conditions. As a result, spatial relations of stadiums based on the type of the user, elevation and stand characteristics are interpreted in line with FIFA and UEFA, which are similar, schemes and general planning properties are investigated.

1.1. History

The contemporary stadium is defined as a building that not only provides facilities for team sports and athletic games but also offers the opportunity to watch the spectators. The name comes from the fact that the stadiums built during the Roman period are equal to 1/8 of the length of the Roman shaft which is called a stadium (Hasol, 2008). The antique ones refer to an open racetrack surrounded by the spectators' stands, where athletic competitions are held in the name of the gods. Those with a 600-foot long runway were associated with the sacred places in the early days but later used only for sports purposes (Saltuk, 1995).

Since the sport was perceived as entertainment rather than competition in Roman times, the activities in the stadiums have also changed. During

this period, gladiator and wild animal fights were one of the most popular performances. Due to having fewer amphitheaters for these Roman activities, stadiums were commonly used. Later, rectangular stadiums with the semicircular end (sphendone) were built and the venue was brought closer to the amphitheater. One of the most important features that distinguish the 19th and 20th-century stadiums from the ancient ones is that they are designed for a specific sport within the scope of their intended use and requirement programs. It is seen that football as a sport branch attracts attention all over the world due to increasing audience and investments, therefore the stadiums only serving for football are built (John, Sheard & Vickery, 2007).

For many years, stadiums are designed in different ways in terms of form and ground. While the basic logic remains the same, stand capacities, playground, and ground characteristics are improved and differentiated in the light of technological developments. Structure of the ground was the soil in the first stadium buildings, but today artificial or natural grass is being used.

1.2. Geometry of stadiums

Stadiums can be analyzed in two main groups according to their geometric forms and spatial arrangements. They have three main geometric forms: Horseshoe-shaped, elliptical, and rectangular. According to their spatial arrangement, they are structured in two forms as open and closed. (John, Sheard & Vickery, 2007).

The rectangular is the most commonly used form and it has gradually raised stands on all sides of the pitch. Therefore, it is a preferred form especially in stadium designs that serve for only football sport (Gürel & Akkoç, 2011). In bad weather conditions, the comfort of spectators is affected by whether the roof is open or closed. The design and location of the stands also affect wind strength which is an undesirable factor on the playground.

One of the basic principles in stadium designs is to organize the space and user relationship by separating the circulation areas in a hierarchical order. According to the user profile of the space, created within the framework of need, separation from each other is one of the most important elements. Consequently, the stadium and its surroundings consist of four main categories from inside to outside.

- Zone 1; playground; pitch, center area (Players)
- Zone 2; spectators' area; stands (Fans)
- Zone 3; stadium; circulation and service areas
- Zone 4; stadium complex; park, sport, activity, etc. located around the stadium (Nixdorf, 2008).

1.3. Urban value

Modern stadiums serve as mixed-function public buildings with space arrangements that allow different activities rather than merely serving sporting ones. In addition to these activities from antiquity to the present, it also serves for meetings and events where a large area is required. The environment of stadiums, which have become an important point for economic development with sports and leisure events, are being used outside the match days to ensure that the building and its surroundings remain alive (Aksu, 2011). As a matter of fact, stadium buildings that cover large areas in urban plans are now influencing transportation plans, urban landscape, infrastructure, and the superstructure, therefore constitute an important focal point for urban transformation and development.

2. The effect of international organizations on stadium design criteria

2.1. FIFA stadium design criteria

"Technical Recommendations and Requirements for Stadiums" instruction issued by FIFA periodically provides guidelines for newly designed and revised stadiums. The fourth version of the work was made available in 2007 but the revised fifth edition was published in 2010. Each version has been developed according to the preceding one and contains new information and recommendations. Directives on the equipment and measurements necessary for the space serving to the spectators, players, referees, media, and other employees;

it contains important information to ensure comfort and safety in stadiums. The stadium and its surroundings are evaluated under a total of 12 main titles. These are; pre-construction decisions, safety and security, parking and orientation criteria, playground, players and match delegation, spectators, hospitality, media, lighting and power systems, communication and additional areas, futsal and beach soccer, temporary facilities.

The pre-construction decisions of the stadiums are important because of factors such as location, orientation and settlement which are the decisions that cannot be changed in the future. The most important of these decisions is the location of the site in a north-south orientation. In this way, the negative effects of sun's movement can be prevented both on the game and the media. *The safety and security* of the stadiums affect the number of active spectators coming to the stadiums. Different stadium users such as spectators, referees, media employees and so, should be isolated from each other by various regulations and it should be ensured that the competitions can be played safely. *Parking and Orientation* criteria are one of the most crucial issues in stadium buildings that serve to high number of users. In order to ensure that the spectators can easily reach the stands and service units, they need directions on the ticket and inside the stadium. Parking requirements in stadiums are quite high in proportion to the number of users; therefore, they should be numbered for orientation purposes and be separated from each other. It is particularly important for users such as players and match delegates to reach the stadium directly. Thus, private parking, pick up, and drop off areas located near the mixed zone is preferred for security reasons (DelMont, Botta & Reddy, 2011).

According to the FIFA 2010 criteria, the *playground* is 68 X 105 m, the edge of the field is 8.5 m and the back of the goal post is 10 m wide and the total area of the field is 125 X 85 m. The ground should be natural or artificial turf and drainage systems must be used to drain the water. Substitutes' benches, that can accommodate 21 people, are produced with unbreakable material. Security doors opened to the field of play should be opened in the direction of the field and max 2 m in height. All linking stairs must meet the doors. Not only fences can be used for separating the tribunes from the playing area, but also moat and arena-type tribune systems can be applied. Safe and fast access to places such as locker rooms, referee rooms, health rooms, etc. reserved for the P*layers and the Delegation* of the match are the requirements of modern stadiums. Passage to changing rooms should be in an isolated area, separate from the spectators' entrances and exits, within easy reach of team buses, ambulances, and match officials. There should be four changing rooms, and especially in international matches, the changing room of both teams should have equal conditions. At least one room must be reserved for referees. The changing rooms should be located on both sides of the road leading to the exit tunnel. There is a need for areas where the entire team can make warm-ups before the match and the substitute players during the match. In the stadiums, there should be a health room to intervene in case of any injury to the players, and a doping control room for doping control. A room should also be designed for delegates in matches (DelMont, Botta & Reddy, 2011).

One of the factors affecting the decision of the *spectators* to come to the stadium is the general comfort standards. Hence, the stadium should be split into at least four sectors, each with its transportation points, toilets, spectator health center, security, and food and beverage points. Each sector is kept separate from each other by barriers or fences. Notification of emergencies and transmitting warning messages to lots of spectators are a requirement for the stadium security. The control center which is established for making and controlling announcements is located in a place that can see the stands clearly. To conduct ticket checks quickly and accurately, the turnstiles should be coded separately for each sector and matched with the tickets; thus, the spectators can reach the correct stands. Activities other than football matches should be provided with the conditions of *Welcome and Hospitality*. Stadium space should be able to meet different venue needs

such as weddings, restaurants, and meetings. In football matches or other events, the equipment and features of the VIP and VVIP areas are superior to other spectators' ones. VIP areas are located in the center of the western stand with the best point of view and direct access to the playground, dressing rooms, media, and foyer places. Their entrance should be close to the main entrance and high-security prevention should be taken (DelMont, Botta & Reddy, 2011).

It is important that *Media* essentials can perform fast and functional tasks in and around the stadium. Media officials working in stadiums should have comfortable, convenient conditions and crucial equipment. These are also required conditions for accurate and rapid information transfer to the spectators following the match. For this reason, stadiums should be designed according to media employees' requirements, such as accreditation office, media tribune and match commentary room, stadium media center, press conference room, interview and multi-purpose area, studios and outdoor broadcast areas (OB-VAN). Television infrastructure and camera positions should be suitable for visual recording of the match and live broadcast. The cameras are located where they can see the whole match and the areas where critical positions can occur. Studios are also needed for living broadcasts and programs. There must be at least three studios for important matches. *Lighting and Power Systems* should ensure that the stadium is well lit and that the field can be viewed at any point in the stands, especially during night matches. Stadium ingress and egress should also be enlightened to confirm the safety of the stadium and the spectators. Technically, the lighting system can be located on the roof as well as it may have its own structure. In case of a power failure, a generator or batteries, capable of providing four hours of power, should be expected to be available. Advanced technology arrangements should be made with *Communication and Additional Areas* to meet the communication needs of many users in stadiums. Live broadcast facilities, building management system, ATM, clock system, common TV and antenna system, fire alarm service, food service, lighting control, mobile telephone service, police, and fire radio, roof control, telephones, scoreboard, electronic pass system, detector scanning, security telephone system, security video system, markings, audio systems, video screens, wireless internet, ticketing systems should be placed in the stadium. There should be a control room that manages all systems and these rooms should be located separately from the electrical ones (DelMont, Botta & Reddy, 2011).

Table 1. *Space definitions and equipment characteristics according to UEFA criteria.*

UEFA DESIGN CRITERIA			Stadiums	
PLAYERS AND MATCH OFFICIALS	Football pitch	Soft and flat surface	✓	All stadiums examined are allowed to play matches as they meet all relevant equipment specifications.
		Natural or artificial turf: approved by FIFA, suitable with international requirements, marked with green and white lines.	✓	
		Drainage system	✓	
		Underfloor heating	✓	
		There should be no objects less than 21 m high from the pitch	✓	
	Projector	min 350 lx	✓	
	Warm up areas	along the touch line or behind the billboards of the back of the goalposts	✓	
	Goalpost	width: 7.32 height: 2.44, white aluminium or similar material	✓	
	Substitutes' bench	2 substitutes' bench, each for at least 13 people and at least 5m away from the touchline	✓	
	Flagpole	At least 5	✓	
	Dressing rooms	Players' dressing room: at least 5 showers, 3 toilets, seating for 25 people, 1 massage table and 1 tactical board	✓	
		Referee dressing room: 1 shower, 1 toilet, 5 chairs and table	✓	
		Safe and quick access to the field	✓	
	Delegation room	Easy access to team and referee rooms and has telephone, fax and internet access	✓	
	Medical room for players and match officials	Appropriate and sufficient equipment	✓	
	Doping room	Next to the dressing rooms, isolated from the spectators and media	✓	
		At least 20 m2: waiting room, test room and toilet	✓	
		Waiting room: 8-person seating area, dressing area and cabinets, refrigerator	✓	
		Test room: 1 table, 4 chairs, 1 sink, lockable cabinet and toilet	✓	
		Sanitary area in test room: 1 toilet, sink and shower	✓	
	Parking	For teams and match officials: at least 2 buses and 10 cars	✓	
		Easy and quick access from dressing rooms	✓	
SPECTATORS	Spectators' stands	Each seat is fireproof, unbreakable, numbered with min 30 cm back	✓	
		Beverage areas in every stand	✓	
	Guest spectators' stand	At least 5% of the capacity of the stadium, separated from other stands	✓	
	Ingress and degress	Turnstiles	✓	
		Separated circulation for each stand, signs for stands' information around the stadium bowl	✓	
		Stairs of spectators on the stands should reach the playing field, but the doors opening to the field at the time of the match should be controlled.	✓	
		Exit, entrance gates and other gates should be marked with international symbols	✓	
	Emergency lighting	Emergency exits and stairs should be indicated with lights	✓	
	Announcements system	It must be able to operate in any power outage inside and outside the stadium.	✓	
	Sanitary	it should be in every stand, be hygienic. Sink, toilet paper and soap should be available.	✓	
		1 toilet, 2 urinals per 250 men, 1 toilet per 125 women	✓	
	Medical room	It should be in every stand with necessary equipment	✓	
	Disabled spectators	Inside the stadium, marked with signs	✓	
		easy access to the disabled stand	✓	
		Private beverage areas and sanitary areas	✓	
		1 WC per 15 wheelchairs disabled	✓	
	VIP seating	Specially separated, close to the centre line and in the middle of the 2 penalty lines	✓	
MEDIA	Media working area	At least 1 room with desks, power supply, telephone and internet access	✓	
	Cameras	The main camera should be positioned in the grandstand, in the middle and at the height that can capture the appropriate viewpoint, in the direction of the middle line, with a slope of 15-20 degrees.	✓	
	Media stand	In the middle of the grandstand with clear viewing angles, has easy access to other media working areas	✓	
		tables with power supply and least 3 chairs	✓	
		At least 1 match commentator desk / room with internet access	✓	
	OB-VAN	As close as possible to the stadium, on the same side with the main camera platform, on solid ground and has power supply	✓	
		It should be positioned in an open and clear area where it can be easily seen from the satellite	✓	

2.2. UEFA stadium design criteria

The European Football Association (UEFA), which has adopted the minimum design criteria set by the World Football Association (FIFA) for stadiums, has also issued "Qualified Stadiums" instruction as a regulator in the organization of its championships. Although this directive shows great similarities to FIFA, it focuses more on the construction areas, height, capacities, spatial needs and ecological values of stadiums and it is also revised in line

with the conditions of the day and published periodically (Fenwick et al., 2011). The qualitative and quantitative values of the stadium units are included in these guidelines that designers and investors can make more efficient planning and site selection (Table 1). Compliance of stadiums, with criteria in international organizations taking place at the European level, is taken into consideration with the help of this instruction. The limits and values of the criteria vary depending on the level of the organization, and the compatibility of the stadiums where the clubs will play matches is inspected (Platini & Infantino, 2010).

3. Spatial planning features of stadiums in line with FIFA regulations

When all the criteria related to FIFA for the stadiums are considered, it is observed that the spatial needs change according to the user profile. Therefore, new stadiums built in Turkey between 2002 and 2019 were generally designed under these criteria of FIFA. But the new structures have differences in terms of the organization of space depending on the characteristics of their designers and capacities. In this section, the planning features of built stadiums in the aforementioned period in Turkey will be discussed according to defined categories.

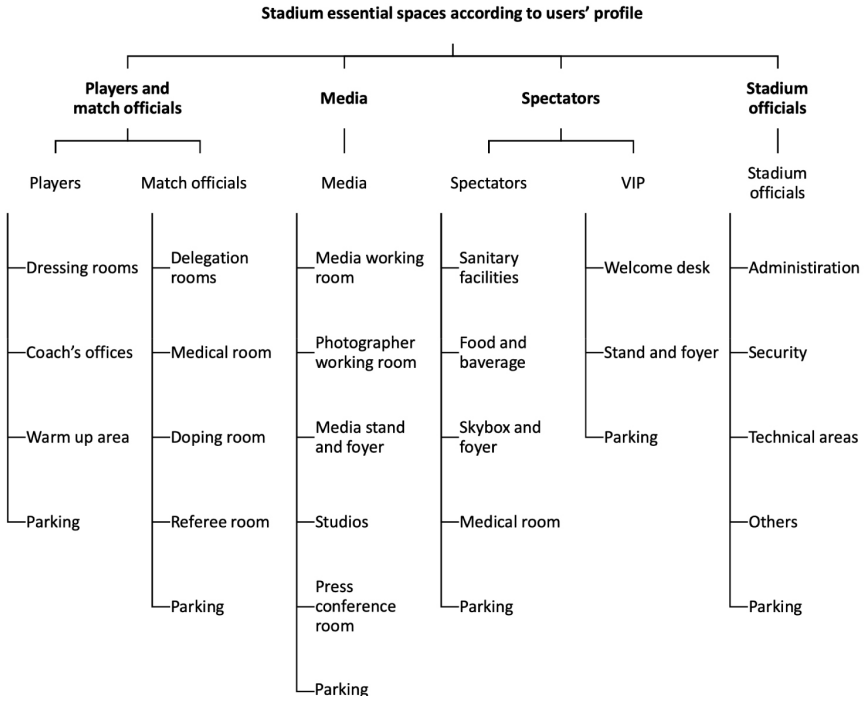
3.1. Space planning features by user profile

Required and used space by each user group in the venue differs in their planning features. The separation of areas healthily and conveniently is the most important cornerstone of stadium security. Players and match delegations, press, spectators, and stadium officers are the four main user groups in the stadiums (Table 2).

3.1.1. Spaces created for players and match delegations

It is very important for the players and match delegation to enter and exit the stadium safely. It is compulsory to have separate entries and exits from the spectators and other users, and they have a direct connection to the playground. The spaces should be organized by considering the mixed zone as the center. Accordingly, the team dressing rooms are separated from each other by positioning on both sides of the mixed zone, and a direct transition from the parking area, where the team buses drop the players off to the stadium, should be provided. Match delegation spaces such as federation representative room, medical room, doping room, referee rooms, press areas are connected to the mixed zone with different corridors.

Table 2. *Spaces created by user profile.*



The circulation differs for each unit, and it is connected to a single space, namely a mixed zone. When the proposed projects and stadium plans are compared, it is seen that these are mostly complied with the FIFA rules and for that reason, an effective circulation is provided. Such as the planning scheme proposed by FIFA for players and match delegations is in line with the plan of Konya Stadium in Turkey (Figure 1).

3.1.2 .Spaces created for media

The space created for the media members should be directly connected uninterruptedly. Media entrance, accreditation center, press conference room, stadium media center, media stand, studios, interview areas, and media parking lot should be in contact with each other, and special floor connection with stairs and elevators should be provided for quick and easy access. As seen in Mersin Stadium, it is observed that the media areas are positioned to provide direct access to the mixed zone and have a specialized circulation network to enable the press members to work in the most effective and fastest way (Figure 2).

3.1.3. Spaces created for spectators

Factors such as the cleanliness of the stadiums, food and beverage services, parking areas, and crowd control affect the comfort of the spectators and their participation rates of the match. For this reason, spectator areas must be designed with comfort standards. These comfort standards are determined and supervised by international organizations such as FIFA, UEFA (Wakefield and Sloan, 1995).

It is necessary and important to ensure the comfort of fans and VIP guests. Just like the separation of players and officials from the spectators, they must be separated within themselves. Principally for VIP guests, access to the VIP stands should be provided with staircases and elevators that are isolated across all floors, starting from the parking lots, so that they can safely enter and exit the

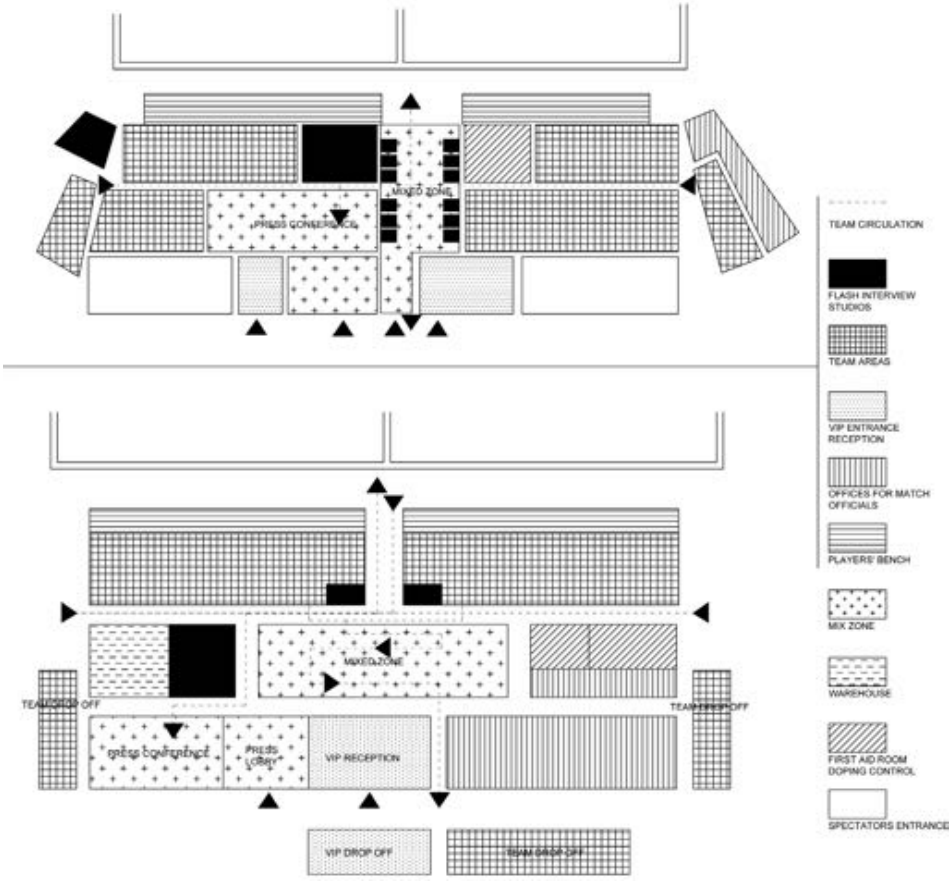


Figure 1. *Konya Metropolitan Stadium team area plan (above) and schematic plan recommended by FIFA for team areas (below).*

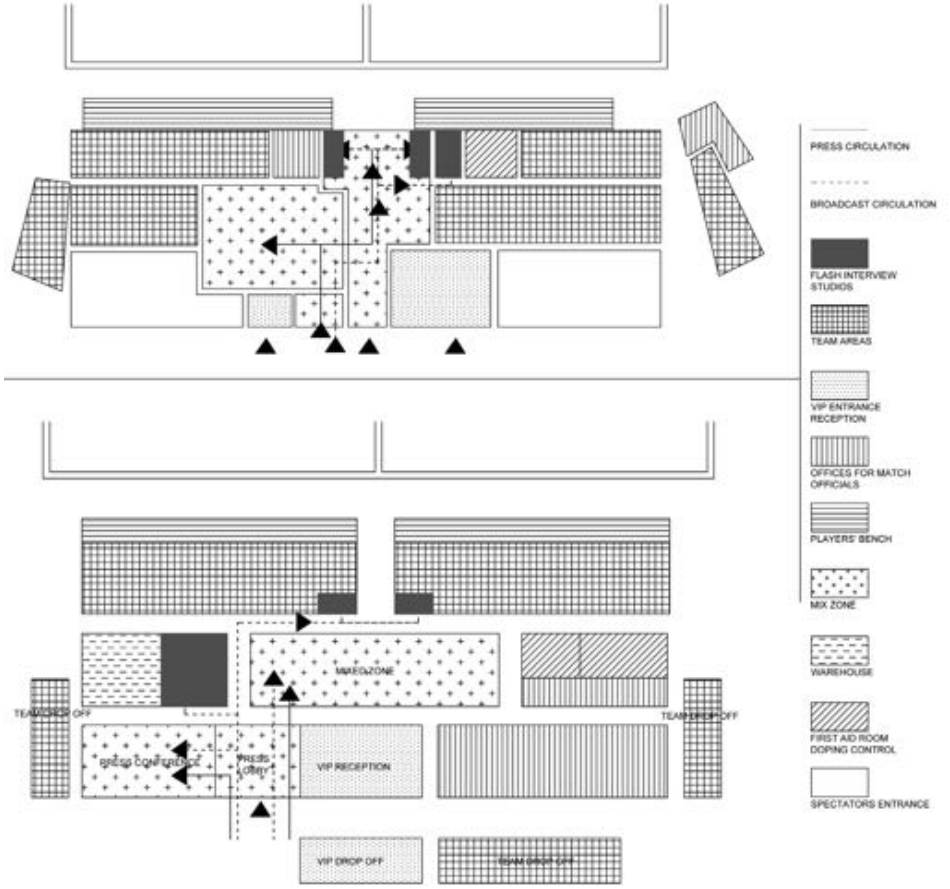


Figure 2. *Mersin Stadium media areas, mixed zone, and dressing rooms plan (above) and schematic plan recommended by FIFA for media areas, mixed zone and dressing rooms (below).*

stadium. Sanitary areas, medical rooms, foyers, and service areas also should be located at the back of the VIP tribune as in general spectators. Consequently, security can be provided at the highest level. As it can be seen in Kayseri Kadir Has Stadium, it is important to locate the foyer and sanitary areas special to VIP guests behind the VIP stand, as in the scheme proposed by FIFA (Figure 3).

3.1.4. Spaces created for stadium officials

Many spaces are created in the stadiums that serve to users such as management, security, technical staff, and employees responsible for food and beverage activities. The management unit for each stadium can be located in different sections and the access of the unit should be provided separately and be isolated from the others. In general, although there is no definite recommended place for the location of the management unit in the stadium, when all spaces are designed, the remaining sections are used for the stadium workers.

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3.2. Customized floor plans

Although each stadium is designed in different geographies, capacities, and styles, they are quite similar to each other due to the compulsory plan requirements. One of the important reasons for this is to comply with the

requirements of FIFA. In addition to that it has a spatial structural character, which is based on space placed around the circulation route in the stadium and rises on certain floors. For this reason, it is not only the circulation that differentiates the stadiums, but also their formal features. Due to the general rules and effective stadium orientation, the necessity of which spaces should be located in which stands, and how the spaces are separated from each other based on floors, and which spatial solutions are enriched by the space-foyer relationship, are the elements that make the designs differentiate.

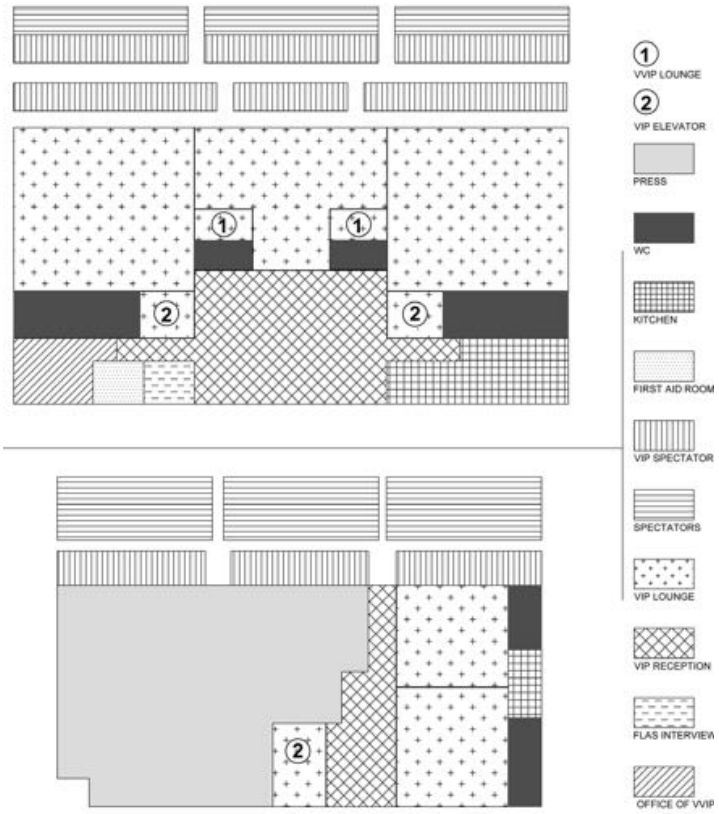


Figure 3. *Schematic plan of VVIP and VIP areas (above) proposed by FIFA and VIP tribune and foyer plan of Kadir Has Stadium (below).*

Table 3. *Stand locations of the functions in the stadium.*

	TÜRK TELEKOM STADIUM	MERSİN STADIUM	KADİR HAS STADIUM	KONYA STADIUM	BURSA STADIUM	VODAFONE STADIUM	Ş. SARAÇOĞLU STADIUM	ATATÜRK OLYMPIC STADIUM	MOSTLY LOCATED IN .....
TEAM AREAS	■	■	■	■	■	■	■	■	WEST STAND
SPECTATORS	■	■	■	■	■	■	■	■	ALL STANDS
SKY BOXES	■	■	■	■	□	■	■	■	WEST & EAST STANDS
VIP	■	■	■	■	■	■	■	■	WEST STAND
PRESS	□	■	■	□	□	■	□	■	WEST STAND
STADİUM OFFICIALS	■	□	■	□	■	■	■	□	NORTH & SOUTH STANDS
PARKING AREAS	■	■	■	□	□	■	■	■	WEST STAND
BUFFET, SNACK	■	■	■	■	■	■	■	■	ALL STANDS
SANITARY	■	■	□	■	□	■	■	■	ALL STANDS

The ground floor of stadiums includes space created not only for players and match officials but also the stadium officers and commercial ones. The ground floor of the west stand of each stadium is designed for player ingress and egress, and all related spatial needs are solved in this area. Due to the orientation of the stadiums in the north-south direction, the east and west tribunes have much larger areas. Therefore, the need for adequate space can be provided in these stands.

For the players to reach the dressing rooms easily and safely, taking the entrance from the ground level (road level) is seen as the most effective solution. In addition, Media and VIP entrances are also drawn from the ground level. While the ground floor of the western stand consists of spaces created for players and match delegations, in the eastern stand, there are spaces for the stadium officials. By

When stadiums in Turkey are compared, it is understood that the plan schemas on certain floors of each unit are similar to others. When these are evaluated and compared, it is observed that a common language exists in planning. The stand locations of the spaces serving for different users in eight stadiums are summarized in table 3. Accordingly, it has been determined in which stands these spaces are densely located. Although it has been observed that high-security areas such as the press, team, and VIP match with the grandstand value recommended by FIFA, the spectator stands, commercials, foyers, and parking can be located in different stands depending on the design approach and capacity of the stadium (Table 3).

3.2.1. Plan features of ground floors in stadiums

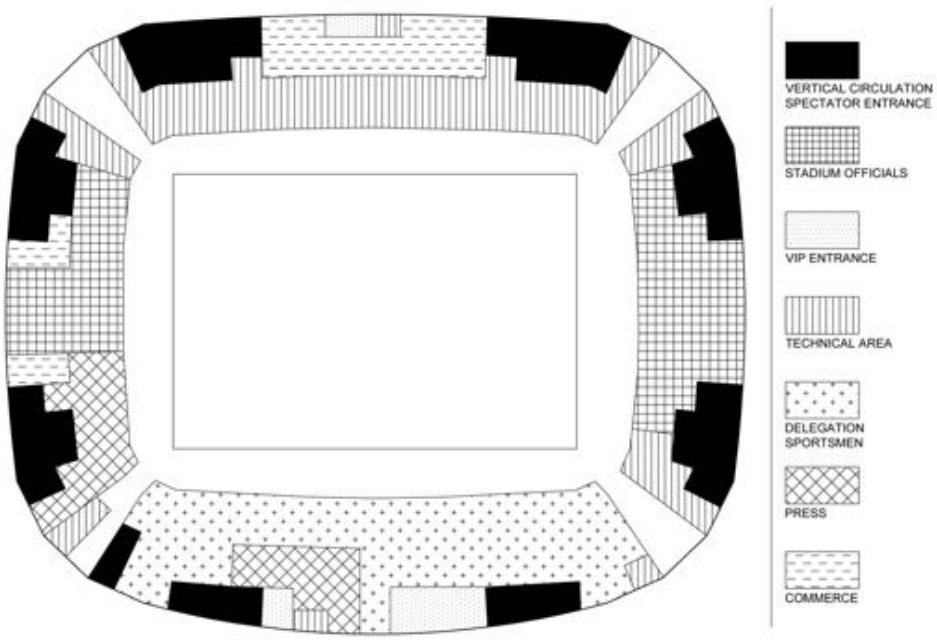


Figure 4. *Example ground floor plan; Konya Metropolitan Stadium.*

locating these facilities on the ground floor, more space can be created for the spectator foyer on the upper levels. The space created for the stadium officials can also be located in the north and south stands. On the other hand, commercial ones can be located on the periphery of the north, south and east tribune, so that the fans can be directly involved from the outside. In this way, the spectators can benefit from commercial activities without being included in the stadium. The entrance of the spectators to the stadium is provided by the east, north, and south stands but players, media, and VIP entrances are provided from the west stand. If it is correctly separated from private entrances, spectators' entrance can be given from the Western stand. Technical space can be located in diagonal corners of the stadium. The openings in the diagonal corners of the ground floor can be connected directly to the road, allowing rapid intervention of the emergency vehicle entry and exit. Generally, the openings in the corners are on both sides of the western tribune and there is a medical room next to these openings.

In the analyses of Konya Metropolitan Stadium, it is seen that the ground level of the western stand is completely formed by the functions reserved for players, media, and match officials, while the other

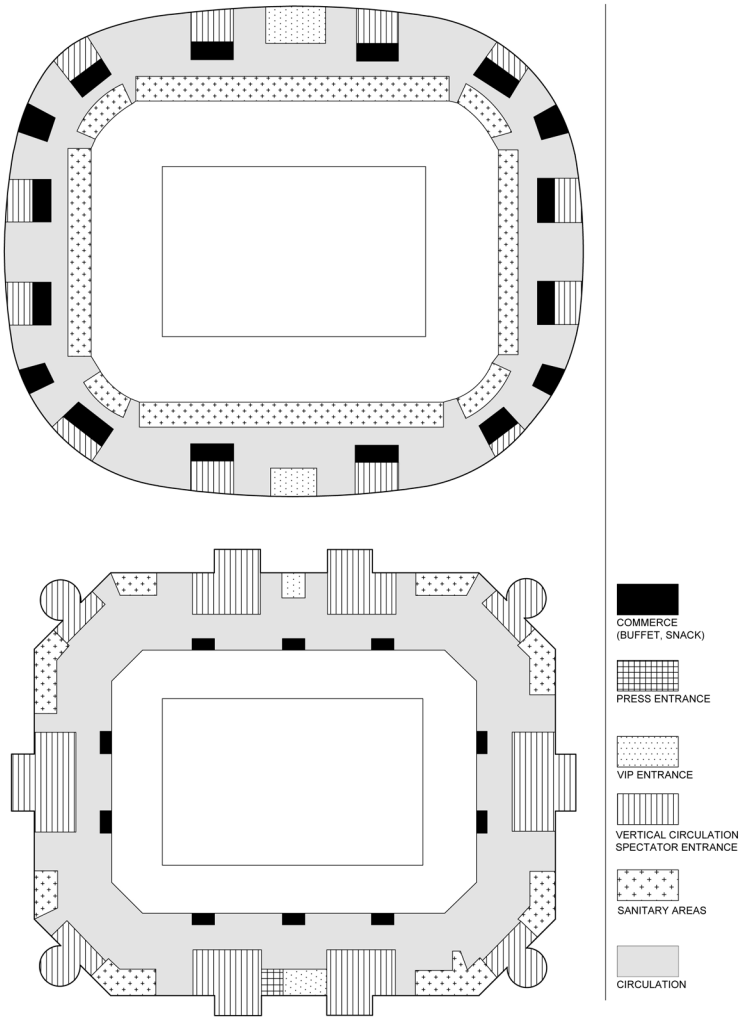


Figure 5. *Sample spectator stand and foyers plan; TT Stadium (above), Kadir Has Stadium (below).*

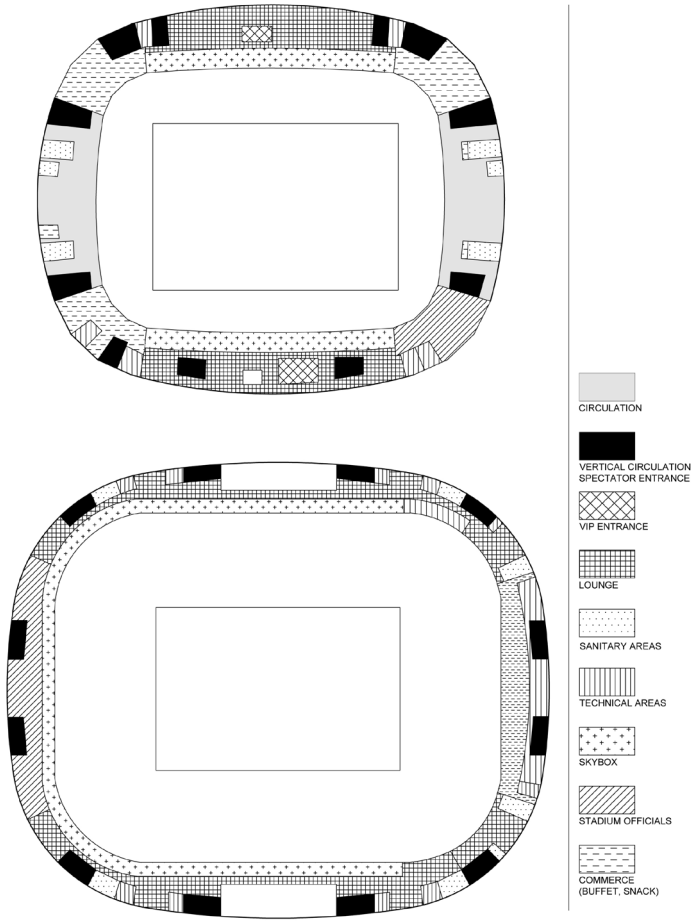


Figure 6. *Sample skybox floor plans; Konya Metropolitan Stadium (above), TT Stadium (below).*

stands serve for the match officials and the commercial functions. In the ground level of the Western stand, only match officials, players, and media entries are located, while spectators' entries are provided from other stands (Figure 4).

3.2.2. Plan features of upper floors in stadiums

The upper floors of the stadiums are mostly designed for spectators and fan's foyers behind each stand. In the foyers, there are functions such as areas where the spectators perform eating, resting activities, sanitary, and infirmary. Spectator's foyers are distinguished according to the user profile. Separate foyers are created for VIP, skybox, guest, and host team spectators so that security and comfort can be offered. Service units in the foyer have been designed with different approaches in each stadium and the main purpose has been to provide the spectator with comfortable and easy access from the stands to the foyers.

It is seen that the foyer areas in the Turk Telekom Stadium, where there are sanitary areas and food and beverage units behind the stands, are separated by structural elements, namely east, west, south, and north (Figure 5).

When two examples of the design of the service units are analyzed, it is possible to find out different approaches. For example, in the TT Stadium above, while the sanitary areas are located in the inner wall just behind the tribune, it is considered appropriate that the kiosks are freely located in the middle circle in the foyer. In the example of Kadir Has Stadium below, the opposite is preferred, and the sanitary areas are gathered in the outer wall, while the buffets are located in the inner wall behind the stands. In both examples, it is seen that the middle axis of the foyer is left empty to ensure the circulation of the high-density spectator, so the service areas are located in the inner and outer walls (Figure 5).

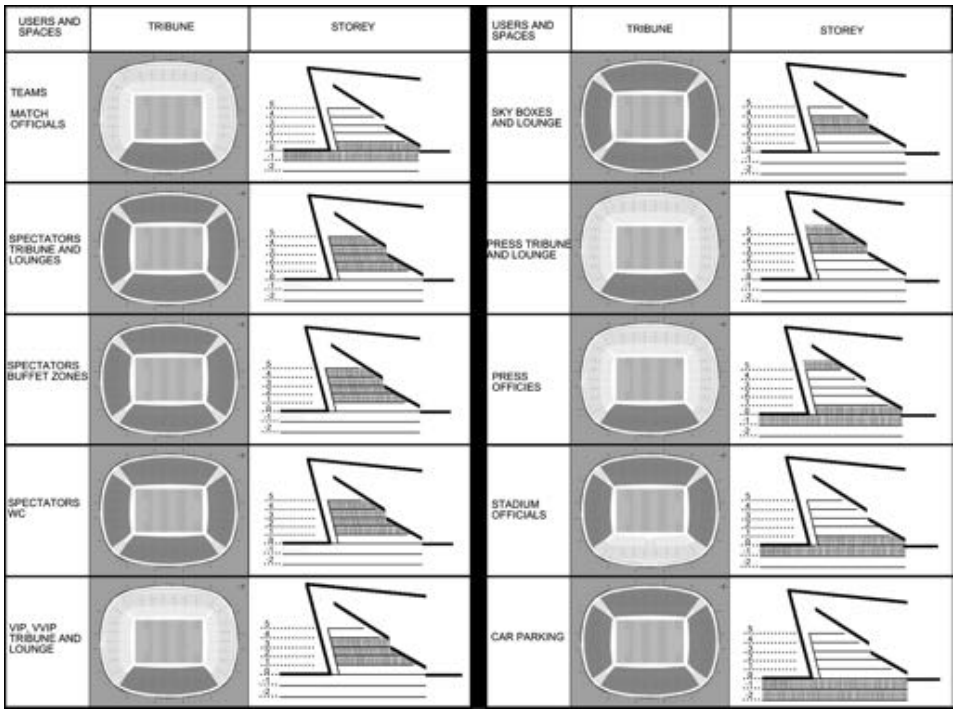
From the private staircases and elevators on the upper floors of the areas such as VIP and Media, entrance and exit are not provided to non-VIP spectator's foyers, so that the circulation areas of different user groups can be safely separated. In Kadir Has Stadium, a customized circulation network has been established on the ground floor, by separating VIP entrances from other spectators.

3.2.3. Plan features of skybox floors in stadiums

Floors with skyboxes in the stadiums are specialized ones. They are located at a distance that can see the field at an optimum level. Therefore, they are located in the area between the upper and lower tribunes. Depending on the design decision, the skyboxes are in the east and west stands, while in some stadiums they can also be located in all the stands for economic reasons. Access to these skyboxes is provided by separate stairs and elevators from the ground to the upper floors. Since the skybox is located on the entire floor, the foyer is common and is not separated with any barrier.

Two different design decisions can be observed between Konya Metropolitan

Table 4. *Schematic plan and section of the relationship between the floor and the grandstand.*



and Türk Telekom stadiums. According to this, since the skyboxes in Konya Metropolitan Stadium are located only in the west and east tribune, the spectator and the skybox foyers are separated from each other by various space. Restaurants and management units in the diagonal corners divided the foyers, thus, beverage and sanitary areas are designed in each foyer. In Türk Telekom Stadium, the foyers are not divided from each other since the skyboxes are located in all three stands of the floor (Figure 6).

3.3. Relation between the floor and stands in the stadium

The location of the space in the stadium has common features in line with the planning requirements. By analyzing the floor and grandstand relationship of the stadiums reviewed in Turkey, the generic features of the main decisions in designs can be understood.[1] As shown in Table 3, the locations of certain space in the stands show similarities between all the stadiums. Results of the examination on stadiums, it has been observed that the functions which serve different users are located in similar stands. Accordingly, the space created for players and match officials, as a rule, is located in the west stand in all the stadiums. Although spectator foyers can be found in all stands, VIP and its foyer, the media and its working area which are very important for the press conference room is located on the western side. Locations of the skyboxes vary according to the design decisions. The east and north grandstands are used intensively for stadium officials and employees. Parking lots can be located under separate stands, based on the transportation axes of the city. By considering the values in table 4 it is proven that a common design language has been formed within the framework of spatial needs.

It is critical to comply with national and international stadium design criteria to ensure correct and safe circulation. For that matter, it is natural that similar typologies appear in the stadiums that comply with the criteria. When the sections of the stadiums in Turkey analyzed, it is understood that the levels of the functions are similar. According to this, depending on the condition of terrain the spaces created for players and match officials are located on the ground or basement floor, spectator foyers are located on all floors beginning from the ground to upper levels; the media can be

found mostly on the ground, 3rd or 4th floors with the media working areas. VIP stands and foyers, skyboxes are usually located between the upper and lower stands. While the basement and ground floors are utilized to stadium officers and employees, basement floors are additionally preferred for parking lots (Table 4).

4. Conclusion

The stadiums are large-scale structures and their environmental effects can spread across the city, that's why they should be designed very precisely. Especially, the stage of making pre-construction decisions plays an important role in terms of considering opportunities and weaknesses. It is possible to create safe stadiums that provide comfort conditions if the subsequent stages of construction and usage processes are planned and implemented correctly.

Associations such as FIFA and UEFA, which manage football around the world and TFF on a local scale set standards for the spatial properties and define technical requirements for qualified stadium constructions. Therefore, space arrangements that provide these standards for the users can increase the number of qualified stadiums in Turkey which enables people to come together under the phenomenon of football the biggest unifying power in the country.

As a result of the analysis, today, it is seen that stadiums should be able to serve different users at a spatial level, and most of them should be separated from each other with a secure circulation network. Therefore, each unit must operate and be equipped sufficiently. Access from outside the stadium to the destination point must be separated according to the characteristics of each unit-user profile, and the functions within the stadium must be properly correlated.

The existence of recommendations and requirements for a building typology is an indication that the technical infrastructure of that typology must be constructed correctly. Eight stadiums, which were analyzed in line with the schemes suggested by international regulations, have similar plans due to comfort and safety conditions. According to these, it is observed that user-oriented functions are located in certain stands due to technical requirements. These layouts also bring along special plan types based on elevation. The circulation network established by the individual spaces located at certain elevations and stands within the framework of the user needs causes the formation of similar floors in each stadium. Consequently, the connection network organized by the spaces not only in the plan but also in the section is important; hence, it is understood that similar functional units are located on certain floors and stands. These plan and section features can claim to provide comfort and safety conditions if they comply with the recommendation schemes of international regulations that optimize complex circulation networks. It is also an important argument, especially in terms of hosting international matches.

The stadiums in this study and the new ones under construction have met the requirements proposed by international associations and this has allowed them to host many important organizations. Among them, Atatürk Olympic Stadium hosted the 2005 Champions League final, while Şükrü Saraçoğlu and Vodafone Park Stadium hosted the 2009 UEFA Cup and 2019 Super Cup finals. Hence, the most prestigious football events taking place in Turkey have created a favorable impression in the international community in terms of stadium infrastructure.

This study also demonstrates that, alongside the comfort and security conditions, facilities such as accommodation, transportation, food, and beverage to be created around the stadium ensure both active participation of local and foreign fans and increase the brand value of sports clubs in Turkey. That's why, not only the stadium but also the services and transport units complying with international requirements, will turn the stadium into one of the important centers of attraction in the city as a social catalyst.

Endnotes

Eight stadiums are selected from among the stadiums with a capacity of forty thousand and above, which were built in accordance with the guidelines issued by FIFA and UEFA. These are; Vodafone Stadium, Türk Telekom

Stadium, Şükrü Saraçoğlu Stadium, Atatürk Olympic Stadium, Bursa Metropolitan Stadium, Kadir Has Stadium, Mersin Stadium, and Konya Metropolitan Stadium

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A field study on thermal comfort in the shopping malls in a temperate humid climate

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Abstract

Shopping Malls where the number of occupants changes according to the days use the HVAC systems in order to provide thermal comfort. This study evaluated the relation between efficiency of the HVAC systems and thermal comfort conditions in the heating and cooling seasons. The aim of this study is to compare the indoor thermal comfort conditions according to standards. In order to analyze the thermal comfort conditions of two enclosed above-ground shopping malls that have a different HVAC systems, measurements (PMV-PPD) and surveys (AMV-APD) were conducted simultaneously. Occupant density and energy consumption data were taken from the shopping malls. The results show that the cooling season was more comfortable than the heating season in both shopping malls and one of the Shopping Malls has a better thermal comfort and a less energy consumption although it has a higher occupant density. According to the results, suggestions were developed for improving the thermal comfort conditions and reducing the energy consumption.

Keywords
AMV-APD, Energy efficiency, PMV-PPD, Shopping malls, Thermal comfort.

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1. Introduction

Nowadays, shopping malls not only meet the shopping needs but also meet the social needs of the people. The number of shopping malls has increased in the past few years (Turkish Federation of Shopping Centers and Retailers, TFSCR, 2016). The increase in the number of the occupants in the shopping malls also increases the importance of maintaining the thermal comfort conditions and energy consumptions. A thermally comfortable indoor environment has significant impact not only on shoppers' well-being, but also the attractiveness of shopping malls (Shang et al., 2016). In this regard, providing and maintaining the thermal comfort condition are important in terms of physical and mental health, especially in enclosed shopping malls.

There are lots of detailed and superficial researches on thermal comfort. When the thermal comfort studies are investigated, it is seen that the functions of the buildings are generally the residential buildings (Chen et al., 2017; Liu et al., 2017; Yu et al., 2017; Yao et al., 2018; Hansen et al., 2019) and office buildings (Karyono, 2000; Liu et al., 2013; Indraganti et al. 2015; Kumar et al., 2016; Andargie & Azar, 2019; Che et al., 2019; Thapa, 2020) and some of these studies are aimed to reduce energy consumption (Karyono, 2000; Chen et al., 2017; Yao et al., 2018; Che et al., 2019; Hansen et al., 2019). However, a few studies have been conducted on the thermal comfort conditions in the enclosed above-ground shopping malls, and these mainly concentrated on temperate humid climate regions and especially carried out during cooling season.

Chun and Tamura conducted a research in order to analyze two underground shopping malls and department stores in Japan in terms of thermal environment and the occupant sensations. As a result, the measurement results of this study showed that the underground shopping malls have unstable thermal conditions compared to the department store (Chun & Tamura, 1998). Kwok et al. not only explained the energy management decisions for the commitment to the voluntary energy conservation agreement but also conducted a survey study in order to understand the occupant satisfaction at a specified temperature during the summer season regarding thermal conditions in the shopping malls in Hong Kong. As a result, suggestions were made related to the thermal comfort and energy consumption (Kwok et al., 2017). Shang et al. conducted a study on thermal parameters, CO2, TVOC and formaldehyde concentrations in the shopping malls in China during the summer season. It is aimed to contribute to the perception of people, the pollutants and the air-conditioning systems (Shang et al., 2016). Li et al. carried out a field study (measurements and survey) on thermal environment in six underground shopping malls in China during summer. Thermal Sensation Votes (TSV) of the occupants and Predicted Mean Vote (PMV) were compared. The sensations of the occupants in the thermal environment were evaluated according to the temperature, relative humidity, air velocity variables and customer's duration (Li et al., 2018).

In the indoor environments that have a HVAC (Heating, ventilation, and air conditioning) systems, vast amount of energy is consumed in order to provide and maintain the thermal comfort conditions. When the number and the gross areas of the shopping malls are considered, it is well understood that attention must be paid to the amount of energy consumed while providing and maintaining the thermal comfort conditions. There are a limited number of researches, in the current literature, that take into account the energy consumption in the field of the shopping malls and thermal comfort. Chow and Lam conducted a field study on the thermal comfort and energy consumption of the commercial buildings in Hong Kong. In the study that includes the shopping malls, the buildings having different functions such as restaurants, hotels and offices are also presented. As a result of the study, it was observed that most of the spaces are cooled 3-4 0C more than the required temperature during the summer season. Also, with the help of the building energy simulation programs it was seen that for a typical office, raising indoor air comfort temperature set-point from 21.5 to 25 achieved an energy saving of 29% during summer (Chow & Lam, 1992). Lam et al. measured the thermal

and visual conditions of ten shopping malls with an HVAC systems in Hong Kong and compared them according to the international standards. The effects of the thermal and visual conditions on energy consumption were generally calculated and evaluated (Lam et al., 2001).

In the current literature, the limited number of studies examining both thermal comfort and energy consumption in shopping malls have been conducted in cooling and heating seasons of temperate humid climate. Most of these studies were conducted in underground shopping malls. The underground shopping malls are different from above-ground shopping malls in terms of environmental effects (solar radiation, air velocity, etc) and indoor thermal environments. Thus, the scope of the study is determined considering the need for defining the thermal comfort condition in enclosed above-ground shopping malls in temperate humid climates regarding energy consumption.

This study is based on the hypothesis that the efficiency of the HVAC systems is different in terms of providing and maintaining thermal comfort conditions of the shopping malls in the heating and cooling seasons. This study aims to investigate whether the shopping malls having a high percentage in energy consumption are in compliance with the thermal comfort conditions. In addition this study propose suggestions for reducing the energy consumption while at the same time maintaining the thermal comfort.

This study, unlike other studies carried out for the temperate humid climate regions, determined that cooling season was more comfortable than heating season. In both seasons the amount of energy consumption was higher than the amount needed to maintain good thermal comfort.

2. Methodology

Two enclosed above-ground shopping malls were selected as thermal comfort study fields. Measurement and survey conditions (seasons, days, hours and points) were determined according to the weather data, occupant density, plans (interior design) and functions.

Thermal comfort data (measurements and surveys) of the shopping malls were collected and also occupant density and energy consumption data were obtained from technical offices of shopping malls. Measurements and surveys were conducted simultaneously between 15.00-19.00 at the same

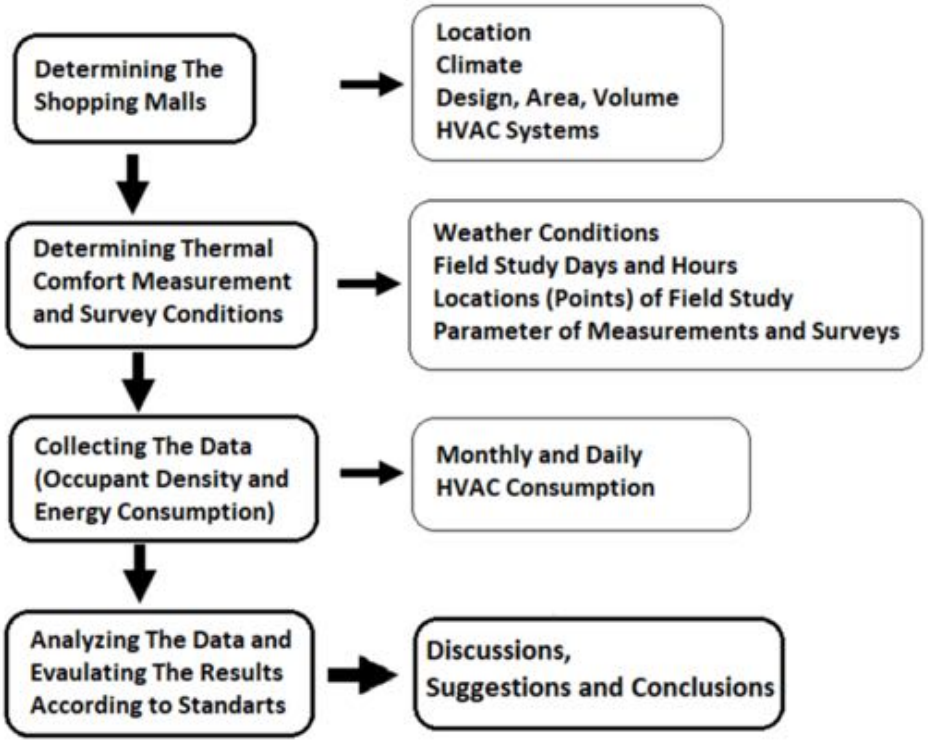

Figure 1. *Method of the study.*

points. The measurement results were compared with international standards. In addition, survey results and measurement results were evaluated and compared with each other. Thermal comfort values were associated with energy consumption and occupant density. According to the results, suggestions were proposed for improving the thermal comfort conditions and reducing the energy consumption at the same time. The method of this study is shown in Fig. 1.

2.1. Determining the shopping malls and the field study conditions

The outdoor conditions are important factors that affect the indoor thermal comfort conditions. This study was conducted in two enclosed above-ground shopping malls on the same transportation axis close to each other for similar weather conditions in Istanbul, Turkey.

The importance of green building rating systems increases day by day, within the concept of sustainable architecture. One of the shopping malls was specifically selected because it has a green energy certificate. Since the HVAC system type is one of the important parameters in thermal comfort and energy consumption, the shopping malls were selected such that they have different types of HVAC systems (heat pumps and air conditioning units).

Shopping Mall 1 (S. Mall 1) is located in a mixed-use project that is composed of shopping malls, residences and offices. The area of the S. Mall 1 is 152,997 m2. The architectural roof system consists of skylights covering the gallery spaces. The skylight to roof ratio (SRR) of S. Mall 1 is 11%. The window to wall ratio (WWR) of S. Mall 1 is 54.8% for the South fa-

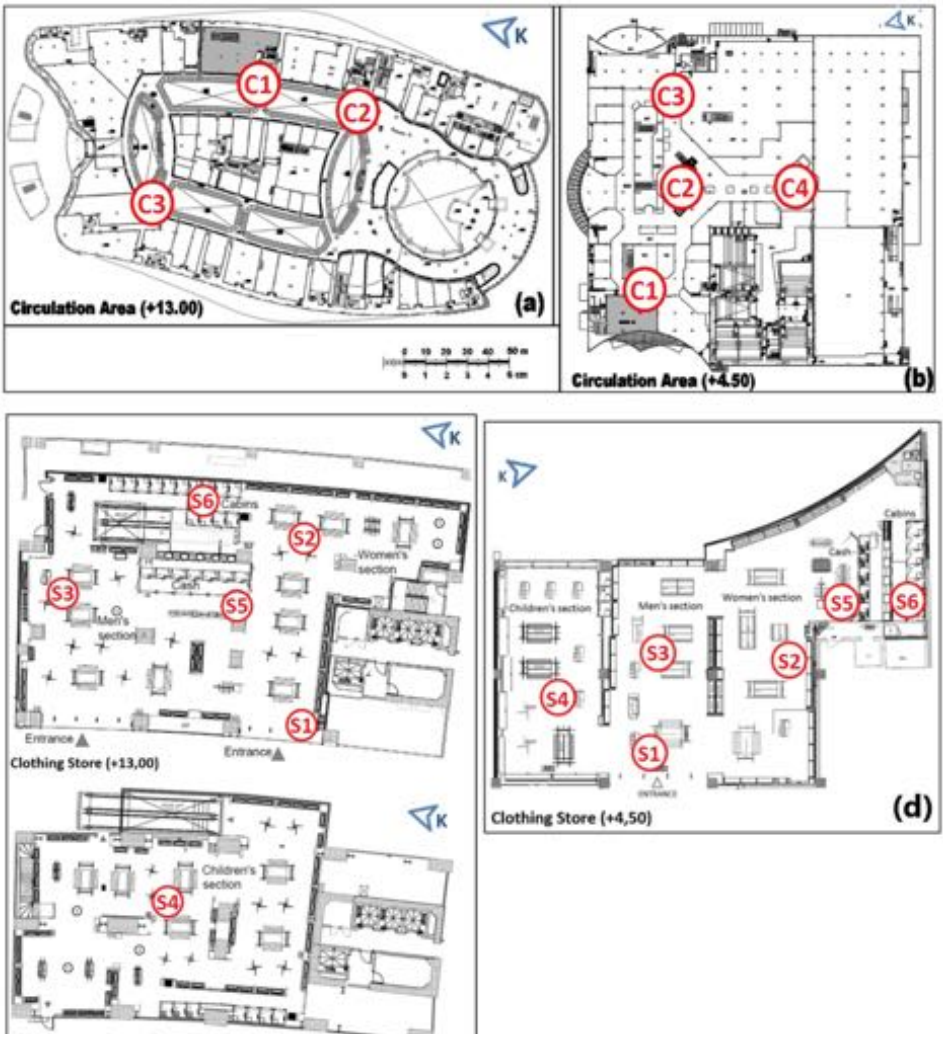

Figure 2. *Measurement points in the circulation areas of S. Mall 1 (a) and S. Mall 2 (b) and inside the clothing stores of S. Mall 1 (c) and S. Mall 2 (d).*

cade, 32.2% for the North facade and there is not or <5% for other facades. In 2013, it certificated as "good" from BREEAM Certification System. The air-conditioning of the shopping mall is accomplished using heat pumps. An automatic system is used to set the required temperature and the fresh air volume in S. Mall 1.

Shopping mall 2 (S. Mall 2) is only consist of shopping mall. The area of the S. Mall 2 is 154,587 m2. The architectural roof system consists of skylights covering the gallery spaces. The SRR of S. Mall 2 is 2.5%. The WWR of S. Mall 2 is 13.9% for the Northeast, 7.4% for the Southeast and there is not or <5% for other facades. The air-conditioning of the shopping mall is accomplished via ACU (Air Conditioning Units).

The stores (clothing stores of the same brand) and circulation areas were determined as measurement areas because they are widely used units. Clothing stores have different sections such as women's and men's. The number of occupants of these sections is different. Measurement points were selected on plans (Fig. 2) according to the functions of the sections and the number of occupants. The measurement points are S1 (Entrance), S2 (Women's section), S3 (Men's section), S4 (Children's section), S5 (Cash), S6 (Cabins). The points in the circulation area were determined in areas not affected by direct solar radiation and natural ventilation.

When the weather condition of Istanbul is analyzed, it is seen that from 1929 to the year 2017 annual mean temperature is 14,4 °C, sunshine duration is 79,7 hours and monthly precipitation is 817,4 mm (Turkish Republic Ministry of Forestry And Water Affairs, 2018). This study was carried out during heating (March, April) and cooling (July) season for the comparison. Occupant thermal sensation in the shopping malls can vary based on the occupant density of the shopping mall. Thus, the field study days and hours were determined as Thursday, Friday, Saturday and Sunday and between 15.00-19.00, respectively. Field study days and weather conditions data for these days are given in Table 1.

2.2. Determining the thermal comfort parameters

According to the steady-state model, Fanger developed a scale consist of seven different senses that define the thermal sensation of the people for the conditioned spaces (Fanger, 1970).

AMV (Actual Mean Vote) is used to measure the thermal condition satisfaction of the occupants. APD (Actual Percentage Dissatisfied) is used to measure the thermal condition dissatisfaction of the occupants. They are used to determine the thermal comfort level of the environment via ASHRAE 55 (American Society of Heating, Refrigerating and Air-Conditioning Engineers) seven-point thermal sensation scale. PMV (Predicted Mean Vote) is calculated according to this scale by taking into account six variables such as clothing insulation, activity level, indoor air temperature, mean radiant temperature, air velocity and relative humidity. Since the thermal sensation changes according to the physiological and psychological variables of a person, PPD (Predicted Percentage of Dissatisfied) index is used together with PMV for determining the thermal condition. In this model, PMV and PPD are developed to evaluate and predict the mean thermal comfort and the percentage of dissatisfaction with the thermal environment of a group of people rather than each individual.

Calculation the PMV and PPD using equations and classification regarding the PMV and PPD values that describe the satisfaction state is given in ASHRAE 55 and ISO 7730 (International Standardization Organization) Standards (BS EN ISO 7730, 2005; ANSI/ASHRAE Standard 55, 2017).

2.3. Determining the thermal comfort measurement conditions

The measurements were carried out with Testo 480 - Digital Temperature and Humidity Meter (Testo 480- Product Details, 2019). This device has an air velocity probe, a black globe probe and a temperature and humidity probe. Testo 480 gives the thermal comfort as PMV and PPD according to the input data and the instantaneous values of the objective parameters.

The input data were entered to the thermal comfort meter based on ISO

Table 1. *Weather conditions of the field study days.*

Heating Season								
	S. Mall 1				S. Mall 2			
Date (2017)	**30.03**	**31.03**	**01.04**	**02.04**	**23.03**	**24.03**	**25.03**	**26.03**
Mean Temperature (°C)	11,8	9,3	7,9	7,8	9	8,7	8,6	9
Mean Relative Humidity (%)	57,6	86	69,4	76,6	78	84,2	83,8	85,7
Mean air velocity (m/sn)	3,8	5,9	4,3	4,5	2,2	1,4	1,5	1,2
Cooling Season								
	S. Mall 1				S. Mall 2			
Date (2017)	**13.07**	**14.07**	**15.07**	**16.07**	**06.07**	**07.07**	**08.07**	**09.07**
Mean Temperature (°C)	25,4	23,6	25,0	21,9	23,2	22,7	23,3	23,9
Mean Relative Humidity (%)	87,3	78,1	76,0	57,3	59,0	71,0	56,5	57,2
Mean air velocity (m/sn)	2,2	4,5	5,0	5,4	2,2	2,3	1,9	1,1

Note: Prevailing wind direction is between North East and North West in Istanbul.

7730 and ASHRAE 55 Standards (BS EN ISO 7730, 2005; ANSI/ASHRAE Standard 55, 2017). The input data were determined as clothing insulation value: 1 clo during heating season, 0.5 clo during cooling season, Activity Level: 1.6 met.

Taking into account the customers' duration time in store, measurements were carried out for 10 minutes at 30 second intervals at each point.

ASHRAE 55 stated that air temperature and average air speed shall be measured at the 0.1, 1.1, and 1.7 m height levels and operative temperature (to) or PMV shall be measured or calculated at the 1.1 m level for standing occupants (ANSI/ASHRAE Standard 55, 2017). In addition, it is assumed that people use their hands for shopping at an average height of 1.1 m and this value is determined as the measurement height.

2.4. Determining the thermal comfort survey conditions

Since the differences in thermal comfort can be due to physiological reasons (Fountaın et al., 1999), surveys should be conducted for the correct evaluation. The aim of the surveys is to determine the thermal comfort conditions of the customers in the stores and to compare survey results with measurement results. For a proper comparison, surveys were conducted at the same time and at the same points with the measurements. In order to determine the quality and convenience of the surveys, a pilot study is conducted on a group of people prior to the field study. Correct understanding and answering of the survey questions affect the reliability of the results. Therefore, the surveys were asked to the participants verbally and the possible mistakes were minimized.

Gender, age, and other factors might lead to individual difference in thermal comfort (Wang et al., 2018). Demographic questions in the survey include age, gender, weight, education level, employment status.

The comfort temperature changes according to adjustment behaviour which are mainly due to changes of clothing (Takasu et al., 2017). Since another important parameter affecting thermal comfort is clothing insulation value, questions were asked to assess the clothes on the participants in the survey. In order to compare the thermal sensations of the participants, clothing insulation values were calculated separately for the two seasons. It is considered that the sensations of the people to the thermal conditions change over time. In this regard, questions were directed to the participants for the purpose of determining the variation of the thermal condition based on the duration they were in the store. The other question was asked to determine the relation between the locations (measurement points) of the customers and thermal comfort condition. The questions were asked to rate thermal sensations on the ASHRAE 55 seven-point thermal sensation scale. Answers were used to find AMV and APD.

Figure 3. *The occupant density (total number of people) according to measurement dates (a) and the relationship between Indoor Environmental Conditions of S2 (women) point (b).*

3. Results

PMV and PPD are based on measurements and AMV and APD are based on surveys. Statistical analyses were performed using SPSS 22 (Statistical Package for the Social Sciences). Occupant density and energy consumption data of the HVAC systems were taken from the shopping malls' management and technical departments.

3.1. Occupant density in the shopping malls

Human body produces heat at the end of the metabolic activity. Since the metabolic heat production will be high in spaces where the number of people is high, it can cause thermal discomfort especially in indoor environments. The number of occupants, of course, changes according to days in the shopping malls.

Occupant density of the S. Mall 1 and S. Mall 2 during the heating and cooling seasons related to study days are given in figure 3 (a). The total number of occupants in the heating season, in March is 1.411,399 (million) people for S. Mall 1 and 831,959 (thousand) people for S. Mall 2; in the cooling season in July total number of occupants is 892,360 (thousand) people for S. Mall 1. Occupant density increases on Saturdays and Sundays in both seasons (Fig. 3 (a)). It is seen that the occupant density of the S. Mall 1 is higher than the S. Mall 2 when daily and monthly data are analyzed.

3.2. Thermal comfort measurement results in the shopping malls

In the evaluation of the measurements, -0,5<PMV<+0,5 range is considered as comfortable according to ISO 7730 and ASHRAE 55 standards. The closer the PMV is to 0, the more comfortable the environment. PMV obtained from measurements were evaluated according to this range (BS EN ISO 7730, 2005; ANSI/ASHRAE Standard 55, 2017). In the evaluation, results on the hot side mean greater than neutral and on the cold side means less than neutral. The measurement results are shown in the Fig. 4.

According to the measurement results, PMV is on the hot side (above neutral) at all the measurement points in both S. Malls and during both season (except S6 (cabin) in the S. Mall 1 during the cooling season). S. Mall 1 and S. Mall 2 have exceeded the comfort range by 62% and 76% on the hot side during the heating season, respectively. PMV is within the comfort range in cooling season. PMV value of S. Mall 1 is within the comfort range in cooling season and is close to neutral by 2% and

69% on the hot side according to comfort range (Fig. 4 and Table 3). PMV value of S. Mall 2 has exceeded the comfort range by 4% on the hot side during the cooling season. Measurement results show that the cooling season is more comfortable than the heating season for both of the shopping malls (Fig. 4). According to the measurement results Saturdays and Sundays are generally the most uncomfortable days (Fig. 4). The relation between PMV and occupant density is statistically significant because of $p<0,05$ according to analysis of variance (ANOVA) and is positive because r is positive according to analysis of correlations. Therefore, the increase in the occupant density caused the PMV to increase on the hot side. The occupant density has affected the indoor air temperature and relative humidity of the S2 point especially in S. Mall 2 (Fig. 3 and 4). Inside the store, generally S2 (women) point is the most uncomfortable point among the measurement points. There is a decrease in PMV value from Point 1 to Point 6 because r is negative according to analysis of correlations.

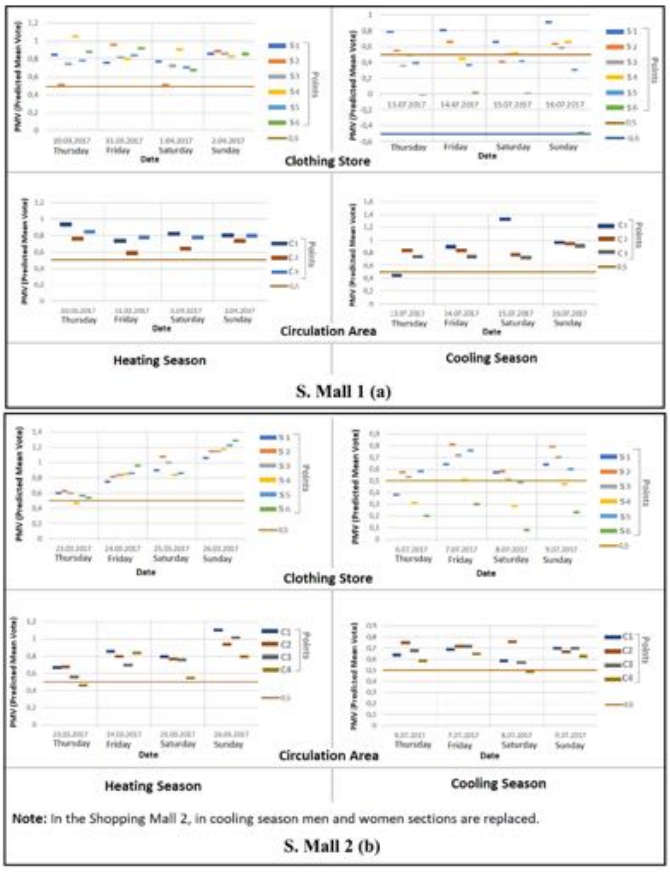

Figure 4. *Thermal comfort measurement results of the S. Mall 1 (a) and S. Mall 2 (b).*

3.3. Thermal comfort survey results in the shopping malls

Results obtained upon processing and analyzing the surveys are presented in Table 2.

The relationship between gender, age, clothing insulation values, location, day and duration data and thermal comfort were examined. According to Cross Tabulation analysis, it is seen that men feel hotter than women during heating season (60.9% of males and 54.1% of females felt hotter) while there is no significant difference during the cooling season. It is determined that as the age gets older thermal sensation approaches normal during both cooling and heating seasons. The average clothing insulation value of the participants during the cooling season is 0.45 clo while during the heating season 0.80 clo. The identified clothing insulation values according to the survey results are closer to the measurement input data determined according to the standards in the cooling season than in the heating season.

According to analysis of variance (ANOVA), in the cooling season, in both shopping malls as the duration increases, they feel colder in the same environment because they have difficulty in achieving their body heat balance over time. In cooling season, after a certain time people feel colder in a conditioned environment (Fig. 5(a)).

At the end of the analysis, it is identified that especially in S. Mall 1 S6 (Cabin) point was to be uncomfortable

Table 2. *Questions and results of the customer (occupants) surveys.*

Questions		Heating Season		Cooling Season	
		S. Mall 1	S. Mall 2	S. Mall 1	S. Mall 2
Number of Surveys		124	124	81	85
Gender	Female	**%73,4**	**%70,2**	**%75,3**	**%67,1**
	Male	%26,6	%29,8	%24,7	%32,9
Age	12-18	%10,5	%10,5	%1,2	%5,9
	18-24	%23,4	%24,2	**%35,8**	%15,3
	24-35	**%35,5**	%24,2	%27,2	**%36,5**
	35-50	%20,2	**%28,2**	%29,6	%29,4
	50+	%10,5	%12,9	%6,2	%12,9
Weight (Mean)		67,1	67,57	66,66	70,15
Clo (Mean)		0,75	0,84	0,43	0,48
Location	S1	%9,8	%5,6	%2,5	%12,9
	S2	**%32,8**	**%21,8**	**%44,4**	%23,5
	S3	%20,5	%19,4	%14,8	**%24,7**
	S4	%16,4	%21	%18,5	%11,8
	S5	%7,4	%19,4	%11,1	%14,1
	S6	%13,1	%12,9	%8,6	%12,9
Thermal Sensation Values	Hot (+3)	%29	**%41,9**	%4,9	%3,5
	Warm (+2)	%12,9	%19,4	%9,9	%7,1
	Slightly Warm (+1)	%6,5	%2,4	%3,7	%7,1
	Neutral (0)	**%40,3**	%32,3	**%29,6**	**%38,8**
	Slightly Cool (-1)	%8,9	%4	%13,6	%23,5
	Cool (-2)	%2,4	%0	%28,4	%20
	Cold (-3)	%0	%0	%9,9	%0

Note: The bold numbers represent high percentages.

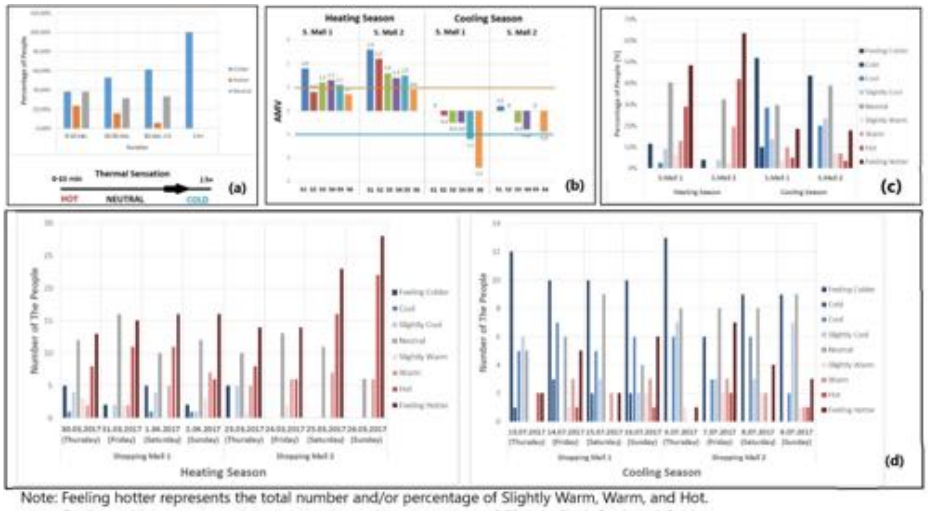

Figure 5. *Thermal sensation according to the duration time in the store in cooling season (a) and to the locations (points) (b). Seasonal thermal sensation (c) and thermal sensation according to study days (d).*

Table 3. *Thermal comfort scales.*

	Heating Season		Cooling Season		ISO 7730 and ASHRAE 55 Standards Comfort Range
	S. Mall 1	S. Mall 2	S. Mall 1	S. Mall 2	
Number of people	124	124	81	85	
AMV (Actual Mean Vote)	1,05	1,58	-0,62	-0,31	-1, 0, +1
Std. Dev. (AMV)	0,16	0,58	0,12	0,44	
APD (Actual Percentage Dissatisfied)	44,3	61,3	53,1	30,6	
PMV (Predicted Mean Vote)	0,81	0,88	0,49	0,52	-0,5 < PMV < 0,5
PPD (Predicted Percentage Dissatisfied)	19,22	22,48	11,56	11,83	<10%

towards the cold side during the cooling season. Also, it is seen that participants feel hotter during heating season and normal during cooling season at S1 (entrance). It has been concluded that S2 (women) point in S. Mall 2 is found to be uncomfortable towards the hot side during heating season and comfortable in both shopping malls during cooling season (Fig. 5(b)).

According to Cross Tabulation analysis, during heating season, there has been an increase in the number of the people who felt hotter than neutral on Saturdays and Sundays (weekends) when compared to Thursday and Friday (weekdays) (Fig. 5(d)). On the other hand, during cooling season there has been generally decrease in the number of the people who felt colder on Saturdays and Sundays (weekends) when compared to Thursday and Friday (weekdays) (Fig. 5(d)).

The acceptable comfort range AMV is classified as +1, 0, -1 (BS EN ISO 7730, 2005; ANSI/ASHRAE Standard 55, 2017). Shopping malls are out of comfort range in heating season. S. Mall 1 and S. Mall 2 have exceeded the comfort range by 5% and 58%, respectively. AMV is within the comfort range in cooling season (Table 3). AMV value of S. Mall 1 and S. Mall 2 are close to neutral by 38% and 69% according to comfort range, respectively. During heating season, the total number of people feeling hotter (Slightly Warm + Warm + Hot) is higher than neutral. During cooling season, the total number of the people feeling colder (Slightly Cool + Cool + Cold) is higher than neutral (Table 2, Fig. 5 (c and d). However, this fact is more apparent in the heating season. Cooling season is more comfortable than heating season (Fig. 5(b and c),

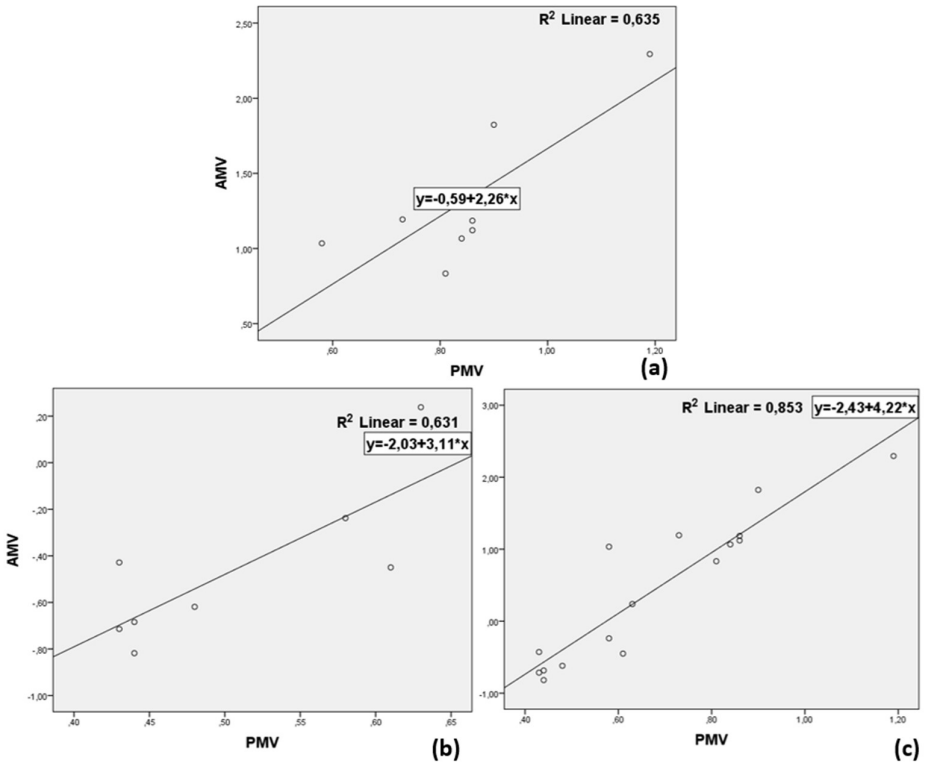

Figure 6. *Linear Regression of AMV-PMV for heating season (a), cooling season (b) and two season (c).*

Table 3). S. Mall 1 is more comfortable than S. Mall 2 during heating season but S. Mall 2 is more comfortable than S. Mall 1 during cooling season according to AMV and APD (Table 3).

Most of the occupants felt colder than neutral although measurement results were positive (hotter) during cooling season (Fig. 4 and Fig. 5 (c and d), Table 2 and 3). Linear regression was used for the comparisons of PMV and AMV. The regression equations control relationship between the variables (dependent and independent). The relation between the variables (dependent and independent) is a statistically significant association when the correlation coefficient (R value) is close to 1. The relationship between PMV and AMV is high (Fig. 6). Linear regression equations are 1 for heating season, 2 for cooling season and 3 for two seasons.

AMV=-0,59+2,26PMV (1) in heating season,

AMV=-2,03+3,11PMV (2) in cooling season and

AMV=-2,43+4,22PMV (3) in two seasons.

3.4. Energy consumption in the shopping malls

Thermal comfort has a direct effect on the comfort, health and productivity of the occupants (Wargocki et al., 2002; De Giuli et al., 2012; Al-Horr et al., 2016) and has a direct impact on energy consumption of any building (Corgnati et al., 2009; Catalina & Iordache, 2012).

Nearly half of the energy consumption in commercial buildings is used to operate heating, ventilation and air conditioning (HVAC) systems (Bisset, 2007; Laustsen, 2008) and varies depending on the location (Enteria & Mizutani 2011). By using the HVAC systems in an increased temperature range reduces energy use by lessening the cooling and heating loads (Hoyt et al., 2009). Energy consumption will reduce significantly with the optimal selection of the set values of air conditioning systems (Arslanoğlu & Yiğit, 2011). Shopping malls that are growing day by day, should use the energy in an effective and efficient way.

HVAC systems are used in the enclosed shopping malls where the study was conducted. Heat pumps are used

Table 4. *Energy consumption data of the HVAC Systems at field study days.*

Months and Days	Heating Season Energy Consumption (kwh)		Cooling Season Energy Consumption (kwh)	
	S. Mall 1	S. Mall 2	S. Mall 1	S. Mall 2
Monthly	323.344,34	376.950	245.263	666.915
Thursday	-	11,590	-	23,232
Friday	-	11,490	-	23,210
Saturday	-	15,530	-	21,440
Sunday	-	11,650	-	21,040

for the air-conditioning system in S. Mall 1. In the air-conditioning system of the S. Mall 1, seasonal temperature adjustment and fresh air amount are changed and fixed with the help of the automation system. The air-conditioning system of the S. Mall 1 is set to 22 °C during heating season while in cooling season it is set to 26 °C. The air-conditioning of S. Mall 2 is provided with air conditioning units (ACU). Heating systems are provided with hot water pipes with a 3-way valve system. Refrigeration compressors are used in the cooling of S. Mall 2 (Shopping mall management, 2017).

Energy consumption data was taken from the energy analyzers in shopping malls and the amount consumed for conditioning was taken consulting the people working at the management and technical departments. Energy consumption data of the S. Mall 1 are saved monthly, thus daily energy consumption data could not be obtained. The energy consumption of the Shopping Malls, during cooling and heating seasons, are presented in Table 4.

The usage area sizes (m2) of the shopping malls that the study is conducted are nearly the same (S. Mall 1: 152,997 m2; S. Mall 2: 154,587 m2). When the energy consumption data are analyzed, in the cooling season, the monthly energy consumption of S. Mall 2 is 172 % more than S. Mall 1. Although heat pump and automation system are used in S. Mall 1, in the heating season, the monthly energy consumption of S. Mall 2 is only 16.5 % more than S. Mall 1. In the S. Mall 1, the monthly energy consumption of heating season is 31.8 % more than cooling season. As given at the end of the study, cooling season was more comfortable than heating season (Fig. 4, Fig. 5(b and c), Table 3). The comfort temperature set-point during the heating period is more than the amount needed in S. Mall 1.

In the S. Mall 2, the monthly energy consumption of cooling season is 76.9 % more than heating season. In cooling season, greenhouse effects occur due to the Shopping Mall's architectural roof system and internal heat gains increase. The greenhouse effect and the lack of an automation system increases the cooling load in the S. Mall 2 in cooling season. The use of the automation system and the heat pumps for the conditioning of the S. Mall 1 lead to an important difference by ensuring an efficient use of energy and lower energy consumption especially in cooling season.

4. The main findings and discussion

As a result of the data obtained, in both seasons the amount of energy consumption was higher than the amount needed to maintain the thermal comfort and this situation causes discomfort. Cooling season was more comfortable than the heating season in both Shopping Malls (Fig. 4, Fig. 5(b and c), Table 3). The S. Mall 1 is generally more comfortable and consumes less energy in cooling and heating seasons than the S. Mall 2 although it has a higher occupant density. The findings obtained while reaching the result are as follows. Suggestions for improving the thermal comfort conditions while simultaneously reducing the energy consumption were developed.

- S. Mall 1: Studies, related to thermal comfort and energy consumption in shopping malls suggested that the temperature set-point should be lower than 25.5 °C during summer (Lam et al., 2001; Shang et al., 2016; Kwok, Xu & Wong,

2017). However, raising indoor air comfort temperature set-point achieved an energy saving during summer (Chow & Lam, 1992; Lam et al., 2001). One of the results of this study is that energy consumption during heating season is higher than during cooling season, but cooling season is more comfortable than the heating season. The reason for this is the HVAC system of the S. Mall 1 is set to 22 °C during heating season. This causes an uncomfortable environment on the warm side and unnecessary energy consumption. This study, determined that the temperature set point was kept high during the heating season. AMV is on the cold side and occupants felt colder than they should feel according to measurement results although set-point was 26 °C during cooling season. The comfort temperature set-points of the HVAC systems should be determined correctly for two seasons.

- S. Mall 2: The amount of energy consumption during cooling season in the S. Mall 2 is higher than the amount of consumed during heating season while the cooling season is more comfortable than the heating season. However, although the monthly energy consumption of cooling season is 76.9 % more than heating season, there is no significant difference in thermal comfort.
- The total number of people feeling hotter (Slightly Warm + Warm + Hot) is higher than neutral and AMV is on the hot side during heating season. Although the S. Mall 1 energy consumption is 16.5% lower than S. Mall 2 in heating season, S. Mall 1 is more comfortable than S. Mall 2 because heat pump and automation system is used in S. Mall 1.
- Thermal comfort changes depending on the occupant density in the shopping malls. The increase in the occupant density caused comfort level to increase on the warm side according to measurement and survey results. Although the occupant density is high, the use of an automation system in S. Mall 1 balances the increase in heat load caused by the occupant density. Fanger suggested obeying five principals in which one of them is that individual control of thermal control of the environment should be provided (Fanger, 2001). The use of automation system especially in the spaces that have high number of occupants such as shopping malls both provides and maintains thermal comfort and contributes to reducing the energy consumption.
- Depending on the function and occupant density, there are large differences in PMV between points in shopping malls. HVAC systems should be planned in design phase according to the function and temperature set values should be different according to the units (points).
- Dear and Nakano stated that the clothing insulation value might have impacted the results is effective in their studies (de Dear & Brager, 1998; Nakano et al., 2002). It was found that the clothing insulation value in shopping malls in the heating and cooling season differs from that given in the standard (ANSI/ ASHRAE Standard 55, 2017; BS EN ISO 7730, 2005). In future studies, conducting the measurement study and determining the clothing insulation value of the occupants should be done simultaneously. Entering the data input to thermal comfort meter according to these results will increase sensitivity of the measurements.
- According to the survey results men feel hotter than women during heating season while there is no significant difference during cooling season. In addition, it was determined in the studies that women prefer a warmer environment than men (Karjalainen, 2007; Nico et al., 2015). When the relation between age and thermal sensation is considered, it is seen that as the age increases people begin to feel more comfortable. Since the shopping malls serve everyone, user profile cannot be limited. For this reason, it is not possible to make the design according to each user in terms of thermal comfort. However, designing to minimize thermal discom-

fort will ensure thermal parameters remains between the values defined in the standards.

- Thermal sensation of the people changes based on the duration. According to Li et al., among customers, those who had spent less than an hour in the underground mall perceived the thermal environment to be cooler during summer (Li et al., 2018). However, this study does not provide detailed information for situations within 1 hour. Considering the 1 hour period (0-10 min, 10-30 min, 30 min-1h), the number of those who felt cold increased as the time of duration approached 1 hour. As a result of this study, it was determined that after a certain time people feel colder in cooling season in a conditioned environment.
- The thermal condition of the circulation areas in shopping malls varies according to the air flows in galleries, the indoor conditions created by the shopping mall's architectural covering systems and the occupant density. In the future design of shopping malls, covering systems should be designed according to sun path and the automation system should be used according to occupant density.

5. Conclusions

Due to the fact that the shopping malls are the places with high volumes of people, large amounts of energy are consumed for providing and maintaining the thermal comfort conditions. This study was aimed to investigate the compliance of shopping malls having different HVAC systems to thermal comfort conditions and to compare their energy consumption in relation to the thermal comfort.

The conclusions of this study are summarized as follows:

- Cooling season was more comfortable than the heating season in both Shopping Malls.
- S. Mall 1 having heat pump and automation systems and rated via green building rating systems has a better thermal comfort condition although it has a higher occupant density and lower energy consumption compared to S. Mall 2.
- Energy consumption during heating season higher than during cooling season, but cooling season is more comfortable than the heating season in S. Mall 1 because temperature set point (22 °C) was kept high during the heating season.
- Although the monthly energy consumption of cooling season is 76.9 % more than heating season, there is no significant difference in thermal comfort of S. Mall 2.
- Thermal comfort changes depending on the occupant density and thermal sensation of the people changes based on the duration in the shopping malls.
- According to the survey results men feel hotter than women during heating season while there is no significant difference during cooling season.
- This study suggested that conducting the measurement study and determining the clothing insulation value of the occupants should be done simultaneously in the future studies.

Although the amount of consumed energy increased, thermal comfort did not change as expected. Efficient usage of energy will make it possible to provide and maintain thermal comfort. It is important that the HVAC systems should be designed according to the season, occupant density and functions in order to provide and maintain thermal comfort conditions in indoor environment. While providing and maintaining the thermal comfort conditions in these buildings where occupant density is continuously variable, passive design systems should also be used and solutions related to the change of the efficiency of mechanical systems should be developed.

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The characteristics of halal and non-halal food territories in multilayered mapping of Jakarta's Chinatown urban foodscape

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Abstract

As food can gather and segregate people, this research aims to explore whether halal and non-halal food create distinct territories in Jakarta's Chinatown urban foodscape. The case study is an exclusive territorial concentration called Glodok, where the ethnic minority and non-Muslim Chinese-Indonesian community reside, eat, and shop. Jakarta's Chinatown is also well known as one of the culinary destinations for Chinese food, which is associated with non-halal food. Since foodscape reflects the relationship between food and other urban elements in a multidimensional layer, this study applied a comprehensive multilayered mapping to record food territories through observation. The study reveals three main findings. First, the superimposed food layers reveal no indication of strict boundaries between halal and non-halal food territories. Second, either halal or non-halal food territories have their historical background, origin, and food activities that influence the territories' characteristics. Third, the building elements, food displayed, cooking activities, and eating activities denote halal and non-halal food territories. This research provided a new perspective on how halal and non-halal food territories' presence creates a specific urban foodscape without strict spatial segregation. In this case, non-halal Chinese food and halal food from various cultural backgrounds contribute to the inclusive urban space and spatial integration in the ethnic Chinese quarter, which supports and maintains the relationships between people from varied backgrounds.

Keywords
Halal food, Jakarta's Chinatown, Non-halal food, Territory.

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1. Introduction

The presence of various ethnic restaurants, grocery stores, and supermarkets shows that food becomes the visible sign of diversities in society (Wood & Landry, 2007). The availability of different types of food can reflect the degree of urban diversities, which has played an essential role in urban spaces' quality. However, the urban diversities may refer to cultural distance that lead to misinterpretation and misunderstanding. The communication across differences covers "a wide array of categories" (Ahmadi, 2018) and does not always run smoothly (Wood & Landry, 2007). The different properties of urban diversity become one of the urban issues as it encourages both urban vitality and miscommunication among diverse communities.

In this case, the way people deal with food creates food culture (Muhammad et al., 2013) and marks the distinction between people (Muhammad et al., 2016). Alexander (1977) found that food provision in urban spaces contributed to the street's social life and had distinct patterns that developed a particular language. Previous studies revealed that people connect food to their rituals, symbols, belief system, social functions (Mintz & Du Bois, 2002), and social meaning (Twiss, 2012). Therefore, food can solidify group membership and set groups apart (Mintz & Du Bois, 2002).

In some cases, certain beliefs restrict the consumption of particular food. For example, Muslims have restrictions and requirements regarding the purity of what they eat, known as halal food. In multicultural cities, owing to the varied communities, both halal and non-halal foods are available and might be in the same supermarket in separate areas; that is, there are designated areas for halal and non-halal foods (Tan, 2008). Relevant to this research, Song (2008) explored Islamic food as a minority in the Korean food culture environment. The study revealed how halal or Islamic food restaurants operate in Itaewon and create a specific cultural experience which covers diversity in the urban landscape (Song, 2008).

On the other side, this research aims to explore the characteristics of halal and non-halal food territories, specifically in an informal urban setting, without specific regulations and clear signage regarding the food types of halal or non-halal food. The investigation also covers how different types of food merge in an urban spatial context. This research argues that the theories of the territory regarding physical proximity and the density of kin and friendship network connections (De Landa, 2010) are contradictory elements in Jakarta's Chinatown urban foodscape because of the coexistence of halal and non-halal foods. Following De Landa (2005), Deleuze and Guattari (1987), this research questions whether the halal and non-halal foods create specific territories. The question also refers to how people organize themselves and distinguish the limited or bordered space through marks, sensations, and qualities in the same urban spatial context.

The structure of this paper consists of two scales of analysis. The macro-level analysis refers to seeing past forms of territory to explore the layer of historical background, seeing territory to reveal the layer of food territories distribution, and seeing around territory to explore the surrounding context of food territories. Meanwhile, the micro-level analysis consists of seeing through the territory to observe the layer of food types and food activities, including the indication or physical appearance of halal and non-halal food territories. The superimposed layer then reflects the multilayered aspects of halal and non-halal food territories in the urban foodscape.

This research applied a comprehensive multilayered methodology to explore the layers of food territories. Mapping represents the data from each layer gathered from direct observation, which functions as a tool to indicate how people grasp the territory. Furthermore, the superimposed layer reveals halal and non-halal food territories' characteristics in the urban foodscape of Jakarta's Chinatown. The implication of this research will give a new perspective on how different communities create the food territories without any regulations regarding the halal and non-halal foods.

2. Theoretical background

2.1. The concept of territory

Generally, learning to see through territory becomes essential because it means understanding the world both as a whole and the worlds within (Delaney, 2005). The concept of territory refers to the provisional framing of chaos in a way that enables new functions to erupt and new forces to regroup (Grosz, 2008). Delaney (2005) suggested that territories are human social creations that relate to how people organize themselves in a space and facilitate or impede the workings of power, control, self-determination, or solidarity. Sack (1973) argued that territorial relationships are within a social context. Territory, in essence, is the relationship between a human collective and the environment, which has social and historical meaning constructions (Strandsbjerg, 2010). The territory is also a system that covers the existence of disparities (Ancuța, 2010). Grosz (2008) emphasized the frame for defining territory's precondition and as "the first construction, the corners, and the plane of composition." Deleuze and Guattari (1987) also suggested that territory is "the product of the territorialization of milieus and rhythms," which has "an interior milieu, an exterior milieu, an intermediary milieu, and an annexed milieu." Therefore, territorialization could have a direct spatial manifestation that controls movement (De Landa, 2010) and functions as an expression of power and how power manifests in the material world (Delaney, 2005). When contradictory elements exist together in a particular place, people create specific conditioning to meet each element's requirements.

The territory is different on the inside than on the outside (Delaney, 2005), by certain distinguishing marks, sensations, or qualities (Deleuze & Guattari, 1987). Furthermore, the territory is a bounded, bordered space that not only classifies and separates but also covers both/and boundaries (Delaney, 2005). In this term, the territory is also "a model compartment of space resulting from partitioning, diversification, and organization" (Gottmann, 1973). Delaney (2005) argued that not every enclosed space is territory because it depends on what it signifies and its meanings, which involve social significance.

The territory has a tendency to be read as a universal homogeneous space within boundaries (Strandsbjerg, 2010), and separateness (Gottmann, 1973) or differentiation within the sameness (Delaney, 2005). Therefore, a territory also refers to distinction and separation (Gottmann, 1973), which can be enduring, quite ephemeral, formal, or informal (Strandsbjerg, 2010). It can mark what is allowed or prohibited ours or theirs, and mine or not mine (Delaney, 2005). Territory informs key aspects of collective and individual identities, which shape and are shaped by the collective social and self-consciousness (Delaney, 2005). De Landa (2010) claimed that although "territory" is possibly a culturally universal concept, its forms vary across history and culture. The bounded cultural spaces focus more on self-ascribed identity (Delaney, 2005). Cultural aspects (including belief systems) characterize territories and create differences among them. In this research, several different communities involved in food activities such that the way they organize food is specific and creates certain food territories.

2.2. Territories of halal and non-halal food in the context of urban foodscape

Food territories refer to all spaces which cover food activities inside. In this case, halal and non-halal food territories refer to how people organize themselves around halal and non-halal food in an urban spatial context. Some previous studies have related food with the territory, in terms of cultural identity (Tricarico & Geissler, 2017), socio-spatial point of view (Borrelli & Mela, 2018), and food tourism (Prada-Trigo, 2018).

Since food represents identity, other ethnic groups bring different cultures to how people deal with food. Specific communities have rules based on their belief system regarding what they can and cannot eat. Observance of the eating and drinking rules associated with the Islamic lifestyle distinguishes Muslims from non-Muslims (Armanios & Ergene, 2018). Food purity, with the

Figure 1. *Study area (adapted from Pemerintah Provinsi Daerah Khusus Ibukota Jakarta, 2014).*

term "halal," meaning "permissible and lawful" (Riaz & Chaudry, 2003), is part of Islam and applicable to food products, cosmetics, and personal-care products (Armanios & Ergene, 2018). Muslims believe that "all food must be pure and clean", and haram or non-halal food (i.e., pork and pork products, noncertified meat and poultry, and any product prepared with alcohol or animal fats) is forbidden (Riaz & Chaudry, 2003).

Furthermore, the terms "halal" and "non-halal" also refer to food preparation. For example, FAO (1997) CAC/GL 24-1997 states that there should be no contact between halal and non-halal foods, primarily because there are strict preparation and processing procedures for halal food. Food territories may emerge because halal and non-halal foods have different requirements when these two food types are within the same area. Some governments have ruled the need to separate halal and non-halal foods in a specific context. For example, the Singapore Government regulates halal food requirements for food sellers, from hawker stalls to restaurants, for being physically segregated from non-halal food (Majlis Ugama Guarantee of Islam Singapura, 2015). The Regulation of Halal Product by Indonesian Government No, 31, the Year 2019, also regulates how halal food has separated location from non-halal food in producing, storing, packaging, distributing, selling, and displaying the food (PP Nomor 31 Tahun 2019, 2019). In many supermarkets in Jakarta, we can easily find the separated counter for food from other halal food (Tan, 2002). Meanwhile, there are both no specific regulations and clear signage to separate and differentiate halal and non-halal food territories in urban spatial context of Jakarta's Chinatown.

3. Study area: Jakarta's Chinatown as an urban foodscape

Jakarta's Chinatown area, so-called Glodok, had a prominent position as a culinary destination in Chinese-Indonesian food history. This area stretches from Pancoran to Jalan Gunung Sahari, where the original Chinese migrants settled and traded in the 17th century (Jakarta City Government Tourism and Culture Office, 2014). Since then, the area has developed as a hub for Chinese business activities (Merrillees, 2015). Glodok also becomes a part of Jakarta's cultural heritage and has played an important role in Jakarta's history, especially for Chinese-Indonesians.

The case study area included five streets in Glodok: Pancoran Street, Petak Sembilan Street Market (Kemenangan Raya Street), Kemenangan III Street, Gloria Alley and Kalimati Alley. Figure 1 illustrates the study area as regards macro (a), mezzo (b), and micro (c) levels.

Foodscape involves not only a secure connection between food and landscape, in terms of conceptual or physical landscapes but also covers multidimensional layers (Adema, 2009). As an urban foodscape, Jakarta's Chinatown offers a wide variety of Chinese-Indonesian food and has an attachment to the environment, culture, and communities of Chinese-Indonesians. Generally, the globalization of Chinese food is closely associated with the Chinese diaspora and their connection "with local others

through international trade, travel, and migration networks" (Wu & Cheung, 2002). Therefore, Chinese restaurants are typical in many countries and cities around the world (Van Esterik, 2008), as is Chinese home-cooking or sidewalk (Chinese-inspired) local food scenes in Southeast Asia (Wu & Cheung, 2002). Chinese food has transformed into Nusantara or Indonesian food in terms of the ingredients used and cooking methods (Bromokusumo, 2013). Tan (2008) explained that Peranakan (meaning "child of the soil" or local-born) food is the "food of the ethnic Chinese of mixed Chinese and Indonesian descent." Chinese food has become part of Indonesian food (Tan, 2008; Wu & Cheung, 2002). Sometimes, it is not easy to differentiate Chinese from Peranakan food.

Jakarta's Chinatown or Glodok Area gained a reputation as one of the Chinese culinary destinations in Jakarta, which is visited by various ethnic groups. Meanwhile, many Chinese foods contain pork (Tan, 2008), which is shunned by Muslims; Chinese food is popular with other Indonesian ethnic groups. Even though most people in Jakarta are Muslims, we can easily find both halal and non-halal foods in Glodok.

4. Methodology

Urban research requires a comprehensive approach because of the different layers involved. Salama, Remali, and MacLean (2017) suggested that a multilayered methodology is necessary to understand human and environmental interactions. The term "foodscape" also assigns to a multidimensional layer that needs multilayered readings (Adema, 2009). For example, Manur (2007) explored the authenticity, nationalism, and diasporic layers when examining culinary nostalgia. Omholt (2015) used a multilevel, multi-perspective analytical approach to explore the development of restaurant clusters. The social use of space and the interactions between people and food regarding the relationships between storing, cooking, serving, eating, and disposing of food could be a food axis (Horwitz & Singley, 2004; Twiss, 2012). Territory analysis also include the institutions, organizations, and activities or aspects of identity that are associated with the social being. The existence of diverse communities also influences the creation of specific or distinct territories (Delaney, 2005).

The food environments deals with macro-scale and micro-scale built environment (Sobal & Wansink, 2007). In this research, the process of exploring food territories comprised two levels: the macro and micro levels. The macro-level analysis deals with social practices concerning which territorial forms emerge or have transformation (Delaney, 2005). It means that exploring the halal and non-halal food territories requires attention to the surrounding environments and the relationship between people and their environment, as they belong to certain areas. The micro-level analysis deals with the indication of the halal and non-halal food territories. It refers not only to how people differentiate the food territories but also how they cover the territories.

4.1. Data collection for macro-level and micro-level analysis

This research explores the complexity of territories in a four-step process: imagining seeing territory, imagining seeing around the territory, imagining seeing through the territory, and imagining past extent forms of territory (Delaney, 2005). Each process needs direct observation by walking around the study area, taking notes and video, photographing, sketching, and recording all food-related elements in an urban spatial context. Direct observation was conducted on weekdays and weekends in public space or in space between buildings to capture the overall image of Jakarta's Chinatown urban foodscape. The observation recorded all food territories, the types of food, food activities, the physical elements which cover and differentiate halal and non-halal food territories.

4.2. Macro-level analysis: Multilayered mapping and superimposed layer

Mapping records the activities within the study area, such as the potential or the problems (Gehl & Svarre, 2013). Furthermore, multidimensional maps expose the

city by bringing unseen urban data (Amoroso, 2010). For macro-level analysis, this research translates the data from direct observation of each process into five-layers-mappings. The mappings record the data from direct observation in google earth maps to be analyzed in each specific layer.

This research explores the process of seeing past forms of the territory into the layer of the historical background layer (first layer) by tracing back the history of Jakarta's Chinatown as a culinary destination, specifically from the era of Dutch colonialization until now. Then, the layer of halal and non-halal food spots captures the process of seeing territory, including the exploration of food territories distribution (second layer). In this step, this research classifies all halal and non-halal food territories according to the territories' permanency. The layer of the surrounding context and the layer of activities center around the food spots highlight the process of seeing around the territory (third layer).

4.3. Micro-level analysis: The mark of halal and non-halal food territories

The micro-level analysis explores the appearance of territory (Deleuze & Guattari, 1987), including how people organize themselves in spaces and differentiate inside and outside (Delaney, 2005). Meanwhile, the process of seeing through territory includes the layers of food types and the categorizing halal and non-halal food territories (fourth layer). The process also involves all food activities within the territories (fifth layer). Furthermore, sketches and overlaying pictures explore the indication of halal and non-halal food territories and how they relate to the micro-level analysis environment.

4.4. The superimposed-layers analysis

As the term of foodscape assigns to multiple factors and multidimensional layers, mapping captures how urban spatial data correlate with the position and distribution for each halal and non-halal food territories. Because territoriality also refers to the relationship between territories and other phenomena (Delaney, 2005), so that the superimposed layer explores the relationship between the halal and non-halal foods with other layers. The superimposed layers process involves all the multilayered mapping (the five layers) in each process of exploring halal and non-halal food territories. As a result, the macro-level analysis will reveal the characteristics of halal and non-halal food territories regarding how they embed in an urban spatial context and how they relate to other urban elements in a micro-level context. Figure 2 shows the multilayered mapping analysis of this research.

5. Finding and discussion

5.1. First layer: Historical background

As Jakarta's Chinatown, Glodok represents the history of minority Chinese in Indonesia. This area has developed from an ethnically segregated area during Dutch colonialization to a specific cultural destination, especially in the main strip of Pancoran Street. In 1927, some Chinese restaurants started to open at Pancoran Street, which became a Chinese food destination for elite European and Chinese communities in the 1940s. During Japanese colonialism, from 1942 until 1945, all restaurants closed their business and reopened after the end of Japanese colonialism in 1945. Unfortunately, discontinuation of diplomatic relations between Indonesia and the Netherland in the 1960s resulted in the European community's deportation, and many restaurants in Pancoran lost customers. In 1966, the first decade of the Indonesian New Order, Pancoran became a destination for Chinese traditional medicine and clinics. Pancoran street regained a reputation as a Chinese culinary destination during the 1970s. The deterioration of this area began in the 1990s as many illegal street vendors invaded Pancoran street.

From 1995 to 2000, the city government redesigned Pancoran street, and the stores started to open their business again. In 2006, the city government evicted many street vendors along Pancoran Street (Persatuan Wartawan Indonesia, 2007). The darkest moment in the Chinese-Indonesian history was when the Indonesian government's policies restricted all Chinese culture

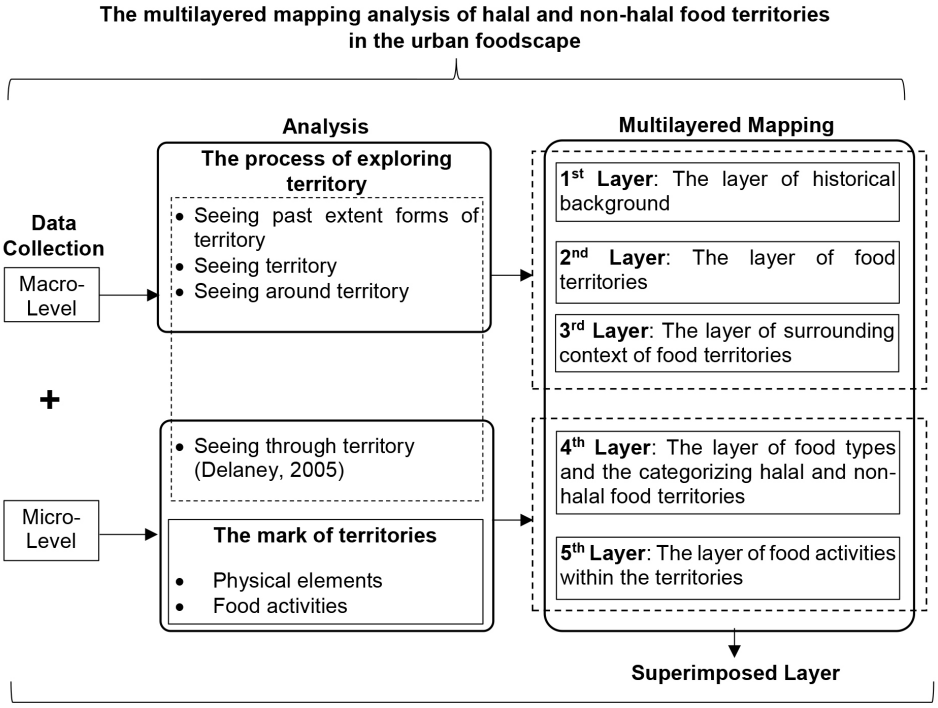

Figure 2. *Data collection, analysis, multilayered mapping and superimposed layer.*

during the Suharto era, culminated in the May 1998 riots (Turner & Allen, 2007). This restriction proscribed all expression of Chinese-Indonesian culture in public areas. However, since the Abdurrahman Wahid government, Chinese-Indonesians have been allowed to practice their cultural and religious beliefs without fear of reprisals (Turner & Allen, 2007). This enactment was a turning point for Indonesian-Chinese culture.

Nowadays, Pancoran Street is famous among people seeking Chinese medicine and traditional snacks. The foodscape has expanded and changed as the food activities moved from the first layer of Pancoran Street into the secondary layer, the spaces between the buildings, and the alleys. The shop houses that dominate the Petak Sembilan Street Market and the Kalimati Alleys have converted the building functions from a residential strip to the most visited culinary strip. Some food territories have also gradually emerged in Kemenangan III Street around the activity centers.

5.2. Second layer: The mapping of food territories

In the second layer, each food territories were identified and classified according to its permanency. Figure 3(a) shows the distribution of food territories in Jakarta's Chinatown. The mapping of food territories indicates that the food territory density is higher in Petak Sembilan Street Market (87 spots/ 31.07%), than in Gloria Alley (54 spots/ 19.29%). The following are Kalimati Alley (47 spots/ 16.79%), Pancoran Street (41 spots/ 14.64%) as the main street, and Kemenangan Street (51 spots/ 18.21%) as the secondary street.

Meanwhile, Figure 3(b) shows the distribution of food territories, based on the permanency, including the fixed-food territories, semi-fixed food territories, and non-fixed food territories. Figure 4 explores the type of food territories based on the permanency and the position of food territories towards adjacent buildings. This research classified three types of food territories. First, the type of fixed-food territories, in the form of building (type A), consists of restaurants (A1), eateries (A2), and food shops (A3). Second, the type of semi-fixed food territories (type B), in the form of food stalls, include free-standing food stalls (B1), attached food stalls (B2). Third, the type of non-fixed food territories, in the form of street vendors, consists of sedentary street vendors (C1) and mobile street vendors (C2). The types of food territo-

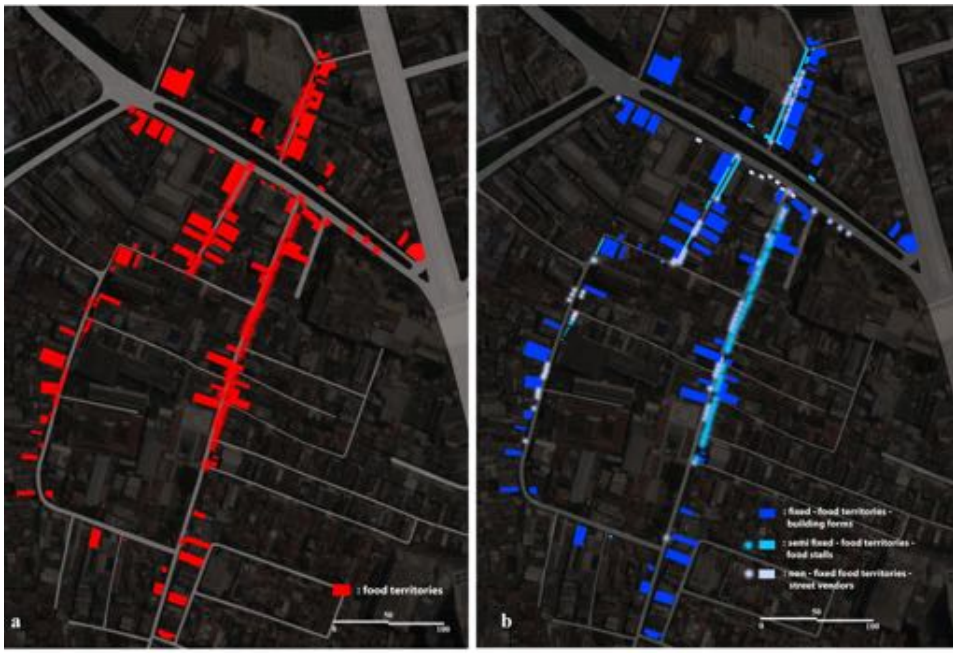

Figure 3. *Second layer: (a) Distribution of the food territories; (b) Permanency of the food territories.*

ries have a particular position with the adjacent building and specific food activities patterns within the territories, as shown in Figure 4.

There are approximately 280 food spots in this study area. The fixed-food spots (94 spots/ 33.57%) are restaurants and other food shops in buildings, which are scattered along the streets in no specific pattern and unevenly distributed along the main street (23 spots/ 8.21%) and the secondary street (31 spots/ 11.07%). There are some semi-fixed food spots (111 spots/ 39.64 %), such as free-standing food kiosks (3 spots/ 1.07%) or kiosks attached to other buildings (108 spots/ 38.57%), with food stalls dominating Gloria Alley (28 spots/ 10%), Kalimati Alley (26 spots/ 9.29%), and Petak Sembilan Market (37 spots/ 12.5%). Most of the food territories concentrate around the activity centers and street junctions. There are also many mobile or sedentary portable street food vendors (75 spots/ 26.79%) in all possible spaces, specifically near the activity centers and the street market. These continuous food territories strengthen the food axis, especially those in Gloria Alley, Kalimati Alley, and the Petak Sembilan Street Market. In this case, semi-fixed food territories in the form of kiosks attached to other buildings dominate Jakarta's Chinatown as an urban foodscape.

Figure 4. *The type of food territories.*

5.3. Third layer: Surrounding context of food territories

Some urban elements influence the emergence of food types. It is essential to know the relationship between the types of food territories and the surrounding environment. This layer explores the food territories' surrounding context, including the building function (Figure. 5(a)) and ten main activities centers of the study area (Figure. 5(b)).

There are four activity centers in Pancoran street, surrounded by traditional Chinese medicine stores, traditional snack stores, and other retail stores, including Pantjoran Tea House (as the gate to Pancoran street and a well-known restaurant for Chinese-Indonesian cuisine), Pasar Jaya Glodok (the commercial center), Pancoran Chinatown Point (new mixed-use building) and Asemka morning market. The fixed-food territories are found randomly along Pancoran Street. Furthermore, the semi-fixed and non-fixed food territories concentrate around the nodes or intersection of Pancoran Street with Petak Sembilan Market/ Kemenangan Raya Street, Gloria, and Kalimati Alleys.

The concentration of semi-fixed and non-fixed food territories in Gloria Alley and Petak Sembilan Market also strengthens the foodscape axis and the function as the circulation network for pedestrians. The nodes of Petak Sembilan Market, Kalimati, and Gloria Alleys are full of non-fixed food territories as the intersection's function from the main layer to the second layer. The food territories in Petak Sembilan street exist in the form of a street market, becoming one of the activity centers for this area. Meanwhile, there are many semi-fixed and non-fixed food territories around Dharma Bhakti Monastery as an activity center for Buddhists. These activity centers encourage more people to come to the area and the emergence of additional food territories.

In Kemenangan III Street, food territories have started to interfere with the residential areas and mixed with other main activities along the street in no specific pattern. There are a concentration of food spots, mostly semi-fixed and non-fixed food territories, around St. Maria de Fatima Church and Ricci Schools. Other food territories scatter without specific patterns along Kemenangan III Street.

5.4. Fourth layer: Food types

The diversity of food in Jakarta's Chinatown cannot be separated from food sellers' and buyers' socio-economic backgrounds. Initially, most Chinese food was sold in several legendary restaurants by Chinese-Indonesian descendants in the main lay-

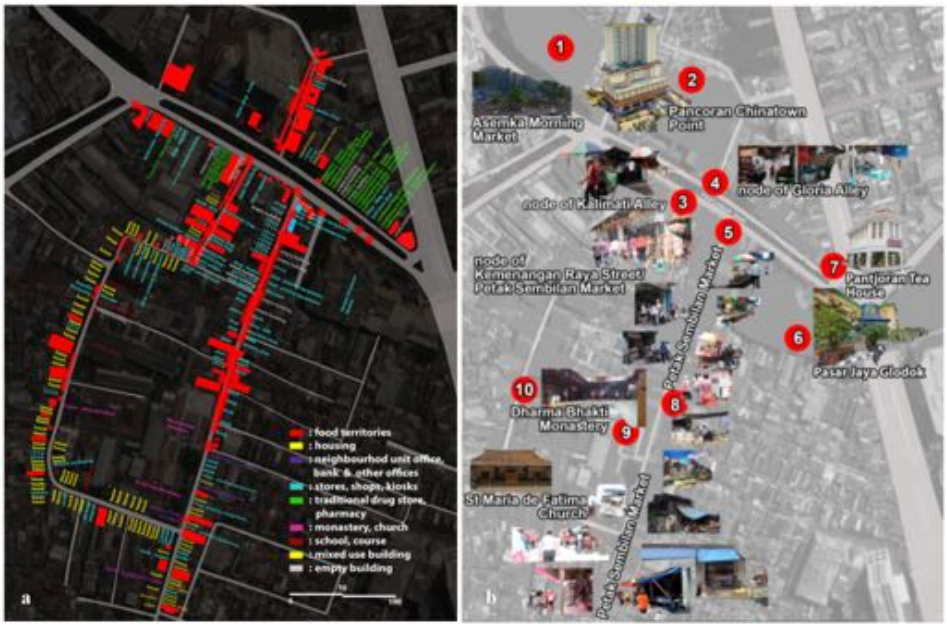

Figure 5. *Third layer: (a) Activity centers around the food territories; (b) Surrounding environment of the food territories.*

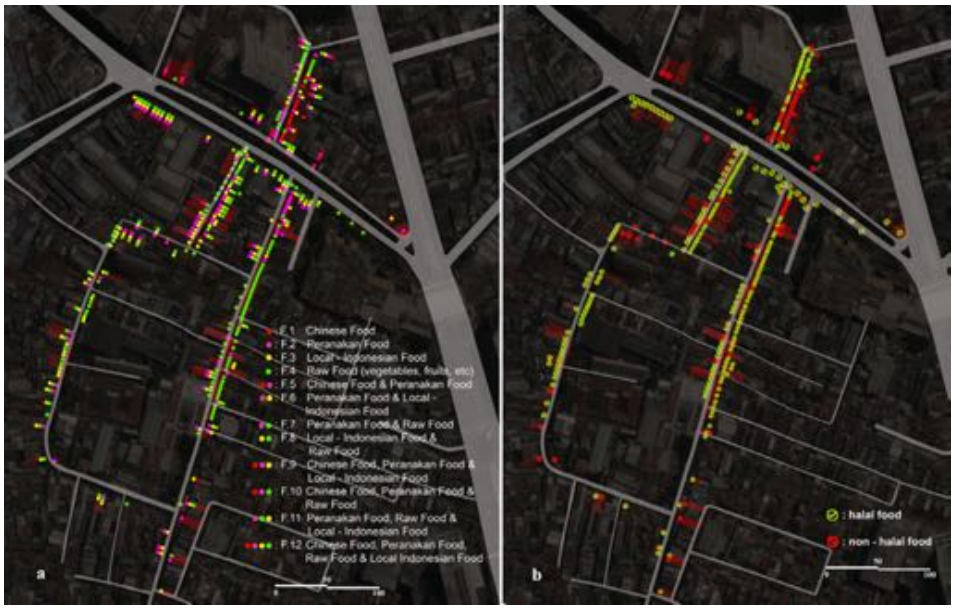

Figure 6. *Fourth layer: (a) Types of halal and non-halal food territories; (b) Food territories according to food origin.*

er of Pancoran street. This street has gradually changed into a commercial strip, whereas the Chinese food territories have penetrated at the second layer. As a vibrant commercial area, Jakarta's Chinatown attracts more people from various ethnic backgrounds, mostly for economic reasons, that adds the demand for more food choices. The need for halal food emerges from the uncertainly whether the Chinese foods in this area are halal or non-halal. This potential situation attracts the informal food sector to sell halal food, specifically in portable and semi-fixed food territories. In this case, Jakarta's Chinatown gives all ethnicities space to offer various food choices from different cultural backgrounds. The diversity of food types is a part of the informal sector's socio-economic niche to make a living in Jakarta's urban foodscape. The important thing in the informal sector's emergence is the availability of space to grow the activities (Tunas, 2009), specifically in the urban context.

The mapping of the fourth layer focuses on territories based on the types of halal and non-halal food (Figure. 6(a)), as well as the origin of the food (Figure 6(b)). This research identifies twelve food type combinations in all food territories (Figure. 6(a)), as follows: Chinese food (F.1, 12 spots/ 4.29%), Peranakan food (F.2, 21 spots/ 7.5%), local Indonesian food (F.3, 31 spots/ 11.07%), raw food (F.4, 95 spots/ 33.93%), Chinese food and Peranakan food (F.5, 12 spots/ 4.29%), Peranakan food and local Indonesian food (F.6, 25 spots/ 8.93%), Peranakan food and raw food (F.7, 2 spots/ 0.71%), local Indonesian food and raw food (F.8, 17 spots/ 6.07%), Chinese food, Peranakan food and local Indonesian food (F.9, 3 spots/ 1.07%), Chinese food, Peranakan food and raw food (F.10, 1 spot/ 0.36%), Peranakan food, raw food and local Indonesian food (F.11, 57 spots/ 20.36%), and Chinese food, Peranakan food, raw food and local Indonesian food (F.12, 3 spots/ 1.07%).

Figure 6 shows that the available non-halal food is Chinese and Peranakan food (68 spots/ 24.29%); however, not all Chinese and Peranakan food is non-halal. Raw food (in F.4; F.7; F.8: F.10; F.11; F.12), which belongs to halal food, dominates this area (157 spots/ 56.07%), specifically at the Petak Sembilan Street Market (53 spots/ 18.93%). Most non-halal food territories concentrate on Gloria Alleys (27 spots/ 9.64%). The halal food territories are mostly semi-fixed (96 spots/ 34.29%) and non-fixed (59 spots/ 21.07%) food territories, which fill all possible public spaces. Both halal and non-halal food territories are in the same food territories as in the alleys and the food court.

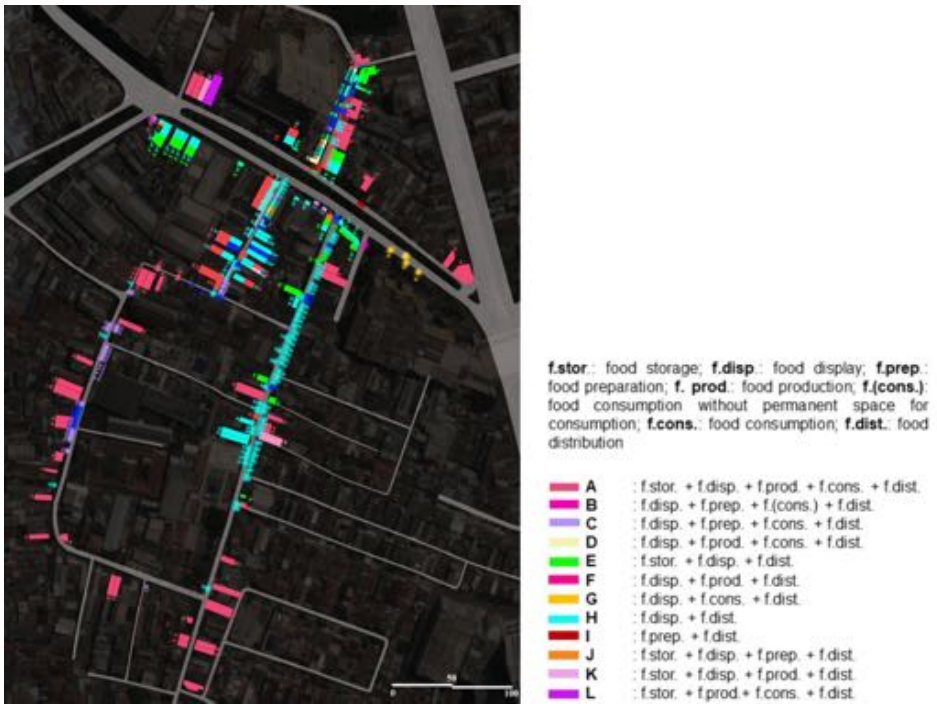

Figure 7. *Fifth layer: Food activities distribution map.*

5.5. Fifth layer: Food activities

The food activities patterns reveal how people associate and organize themselves around food and the complex activities that define each halal and non-halal food territories within urban food spaces. There are at least seven basic types of food activities in the study area: food storage (f.stor.), food display (f.disp.), food preparation (f.prep.), food production (f.prod.), food consumption with specific space for food consumption (f.cons.), food consumption without permanent space for food consumption (f.(cons.)), and food distribution (f.dist.), with each food territory having particular food activity combination and distribution patterns. There are at least 12 food activities combinations in the study area, as shown in Figure 7.

Most food territories cover the food display and food distribution activities, f.disp.+f.dist. or pattern H (139 spots/ 44.41%), with mobile or non-fixed food territories (32 spots/ 10.22%) being present in all available spaces, especially around the center of activities. Fixed food restaurants and eatery territories have a combination of food activities, f.stor.+f.disp.+f.prod.+f.cons.+f.dist. or pattern A (68 spots/ 21.73%), which mostly located in the secondary streets. While both halal and non-halal food territories display the food, the non-halal food vendors tend to display the eating and cooking activities in the alleys or secondary streets.

5.6. Superimposed layers of halal and non-halal food territories

5.6.1. The relationship between halal and non-halal food territories and other layers

The superimposed layers reveal not only the relationships between the foodscape layers of Jakarta's Chinatown but also the way in which halal food congregates with non-halal food within the surrounding urban context (Figure 8).

Nowadays, less fixed-food territories located in Pancoran Street. Instead, the food territories dominate the nearby streets. Therefore, as new food spots emerged, the concentrations of food territories have moved from the main layer to the secondary layer, in the form of food strip and food nodes. They have also begun to emerge on the residential strip along Kemenangan III Street and Kalimati Alley. The food strip, which encompasses Gloria Alley, Kalimati Alley, and Petak Sembilan Street Market, has both halal and non-halal foods. High-density food strips are emerging in small pockets between buildings. In Petak Sembilan Street Market, the

food territories are mostly semi-fixed food stalls and non-fixed food spots. Portable food territories freely move across all parts of the case study area. Some food stalls and mobile food territories are concentrated at certain spots and create a food node in the center of neighborhood activities.

The street food vendors providing halal and non-halal foods along the secondary layers form continuous food territories as food axes. On the main layer, most food street vendors have mobile eating activities and peacefully compete to fill the best spaces wherever possible to sell their food. The street vendors usually concentrate around the activity centers, such as schools and the Klenteng. As some street food vendors sell raw food, they also set up their territories in certain positions. For example, the street food vendors are temporarily situated at Petak Sembilan Street Market from morning until dusk. They move to the main Pancoran Street layer from late afternoon until late at night.

Furthermore, there is no rigid separation between halal and non-halal foods at the Kopitiam (food courts) at Gloria Alley, Kalimati Alley, and Pancoran Street. Although halal and non-halal foods have specific restrictions, they meet without strict boundaries between Jakarta's Chinatown vendors. The range of food available in Jakarta's Chinatown reflects cultural diversity, as evidenced by the availability of halal and non-halal foods.

5.6.2. Indication of halal and non-halal food territories

This research classified six indications as the frontage of both halal and non-halal food territories as food-displayed (I.1), cooking-displayed (I.2), cooking and eating-displayed (I.3), eating and food-displayed (I.4), cooking, eating and food-displayed (I.5) and building elements/ signage (I.6), as shown in Figure 9.

The micro-level analysis concludes some patterns regarding the relationship between territories' indications and the position in an urban spatial context. Halal and non-halal food territories tend to use food-displayed or I.1 (61.07%) to indicate territories both of halal (50.71%) and non-halal food

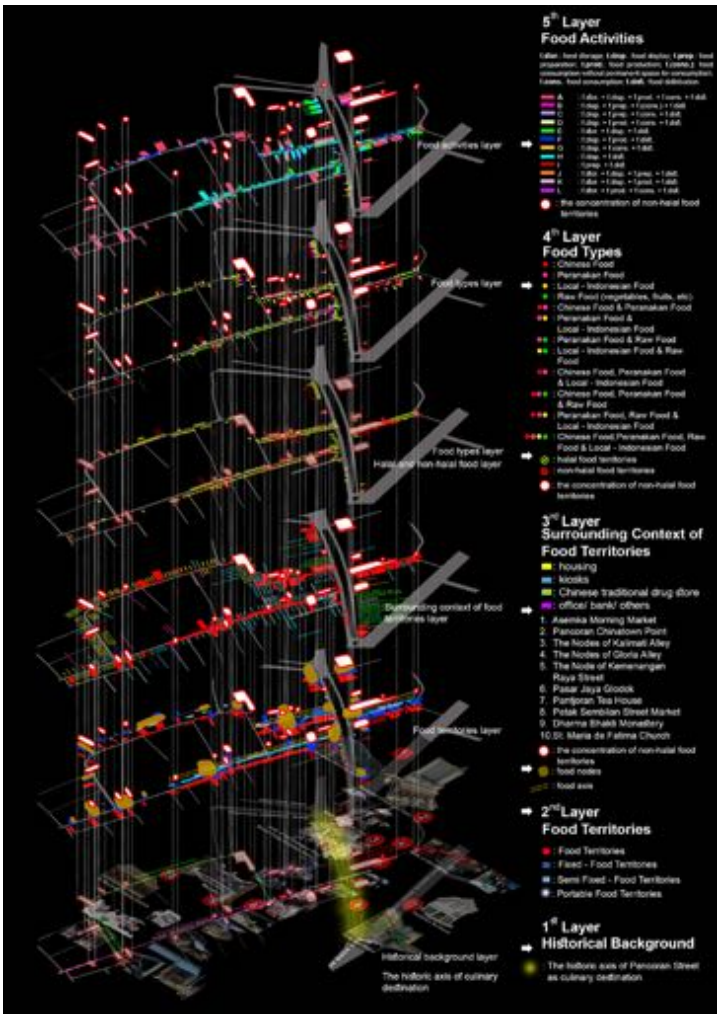

Figure 8. *Superimposed layers.*

(10.36%), in all streets and alleys, except the secondary street. Besides food-displayed, non-halal food territories tend to expose more cooking and eating activities or I.3 (38 spots from 68 spots or 55.88%) than the halal-food territories (66 spots from 212 spots or 31.13%).

Figure 9 illustrate the everyday situation of halal and non-halal foodscape. The colors in Table 1 emphasize food as the indication of halal and non-halal food territories. It shows no contrast differences appearance or ambiance between halal and non-halal food territories. Furthermore, there is no signage nor literal marker indicate the halal and non halal foods; except the food displayed itself that has become the common indication of halal and non-halal food territories.

5.6.3. The characteristics of halal and non-halal food territories

Initially, Jakarta's Chinatown and other ethnic quarters were built by

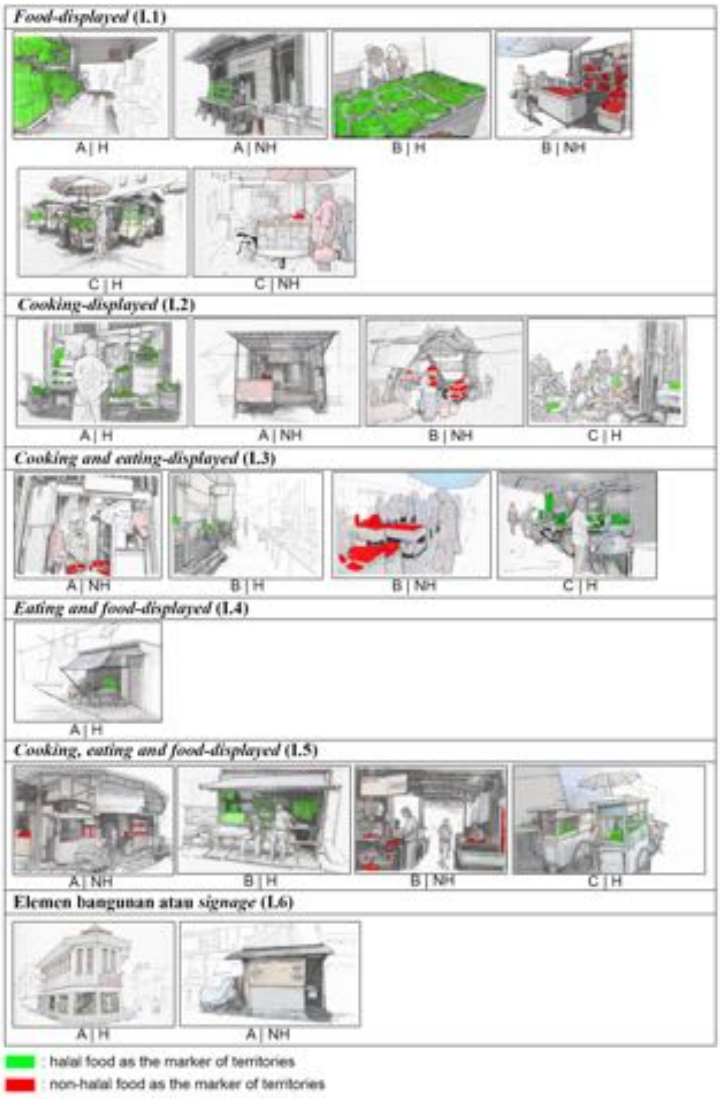

Figure 9. *The indication of halal and non-halal food territories.*

Dutch colonialization as a strategy to segregate and control people based on their ethnicity. Despite the discrimination and prejudice had historically built up for decades that triggered the rejection of Chinese culture in the past, nowadays this area has gradually attracted more people from many cultural backgrounds, without any stigma as "an exclusive Chinese quarter" anymore. The foodscape of Jakarta's Chinatown strengthened its character as the specific food zone and enjoys the role as the culinary destinations in Jakarta.

The varieties of food in Jakarta's Chinatown reflects cultural diversity, as evidenced by the availability of both halal and non-halal foods. Although halal and non-halal foods have specific restrictions, they meet without strict boundaries between food vendors in Jakarta's Chinatown. This research finds some differences and similarities between the patterns of halal and non-halal food territories. On the other hand, the superimposed layer exposes some spatial patterns that reflect the relationship between halal and non-halal food territories with other elements in an urban spatial context. The micro-level analysis also reveals that halal and non-halal food territories have specific spatial patterns to indicate and differentiate the territories.

The first layer of the historical background shows that Pancoran street has a strong history of Chinese food restaurants, traditional snack kiosks, and a Chinese medicine store. However, Pancoran street's position as food axis has gradually weakened because the concentration of food territories has moved to the second layer. Hence, the halal food territories have no specific historical background, which tends to develop without particular patterns. Furthermore, the second layer of surrounding context around food territories highlights that non-halal restaurants mostly occupy the private territories along the main street and secondary streets. The hidden non-halal food stalls and street vendors concentrated on the nodes of the secondary streets. In this case, the typical fixed halal food territories scattered in all possible public spaces. Meanwhile, the halal food stalls and street vendors tend to concentrate around the center of activities and street junctions.

The third layer of food distribution reveals that permanent non-halal food territories mostly occupy private spaces. The rest of the food territories are along scattered the main street and the secondary street. Some non-halal food street vendors concentrated at the node of the food axis and the street market. On the contrary, the typical portable or non-fixed territories of halal food, mostly represented by the street vendors, are fluid and fill all possible urban spaces, specifically around the center of activities. Most halal food stalls attached to other buildings are

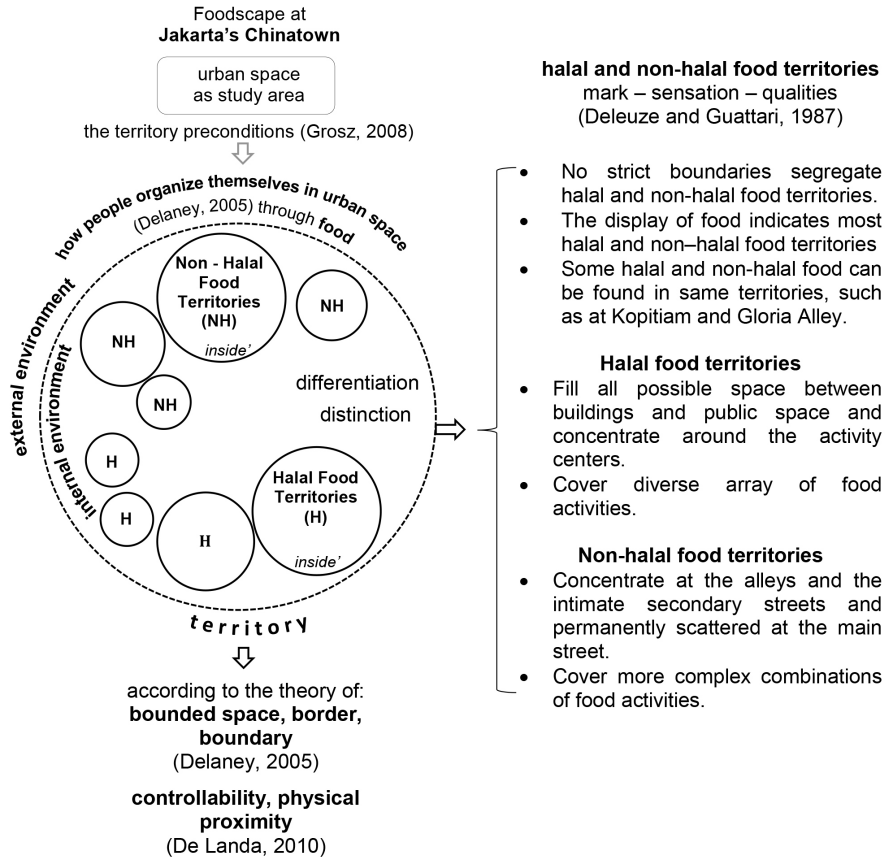

Figure 10. *The concept of territory; The halal and non-halal food territories in Jakarta's Chinatown (adapted from Komala, Ellisa, & Yatmo, 2017; Delaney, 2005; Deleuze & Guattari, 1987; Grosz, 2008).*

concentrated around the secondary street and the street junctions. Besides, restaurants and eateries of halal food are scattered randomly through the area of Jakarta's Chinatown.

The fourth layer's distribution of food types and origin signifies that most non-halal food comes from Chinese and Peranakan food, and most halal food is Indonesian food or Peranakan food. Yet, not all Chinese or Peranakan food is halal food. The fifth layer of food activities uncovers that non-halal food territories' activities tend to occupy private space or the area between public and private space. Otherwise, halal food territories' activities display more food combinations and take place in any possible urban space.

Figure 10 shows the characteristics of halal and non-halal food territories in Jakarta's Chinatown, based on the concept of territory as a bounded space (Delaney, 2005), the condition of controllability and certain physical proximity (De Landa, 2010), as well as the mark of each territories (Deleuze & Guattari, 1987).

6. Conclusion

This research provided a new perspective on how the presence of both halal and non-halal food territories creates a specific urban foodscape. In this case, non-halal Chinese food and halal food from various cultural backgrounds contribute to the inclusive urban space and spatial integration in the ethnic Chinese quarter, which supports and maintains the relationships between people from varied backgrounds. This research offers a multilayered mapping to know the distribution of halal and non-halal food territories and the relationship between food and other urban elements. The multilayered mapping involves seeing the past forms of territories, around and through the territories. At the same time, the process of exploring the urban foodscape covers the physical elements related to food and the activities related to the urban food system.

Although halal food and non-halal food have distinct requirements, there is no spatial segregation between halal and non-halal food territories. Howev-

er, halal and non-halal foods have specific spatial patterns in creating the territories in both micro and macro-level contexts. These patterns reveal not only the differences but also the similarities between halal and non-halal food territories. How different types of food create their territories and occupy urban space explain how they relate to other urban elements. In this research, the historical background and the surrounding environment's context are the external factors that influence halal and non-halal food territories regarding the distribution patterns and the types of food territories. Furthermore, food origin and food activities as the internal factors determine how people organize themselves around food.

The relation between urban elements and food territories reveals how specific urban spatial elements intersect with food territories. The halal food tends to penetrate in all possible space so that the territories are scattered and easily found around the study area. The non-halal food territories gradually moved from the main layer to the secondary, where the scale of urban space is more intimate than the main layer. The secondary layer of foodscape has a more open food territories than in the main layer, for both halal and non-halal food territories.

The study reveals that each territory has specific indications to differentiate from other territories and function as the boundary between food territories and public spaces. Halal and non-halal foods mostly use food, cooking, and eating-displayed as the territories' indications, specifically in the second layer. The territories' indications play an essential role in creating the boundary between public space and halal and non-halal food territories, which significantly characterize the urban foodscape. In this case, food operates as an agent to create an inclusive urban community space, even though there is no regulation regarding the halal and non-halal food territories. The diversity of food strengthens the function of ethnic enclaves to be social integration space. The availability of various foods attracts people from different backgrounds to experience Indonesian-Chinese culture without worrying about their food choices.

However, the limitation of this research is the specificity of the urban spatial context. Thus, the research in a different urban area might give different results regarding halal and non-halal food territories. Nevertheless, this research will give a niche for further research, specifically on how food influences the form of urban foodscape, in terms of urban morphology. Food can be the trigger in determining the physical elements of urban spatial context.

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Measuring place satisfaction by university campus open space attributes

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Abstract

Campuses, which are a whole with education, teaching, cultural structures and open spaces, are spatial organizations where students, academicians and staff come together. In this respect, in the design of university campuses, it is necessary to focus not only on physical and aesthetic features, but also on spatial organizations that can create the meaning and social interaction of the place. The purpose of this research is to determine the performance levels of existing campus open spaces and to investigate their effects on place satisfaction. The present study, constructed to determine the impact of functional, social and perceptual attributes of campus open spaces on place satisfaction, was conducted at Karadeniz Technical University-Kanuni Campus. When the campus open spaces were selected in the study, open spaces that allowed socio-cultural activities in the campus were preferred, excluding the educational buildings. Within the scope of the study, in which the analysis of the space as an attitude element constitutes the general framework and originality of the study, a total of 240 people were surveyed in 3 regions selected. In conclusion, the present study discussed the environmental attributes of campus open spaces with a 3-dimensional approach and determined that not only perceptual attributes affected place satisfaction. The study findings suggested that functional and social attributes, occupancy frequency and duration variables had positive effects on place satisfaction. The study findings are considered important for both urban planners and administrators, who are responsible for protection and development of campus open spaces, and the users.

Keywords
Campus open space, Space and place, Place satisfaction.

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1. Introduction

Universities are social institutions where educational, research and practice activities are conducted. Universities educate the students who are the future of society and produce and share scientific knowledge, as well as fulfilling the physical and social requirements of the users. An analysis of the historical development of universities would demonstrate that the term means the community of teachers and scholars (Yılmaz et al., 2005). These dimensions describe the universities as institutions that provide the highest level of education, research and produce knowledge, and are spatial constructs with a dense student, support staff, academician and administrator population.

Campus open spaces are defined or undefined spaces that are outside of the buildings, and the relationships that are established with other spaces expressed as green spaces and gray spaces (Pascual and Peña, 2012). With this dimension, they can be expressed as accessible urban ecosystems (Tudorie, 2020). The success of campus open spaces is also very important for the implementation of the needs of the university education system. In particular, they should be evaluated in terms of creating a good learning environment and promoting social interaction through everyday encounters, relationships and interactions.

The historical development of higher education institutions would also reveal that the development of social and cultural requirements along with educational activities has been the cornerstones of college campuses. The campus should be considered as a complete learning environment that provides a complete learning experience also in open spaces outside the educational and cultural buildings (Kenney et al., 2005; Düzenli et al., 2012; Scholl and Gulwadi, 2015; Özkan et al., 2017). Thus, in university campus design, open spaces that provide physical and social opportunities to fulfill the physical and social needs of students and ensure their individual and social development should be included along with the indoor spaces (educational and instructional, etc.). In the literature, previous studies tackled the development of university campuses, as well as studies that of the open space facilities and campus life. Campus open spaces should be considered as spaces that allow students, academicians and staff to socialize, interact and conduct activities to meet their needs (Dober, 2000; Aydın, 2008). Thus, Hanan (2013) analyzed the campus as a behavioral setting and reported that the campus was a combination of human or social and non-human or physical dimensions. The above-mentioned studies that approached the campus open spaces as a space of social interaction rather than spaces of aesthetic appeal or physical activities emphasized the significance of open spaces. Thus, it is very important to focus on physical and aesthetic elements, as well as creating spaces for events that allow social interaction and associated spatial organizations in university campus open spaces design. When we think of the campus as a behavioral position, we should consider it as a combination of physical dimensions and human and social dimensions. With this aspect, in the design of university campuses, it is necessary to focus only on physical and aesthetic features, as well as spatial organizations that can create a social interaction and sense of place. The present study aimed to focus on open spaces where students could interact with themselves, their friends and their environment, as well as architectural structures. It should be known that the voids between the campus buildings were not designed to allow social interaction between the students, but they are at least as important as the campus buildings. Thus, it is known that the voids created in the architectural space determine, guide and enforce the relationships between the spaces beyond the spatial design (Kuloğlu, 2013). When the campus open spaces are considered based on this approach, spaces or "places" where experiences, memories, reminiscences and social interaction occur could not be created without campus open spaces.

- Is each void or space in campus open spaces a place?
- What are the physical, social and perceptual characteristics that lead to user satisfaction in these places by fulfilling user needs?

The above-listed questions constituted the baseline of the present research. The aim of the present study was to determine the performance of existing campus open spaces based on user needs and to investigate the effects of the performance of these spaces on place satisfaction. In the present study that aimed to investigate the satisfaction with campus open spaces, the analysis of the space as an attitude element constituted the originality of the research. Thus, it primarily focused on the concepts of place satisfaction, university campus open spaces, and physical and social characteristics that these spaces should offer.

1.1. University campus open spaces

It was determined that not only educational activities but also various functions required for the current education system should be provided by the universities in Turkey and abroad; and thus, the importance of campus planning and design criteria was recognized. Campus open spaces are places where campus users carry out their activities and interact within the scope of their needs. These places of interaction where students, academicians and staff come together are the centers that make up campus life. In campus life, it is known that these centers, apart from education and training activities, undertake very important tasks and are socialization centers. Therefore, in recent years, there has been a renewed interest in campus open spaces and the features it offers. According to Aydın (2003), the above-mentioned functions, which should be consistent with non-educational requirements and include dimensions such as study, entertainment, sports, recreation, health and nutrition. Yaylali-Yıldız et al., (2014) reported that campus spaces similar to open space organizations, although the occupancy differs from that of urban streets, squares and commercial areas. Thus, the campuses could be considered a small city. While designing university campuses, functions such as accommodation, study, transportation, recreation, socialization are designed within the system, just like the city. To provide adequate functions in the campus, a systematic approach is required. Although this systematic organization required in planning and design varies, it has been discussed within the context of campus settlement systems.

Instead of focusing on campus planning and design criteria, the present research aimed to investigate the current common campus spaces and the effects of physical and social characteristics of these spaces on place satisfaction. Therefore, it was necessary to focus on the characteristics of common campus spaces. According to Carmona (2010), the importance of open spaces was not only due to the fact that they fulfill specific human needs but also the comfort, relaxation, socialization, etc. they provide. Campus open spaces offer learning opportunities by allowing informal and social relationships as well as physical opportunities. Carr et al. (1992) included 'comfort', 'relaxation', 'passive engagement', 'active engagement' and 'discovery' among the facilities that open spaces should provide. These dimensions were simply based on Maslow's (1954) hierarchy of needs. Preiser (1983) argued that people can live in an environment when their basic needs are met, but personal high-level needs should be met for environmental satisfaction. Previous studies reported that successful open spaces lead to a sense of satisfaction in the users (Herting and Guest, 1985; Ramkissoon et al., 2013; Stedman, 2002).

According to Hanan (2013), students' active experiences, memories and remembrances are generally dependent on meaningful open spaces and symbolic structures that make the campus unique. These meaningful spaces that students will remember and miss are related to the success criteria it offers. The more successful the physical, social and perceptual features of a location, the more space satisfaction occurs. As a result, they turn into places with a high level of use, experienced and missed.

The success of open spaces could be analyzed within several categories. Salama and Azzali (2015) categorized open space properties into three groups. These were functional attributes, social attributes and perceptual attributes. Lutzkendorf et al. (2005) considered these properties as performance criteria and grouped them

in 6 categories: functional, economic, environmental, social and process performance. Since the economic and process dimensions of campus open spaces was not included in the present study, the focus was on perceptual, functional and behavioral-social features as categorized by Salama and Azzali (2015). In place satisfaction, which is discussed in the next section, analysis criteria was determined based on previous studies on satisfaction.

1.2. Place satisfaction

As determined by Canter (1977) in the theory of place, individuals establish emotional relationships with places, similar to those they with people and objects. The qualities/features of a place affect the interaction and behavior of the individual with that place and consequently individual satisfaction or dissatisfaction. The interaction between individuals and open spaces leads to a satisfaction or dissatisfaction with that space/place. Thus, place satisfaction and the factors behind satisfaction level should be discussed. Stedman (2002) described place satisfaction as the perceived quality of the environment that meets the physical, social and service characteristics. If we substitute place with campus open space in the previous statement, the level where the place meets the needs, that is, the perceived quality of the place corresponds to the level of satisfaction for campus open spaces.

In the literature, place satisfaction is used in different fields. It is a frequently used concept especially in tourism research (Hosay and Prayag, 2013). However, there are very few studies evaluating location satisfaction within the scope of open campus spaces. Especially, there are no studies focusing on the relation of physical, social and perceptual features offered by campus open spaces with place satisfaction. When the concept of satisfaction with the place comes up, it is called place satisfaction. Mesch and Manor (1998) defines place satisfaction as an expression of experience regarding the physical and social dimensions of a place. Canter and Rees (1982) defined the concept of satisfaction as the contribution level of the physical and social spatial characteristics to the user goals, objectives, and expectations. Thus, it could be suggested that satisfaction is an emotional response to the space as a result of the individual's analysis of the environment based on individual needs, expectations and achievements. In this context, Amerigo and Aragones (1997) and Bonaiuto et al. (1999) focused on the interaction between the individual and the place along with environmental criteria in their studies on satisfaction. Kahana et al. (2003) discussed the dimensions of person, environment and person-environment in their study on satisfaction. They analyzed personal preferences in the person dimension and physical and social characteristics in the environment dimension. Similarly, Mesch and Manor (1998) focused on the physical and social environment among the environmental variables and investigated these variables based on the relationship between human and place. Stedman (2002) summarized satisfaction as the perceived quality of the location and analyzed it based on the concepts of place attachment and identity.

According to Fleury-Bahi et al. (2017), these studies that investigated satisfaction based on emotional ties such as place attachment, place identity, and place dependency, and the correlations between satisfaction experiences and psychological ties in human-place relationships in the literature were theoretically productive, albeit their unclear findings. However, current studies on satisfaction are conducted to include not only the physical properties of the environment but also the social characteristics. All these trends in the literature gained momentum with the realization that the place is a total of its social and physical attributes within the human-place relationship and the focal point of environmental experiences that include personal, social, cultural and psychological elements (Canter, 1983). Later, the sense of place concept (Montgomery, 1998), which addressed the dimensions of physical properties, activities and meaning in the relationship between the individual establishes and the place, was included in satisfaction studies.

Table 1. *Sense of place and open space attributes (Source: Montgomery, 1998; Lewicka, 2010; Salama & Azzali, 2015).*

Concepts	Dimensions	Attributes	Authors
Sense of Place	Activities	Land Uses	Montgomery (1998)
		Pedestrian Flow	
		Behaviour	
		Patterns	
		Noise&Smell	
		Vehicle Flow	
	Physical Setting	Townscape	
		Built Form	
		Permeability	
		Landscape	
		Furniture	
	Meaning	Legibility	
		Cultural Associations	
		Perceived Functions	
		Attractions	
		Qualitative Assessments	
Sense of Place	Physical	Type of housing	Lewicka (2010)
		Building size	
		Yard House	
	Social	Social Relation	
		Feeling of security	
	Social and Demographic	Age and Education	
		Period of stay	
		Family size	
Attributes of Urban open Space	Functional attributes	Diversity of use	Salama and Azzali (2015)
		Environmental responsiveness	
		Appropriateness of form	
		Accessibility	
		Diversity	
		Visibility	
		Clarity	
		Quality	
		Adaptability	
		Opportunities	
	Social attributes	Promoting User experience	
		Social inclusivity	
		Diversity	
		Interaction	
		Serving different social group	
		Social accessibility	
	Perceptual attributes	Human experience	
		Comfort and relaxation	
		Personal space and privacy	
		Safety and securtiy	
		Memorable architectural	
		Signage system	
		Navigation and movement	
		Spatial experience	
		Reflecting local identity	
		Attractiveness	

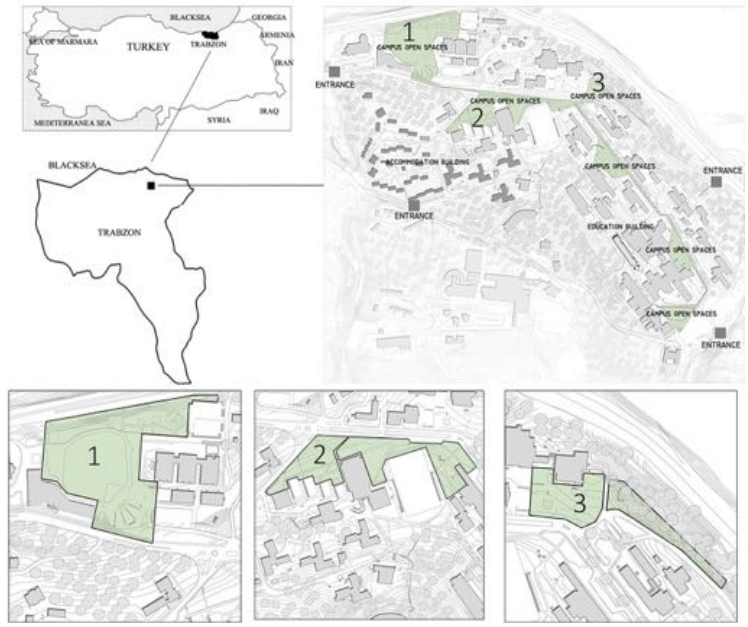

Figure 1. *The study area location.*

In the present study that aimed to investigate place satisfaction in campus open spaces, campus open spaces could be considered as an element of attitude as proposed by Fishbein and Ajzen (1975), where sense of place could provide a theoretical framework. When campus users encounter campus open spaces, they analyzed the space through emotional cognition and behavior processes. This analysis is determined by the physical properties, social attributes and socio-demographic properties of the place. These criteria correspond to the categories employed by Lewicka (2010) in the definition of the sense of place. In the present study, campus open space satisfaction was determined based on the categories proposed by Salama and Azzali (2015), Montgomery (1998), and Lewicka (2010) were employed (Table 1).

2. Material and method

2.1. Study area

The research, constructed to determine the impact of physical, social and perceptual attributes of campus open spaces on place satisfaction, was effected at Karadeniz Technical University (KTU) Kanuni Campus, which was established in 1955 in Trabzon province, Turkey (Figure 1).

KTU includes 12 faculties, 6 institutes, 1 college, 8 vocational schools and more than 40,000 students, 2105 faculty staff, and 3339 administrative staff. The campus where the study was conducted has educational, administrative, social and cultural buildings and student and staff accommodations, spanning an area of 1000000 m2. When the campus open spaces were selected in the study, open spaces that allowed socio-cultural activities in the campus were preferred, excluding the educational buildings. These campus open places were coded as COP1, COP2 and COP3 as shown in Figure 1.

COP 1 is a location named "july 15 Democrachy Square". This location was redesigned in 2009 and implemented in 2010. It is a more recently designed space than COP 2 and COP 3. Before this area was redesigned, it was an area where events such as festivals were held only on certain days of the year. This 40,000 m2 area has been redesigned to transform it into a lively location that is used every day of the year. In this context, a design setup consisting of a wide grass surface, water element and amphitheater was realized. Some activities

Table 2. *Attitude scale items (Developed from Montgomery, 1998; Project for Public Space, 2000; Lewicka, 2010; Salama & Azzali, 2015; Özkan and Yılmaz (2019).*

SETTING (CAMPUS OPEN SPACE)		
FUNCTIONAL	**SOCIAL**	**PERCEPTUAL**
· Providing facilities for various activities	· Common uses	· Reflecting local identity
· Vitality	· Participation in informal and formal activities	· Safety and Security
· Popularity	· Security (Social)	· Aesthetics
· Usefulness	· Availability for Daily meetings	· Well-kept, clean
· Management	· Diversity	· Unique character
· Appropriateness of form	· Interactive	· Legibility
· Clarity		· Attractive
· Quality		· Popularity
· Adaptability		
· Opportunities		

performed at the location are: sitting, resting, walking, walk the dog, running, doing exercise, dance, concert, biking, theater, sunbathe, sit on Lawn etc. COP 2 is called the "Lovers Park". It includes the following activities: It enables its users to activities such as walking, sitting, resting, watching the environment and eating with its walking paths, sitting benches, dining tables. COP3, on the other hand, is one of the oldest points of the campus and has no revisions. Its proximity to the library structure and its role as a meeting place increase the importance of the location. In this area, activities such as meeting, sitting, resting, watching the environment, listening to music, watching the sea, meeting are carried out.

2.2. Survey and participants

The place satisfaction level is determined with the analysis the physical and social attributes of the environment based on the needs, expectations and achievements of the individual. In the present study that aimed to investigate the satisfaction with campus open spaces, the analysis of the space as an attitude element constituted the general framework of the research design. Thus, the research included the following stages:

- The assessment of campus open spaces by the users based on functional, social and perceptual attributes
- The analysis of general place satisfaction level
- The analysis of overall study data to determine the correlations.

The survey questions were organized under two main titles to conduct the above-mentioned analyses. The first was the determination of the functional, social and perceptual attributes of campus open spaces, and the second was the determination of the total place satisfaction. Each item was measured on a 5-point Likert-type scale. Participants were randomly selected from the users of campus outdoor spaces. The survey was conducted face-to-face with a total of 240 participants, including 80 participants from each setting. Data were entered, organized, and analyzed with SPSS 24.0.

2.2.1. Campus open spaces functional, social and perceptual attributies survey

The satisfaction with open spaces, in other words, place satisfaction is a result of the interaction between the individual and the environment. In the first stage of the study, campus open spaces were analyzed as an attitude element based on the functional, social and perceptual attributes. Thus, in the determination of the attributes of the place, the criteria proposed by Montgomery (1998), Project for Public Space (2000), Lewicka (2010), Salama and Azzali (2015) and Özkan and Yılmaz (2019) were employed. (Table 2).

Functional features offered by location; It is restricted to, vitality, popularity, usefulness, management, appropriateness of form, clarity, quality, adaptability and opportunities. Social features are; common uses, participation in informal and formal activities, security (social), availability, diversity and interactive. Perceptual features are; reflecting local identity, safetiy and security, aesthetics, well-kept, clean, unique character, legibility, attractive and popularity dimensions. Expressions regarding these physical, social and perceptual features of the location are shown in Table 3.

Table 3. *Principle component analysis for environmental attribute items with varimax rotation.*

Dimension	Factor	Variance (%)	Mean	α
Functional Attributes (13 items)		**42.982**	**2.89**	**.96**
10. The area is intensively used by people.	0.866			
17. I use the space, albeit not for a particular activity.	0.830			
24. The space enables me to meet different people.	0.830			
13. The space is known and used by all.	0.825			
12. People form groups in the area.	0.819			
15. The activities conducted in the area involve more than one.	0.816			
19. The number of female users of the area are more than male	0.814			
16. I use the area regularly or to conduct a particular activity.	0.812			
22. I always want to participate in the activities when I visit this	0.794			
25. I can establish eye contact with others in this space.	0.788			
21. I want to introduce the area to a friend of mine.	0.763			
18. I can safely use the area at night.	0.757			
11. The area can be used actively.	0.731			
Social Attributes (9 items)		**18.142**	**2.94**	**.96**
7. I can easily walk in this area.	0.908			
3. The furniture elements are comfortable and practical in this	0.905			
1. The activity spaces are sufficient in this area.	0.883			
2. The furniture elements are sufficient in this area.	0.881			
4. The pavement elements are comfortable and practical to walk.	0.856			
6. The location of the area is quite close to other spaces.	0.841			
5. The locations of the area activity spaces are well-connected.	0.725			
9. The area makes it possible to conduct several activities.	0.705			
8. The area activity spaces serve their purpose.	0.701			
Perceptual Attreibutes (7 items)		**12.415**	**3.36**	**.89**
26. This area reminds the local identity of the region.	0.963			
28. I like the form, texture and color of the green fields in this area	0.963			
31. The activity spaces in this area is different when compared to the surroundings.	0.945			
27.I feel that this area has certain responsibilities and security.	0.908			
29. Security services are sufficient in this area	0.763			
30. The green fields in this area are clean and well maintained.	0.699			
32. I can see the area activities from a distance.	0.652			
Total variance		**73.539**		

* Items coded on 5-point scales: strongly agree (1), mildly agree (2), unsure (3), mildly disagree (4), strongly disagree (5)

Table 4. *The mean functional, social and perceptual attribute scores based on spaces and ANOVA test results.*

Factors	Open Spaces	Mean		Sum of Squares	df	Mean Square	F	p	Post-hoc analysis
Functional	COP1 (n:80)	3.74	Between G.	95.486	2	47.743	53.811	0.00	1-2
	COP2 (n:80)	2.68	In. G.	210.276	237	0.887			1-3
	COP3 (:80)	2.23	Total	305.762	239				2-3
Social	COP1 (n:80)	3.50	Between G.	43.650	2	21.825	20.976	0.00	1-2
	COP2 (n:80)	2.82	In. G.	246.590	237	1.040			1-3
	COP3 (:80)	2.48	Total	290.240	239				
Perceptual	COP1 (n:80)	3.41	Between G.	.613	2	0.307	0.405	0.66	
	COP2 (n:80)	3.36	In. G.	179.386	237	0.757			
	COP3 (:80)	3.29	Total	179.999	239				

2.2.2. Place satisfaction survey

In the second stage of the study, the satisfaction with campus open spaces was determined. The analysis of the selected open spaces was conducted with the 3-item (SAT1- I believe I did the right thing when I chose to visit this Campus open spaces, SAT2-Overall, I am satisfied with my decision to visit this Campus open spaces, SAT3 - I am happy about my decision to visit this campus open spaces) place satisfaction scale developed by Yuksel et al. (2010), which was determined as valid and reliable.

3. Results

3.1. Socio-demographic and visit attributes

The survey was conducted with 240 individuals in 3 regions, where 80 individuals were surveyed in each open space in the study. It was determined that the respondents included 48 females, 32 males in COP1, 42 females, 38 males in COP2, and 32 females and 48 males in COP3. Participants in COP1 were 18 freshmen, 22 sophomores, 24 juniors, 16 seniors, while COP2 participants were mostly juniors, and COP3 participants were mostly seniors. The analysis of outdoor space occupancy frequency revealed that COP1 users mostly visited daily, COP2 users visited every weekend, and COP3 users visited once a week. Finally, the analysis of occupancy duration demonstrated that ASP users mostly spent 1-2 hours, while AP users predominantly spent less than half an hour in the space.

3.2. Campus open place functional, social and perceptual attributes

The mean scores for 33 items developed to analyze functional, social and perceptual attributes of campus open spaces were found. The mean environmental attribute scores were 3.61 for COP1, 2.95 for COP2, and 2.41 for COP3. Factor analysis was conducted to determine the open space environmental attribute sub-dimensions. Factor analysis was required to determine the correlation and prediction of the sub-dimensions and place satisfaction in further analyses. Through the Varimax method was conducted in 5 repetitions and factor loads that were lower than 0.40 were omitted.

The 33-item environmental variables scale was reduced to 29 items (Table 3) in 3 factors. Three factors explained 73.539% of the total variance. To determine the fitness of the scale for factor analysis, Kaiser Meyer Olkin (KMO) coefficient was determined as 0.937 and Bartlett sphericity test revealed χ^2: 14149,257, sd820, p <0.001.

Based on the analysis results, the first factor was named "functional attributes" (items 10, 17, 24, 13, 12, 15, 19, 16, 22, 25, 21, 18, 11). This factor alone explained 42.982% of the total

variance and included 13 items. The second factor was named "social attributes" (items 7, 3, 1, 2, 4, 6, 5, 9, 8). This factor explained 18.142% of the total variance and included 9 items. The third factor was named "perceptual attributes" (items 26, 28, 31, 27, 29, 30, 32). This factor explained 12.415% of the total variance and included 7 items.

The analysis revealed a 3-factor structure with 29 items and these three factors explianed 73.539% of the total variance and the reliability coefficient (α) was 0.922.

The mean factor scores for campus open spaces were calculated and the differences between the places were analyzed with one-way ANOVA. In the ANOVA test conducted to determine whether environmental attribute sub-factors differed based on open spaces, it was found that there were no significant differences between perceptual attributes factors based on open spaces, while there were significant differences between functional attribute and social attribute factors (Table 4). As seen in Table 4, there were significant differences between functional attributes of all places and between the social attributes of spaces 1 and 3 and 1 and 2, there was no significant difference between spaces 2 and 3.

3.3. Place satisfaction

The mean user place satisfaction scores and standard deviation for campus open space environmental attributes are shown in Table 5. Then, The results of the factor analysis of the place satisfaction produced single factors and explained 76.666% of the variance (Table 6). While the mean of place satisfaction score was 3.99 for COP1, the same value was 2.72 for COP2 and 1.99 for COP3. One-way ANOVA was conducted to determine whether there was a significant difference between these three campus open space scores and place satisfaction. As seen in Table 7, there was a significant difference between campus open space scores and place satisfaction (F: 100.430; p <0.00).

3.4. Correlations between place satisfaction and environmental dimensions

It was aimed to determine the relationship between environmental features including functional attributes, social attributes and perceptual attributes dimensions and space satisfaction (Table 8). Correlation analysis results revealed a significant, high and positive correlation between functional attributes and place satisfaction (r = 0.847 **; p = .000). There was a

Table 5. *Frequency distribution of place satisfaction.*

	COP1		COP2		COP3	
Environmental attributes	Mean	SD	Mean	SD	Mean	SD
PS1 I believe I did the right thing when I chose to visit this Campı	3.87	1.07	2.67	1.00	1.98	1.19
PS2 Overall, I am satisfied with my decision to visit this Campus open	4.03	0.80	3.00	1.54	1.93	0.74
PS3 I am happy about my decision to visit this Campus open spaces	4.07	0.94	2.50	1.59	2.08	0.91

Table 6. *Principle components analysis of place satisfaction with varimax rotation.*

Dimension	Factor	Variance (%)	Mean	Cronbach α
Place Satisfaction (3 items)		76.766	2.82	0.844
PS1. I believe I did the right thing when I chose to visit this Campus open spaces	0.893			
PS2. Overall, I am satisfied with my decision to visit this Campus open spaces	0.882			
PS3. I am happy about my decision to visit this Campus open spaces	0.853			

Table 7. *The mean place satisfaction based on campus spaces and ANOVA test results.*

Factors	Open Spaces	Mean		Sum of Squares	df	Mean Square	F	p	Post-hoc analysis
Place satisfaction	COP1 (n:80)	3.98	Between G.	177.368	2	88.684	100.430	0.00	1-2
	COP2 (n:80)	2.56	In. G.	209.282	237	0.883			1-3
	COP3 (:80)	1.93	Total	386.650	239				2-3

Table 8. *Environmental Factors and Place Dependence: Bivariate correlations.*

Environmental Factors	Place Satisfaction
Functional attributes	0.847**
Social attributes	0.518**
Perceptual attributes	0.119
Gender	0.096
Year	0.091
Frequency of Use	0.217**
Length of Use	0.248**

Note. Significance indicated by *p<.05, **p<.01

Table 9. *Regression analysis conducted on place satisfaction to predict environmental attribute dimensions*

Model		B	Std. Hata	β (Beta)	t	p
4	Constant	0.102	0.018		5.609	0.000
	Functional attributes	0.601	0.006	0.713	100.156	0.000
	Social attributes	0.359	0.006	0.415	58.301	0.000

$R=0.851$; $R^2=0.725$; Adj. $R^2=0.722$; Model $F_{(2\text{-}237)} = 311.808$; $p<0{,}01$

positive correlation between social attributes and place satisfaction, and this correlation was moderate (r = 0.518 **; p =, 000). No significant correlation was determined between perceptual attributes and place satisfaction. Similarly, there was no significant correlation between age and year variables and place satisfaction; however, there was a significant and positive correlation between the frequency of campus outdoor occupancy (r = 0.217 **; p = .000) and occupancy duration (r = 0.248 **; p = .000).

Regression analysis revealed that the occupancy frequency and duration variables that were associated with place satisfaction could not be included in the model. In Table 11, it could be observed that the functional and social environmental attributes predicted place satisfaction. The analysis was fit for the linear model (F(2-237) = 311.808; p = 0.000) and there was no autocorrelation. Thus, it was demonstrated statistically that the functional and social environmental attributes has a significant and positive effect on place satisfaction.

In conclusion, the study findings on the environmental attributes of campus open spaces, place satisfaction and overall analysis are presented.

4. Conclusion and recommendations

The present study aimed to determine the environmental attributes that a place should offer to the users, the correlations between these attributes and their predictive power on place satisfaction. Thus, three campus open spaces with different environmental attributes were selected as the study area. Although there are previous studies in the literature on campus open space planning and design criteria, no studies are available on the correlation between successful open spaces and place satisfaction. Thus, initially, the environmental attributes and sub-dimensions of open spaces and space satisfaction scores were determined and the correlations between these variables were investigated.

The analysis of the distribution of environmental attributes across campus open spaces demonstrated that the highest score was determined in COP1 and the lowest score was determined in COP3. The analysis of place satisfaction scores revealed similar findings. These study findings were consistent with the results of previous studies (Herting & Guest, 1985; Ramkissoon et al. 2013; Stedman, 2002) which reported that as the success of the environmental attributes of open spaces increased, user satisfaction increased as well. When defining space satisfaction, Stedman (2002) stated that it was the success of the space in meeting individual requirements due to physical properties and social attributes. Then, what are the environmental dimensions that are associated with place satisfaction and have a high impact on it? To determine this, factor analysis was conducted on the environmental variables. Then, all study data were analyzed and correlation and regression analyzes were conducted to determine the correlations and effects.

The analysis of the environmental attribute sub-dimension findings revealed 3 factors including functional

attributes, social attributes and perceptual attributes. The analysis of variance conducted on these factors demonstrated functional, social and perceptual explained the total variance, erspectively. This 3-factor environmental attribute structure was consistent with the criteria that Salama and Azzali (2015) utilized in open space classification. In the one-way ANOVA analysis conducted to determine whether there were differences between the environmental factors based on open spaces, it was determined that functional and social dimensions exhibited differences based on open spaces, and perceptual dimension did not significantly differ.

Place satisfaction was determined with the scale developed by Yuksel et al. (2010) and it was determined that was 0.84. The analysis of place satisfaction findings demonstrated that the highest satisfaction was observed in COP1 and the lowest satisfaction was observed in COP3, similar to the environmental attribute analysis. It was determined that there were significant and high correlations between functional and social attributes and place satisfaction, while no significant correlation was determined between perceptual attributes and place satisfaction. There were significant correlations between occupancy frequency and duration and satisfaction, while no significant correlation was determined between gender and year variables and satisfaction. The analysis conducted to determine the variables that predicted place satisfaction revealed that only functional and social dimensions were included in the model. This finding was consistent with previous study findings that campus open spaces created are of interaction due to physical and social facilities rather than the aesthetic appeal. These results were similar to those reported by Hannan (2013), who considered campus open spaces as behavioral locations and emphasized the social relations between individuals and space.

When the physical, social and perceptual opportunities offered by the open spaces of KTU Kanuni Campus were evaluated, it was seen that COP1 received the highest averages in terms of its location and facilitating different usage types. Marcus and Francis (1997) stated in their open space design proposals that large lawn surfaces facilitate different types of use. Research results are consistent with this recommendation. Especially, COP1's relationship with the campus open spaces and the wide grass surface created a free behavioral environment for students (sunbathing, exercising, dancing, listening to music, studying, organizing outdoor shows, etc.). Thus, the level of usage and space satisfaction has turned into a high position.

Campus open spaces are interactive locations where human-place relations are intensely established. The programming and design phase of these areas is very important. Because campus open spaces are to meet the different needs of young people of different profiles and to create spatial organizations for this. The need-activity and space setup should be created by evaluating the changing user needs, determining the appropriate activities for them, and finally constructing the spatial organizations within the framework of flexible design accordingly. In this context, as stated by Gür (1996); Holistic approaches that are sensitive to the needs and lifestyles of the users should be displayed in a way that the structural components and elements of the space are harmonious, useful, and provide a happy and peaceful life (Düzenli et al., 2019).

In the literature (Günaydın, 2011), he conducted a research to determine the leisure time needs of students on the campus campus and to reveal the current situation. The difference of this research from those conducted in open campus spaces is that it evaluated open spaces as an object of attitude. In conclusion, the present study discussed the environmental attributes of campus open spaces with a 3-dimensional approach and determined that not only perceptual attributes affected place satisfaction. The study findings suggested that functional and social attributes, occupancy frequency and duration variables had positive effects on place satisfaction. It was determined that age and seniority in the university were not effective on place satisfaction. It could not be claimed that all spatial attributes were analyzed in the present study, which was conducted specifically on campus open spaces. Instead of analyzing all possible

spatial attributes, it could not be suggested that the present scale, which was developed based on previous studies and theories in the literature, included all variables that would predict place satisfaction. This fact was among the limitations of the present study. Thus, it was aimed to conduct further studies to control and improve the overlaps by applying the scale in different spaces to overcome this limitation. In particular, future studies should analyze different university campuses to determine the similarities and differences between the perceptions of campus open space users and correlations between these perceptions and place satisfaction. The study and study findings are important and guiding for both urban planners and administrators, who are responsible for protection and development of campus open spaces, and the users.

5. Limitation of study

The research was carried out in open spaces of KTU Campus with a total of 240 participants. Among the socio-demographic factors of the participants, only gender and time spent on campus were evaluated. Apart from these variables, which are thought to have an effect on place satisfaction within the scope of the research, preferences, outdoor use perceptions, etc. variables can also be included in the research. The limitation of socio-demographic variables with gender and time spent on campus can be considered as the limitations of the study. Another is that the spatial organization of the locations included in the study (their design features such as existing plantation, walkways, size of material used) were not evaluated on a micro scale.

6. Future research

As stated in the limitations of the study, socio-demographic factors can be discussed more comprehensively in future studies that will examine the effects of campus open spaces on place satisfaction. Especially since universities are the meeting points of students from different cultures, the relationship between place satisfaction and intercultural differences can be discussed.

As we stated in the limitations of the research, studies that will question the relationship of space organizations with place satisfaction can be detailed in future studies on campus open spaces. In particular, the effects of outdoor design features, locations, design and application details on space satisfaction can be examined in future research. This research will serve as a basis for future studies on the relationships between spatial organizations that will be evaluated on a micro scale and place satisfaction. At this point, it is very important to reveal the effects of the functional and social characteristics of the place on place satisfaction from the results obtained in the study. These two dimensions should be investigated more comprehensively in studies on campus open spaces to be researched in the future. At the same time, it is thought that the results obtained from this research will form a basis for all administrative units that are involved in campus layout, design and implementation.

Campus open space use and the importance of campus life have been understood more clearly with the COVID-19 pandemic we are in. With the transformation of education and training in universities into a distance learning model, campus open spaces have turned into empty spaces where students are not the main users. The pandemic situation will cause differences in outdoor use in cities, as well as in campus outdoor use. Especially the needs of the users and their outdoor usage expectations will vary. "What kind of changes can occur in outdoor designs in the post-pandemic period? It is clear that their questions will need to be answered. In this context, in future studies, the differences in campus outdoor use after the epidemic can be investigated and compared with this research.

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Implementation of government policies in the construction industry: The case of Sri Lanka

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Abstract

Public policy system of the construction industry of a country will reflect the country's economic, political, social, and cultural status. In any country, especially in developing countries like Sri Lanka, the success of government policies depends on their effective implementation. Thus, the aim of this study was to explore how construction related government policies could be effectively implemented to facilitate the development of the construction industry of Sri Lanka. The study used the qualitative approach consisting of 15 expert interviews and manual content analysis was used to analyze the empirical data collected through the interviews. The findings revealed that National Policy on Construction (NPC) formulated by the National Advisory Council on Construction (NACC) is the only construction policy implemented in Sri Lanka. NPC, which contains 18 policies applicable to both public and private sectors, is found to be sufficient for the effective operation of the construction industry for the time being. However, the proper implementation of the policy could be a challenge given the nature of the country's construction industry. The implementation of the policies gets interrupted when there are financial issues, insufficient human and technical resources, political influence, poor delegation of authority, and ineffective leadership. If the recommendations made in the study to overcome the barriers for policy implementation could be implemented, the country's construction industry would develop rapidly.

Keywords

Construction industry, Implementation barriers, National policy on construction (NPC), Recommendations.

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1. Introduction

The construction industry of a country plays a significant role in its national economy (Alaghbari et al., 2019). In Sri Lanka, the construction industry, which significantly contributes to the Gross Domestic Product (GDP) and creates employment (Vijayaragunathan & Rasanthi, 2019), is the fourth-largest industry in the country with its percentage contribution to the GDP during the past 10 years standing at 6-7% (Jayalath & Gunawardhana, 2017). The government policy on construction will reflect the economic, political, social, and cultural status of the country (Seaden & Manseau, 2001).

A policy is a general declaration regarding priorities, formal laws or rules, procedures, and standards. In its simplest sense, a policy refers to a course of action to achieve one or more intended goals at specified intervals as desired by a firm or an individual as the case may be (Mackay & Shaxton, 2005). The success of such a policy will, however, depend on its effective implementation (Khan, 2016). According to Meier et al. (2016), even the best policy will not be of any value if it is not applied effectively or correctly. A stable government policy on construction will be very useful to overcome the numerous issues currently faced by the construction industry in Sri Lanka (Silva et al., 2008). According to Mohd Nawi, Baluch, and Bahauddin (2014), because of structural reasons, such as insufficient learning across projects, the construction industry has become less productive than most of the other industries (e.g. manufacturing), the construction value chain has got fragmented, and the industry has been unable to keep pace with technological developments. To resolve these issues faced by the construction industries of their respective countries, various governments have progressively introduced new policies to improve the construction performance of their countries. However, these construction policies have often failed to obtain the active participation of construction industry stakeholders (Park et al., 2011). According to Ratnasingham (2015), a major concern of the construction industry in Sri Lanka has been the changes made to construction policies with the change of the government. Thus, addressing the loopholes in the current policies and providing recommendations to prevent the governments from making changes to the policies as they wish is important (OECD, 2016).

Several authors have discussed the roles of the government policies and their effects (Morestin, 2012; Taofeeq, Adeleke, & Lee, 2019; Taofeeq, Adeleke, & Lee, 2020; Taofeeq, Adeleke, & Hassan, 2019; Weller, 1980), policy changes (Stewart, Hedge, & Lester, 2008; Wong, 2019; Xiaopeng & Pheng, 2013), policy implementation (Mazmanian & Sabatier, 1989; Meter & Horn, 1975; Wali, 2010), policy implementation issues (Meier et al., 2016), and the relationship between government policy and construction sustainability and innovation (Seaden & Manseau, 2001; Waddell, 2008). The importance of government policies (Hettiarachchi et al., 2019) and policy gaps that deter sustainable construction (Jayalath & Perera, 2019) in Sri Lanka have been discussed by only few researchers. Literature on the effectiveness of the application of government policies in Sri Lanka, especially with regard to the development of the construction industry in the country, is scarce. According to Jayalath and Perera (2019), Sri Lanka lacks robust policies. Therefore, a policy gap analysis like done in this study may be useful in the long run. The recommendations provided will help the construction industry identify the productive policies that suit it as without such recommendations the industry will lack interest in implementing construction policies. Therefore, a comprehensive study on construction policies that will identify their current implementation status, implementation barriers, policy gaps, and provide recommendations to overcome the policy barriers / gaps will help better management of the Sri Lankan construction industry. Thus, the aim of this study was to explore how construction related government policies could be effectively implemented to facilitate the development of the construction industry of Sri Lanka. The objectives of the study were to identify and study the policies related to the construction industry in Sri Lanka; in-

vestigate the adequacy of government policies for the effective operation of the construction industry; identify the barriers to implementing construction policies; and recommend steps that can be taken to address construction policy gaps or barriers to construction policy implementation.

2. Literature review

2.1. Government policies

Government policies are a collection of actions containing an extensive framework for implementing a philosophy, concept, vision, or decision by transforming it into numerous programmes, projects, and actions (Anderson, 2010; Fox & Meyer, 1995). While these policies can either encourage or hinder new strategies and innovations, strict and focused policies can spur significant and fundamental changes (Patanakul & Pinto, 2014). Governments set the foundation for public policymaking to help decide the social goals to pursue and the mode of attaining them (Young, 2013). According to Presley and Meade (2010), a policy allows for a robust uniform system in the industry concerned. The closing of the gap between the purpose of a policy and its effective approaches is difficult (Meacham, 2016). For successful policymaking related to the construction industry of Sri Lanka, the different strategies of policy implementation should be unbundled to avoid any interruptions or unequal growth (Jayalath & Perera, 2019).

2.2. Need for a government policy in the construction industry

Construction industry requires government policies and legislation for its regulation (Nawi et al., 2012). Government policies are important for the development of new construction technologies or products, the government being a major client of the construction industry (Nifa & Ahmed, 2010). According to Drewer (1980) and Taofeeq, Adeleke, and Lee (2019), government policies are required to encourage the construction industry to use appropriate technology, strengthen small and medium-sized local contractors, establish appropriate training programmes, and encourage innovation. The public policy regime for this sector will reflect the economic, social, political, and cultural values of the country (Seaden & Manseau, 2001). Countries like Japan, France, the United Kingdom, Netherlands, Denmark, and Finland, which have more centralised government structures, have a national construction ministry, to champion the particular needs of the construction industry and promote customised innovation-enhancement construction policies. The government should set rules and regulations, which come through policies, to help shape the risk and competitive environment of the construction industry (Bosch & Philips, 2003). Without government policies, the industry will be overwhelmed by many small companies with limited fixed capital, letting competitive subcontractors to flourish. Furthermore, the absence of a government policy can exacerbate employment conditions, and reduce the skills and the training opportunities available to the workers of the industry (Moran et al., 2008). Adeleke, Bahaudin, and Kamaruddeen (2017) also indicate that policies are strongly related to successful workforce management. A policy in the construction industry will refer to all construction operations, such as all procedures, or actions required before a project is started and completed. Organisations that properly adhere to the government's approved policy on procuring supplies, drawing plans, or conducting certain building activities will face only a few risks (Taofeeq, Adeleke, & Hassan, 2019). Therefore, appropriate government policies would overcome the current shortcomings faced by the construction industry and ensure its long-term survival.

2.3. Government policies in the Sri Lankan construction industry

The National Advisory Council on Construction (NACC) in Sri Lanka that deals with matters relating to the country's construction industry and its aims are empowered by the Construction Industry Development Act No.33 of 2014 adopted on 29 December 2014 to create a National Policy on Construction (NPC) (Wettasinghe, 2015). The main purpose of the NPC, which has 18 sub-policies, is to create

an efficient Sri Lankan construction industry that meets national development needs by controlling, standardising, capacity building, and facilitating the industry (Jayalath & Perera, 2019; Ministry of Housing Construction & Culture Affairs, 2017). The policy, which applies to both the private and public sectors involved in construction, aims to align with it the strategies and operative backgrounds of the different sectors of the industry to ensure complementarity (NACC, 2016). The changes made to the construction policies by different governments is a major concern of the construction industry in Sri Lanka (Ratnasingham, 2015).

The success of a policy is measured by how well it is implemented (Khan, 2016). Even the finest policy will be of little value unless it is successfully or properly implemented (Meier et al., 2016). The failure of government policies has interrupted construction industry development (Hui et al., 2011). The political instability of the government also makes a huge impact on the construction industry and its productivity because such instability may lead to swift changes in certain policy decisions already taken by the government.

2.4. Government policy implementation and its barriers

According to Stewart, Hedge, and Lester (2008), implementation is a significant phase of policymaking. Simon (2010) defines policy implementation as the application of the policy by the management to achieve its goals. In particular, policy implementation includes government and private activities aimed at achieving the objectives stated in previous policy choices (Meter & Horn, 1975). The implementation of a specific policy is very context-related because it relies on political, cultural, economic, organisational, and attitudinal factors that affect the effectiveness or the inadequacy of policy implementation (Meter & Horn, 1975; Stewart et al., 2008). According to Smith and Larimer (2009), the gap between the intention of policy and its results is mentioned in the most frequently cited definitions of implementation.

According to Meier, Ripley, and Franklin (2016), one of the major challenges that developing countries face is policy implementation which encounters barriers when the desired outcome is not available for the intended beneficiaries. When the elements crucial for public policy implementation are absent, implementation issues can arise (Makinde, 2005). Sharpe, Rossi, Lipsey, and Freeman (2004) indicated that many policies fail to get enforced or implemented according to policy design. One of the main issues faced during policy implementation is the lack of guidance on how to implement the policy in the right direction (Hudson et al., 2019). Furthermore, a lack of theoretical understanding is also found to be a key issue with policy implementation (Mazmanian & Sabatier, 1989). Uncertain goals and objectives in policy implementation is another obstacle (Pressman & Wildavasky, 1973). The consistency of the goals and objectives of the policy promotes timely policy implementation. Non-achievement of policy objectives is attributed to incorrect policy implementation (Brinkerhoff & Crosby, 2002).

Investigators who check the policies may seriously undermine their implementation because of the insufficiency of their professional and technical resources (Brinkerhoff & Crosby, 2002; Goggin et al., 1990; Lipsky, 2010; Mazmanian & Sabatier, 1989; Meter & Horn, 1975), insufficiency of the funds provided, unavailability of experienced staff, negative disposition of front-line implementers toward policy interventions (Meter & Horn, 1975; Meier et al., 2016), intra-agency antipathy and lack of intra-agency communication between task force officers and programme superiors (Meter & Horn, 1975; Bridgman & Davis, 2004), political interference, poor delegation and flexibility (Fox et al., 2006), inadequate independency (Wali, 2010), the impact of socio-economic conditions (Bridgman & Davis, 2004), the inadequacy of managerial capabilities and willingness, enhanced demand for services, ambiguous goal expectations, and the difficulties experienced in achieving goals (Lipsky, 2010). According to Silva et al. (2008), corruption and favouritism are

two main disadvantages encountered in many developing countries during policy implementation. However, similarities, as well as dissimilarities, can exist between the barriers to policy implementation encountered in other developing countries and those encountered in Sri Lanka.

Thus, the effectiveness of the policies depends on the policies themselves and the management of their implementation (Brinkerhoff & Crosby, 2002). Therefore, the proper implementation of policies is very much important to the development of a country. Makinde (2005) and Hudson, Hunter, and Peckham (2019) have studied policy implementation barriers in various countries, while Khan (2016) has found solutions to overcome those barriers. However, only a few studies have been conducted on the implementation of policies specific to the construction industry and their barriers. Moreover, a detailed study has so far not been conducted to identify the construction policies currently being implemented in Sri Lanka and the effective implementation of the policies to develop the construction industry.

3. Methodology

According to Ritchie, Lewis, Nicholls, and Ormston (2014), a qualitative research approach will be ideal to gather opinions and information from people based on their experience and will be useful in situations where an in-depth analysis of the data gathered is necessary. Creswell (2014) suggests a qualitative research approach when the variables to be investigated are unknown or when the literature is not comprehensive enough. According to Creswell (2014), the qualitative approach is well suited to exploratory data analysis and to gather new knowledge. Thus, a qualitative research approach was adopted in the study. Merriam (2019) had mentioned that expert interviews are ideal for two-way information exchange. Since qualitative research considers 15 to be the smallest acceptable sample size (Bertaux, 1981; Mason, 2010), the study included 15 expert interviews. The sample size was limited to 15 following the concept of data saturation. Moreover, data saturation enables the establishment of the validity of a data set (Nascimento et al., 2018). According to Rowley (2012), semi-structured interviews enable participants to explain their feelings, experiences, and opinions vividly on the importance of a subject. Thus, in this study, a semi-structured interview design was adopted with semi-structured questions, which allowed certain questions to be raised when required (Berg, 2009). The interview guideline was divided into sections to identify the appropriateness of the policies for the effective operation of the construction industry, barriers to implementing the NPC, and recommendations to address construction policy gaps/ issues on policy implementation mechanisms in Sri Lanka. The experts were requested to state their level of awareness about the NPC, present policy mechanism practices, barriers to policy implementation, and recommendations to overcome the barriers (Refer Table 2). Each face-to-face semi-structured interview was conducted for 60-90 minutes, with knowledgeable and experienced experts associated with the construction industry. The experts were selected using purposive sampling, based upon their knowledge and experience of more than 15 years in the industry (Refer Table 1), awareness on NPC, availability for interviewing, and willingness to take part in the interviews (Etikan et al., 2016). Further they had experience in the areas of preliminary cost advice, cost planning including investment appraisal, life-cycle costing and value analysis, tendering and tender evaluation, procurement and tendering procedures, contract documentation and value analysis which allow them to get exposure to NPC in their day to day work. Moreover, all the selected experts were especially selected considering either being on the advisory committee or engaged in policymaking process of the NPC. Thus they were familiar with the process of policy making. The collected data were manually analysed using directed content analysis to concentrate on the research question (Azungah, 2018; Hsieh & Shannon, 2005). Table 1 provides details about the interviewees.

Table 1. *Profiles of the interviewees.*

Respondent	Profession	Designation	Total Industry Experience	Key Experience Areas and Experience Years				Key Knowledge Areas	Relation with the NPC	
				Civil and structural engineering	Project management	Surveying and construction	Consultancy		Engaged in policymaking	Being on the advisory committee
R1	Chartered Quantity Surveyor	Director	30 years		✓ (20)	✓ (10)	✓ (5)	Preliminary cost advice, Cost planning including investment appraisal, Life-cycle costing and value analysis, Procurement and tendering procedures, Contract documentation	✓	
R2	Chartered Quantity Surveyor	Chairman	47 years		✓ (32)	✓ (15)	✓ (21)	Procurement and tendering procedures, Contract documentation, Evaluation of tenders, Cash-flow forecasting, financial reporting and interim payments, Final accounting and the settlement of contractual disputes, Preliminary cost advice, Cost planning including investment appraisal, Life-cycle costing, and Value analysis	✓	
R3	Chartered Quantity Surveyor	Senior Lecturer	30 years			✓ (30)	✓ (20)	Preliminary cost advice, Cost planning including investment appraisal, Life-cycle costing, and Value analysis, Research skills		✓
R4	Chartered Engineer	Director	18 years	✓ (15)	✓ (3)			Technical specialisation, Planning, and scheduling, Negotiation, Budgeting, Conflict Resolution	✓	
R5	Lawyer	Legal Draftsman	15 years		✓ (10)		✓ (7)	Construction contracts, Insurance claims, Legal procedure	✓	
R6	Chartered Engineer	Director	15 years	✓ (10)	✓ (10)			Technical specialisation, Planning and scheduling, Negotiation, Budgeting, Conflict resolution		✓
R7	Chartered Engineer	Chief Executive Officer	35 years	✓ (22)	✓ (12)		✓ (10)	Management, Technical knowledge, Planning and scheduling, Negotiation, Budgeting, Conflict resolution	✓	
R8	Chartered Town Planner	Director	30 years	✓ (10)		✓ (20)	✓ (20)	Knowledge on urban spatial structure, Legal knowledge, Technical skills, Research skills, Negotiation	✓	
R9	Chartered Architect	Deputy Director	20 years	✓ (10)		✓ (12)		Documentation, Cost estimation, Construction contracts, Technology knowledge, Research skills		✓
R10	Chartered Architect	Director	30 years	✓ (19)		✓ (20)	✓ (18)	Documentation, Cost estimation, Construction contracts, Management, Technology knowledge, Research skills		✓
R11	Chartered Architect	Deputy Director	19 years		✓ (5)	✓ (15)		Documentation, Research skills, Cost estimation, Construction contracts, Technology knowledge		✓
R12	Chartered Architect	Director	25 years	✓ (20)	✓ (5)		✓ (13)	Documentation, Cost estimation, Construction contracts, Technology knowledge, Research skills	✓	
R13	Chartered Town Planner	Deputy Director	18 years	✓ (12)	✓ (7)			Knowledge on urban spatial structure, Legal knowledge, Technical skills, Research skills		✓
R14	Lawyer	Legal Advisor	23 years	✓ (18)		✓ (12)	✓ (17)	Construction contracts, Insurance claims and disputes, Negotiating, Drafting, and advising on contract amendments	✓	
R15	Lawyer	Legal Advisor	20 years	✓ (12)		✓ (10)	✓ (9)	Construction contracts, Insurance claims and disputes, Negotiating, drafting and advising on contract amendments, Research skills	✓	

4. Research findings and discussion

4.1. Appropriateness of the policies for the effective operation of the construction industry in Sri Lanka

Even though the literature findings revealed that changes made to construction policies by different governments are a major concern in Sri Lanka, the interview findings revealed that NPC formulated by the National Advisory Council on Construction (NACC) under the provisions made in the Construction Industry Development Act No.33 of 2014 for the protection and development of the construction industry is the only construction policy in Sri Lanka. The main objectives of the NACC are to formulate the NPC and achieve sustainable development in the construction industry. The basic purpose of the NPC is to establish an effective Sri Lankan construction industry that serves national growth needs by controlling, standardising, capacity building, and facilitating the industry. R2 mentioned that in developing this NPC, the NACC took several steps such as identifying the need for a construction policy in the construction industry, gathering necessary information, drafting the policy, consulting appropriate industry

stakeholders, obtaining approval for the policy, implementing, monitoring, and finally revising the policy. The stakeholders, such as construction experts, advocacy groups, researchers, and policymakers who were well-suited to consider and discuss the potential implications of the policy, were recruited to develop the policy. For the development of the construction industry in a country like Sri Lanka, a construction policy is essential as an action guide that could be followed by the construction industry stakeholders. According to R3, "construction policy is a must to monitor the construction industry in Sri Lanka properly, the industry being one of the major contributors to the GDP". The experts mentioned that policies ensure the consistency of an industry as otherwise, no one will know what to do, how to do it, and when to do it when in an ad-hoc situation.

When the experts were questioned on the adequacy of the existing policy to the construction industry in Sri Lanka, the majority stated that the policy being the first of its kind in Sri Lanka, it has to be implemented for several years to gauge its effectiveness and if necessary, amended. Some of the interviewees stated that certain areas in the country are not being covered by the NPC. R1 elaborated that Sri Lanka is well behind the other countries in the use of Building Information Modelling (BIM). The government agencies in several countries such as Singapore, South Korea, the UK, and the USA have made the use of BIM mandatory through the government policies established for public construction projects (Information Resources Management Association, 2018; Olawumi & Chan, 2019). Thus, in Sri Lanka too, BIM should be implemented through policies. The use of solar energy for construction also has to be promoted in Sri Lanka using policies. New legislation and policies of the UK government on improving renewable energy usage have had a major impact on how the buildings are designed and constructed in the country (Waddell, 2008). Moreover, the experts suggested that popularising green technology should be a part of NPC, which Jayalath and Perera (2019) have already identified as a policy gap in Sri Lanka. The little consideration given to these new concepts in the NPC has led to a lack of theoretical sophistication in the policy, which Meier et al. (2016) identified as a global issue. However, some of the experts mentioned that policies alone will not help meet the challenges faced by the industry and that they only help improve industry practices rapidly and reliably.

Though the literature states that countries like the Middle East, Africa (Xiaopeng & Pheng,2013), China (Shen et al., 2001), Vietnam (Ling & Hoang, 2010), India (Ling & Hoi, 2006), and Sri Lanka (Ratnasingham, 2015) experience policy uncertainty, this study revealed that Sri Lanka does not experience such uncertainty because NPC has remained unchanged since the date of its formulation. All the experts agreed that the 18 policies (Table 2) mentioned in NPC have not changed with government changes and that the existing policy is more than sufficient for the effective operation of the construction industry in Sri Lanka although its implementation could be an issue.

4.2. Barriers to implementing the National Policy on Construction in Sri Lanka

The current level of implementation of NPC and the barriers to implementing it are discussed in the following sections.

4.2.1. Current level of implementation of NPC

Before identifying the barriers to implementing NPC, the identification of its current level of implementation is important. Table 2 summarises the findings on the current implementation level of NPC in Sri Lanka.

The descriptions of the 18 policies presented in Table 2 were extracted from the NPC. Each policy has its own policy mechanism. As Table 2 indicates, 7 out of the 18 policies are yet to be implemented. Only 2 policies have been implemented "considerably," 9 policies have been implemented to "a degree" while the rest of the policies have not yet been implemented at all.

Table 2. *Current level of implementation of NPC*

Policy	Current Implementation Level	Number of Respondents
NPC 1- Provide strategic leadership to the stakeholders of the construction industry to stimulate sustainable growth, reforms, and improvement of the construction sector	To a degree	15/15
NPC 2- Regulate and monitor the activities of all stakeholders of the construction industry as may be prescribed from time to time	Considerably	15/15
NPC 3 - Promote sustainable economic growth of the construction industry with special attention to the design and development of disaster-resilient, energy-efficient, and environmentally sustainable buildings, structures, and construction practices	To a degree	15/15
NPC 4 - Promote innovation, research, dissemination, and publication of research work on matters relating to the construction industry and its development	To a degree	15/15
NPC 5 - Establish national standards and specifications for the construction Industry	Considerably	15/15
NPC 6 - Establish codes of conduct, practices, procedures, processes, and documentation to promote good practices relating to the construction industry	To a degree	15/15
NPC 7 - Enhance human capital, professionalism, efficiency, and productivity of the human resource of the construction industry	To a degree	15/15
NPC 8 - Enhance occupational safety and health standards and practices in the Construction Industry	To a degree	15/15
NPC 9 – Enhance the use of Information Technology to improve the efficiency and productivity of the construction industry processes	Not yet implemented	15/15
NPC 10 – Promote access to overseas markets for Construction Companies and personnel	To a degree	15/15
NPC 11 - Create an enabling environment for local and foreign investment in the construction Industry	Not yet implemented	15/15
NPC 12 – Establish a monitoring and evaluation procedure to ensure compliance of industry practices including disaster-resilient construction standards & practices, with the National Construction Policy	To a degree	15/15
NPC 13 – Promote domestic participation in foreign-funded construction projects implemented by foreign contractors and consultants	Not yet implemented	15/15
NPC 14 – Encourage private sector participation in policy development	Not yet implemented	15/15
NPC 15 – Encourage effective management of construction projects by the industry	Not yet implemented	15/15
NPC 16 – Establish Codes of Conduct among partners of the industry	To a degree	15/15
NPC 17 – Encourage Human Resource Development in the Construction Industry	Not yet implemented	15/15
NPC 18 – Establish appropriate procurement practices in the Construction Industry	Not yet implemented	15/15

Thus, not a single policy has been fully implemented. Although the implementation mechanism for each policy is mentioned in the NPC, according to the interviewees, most of those mechanisms are not being implemented. Even though the policy as a whole is more than sufficient for developing the construction industry in Sri Lanka, the proper implementation of the policy has been neglected by the relevant stakeholders. The real benefit of this policy would not be achieved if it is not implemented properly. This was confirmed by Hudson et al. (2019) when they stated that there is a growing acceptance that a policy will not be a success or failure on its own but its implementation.

4.2.2. Barriers to implementing construction policies

Table 3 lists a set of barriers for each policy and recommendations for overcoming those barriers identified from the expert interviews.

Common barriers

According to Table 3, financial issues, lack of human resources, political influence, lack of technical resources, lack of authority, lack of effective leadership/ proper guidance, delays caused by government organisations, corruption and transparency issues, and research and development weaknesses are the common barriers that impede the smooth implementation of the policies. All of the interviewees indicated that lack of funding is a major obstacle to the implementation of NPC and that it may lead to other issues as well. Therefore, it is the most important barrier to be considered. Because the Construction Industry Development Authority (CIDA) is the main organisation set up by the Government of Sri Lanka to develop and promote the domestic construction industry, the Authority needs sufficient human and technical resources to implement procedures and store, update, regulate, and monitor data. However, CIDA is lacking in these resources.

Table 3. *Barriers and recommendations to NPC.*

Common Barriers	Number of Respondents	Policy	Implementation Barriers/ Policy gaps	Number of Respondents	Recommendations to Overcome the Barriers	Number of Respondents
Financial issues	15/15	NPC 1	Lack of interest in the responsible personnel	14/15	Establishing an effective and dedicated leadership with the required skills	15/15
Lack of human resources	14/15		Improper monitoring of the responsibilities	13/15	Bringing back Sri Lankan professionals, who have migrated overseas	12/15
Political influence	13/15		Poor commitment of the frontline implementers	12/15	Establishing a proper monitoring system	13/15
Lack of technical resources	14/15		Lack of awareness about the policy	15/15		
Lack of authority	13/15	NPC 2	Regulatory problems and 'political will'	13/15	Providing human resources, computer facilities, and computerised systems	14/15
Lack of good leadership/ proper guidance	14/15		Long time taken to update regulations and guidelines	11/15	Introducing construction industry development levy	
Delays caused by government organisations	12/15		Lack of computer facilities		Recruiting competent staff	13/15
Corruption and transparency issues	14/15		Lack of competent staff	14/15	Considering the ideas of all stakeholders	15/15
Research and development weaknesses	13/15		Outdated documents	10/15	Registering all stakeholders of the construction industry	12/15
				12/15		13/15
		NPC 3	Time-consuming processes	9/15	Making approval procedures fast and efficient	13/15
			Lack of support from the consultants	5/15	Allocating funds	14/15
		NPC 4	Non-availability of a separate research entity for the construction industry	10/15	Encouraging research and establishing a research fund	10/15
					Establishing a separate entity responsible for research in the construction sector	5/15
		NPC 5	Unavailability of standards and guidelines	12/15	Obtaining advice from Sri Lankan professionals, and seeking their involvement and commitment	10/15
			Outdated specifications	12/15		
			Absence of a clear vision in the frontline implementers	13/15	Preparing standards for machinery	7/15
			Lack of contribution from industry experts	14/15	Getting frontline implementers to be committed and skilled	7/15
					Arranging effective leadership to direct frontline implementers	13/15
		NPC 6	Failure of industry personnel to follow codes of conduct and best practices	13/15	Getting the professionals to speak up against corruption	15/15
		NPC 7	Lack of programmes to promote the use of information technology in the industry	14/15	Arranging effective leadership, strong management, and proper coordination	12/15
					Developing the interest and knowledge of the construction sector	
					Giving consideration to labour categories	12/15
						11/15
		NPC 8	Reluctance to adhere to safety standards	8/15	Including occupational health and safety (OHS) standards and practices in the bills of quantities as a paid item	12/15
			Inability of the contractors to purchase safety standards because of their high costs	9/15	Introducing a penalty for failing to comply with OHS standards	9/15
		NPC 9	High cost of procuring IT facilities	15/15	Establishing a sub-committee under the Advisory Council for all areas	8/15
			Reluctance to adopt new technologies	13/15	Conducting training programmes	15/15
					Conducting awareness programmes on new technologies	14/15
		NPC 10	Lack of incentives to encourage contractors	8/15	Providing incentives to encourage contractors to access foreign markets	13/15
			Issues related to communication infrastructure	13/15	Expanding the communication infrastructure	12/15
			Lack of technical and software skills	12/15	Conducting training programmes	15/15
		NPC 11	Insufficient support extended by the Sri Lankan government to foreign investors	7/15	Establishing an online platform for foreign investors	6/15
			Time-consuming approval systems	8/15	Computerising all the processes	12/15
			Rigidness of rules and regulations	13/15	Relaxing the rules and regulations pertaining to foreign investors	7/15
			Political instability	14/15		
			Absence of a 'level playing field'	12/15		
		NPC 12	Reluctance of the developers to participate in awareness programmes	10/15	Promoting interactions with the banks	9/15
					Recruiting competent staff	10/15
		NPC 13	Inadequate consideration given to local contractors	11/15	Removing NBT from construction contracts and charging 1% as an industry development levy	9/15
			Absence of a penalty system to punish those who violate rules and regulations	14/15	Reducing taxes and interest rates on loans and providing incentives	9/15
		NPC 14	Lack of support and contribution from the private sector	6/15	Providing additional benefits to the private sector	7/15
			Lack of awareness about the policy		Conducting awareness programmes on the policy	7/15
			Lack of incentives to encourage the private sector	7/15		
				11/15		
		NPC 15	Lack of interest by the private sector	15/15	Conducting awareness programmes on the policy	15/15
		NPC 16	Lack of proper coordination	8/15	Reducing corruption and introducing a penalty system	8/15
					Conducting awareness programmes in the private sector	7/15
		NPC 17	Lack of a requirement to register professionals under CIDA	7/15	Bringing back the Sri Lankan professionals, who have migrated overseas	8/15
					Providing effective leadership	9/15
					Conducting awareness programmes in the private sector	10/15
		NPC 18	Lack of required documents	10/15	Improving procurement practices	6/15
			Lack of professionals	14/15	Recruiting competent staff	13/15
			Lack of proper accreditation criteria	8/15	Conducting awareness programmes on CIDA publications in the private sector	12/15

Many of the interviewees emphasised that political interference makes it impossible to implement policies and that the authority vested in CIDA is not sufficient to implement the policies. According to most of the interviewees, the success of the construction industry could be ensured by getting all construction projects to be managed and supervised by a single authority; yet the construction industry in Sri Lanka is not well organised. Although an industry could be controlled by one single regulatory commission, it is not the case with CIDA, being only an authority. R2 stated that because CIDA comes under the Ministry of Housing, Construction, and Cultural Affairs, the ministry is more concerned on the construction of houses. CIDA, however, is expected to focus on housing construction and construction activities in other sectors.

For the success of any venture, proper leadership is necessary. The frontline implementers and the country's leaders should have the interest, commitment, skill, and knowledge to implement the policies. The experts mentioned that lack of interest and good governance cause issues related to implementation mechanisms. Delays caused by government organisations are common to all sectors in Sri Lanka and corruption has disturbed policy implementation. Activities relating to policy implementation are not transparent to the interested parties. Besides, research and innovations are absent in the construction industry in the absence of no separate entity responsible for research.

Phulkerd, Sacks, Vandevijvere, Worsley, and Lawrence (2017) have identified several common barriers to policy implementation in the health sector in Thailand, such as lack of monitoring and evaluation systems, lack of organisational knowledge regarding the skills required for implementation, poor governance, and lack of funding and resources, which are similar to the barriers identified in this study for the construction sector. Moreover, the Malaysian construction sector is also said to be undermined because of policy implementation barriers, such as lack of sufficient resources, lack of incentives, lack of competent staff, implementers' negative dispositions, lack of inter-organisational communication, and lack of official commitment to statutory objectives (Adnan et al., 2012), which were recognised in this study too. Therefore, most of the policy

implementation barriers in developing countries appear to be similar. However, the lack of a clear policy, which was revealed as a barrier for policy implementation in Thailand (Phulkerd et al., 2017) and Ghana (Ofori, 2012), has not been identified as a barrier in Sri Lanka because the existing policy is adequate subject to its proper implementation. Yet, the unavailability of a separate research entity is a unique barrier to policy implementation in Sri Lanka as discovered in this study.

Specific policy implementation barriers/policy gaps

Eight sub-policies are included in NPC (Table 2) These 18 sub-policies were further analysed in the study by identifying the specific barriers to implementing each sub- policy (Table 3). Under NPC 1, all the experts mentioned that all cabinet ministries have received a copy of the policy. Nevertheless, it was revealed that most of the public and private sector organisations involved in construction are still not aware that such a policy even exists, which, therefore, is an important issue to be considered. R10 stated, "Even if people know that a national policy exists, they would not be interested in it because they know that in Sri Lanka policies are only on paper and not implemented. The people believe that there is no point in knowing a policy that is not going to be implemented. Hutahaean (2016) disclosed that stakeholder interest in a policy is very important for its effective implementation, which confirms the findings of this study. With reference to NPC 2, it was stated that it is very important to have a register of all the stakeholders of the construction industry although in Sri Lanka no such register is available. With only contractors being registered under CIDA, the former has become powerful. Thus, contractors try to change the guidelines and standards developed by CIDA to suit their own purposes. This was confirmed by Fox et al. (2006) when they said that in the absence of delegation of authority, the smooth implementation of policies would get affected.

Although under NPC 3, CIDA has to prepare a green building rating system in collaboration with the National Building Research Organisation to promote disaster resilient buildings, the implementation of this policy had been slow because of barriers. According to the interviewees, NPC 5 lists the specifications that are mandatory in Sri Lanka. However, a master specification that suits the present status of the industry has not yet been prepared. Most of the specifications used for materials are outdated and no guidelines related to sustainability are available. Bourdeau (1999) revealed that the way the construction sector could follow the global approach to sustainable development should be clarified and that the approach should be established through policies. Jayalath and Perera (2019) confirmed the study findings as they have stated that lack of policies is the most significant barrier to the implementation of sustainable practices in the Sri Lankan construction industry.

NPC 6 and NPC 7 state that continuing professional development programmes have to be conducted by government authorities and professional bodies to promote good practices in the construction industry. Industry personnel, however, ignore the codes of conduct and best practices. NPC 8 mentions that due to the high cost of standards, most of the contractors do not purchase those standards. Although according to NPC 9, workplaces have to adopt new technologies, people dislike new technologies. This was confirmed by Pressman and Wildavasky (1973), who mentioned that "intra-agency antipathy" causes delays in policy implementation.

The interview findings reveal that NPC 10 implementation in collaboration with the Export Development Board is in progress. According to the experts, although contractors have access to overseas markets, the NPC does not encourage them to capture those markets. R8 stated that NPC 11 sets out strict rules and time-consuming procedures for foreign investors without creating an environment that welcomes them. The interviewees were also of the view that no 'level playing field' is available in the country because the bank interest rates in Sri Lanka on loans are as high as 15-25%,

whereas in other countries this rate is only 1%-3%. Hence, foreign contractors are in a more advantageous position than local contractors. Generally, a 40-60% tax is levied on imported construction products.

The experts stated that in national competitive bidding, foreign and local contractors are placed on an equal footing, which is not fair by the local contractors. Domestic participation is considered in NPC 13, but because of political reasons, it has not been effectively implemented. A mechanism to penalise those who violate rules and regulations is not available, creating an environment conducive to the preparation of bilateral documents and employer-biased documents.

All of the interviewees believed that NPC 15 is not being implemented because the private sector was not interested in it. Yet, the steps involved in its implementation require consideration. Concerning NPC 18, the interviewees mentioned that although all procurement guidelines applicable in Sri Lanka are available with CIDA, no documents catering to procurement systems except those pertaining to re-measurement and, design and build contracts are available. The interviewees also stated that the professionals and staff available to accredit service providers are not sufficient and that proper accreditation criteria are not available. Most of the barriers highlighted by the experts are unique to Sri Lanka.

4.3. Recommendations to address construction policy gaps/ issues on policy implementation mechanisms

Table 3 presents the policy-wise recommendations identified by the expert interviewees to overcome the barriers that impede policy implementation. The main point highlighted by all the interviewees was that if the required financial facilities, human and technical resources, competent staff, and effective and dedicated leadership with skills could be made available all barriers could be resolved. A majority of the interviewees mentioned that many construction professionals have migrated to other countries. Therefore, they suggested obtaining the views of these professionals and making use of the experience they have gained by working in other countries, to implement effective policy monitoring through them after identifying their specific roles and responsibilities regarding the same. Furthermore, under NPC 2, some of the experts suggested that a construction industry development levy should be imposed properly to address the shortage of funds. The recommendation concerning NPC 3 was to make approval procedures fast and efficient. With regards to NPC 4, the interviewees were of the view that a proper programme has to be launched to encourage research on the construction sector through investments. They suggested establishing a separate research entity to identify the issues facing the industry and solutions to them. A research fund is also required to provide monetary support.

With regard to NPC 5, a majority of the experts recommended seeking advice from Sri Lankan professionals because of their involvement in and commitment to updating specifications would help solve the issues related to the policy. R6 stated that the machinery used should comply with the required standards because the rate of accidents involving machines is high. Referring to NPC 6, all the experts recommended that professionals should speak up against corruption instead of contributing to it, which was identified as an important recommendation toward implementing the NPC.

The interviewees suggested under NPC 8 that adherence to occupational safety and health standards and practices should be included in the bills of quantities. They also suggested that if contractors fail to comply with these standards and practices, a penalty should be imposed on them. The suggestion made under NPC 9 was to appoint a sub-committee under the Advisory Council for each area to be implemented to prevent the minister in charge from blocking the implementation if he/she does not have an interest in that particular area. All of the interviewees recommended developing staff skills by conducting training and programmes on new technologies, which is an important recommendation. According to the interviewees, the

government should offer incentives to contractors to encourage them to access foreign markets through the policies to overcome the difficulties encountered in implementing policies like NPC 10. Some of the experts recommended improving communication infrastructure to help gather information on work opportunities available overseas. The experts proposed under NPC 11 that an online mechanism be established to enable foreign investors to easily seek approval for investment and development projects in Sri Lanka. Another recommendation was to relax the rules and regulations pertaining to foreign investors to encourage them to invest in Sri Lanka. With regard to NPC 13, the experts recommended removing the National Building Tax (NBT) from construction contracts. They suggested charging 1% as an industry development levy in its place. They also recommended reducing the taxes and interest rates on loans and providing incentives to motivate the domestic parties involved in the construction sector.

With regard to NPC 14, the recommendation was to increase the incentives given to private parties to encourage them to participate in policy development. As for NPC 15, all the interviewees recommended that the stakeholders should be made aware of the policy through awareness programmes to change their attitudes toward the policy, which is an important recommendation that will popularise the policy. The interviewees proposed under NPC 16, to penalise those involved in corruption. Concerning NPC 17 and NPC 18, R1 stated that almost all of the recommendations made in respect of NPC 1-16 would apply. Another recommendation was to improve the procurement practices and resolve any disparities among any new practices introduced under NPC 18. As an overall recommendation, the interviewees suggested that the NPC should not be modified along with political changes, because it would then have a direct impact on the continuous development of the construction industry and function as a barrier. However, they have proposed that the NPC should be changed only if any strategic level change has occurred.

Most of the key strategies identified in general by past researchers without referring to any specific industry, such as resource accumulation, technical resources, commitment and skills of the frontline implementers (Mazmanian & Sabatier, 1989), appropriate use of technology, delegation of authority (Brinkerhoff & Crosby, 2002), defined roles and responsibilities (Bardach, 1977), rewards and punishment (Meier et al., 2016), continuous monitoring, active involvement and engagement of stakeholders (Wali, 2010), and active leadership (Wong, 2019), to overcome policy implementation barriers/ gaps are similar to the strategies recommended by this study to the construction industry specifically. However, a stable flow of resources, policy legitimisation (Brinkerhoff & Crosby, 2002), and resolution of the complexity of joint actions (Meier et al., 2016) are some of the strategies that were identified in the literature but not suggested through this study. This study discovered several novel and unique policy-based recommendations to overcome the barriers/ gaps in the policy mechanisms set out in the NPC of Sri Lanka.

5. Conclusions and recommendations

Because the construction industry is a major contributor to the national economy, a proper national policy for construction will be necessary. Proper policies will guide and drive the industry both effectively and efficiently while managing it and catering to its needs. Policies can give a better shape and contribute to the economic activities of a country. They can significantly influence the development of the construction industry. A policy should not be merely a list of words in a document but should be implemented for the development of the industry. Any barriers to implementing the policies should be identified and treated properly or removed.

According to the findings of the study, the only construction policy in Sri Lanka is the NPC formulated by the National Advisory Council on Construction as provided in the Construction Industry Development Act

No. 33 of 2014. The NPC highlights 18 sub-policies. These sub-policies are currently adequate for the effective operation of the construction industry in Sri Lanka. The experts revealed that NPC after its formulation has so far not been changed although the literature mentions that a major concern of the construction industry in Sri Lanka is the changes made to the construction policies by different governments. The policy, per se, is not an issue; only its implementation has caused issues. Lack of effective leadership, insufficient resources, staff unavailability, lack of technical and professional resources, lack of delegation of authority, and political interference are the key barriers to implementing NPC properly. Policies can be implemented effectively if the required resources (financial, human, and technical) and effective and dedicated leadership with the required skills are available. Moreover, the experts recommended that the stakeholders be made aware of this policy and updated with future revisions. The interviewees suggested that the NPC should not be changed with political transitions, because such changes could have a significant effect on the growth of the construction industry hindering the establishment of the NPC. They insisted that the NPC should be changed only when strategic level decisions have been changed.

This study facilitates a better understanding of the NPC, which is still not popular among the public and construction industry stakeholders. The study contributes to theory by facilitating the proper implementation of government policies, which will help shape the risks and the competitive environment of the construction industry to enable it to meet future challenges. The study findings provide an overview of the effective application of policies toward the development of the construction industry, for the benefit of future researchers, who can base their research on the study findings.

Practitioners, and/or policymakers can use the study findings to overcome the prevailing barriers to policy implementation related to the construction industry in Sri Lanka using the study recommendations. As an initial output, this study can be benchmarked to developing countries and the findings can provide a basic guideline, which can be followed by other developing countries for the effective application of policies toward the development of their construction industries. However, as the study is still on-going, its focus was only on the effective application of policies toward the development of the construction industry in Sri Lanka. In the study, the housing sector was not considered because the political strategies used in the sector are different from those used in other sectors. The housing sector is unique in the Sri Lankan construction industry.

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Evaluation of the location choice of software industry in Istanbul based on the types of economy

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Abstract
One of the main fields of economic growth in developing countries is the software industry, which is one of the innovative industries. Istanbul has a great potential for software creation with its artistic potential, its unique cultural heritage, social networks, and engagement. The purpose of this article is to explore the clustering pattern of Istanbul's software industry and the choice of location from a spatial perspective, based on the types of economy. Three important conclusions have been reached by studying the spatial activity trends of the industry. Results include: (i) the software industry has a polycentric cluster pattern in the historical city center axis, (ii) a seat for the technological parks of particularly prestigious Universities in the center, and (iii) a chosen location in the center of town to benefit from the artistic industry. The results of this study will be a guide to the potential that will lead to the creative economy's growth in Istanbul's future plans.

Keywords
Creative economy, Software industry, Istanbul.

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1. Introduction

With the creative industries as the main economic growth sectors over the past twenty years, the emphasis has been on academic research as well as on public policy. The fact that information itself generates surplus value and that individuals establish their creative values in relation to their social structure has contributed to the development of a creative economy in the process of passing from the manufacturing sector to the information industry. The globalization of the world has a positive impact in metropolitan areas, while integrating with concepts such as innovative economic cultural diversity, human mobility, mobile information, corporate delivery, and mobile enterprise. These industries offer creative and original urban climate unlike other industries, create new jobs, enhance the city's image, and attract new urban possibilities (Enlil et al., 2011, 167).

Istanbul has major potential for the growth of these industries in terms of geographical place, cultural diversity, historical ruins, and urban vitality. These features make Istanbul a sector-based metric, an indicator where everyone in a broad spectrum measures their output, from production to consumption, in a creative sector; as Istanbul is geography that accumulates resources, new ideas are born, and production roots (Enlil & Evren, 2010).

The purpose of this article is to analyze the final structure, trends, and development of the software industry, which is seen as a creative industry defined as the economic development tool of Turkey, and to understand the potential and problems of spatial behaviors in Istanbul. In this context, the article makes two contributions to the literature findings on the software industry. First, to analyze the spatial distributions of software companies with a large data set using some of the latest modeling approaches for location, second to examine the urban services that the industry inevitably needs at a micro-level by determining the factors that affect the location behavior of the industry according to the types of economy.

In the next section, literature review is given for the purpose of this study. Chapter 3 presents the spatial econometric characteristics of software companies and the methodology of data used in forecasting. In Chapter 4, the estimation results are presented and discussed together with the characteristics of the study area. Section 5 concludes the article, summarizes the main contributions of this study, and makes recommendations for future research.

2. Evalution of location choice criteria of creative industries

Literature on factors determining the location choice criteria of industries such as agglomeration economies, human capital, taxes, wages has increased in recent years. In the literature, two approaches are often used regarding location selection modeling and criteria. The first focuses on the selection behavior of firms, and the second on the perspective of the region in which firms will be positioned (Arauzo-Carod, 2013). Among the empirical studies on the geography of creative industries, the most emphasized determinants are: firm size, industry concentration, local employment, industrial share, such as transportation and trade costs, 'location economies', industrial diversity, the market, the share of services, population density, social capital and links with different industries, etc. covering the 'urban economies' which implies cultural and artistic amenities 3T of Florida and finally, the foreign population with foreign labour 'Tolerance', population with higher education levels, qualified skilled labour, high-skilled jobs 'Talent/human capacity', R & D investments, the presence of Technology Parks, patented products, high-tech companies and concentration of technology-oriented occupations with employment density 'Technology (Cruz & Teixeira, 2014, 3-4).

2.1. Localization and urbanization economies

The location economy, which was defined by Marshall in 1890, is of great importance with its industrial concentration externalities, low costs, increasing income by scale, labor market and rapid access to and sharing local information (Marshall, 2013).

There are two types of economies represented as external scale economies. These are local economies and

urbanization economies. "Economies of localization" are defined as many different independent firms located close to each other in the same sector. "Economies of urbanization", on the other hand, are mainly defined as the maximum benefit from the diversification of industries and/or the choice of location by different industries (Meyer, 2000). The advantages of urbanization economies arise in metropolitan areas with large functional characteristics (UN-HABITAT, 2011, 3). The existence of these advantages also explains the clustering of the population and firms. Therefore, creative industries can cluster to benefit from the existence of a skilled labor market, specialized local suppliers of other creativity-fueled sectors, and local knowledge sharing (Lazaretti et al., 2009, 5).

A lot of research has been done on this subject in the last two decades. In recent field studies, it has been observed that localization and urbanization economies generally have positive effects on the location preferences of companies operating in creative industries. Localization economies and related determinants of urban externalities have a statistically positive effect on firms' location decisions (Cruz & Teixeira, 2014, 5). In the study of Lazaretti et al., the clustering patterns of creative industries in large and medium-sized cities in France and Italy based on economic geography and urban economy, and the cluster pattern of creative labor has been comparatively analyzed. In both countries, three cluster patterns, the structure of the industry/scale, localization economies, and urbanization economies (Lazaretti et al., 2009), had shown to have a positive impact. In the study of Lazaretti et al., It was found that the creative industries in the two countries have different characteristics. Creative industries in Italy mostly centered on cultural and artistic activities. And these activities have been supported by local economies and have a dispersed spatial pattern in the region. In Spain, on the other hand, creative industries are concentrated in large metropolitan areas to benefit from localization economies as well as from urbanization economies (Lazaretti et al., 2009).

Cruz and Teixeira (2014) have been researching the factors that decide the creative industry's spatial position in Portugal. The study examined the positive and important influence of localization economies on location determination and the positive effect of the urbanization economies, human resources, tolerance, and technology factors. Currid and Williams (2010) used GIS mapping techniques with zip code level data to examine the spatial clustering pattern of cultural industries. They concluded that cultural industries tend to cluster in highly concentrated areas such as Manhattan city center, Beverly Hills, and Santa Monica. In the study by Florida et al., 297 U.S.A. Although they only made a statistical analysis for the metropolitan city at the metropolitan level, they analyzed that the types of creative industries that complement each other have cluster patterns in similar areas (Florida et al., 2009; Kolenda & Yang Liu, 2012, 5). Enlil, Evren, and Dinçer (2011) analyzed that the cultural industries in Istanbul are clustered in the historical city center, the modern city center, and the sub-center developing around it. They defined the spatial distribution of this cluster pattern as the "culture triangle".

Although localization and urbanization economies are the first steps for the development of many industries, they are not a sufficient phenomenon for their innovation process and growth. In particular, the condition that the hi-tech industry can take place in the global market is based on integrating knowledge. Asheim (2007) examined the types of knowledge required for firms' innovation on three bases. Analytical knowledge base is primarily concerned with scientific knowledge aimed at understanding and explaining empirical facts. That is know-why. Synthetic knowledge base is applied to existing knowledge and is aimed at practical solving and designing problems. That is know-how. Symbolic knowledge base is a variety of economic forms of the aesthetic, culture-oriented content, designs, and images of products. That is 'everyday culture' (Asheim, 2007, 226). Innovation and design-oriented creative

industries that recreate an existing product or knowledge with new ideas and images feed on this knowledge.

For the globalization of industries, spatial proximity, often included in the literature, also requires non-spatial factors to ensure the learning and dissemination of the above-mentioned types of information (Mattes, 2011). Boschma (2005) stated that geographical proximity in knowledge transfer and learning processes is not an adequate factor in explaining their relations with their partners in remote locations, argued that firms need four more different types of proximity. These are organizational, institutional, social, and cognitive proximity. Cognitive dimension is associated with the essence of knowledge. If it is too much proximity, the learning process is fast and limited. If it is too little proximity, information that needs to be transmitted between actors can also cause misunderstandings and inaccuracies (Nooteboom, 1999). Social proximity is concerned with the effects of actors' social ties on the economy, such as family, friends, ex-collaborations (Boschma, 2005). Institutional proximity refers to the sharing of norms, practices within the identical social ecosystem, such as the institute, industry, academia, or government located in the same region. Organizational dimension refers to the proximity of knowledge shared by different departments of the same firm or membership in the same organizational institution (Davids & Frenken, 2017).

Weterings and Boschma, in a study with 256 software firms located in the Netherlands, analyzed that spatial proximity has a more dynamic structure than assumed interaction between young firms, but old firms are more prone to organizational and institutional proximity than spatial proximity (Weterings & Boschma, 2009). In research conducted by Broekel and Boschma (2016) with 372 companies from different industries and European countries, the relationship between dissimilar types of proximities of firms was investigated. The findings showed that more than %50 of firms have a relationship between cognitive and spatial proximity. They emphasized that most of the firms that exhibit the exact behavior consist of small companies and benefit from regional clustering. Furthermore, the findings stated that spatial proximity also helps firms to develop social proximity and institutional proximity (Broekel & Boschma, 2016). The literature and field studies show that small companies primarily share knowledge on a local scale with spatial proximity, whereas old firms focus more on institutional proximity. It is seen that spatial proximity has a positive impact on information sharing, interactive and dynamic learning processes for small companies, while it causes an adverse effect for old and international companies.

As in many conventional manufacturing industries, industries that develop technology also enjoy clustering advantages. So is the software industry that underlies the technology more spatially dispersed or more clustered over time? Isaksen (2004) analyzed that in his study involving 64 software companies in Oslo, the software industry exhibits an information-based cluster pattern in big cities. Maine et al. (2008), by examining the cluster pattern of 457 firms based on new technology, concluded that they benefit from clustering potential but have a more heterogeneous spatial distribution. They also stated that the software sector included in the study has positive effects on the growth of companies when they are located in various economic fields. Finally, while there are studies that high-tech manufacturing has spatially fewer densities, it seems that high-tech services strongly exhibit spatial accumulation processes (De Vol, 2009, 9).

Based on the definitions made, while the clusters in some industries of urban centers nurture the localization economy, the urbanization economy tries to provide all these clusters with the best climate, especially metropolitan areas and mega-cities. According to empirical studies on the choice of location of creative industries, it is expected that the localization economies, and especially the urbanization economies, will have a significant impact on the spatial behavior patterns of creative industries. Because innovation and creative processes are strongly connected

with the urban environment (Florida, 2002). Based on the definitions made, while the clusters in some industries of urban centers nurture the localization economy, the urbanization economy tries to provide all these clusters with the best climate, especially metropolitan areas and mega-cities.

2.2. Creative economy and software industry

Creative industries are defined as activities with the potential to create jobs and wealth based on creativity, individual talent, skills, and intellectual property rights (DCMS, 1998). In this context, creative industries Visual Arts, Performing Arts, traditional cultural products such as music and literature as well as creative talent and skill that requires the production of multimedia, software, video games, design, and contemporary architecture, such as 'content' covers production activities(O'connor, 2002). These activities have been around for a long time, but only at the end of the 20th century they were gathered under one category (Tomczak & Stachowiak, 2014, 7).

Since the definition and content of creative industries are handled in different dimensions from country to country, studies on their spatial distribution and economic effects are generally associated with the policies adopted by countries in the literature. However, there are four general approaches to creative industries in the literature (ESSnet-Cultute, 2012). The first approach was made by Hawkins, who stated that the development of digital technologies and the phenomenon of creativity divide the world. But with this division, Hawkins emphasized skills that express creativity through marketable products, not people's creativity (Levickaite, 2011, s744). According to Hawkins, creative industries are the core of the creative economy and are considered 'just another industry' (Hawkins, 2007; Moree, 2013, 744).

Hawkins has defined creative industries in 15 sectors. The software industry is among these sectors. The second approach is made by Florida (2002), who approaches the creative industries as a certain class, and defined the industries as "creative class". The creative class, more precisely, consists of people working in the science and engineering, architecture and design, education, science, music and entertainment sectors, whose economic function is to create new ideas, technology or creative content (Florida, 2002). Florida's theory differs from other creative industry theories. Because Florida argues that investigative talent drives economic growth. His economic growth theory consists of 3T, technology, talent and tolerance. He takes his theory one step further by adding the concept of tolerance to attract the necessary human resources needed by cities (Levickaite, 2011, 87).

The third approach is about the 'creative city'. Landry (2000) argues that only people are the most important resource for cities. According to Landry (2020), the purpose of big cities is clear, and those cities know where they are going. So for these cities, they have hardware that refers to physical structures such as streets, buildings and parks, software that refers to activities such as cultural life or shopping experiences, and 'orgware' that refers to how they are organized and managed.

The fourth approach is accepting creative economy as part of a broader economic system and supporting the new economy through the clustering of employees, firms, institutions, infrastructures, communication channels, and other active components (Moore, 2014; Scott, 2006). These approaches reveal that creative industries cannot be simply defined. Creative industries accommodate many components in cities with a wide variety of forms and applications, including creative networks, creative places, creative connections. But, rather than all the components, the main factors of the excessively rapid growth of creative industry types almost everywhere in the world are due to the fact that they are directly linked to technology and the economy. The combination of the digital revolution and economic environments has revealed many conditions necessary for the growth and development of the new economy (Levickaite, 2011, 91).

The advanced technology services that emerged with the digital revolution have been proven by many scientists to be of great importance for the

development of creative industries and other sectors. In advanced technology services, solid business costs become less important for the growth and maintenance of technology clusters in metropolitan economies, while locations with high access to information play a vital role in determining the economic success of regions (Vol et al., 2009, 9). Since no one knows how information and communication technologies will affect the way people and companies use spaces, much of the scientific and popular research on the subject is based on more theoretical, anecdotal, and speculation, and less careful empirical analysis (De-Michelis, 1996).

But the spatial practices of these technologies are quite important. Because they offer the opportunity to perform much more economic operations remotely quickly, from home employee to head office employee, consumer to store, from one company to another, they can decrease the necessities of people and industries to cluster in metropolitan cities (Atkinson, 1998, 134).

Many factors of traditional location factors, which have always been attractive to industries, are also important for high-tech industries. But along with these factors, factors such as access to qualified labor, proximity to educational facilities and research institutions, connections with existing complementary sectors, venture capital, competitive environment, climate, other quality-of-life factors, and overall cost of living seem to be the most supporting location decisions for high-tech industries (De Vol et all., 2009, 4).

The software industry, which forms the core of high technology, it is seen as an opportunity to support the economic growth and development of developing countries (Nicholson & Sahay, 2008). The software connects different sectors; it creates an interface that offers transitive between them. This dynamic is an important opportunity for creative industries, which is a vital requirement to engage with the rest of the economy (Enlil et all., 2015, 32). The advantage of the software industry, the engine of significant economic growth and development, provides sufficient evidence with its examples in the cases of India and Ireland (Baraya et.all., 2008). Therefore, this study will examine the clustering pattern of the software industry and the location choice preferences of the industry based on the economy types in Istanbul, which is one of the mega-cities of Turkey.

3. The methodology of the research

The data sets of this study consist of the software firms that are actively seen in the Turkey Software Industry Association. Face-to-face surveys were conducted between 10.09.2019 and 30.10.2019 with all 177 companies registered with the association and operating in Istanbul (Köse, 2019). The interviews were held with company founders, senior executives, or managers, and they were asked different questions about the company other than location selection criteria. After creating the data set, the Exploratory Spatial Data Analysis method (ESDA), which is frequently used in regional studies, and the AHP (Analytic Hierarchy Process) method, which is used to determine the location selection criteria of the companies, were deemed appropriate for the analysis of the spatial data analysis of the research.

ESDA includes techniques used to visualize and explain spatial distributions, discover the pattern of spatial clustering, and identify outliers (Anselin, 1998, 258). Various methods of ESDA help in revealing possible clustering tendencies of the data in the pre-modeling phase of empirical research (Varga, 1998, 27). In addition to clustering tendencies, ESDA includes defining data characteristics and formulating hypotheses from the data (Haining, 2003, 5). Therefore, "the Global Moran's I" analysis and "Local Moran's I" analysis were applied in the first stage of this study.

The Global Moran's I statistic is expressed as (Rey & Montouri, 1999):,

$$I_t = \left(\frac{n}{s_o}\right)\frac{\sum_{i=1}^{n}\sum_{j=1}^{n} w_{i,j}x_{i,t}x_{j,t}}{\sum_{i=1}^{n}\sum_{j=1}^{n} x_{i,t}x_{j,t}},$$

where i and i are neighbors, W is a standardized spatial weight matrix. w_{ij} If i and j are neighbors, it takes a value of 1, otherwise it takes a value of 0. $x_{i,t}$ Besides, is the number of

software firms in t, n is the number of neighbors, and s_o is the sum of all w_{ij} (Rey & Montouri, 1999).

Test statistics were applied to all provinces to better explain the spatial coralization properties of the software firms, including whether local Moran's I test firms differ from the surrounding provinces. Local Moran's I test is as follows:

$$I_{i,t} = \left(\frac{x_i}{m_o}\right) \sum_{j=1}^{n} w_{i,j} x_{i,t},$$

with

$$m_o = \sum_{i}^{n} x_{i,t}^2$$

In addition to the Global Moran's I expression, m_o is equal to the sum of the elements of w_{ij} (Rey & Montouri, 1999).

The more similarity of data in locations close to each other than distant data reveals the dependency structure. The application of classical statistical theory to these data causes problems (Haining, 2003, 16). In the first part, after analyzing the spatial clustering styles of software firms, factors affecting the location selection criteria of firms based on literature research were determined and these factors were examined using the AHP method. AHP method was developed by Thomas L. Saaty in 1977 for the solution of complex multi-criteria decision-making problems. In order to solve the problem with AHP, the following steps should be taken:

Step 1: The decision-making problem is defined.

The definition of the decision-making problem consists of two stages. In the first stage, decision points are determined. In the second stage, factors affecting decision points are determined. In this study, the number of decision points is symbolized by m and the number of factors affecting decision points with n.

Step 2: The binary comparison matrix is created.

The comparison matrix between factors is a dimensional square matrix. The matrix components on the diagonal of this matrix take the value 1. The comparison matrix is shown below.

$$A = \begin{bmatrix} 1 & a_{12} & \dots & a_{1n} \\ a_{21} = 1/a_{12} & 1 & \dots & a_{2n} \\ . & . & . & . \\ . & . & . & . \\ . & . & . & . \\ a_{n1} = 1/a_{1n} & a_{n2} = 1/a_{2n} & \dots & 1 \end{bmatrix}$$

a is the binary comparison value of i criterion and j criterion, and the aji value is obtained from 1 / aij. This feature is called reciprocity. aij value is the answer to the question, "How much should the criterion i value be preferred over another criterion j?". Decision options are compared separately according to each criterion. Decision matrices are constructed using the comparison scale 1-9 suggested by Saaty below.

Table 1. *The significance scale of the comparison matrix.*

Intensity of Importance	Definition	Explanation
1	Same	Neither of the two alternatives is preferable over the other
3	Weak	One alternative is preferred slightly over the other
5	Clear	One alternative is preferred clearly over the other
7	Strong	One alternative is preferred strongly over the other
9	Very Strong	One alternative is preferred very strongly over the other
2.4.6.8	Compromise	Can be used for graduation between evaluation
Reciprocals of above	If activity i has one of the above nonzero number assigned to it when compared with activity j, then j has the reciprocal value when compared with i	A comparison mandated by choosing the smaller elemet as the unit to estimate the larger one as a multiple of that unit

Step 3: Binary comparison matrices are normalized.

Each element in the matrix is normalized by dividing it by its column sum. Each column sum of the normalized matrix is 1. The following equation is used.

$$a_{ij}' = \frac{a_{ij}}{\sum_{i=1}^{n} a_{ij}}, \quad i,j = 1,2,\dots,n$$

Step 4: The priority vector is calculated.

Each row sum of the normalized matrix is divided by the size of the matrix and averaged. These values are the weight of significance calculated for each criterion. These weights form the priority vector. The following equation is used. Thus, percentage significance distributions showing the relative importance values of the criteria are obtained.

$$w_i = \left(\frac{1}{n}\right)\sum_{i=1}^{n} a_{ij}' \quad , \quad i,j = 1,2,\ldots,n$$

Step 5: The consistency rate is calculated.

After the paired comparisons and determination of their priorities, the consistency of the comparison matrices is calculated. In order to determine whether an A matrix formed as a result of binary comparison judgment is consistent or not, it is necessary to calculate the coefficient called "Consistency Index (CI)". The CI coefficient is as follows:

$$CI = \frac{\lambda_{max} - n}{n-1}$$

Formula equality is calculated. The formula is

$$\lambda_{max} = \frac{1}{n}\sum_{i=1}^{n}\left(\frac{\sum_{j=1}^{n} a_{ij} w_j}{w_i}\right)$$

In order to evaluate the consistency, the value of "Random Index (RI)" should be known. RI values defined for n-dimensional comparison matrices are given in Table 2.

Table 2. *Random Index_RI.*

n	RI
1	0
2	0
3	0.58
4	0.90
5	1.12
6	1.24
7	1.32
8	1.41
9	1.45
10	1.49
11	1.51
12	1.53
13	1.56
14	1.57
15	1.59

After the CI and RI values are determined, the "Consistency Ratio (CR)" is calculated.

$$CR = \frac{CI}{RI}$$

If the CR is less than 0.10, it is decided that the comparison matrix is consistent.

Step 6: The decision options are listed.

All priorities matrix is obtained by combining the priority vectors obtained for the criteria. The resulting vector is obtained by multiplying the priority vector of the decision options with the all priorities matrix. The decision option with the highest weight in this vector is determined as the decision option to be preferred for the solution of the problem.

4. The potential of the software industry in Istanbul

Turkey is the world's 17th largest economy and Istanbul represents almost one-quarter of the economy (Enlil & Evren, 2010, 38). Istanbul is Turkey's most popular city for creative industries with its urban appeal, population diversity, cultural and historical heritage. As innovation centers in the city, it strongly supports the clustering of creative industries within the city with its advanced technological infrastructure and technoparks, contributing to the increase of creative workforce and international awareness Öztürk-Ekdi & Çıracı, 2015, 71).

The software industry is one of the main industries of development that can contribute to the creative economy of Istanbul in current planning strategies and policies. Examining the relationship between the software industry and the city, which is also emphasized in the plans and policies made on regional and provincial basis, and determining the potential of Istanbul in becoming a creative city has encouraged to work on this subject. The study will help to observe the current potentials and problems of the industry within the scope of the creative economy by examining the spatial behavior patterns of the software industry in Istanbul and determining the factors

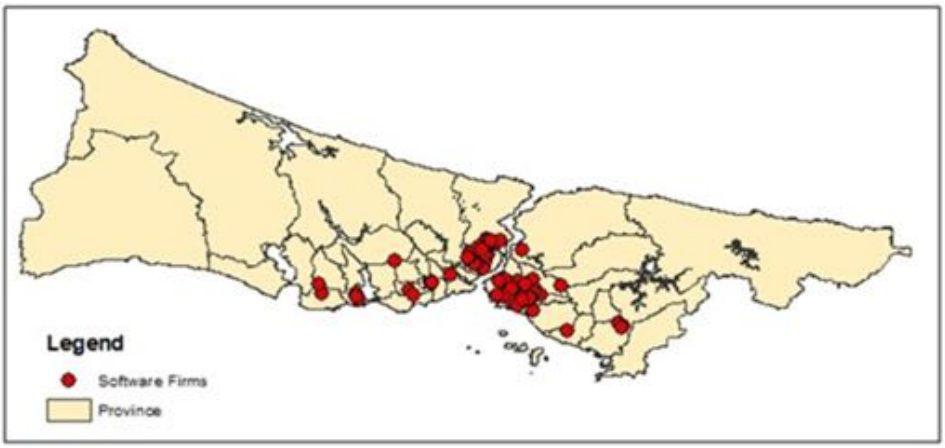

Figure 1. *Spatial distribution of YASAD member software companies in Istanbul, 2019.*

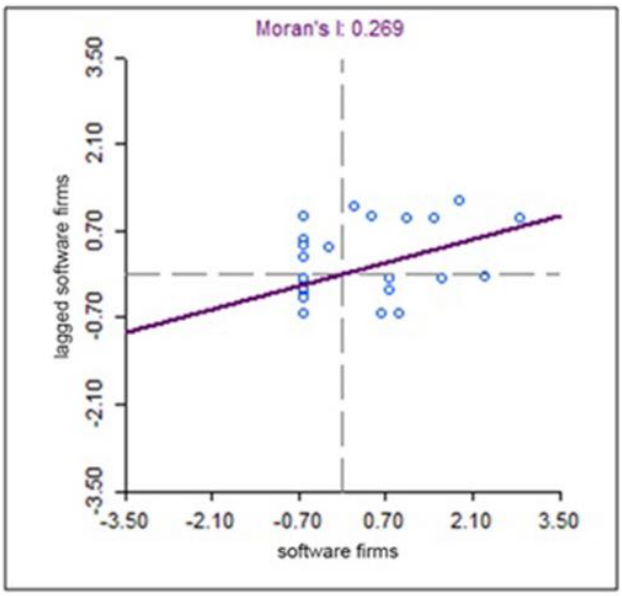

Figure 2. *Moran Scatter Diagram of the Number of Firms in Istanbul, 2020.*

affecting the location selection criteria. In this direction, firstly, the spatial cluster pattern and clustering regions of the industry were examined. In the second stage, factors affecting location selection criteria of firms based on the literature were determined. The potentials of these factors in the location of the software industry, in the urban and creative economy have been identified with the urban elements that affect the location selection.

The sample of the research consists of all software companies that are members of YASAD. Face-to-face interviews were held with 177 software companies registered with the association. As shown in Figure 1, 32 of the companies on the European Side are located in Maslak, 14 in Beşiktaş, 12 in Kağıthane, 5 in Beyoğlu, 11 in Esenler, 9 in Avcılar and 28 in different districts. On the Anatolian side, 10 of the companies have chosen locations in different districts, including 21 in Ataşehir, 12 in Kadıköy, 9 in Üsküdar, 7 in Maltepe and Pendik.

In Figure 2, it is observed that the numbers of firms are not randomly distributed in the Moran scatter diagram, but are concentrated in areas with positive autocorrelation. The Moran's I value, which is calculated as 0.269, indicates that the distribution of software companies in Istanbul has positive spatial autocorrelation.

In order to examine the meaningful spatial clustering or scattered place selection pattern in the districts within the city and to examine the neighborhood relations of the observation values whose distribution is handled with the Moran's I diagram, the local indicator LISA analysis of the spatial relationship was used.

In the LISA map expressed in Figure 3, districts in the HH region, expressed in red, represent the districts with the highest clustering of the industry. It is observed that these districts chose places intensely in Maslak, Beşiktaş and Kâğıthane districts, which are included in the central business area of Istanbul, and in the sub-center Ataşehir district, which is designed as the financial center of Istanbul. In addition, it is observed that the districts in the city center are affected by the neighborhood relations. The HL region, on the other hand, refers to the districts with higher clustering potential but lower neighborhood relations compared to the HH region. These are Esenler

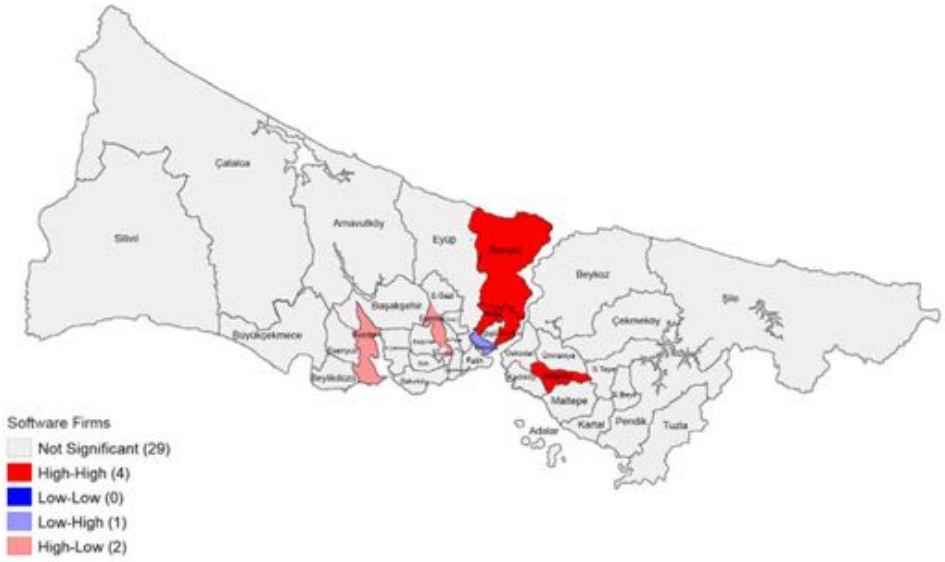

Figure 3. *LISA map of the number of companies in Istanbul, 2020.*

and Avcılar districts. Beyoğlu district, which has the status of a historical city center in the LH region, states that its clustering potential is low, but its environment has a high spatial clustering.

After examining the spatial clusters of the software industry according to districts in Istanbul, the dynamics affecting the location of the industry are tried to be revealed by spatial analysis methods. In this direction, it was aimed to determine the factors affecting the location selection of the companies as well as the research of the spatial cluster. For this purpose, similar studies in domestic and foreign literature were examined. Using the dynamics in the literature, 3 main criteria affecting the location preferences of the companies, and the sub-criteria of these main criteria were determined. Firstly, the consistency ratio (CR) was calculated as 0.062 as a result of paired comparisons for the main criteria. This value is proof that the weights calculated according to the formula mentioned in Table 2 are reliable. Paired comparisons for the main criteria are given in Table 3.

When the location selection criteria of the firms are evaluated according to the types of economy, it has been observed that "Creative Economy" (0,723) is by far the most important factor among other types of economy. The second important element following the Creative economy is "Urbanization Economies" (0.193) and lastly "Localization Economies" (0.083). After the comparison of the main criteria, sub-criteria were compared according to Florida's 3T, which was determined as the main criteria of the creative economy. As a result of the binary comparison of these criteria, the weights have been proven to be reliable with a consistency ratio (CR) of 0.06. The comparison table is given in Table 4.

The main criteria of the creative economy have been determined according to Florida's 3T and are examined in more detail in sub-criteria in these criteria. According to Table 5, the factor affecting the creative economy the most was Talent (0,643), second place was taken by Technology (0,282) and finally Tolerance (0,073). After comparing the main criteria, the weights and compliance rates of 15 sub-criteria were tested in the last stage. Table 5 shows the weights of all main criteria and the weights and rates of compliance of their sub-criteria.

The findings of the research proved that the important type of economy for company officials is the creative economy. Among the 3 main criteria considered within the creative economy, it has been observed that Talent / Human Capital is in the first place, Technology is in the second and Tolerance is in the last place. In the location selection criteria of the companies, they tend to choose places that meet the investment criteria of high-tech companies, the level of science and technology development, and special R&D, especially with access to a qualified workforce,

Table 3. *Paired comparisons matrix and weight values created for the main criterion.*

Main Criteria	Creative Economy	Urbanization Economies	Localication Economies	Weight
Creative Economy	1.00	5.00	7.00	0,723
Urbanization Economies	0.20	1.00	3.00	0,193
Localicaition Economies	0.14	0.33	1.00	0,083
Consistency Ratio (CR)	0,062			

Table 4. *Pairwise comparison matrix and weight values for the main criteria of the creative economy.*

Main Criteria	Talent	Technology	Tolerance	Weight
Talent	1.00	3.00	7.00	0,643
Technology	0.33	1.00	5.00	0,282
Tolerance	0.14	0.20	1.00	0,073
Consistency Ratio (CR)	0,06			

Table 5. *Weight values of all criteria affecting software companies' location selection criteria according to location factors.*

Main Criteria	Sub-criteria		Weight	CR
CREATIVE ECONOMY (0,723)	Talent/ Human Capital (0,643)	Access to a qualified workforce	0,602	0,025
		Openness to new ideas/difference	0,290	
		High focus on talent	0,108	
	Technology (0,282)	The density of high-tech firms	0,433	0,045
		Level of science and technology development	0,317	
		Province's Private R&D investment	0,250	
	Tolerance (0,073)	City's unique cultural amenities and museums	0,600	0,063
		Foreign workforce working in the software industry	0,400	
URBANIZATION ECONOMIES (0,193)		Coexistence with complementary sectors	0,565	0,069
		Proximity to the labor market	0,235	
		Customer potential	0,105	
		Being in a prestigious neighborhood	0,095	
LOCALICATION ECONOMIES (0,083)		Coexistence with the same sectors	0,484	0,035
		Easily accessible location	0,426	
		Availability of land and rental values	0,090	

openness to new ideas, and high focus on talent. The fact that many software companies chose a place in the city center, sub-centers, and technoparks of prestigious universities close to the city center supports the findings of the research. Among the criteria in the creative economy, data based on tolerance are quite low in the creative economy. The fact that companies primarily need a qualified workforce and secondly focus on technological infrastructure services has reduced the importance of tolerance based criteria. This finding shows that most of the software companies have deficiencies in working at the local scale and in interactive learning, sharing information, and creating a creative environment with different international institutions or organizations.

The secondary factor considered in the location selection of companies is urbanization economies. Coexistence with complementary sectors in urbanization economies is as important as clustering in places with high-tech firms. In order to minimize risks and increase the probability of success, software companies try to exist in the free market mechanism by forming alliances with other sectors with complementary skills. Therefore, the findings support that firms tend to choose locations in the city center and sub-centers where complementary sectors are concentrated / clustered, rather than in the labor market, customer potential and prestigious districts.

The last factor taken into account in the choice of location of companies is localization economies. Coexistence with the same sectors in this element and being in an easily accessible location are of high importance and close to each other, while land and rental values are very low. The software industry, which requires intense information flow and strong communication, cares about being in an accessible place in order to provide qualified workforce, and benefits from location economies to keep the competition alive with other sector companies in regions with technological infrastructure. Although this element is evaluated in the last place, it is among the factors considered.

5. Evaluation and the results

The software industry, which is the core of digitalization, became a focus in almost every field around the world, and is also known as a high-tech industry, has become one of the main sectors that support the urban economy, especially in recent years. The increasing importance of the sector has formed the basis for this study to examine the spatial behavior patterns in

metropolitan Istanbul in the context of the urban economy. Our results strongly suggest that the city tends to cluster in the highly competitive central business districts (CBD) and benefit from urban economies.

In this study, the ESDA method was used to analyze the spatial clustering pattern of the software industry first, and then the AHP technique was used to determine the weights of the factors that are important in the choice of location according to the types of economy. The opinions of YASAD member companies included in the scope of the study were interviewed with the authorities, considering the critical characteristics that companies should have in order to be successful. The results of the research reflect the perspective of the company officials on the factors that are effective in the location selection decision of their companies.

In the study, the opinions of company officials were tested by statistical methods. The findings of the research show that the software industry, was made by determining location criteria of firms according to cluster pattern using ESDA method and economic types with AHP technique. However, since there are no similar studies on this subject, comparison with other studies cannot be made. Similar results have been obtained with the spatial studies on the software industry in the literature.

In their study, Mendez-Ortega and Arauzo-Carod (2019) examined the spatial distributions of the software and game industry in Hamburg, Lyon, and Barcelona cities using the near neighbor index (NNI), Kernel density, K-density functions and entropy index techniques and observed that they have different cluster patterns in metropolitan areas. This study, on the other hand, has reached the conclusion, based on Berköz and Türk's (2007) city center stratification study in Istanbul, that firms exhibit a polycentric cluster pattern in the sub-center covering Maslak, Beşiktaş, Kâğıthane, which develop around the traditional historical city center, and Ataşehir and Kadıköy districts on the other side of the city. When compared with the Mendez-Ortega and Arauzo-Carod study, it has been observed that Istanbul has similar spatial behavior patterns to Hamburg.

The study strongly indicates that the software industry is fueled by the creative economy through clustering. Among the location selection criteria of the sector, It has been observed that criteria such as qualified and equipped workforce, technological services, coexistence with the same sector and service provider sectors, and accessibility come to the fore, and although these criteria have been examined in separate economic activities, it should be noted that there are spatial criteria that affect each other and are dependent on each other. In other words, the central core of Istanbul not only supplies an urban environment for interactive learning and services but also provides a 'creative milieu' (Enlil et all, 2011, 181; Landry, 2006). Therefore, the reason why the software industry in Istanbul chooses a location close to the city center is to feed on the creativity of the city and the

Therefore, the reason why the software industry in Istanbul chooses a location close to the city center is that the industry's customers in the center, face-to-face relations with other sectors, advanced infrastructure and transportation systems, living labs, prestigious universities, and innovation centers benefit from a competitive environment that improves knowledge bases, learning process, innovation, and active productivity. In addition to all creative amenities, the software industry also is fed on the social and cultural capital of dense urban facilities such as museums, workshops, exhibition areas, heritage structures, touristic places, parks, local markets, squares, restaurants, and cafes to trigger individual creativity and reach the needed human capacity.

This study focuses on issues that will contribute to the socio-spatial development of the software industry, which is strategically important for Istanbul, with field-specific findings in a certain period of time. For the sustainability of the sector, it has been observed that the spatial pattern of the firms has positive effects on their economic types depending on their choice of location and it is clearly seen that the city has the potential to turn into "creative innovation clusters" in future scenarios.

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Builders and building tradition of Barbaros as intangible cultural heritage

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Abstract

This paper aims to document the traditional builders and their know-how in a particular geography, namely the rural settlement of Barbaros in the Urla district of İzmir, Turkey. It aims to shed light on the actors of the building traditions of Barbaros, the process of knowledge transfer among builders, and the traditional know-how related to local building materials and construction techniques as intangible cultural heritage. The research method of this study includes literature review, site survey, and study of oral history. Literature sources provided the theoretical background and limited information related to the history of Barbaros. To understand the traditional building stock in Barbaros, site surveys were conducted in 2016, 2017, and 2020. An oral history study was done with the last living builders and the relatives of late builders. These narratives provided invaluable information for answering the research questions. The results of the study contribute to the conservation of intangible heritage by recording the know-how of the last bearers of traditional construction in Barbaros. This documented experience can be used in future restoration projects not only in Barbaros but also in surrounding settlements with the same traditional construction features. The results of the study are also remarkable in terms of revealing the importance of oral history in documentation studies.

Keywords

Barbaros, Building masters, Building tradition, Intangible cultural heritage, Traditional construction know-how.

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1. Introduction

Traditional construction know-how has been transferred from generation to generation by word of mouth, observation, replication, and through the master-apprentice relationship for centuries (Hubka 1979, Karakul 2012, Karakul 2015b). This construction know-how has recently been the concern of conservation of intangible cultural heritage, especially after the UNESCO 2003 Convention (Karakul, 2015b). The UNESCO Convention defines traditional craftsmanship as one of the domains of intangible cultural heritage to be protected (UNESCO, 2003). Identification, documentation, and transmission are mentioned among the safeguarding measures to ensure the viability of intangible heritage (UNESCO, 2003). However, drastic changes in building technology and the availability of cheap, easily applicable modern building materials and construction techniques have resulted in the abandonment of building traditions. Thus, the traditional construction knowledge that remains in the minds of the last masters faces the danger of extinction as it is no more being transmitted to younger generations.

This loss of traditional construction techniques in relation to loss of traditional building masters is one of the conservation problems of rural heritage in Turkey (ÇEKÜL, 2020). Any still-living builders are too elderly, and they have not raised a new generation of builders generation of builders (ÇEKÜL, 2020). There is a huge gap in the literature related to traditional builders in Turkey and their knowledge.[1] This study aims to contribute to this limited literature by documenting the traditional builders and their know-how in a particular geography, namely the rural settlement of Barbaros in the Urla district of İzmir, Turkey (Figure 1).

All rural settlements in Urla are rapidly changing due to the effects of tourism and urbanization. Among the fifteen rural settlements in Urla, the settlement of Barbaros hosts the most traditional buildings (Kırcalı, 2017)[2]. Thus, Barbaros has important potential for understanding traditional construction materials and techniques. In comparison to many neighbors, Barbaros did not experience the population exchange of 1923, so building traditions were sustained.[3] Moreover, the last bearers of this continuity of building tradition are still living. For these reasons, Barbaros is chosen as the case for this research. The paper aims to shed light on the actors of the building traditions of Barbaros, the process of knowledge transfer among builders, and the traditional know-how related to local building materials and construction techniques.

2. Research method

The research method of this study includes literature review, site survey, and study of oral history. Literature sources provided the theoretical background and limited information related to the history of Barbaros. To understand the traditional building stock in

Figure 1. *Location of Barbaros settlement.*

Barbaros, a site survey was conducted in 2016-2017 within the scope of the master thesis written by the author. In 2020, another site survey was done for completing missing data. 113 parcels were surveyed in lot scale. Structures in the lots, their locations, functions, and exterior characteristics were analyzed. The 13 houses that maintain their original characteristics were examined in detail (Figure 2). Most of these 13 houses were not in use and had material and structural problems. The structural problems and partial collapses enabled the author to understand the construction details including the walls, floor slabs, and roofs.

Besides the site survey, an oral history study was conducted with the last living builders and the relatives of the late builders. Interviews were held with Emine Uz, Suat Taşkın, Tolanay Barış, İlhan

Figure 2. *Distribution and photos of surveyed houses. Parcel numbers are given at the lower right corner of each photo.*

Ece, and Ahmet Koşfur in 2016 and 2017. Emine Uz is the wife of builder Hasan Uz who passed away. Suat Taşkın and Tolanay Barış are builders who previously worked in Barbaros. Ahmet Koşfur is a builder who has worked in Barbaros and as of 2016, continued to work with contemporary building materials and techniques. Ilhan Ece is the son of the builder Hafız Ömer and has taught carpentry in villages including Barbaros. These narratives provided invaluable information for answering the research questions.

Other than interviews, the deconstruction process of a traditional earthen flat roof is documented in situ together with Ahmet Koşfur, who supervised the process (Figure 4). While deconstructing the earthen flat roof, Koşfur explained the construction process of each element step by step. By taking these data in reverse, the information about the earthen flat roof system was able to be deciphered in detail.

3. Building tradition as intangible cultural heritage and builders as tradition bearers

As Hubka points out, the design of traditional architecture is formed in the minds of the builders, contrary to the modern design process (Hubka, 1979). The know-how related to traditional architecture is transmitted to the next generations via a master-apprentice relationship. This traditional knowledge, craftsmanship, and the techniques and skills of builders constitute the intangible aspects of traditional architecture, and conservation of these intangible aspects is as important as the conservation of the buildings themselves (Karakul, 2015b).

Conservation of the intangible aspects of buildings requires the continuous transmission of traditional construction know-how. With this aim, in 1993 UNESCO launched the Living Human Treasures system. Living Human Treasures are defined as "persons who possess to a very high degree the knowledge and skills required for performing or re-creating specific elements of intangible cultural heritage" (UNESCO, n.d.). This system aims to encourage member states to grant official recognition to talented tradition-bearers and practitioners, thus contributing to the transmission of their knowledge and skills to the younger generations. The national version of this system was launched in 2008 in Turkey with the name of National Inventory of Living Human Treasures under the Ministry of Culture and Tourism. However, only one master builder has been recognized in the national inventory so far.[4] The project, organized by Associate Professor Dr. Özlem Karakul in the Fine Arts Faculty of Selçuk University in 2013, is worth mentioning as this workshop, aiming to continue the knowledge, skills, and experience of master craftsmen (Karakul, 2015a), is one of the pioneering studies in Turkey.

4. Barbaros settlement and its transformation

Barbaros is located in the Urla district of İzmir, a metropolitan city in the western skirt of Turkey (Figure 1). It is situated on the Barbaros plain together with three other villages, which are Uzunkuyu, Zeytinler, and Birgi (Figure 1). The previous name of Barbaros was Sıradam. The earliest existing document about Sıradam is an Ottoman Period census of 1842-1843. According to this census, Sıradam was a small village with a population of 129 (Başaran & Haykıran, 2015). As understood from the names, family epithets, hometowns, and professions, it was a Turkish village in the mid-19th century[5], although there was a relatively dense Rum population in neighboring villages.[6]

Barbaros was officially classified as a village until 2012, at which time it became a neighborhood with the law numbered 6360 (Resmi Gazete, 2012).[7] The settlement has experienced a rapid transformation spatially, socio-culturally, and economically in recent years. Even so, becoming distanced from agriculture has been an issue for many decades and has created changes; in the early 2000s, the non-use of most of the agricultural land in the plain due to the loss of tobacco agriculture for economic reasons caused a rapid transformation. Lands have remained empty and have become for-profit properties. In 2008, 300 decares of land were sold to people from outside Barbaros (Yaka, 2016). Not only lands but also some buildings have passed into other hands over the last two

decades. Property values have increased in recent years, and an estate agency was opened in the village in 2015. There are several other reasons for the changes in Barbaros including the opening of the toll motorway connecting İzmir, Urla, and Çeşme in 1997; construction of the Karaburun state road; the plan for an airport in Çeşme; the constitution of İzmir Institute of Technology in the early 1990s; the opening of the Labor, Culture and Art House in Barbaros in 2009; the first culture festival of Barbaros in 2012; the shooting of a television series in the village; the Peninsula Project that includes the Ephesus-Mimas Road[8] passing through Barbaros; and the Strawman Festival[9] first organized in 2016, then again in 2017 and 2019, which made Barbaros especially known for its charm. The impact of these activities has made Barbaros into a settlement of remigration today. Traditional buildings are being modified with modern interventions or replaced with new modern buildings. Also, new buildings are being constructed both in the settlement center and in the Barbaros plain. These are changing the traditional character of the settlement and leading to the loss of related information.

5. Learning about builders and building tradition of Barbaros

5.1. Actors of building tradition in Barbaros

The actors of the construction of the traditional buildings were mainly builders and unskilled workers. Home owners were also actively involved prior to construction by supplying materials and sometimes by making decisions about the building. They would supply necessary building materials such as stone and earth, either directly from nature with their physical effort or by buying them. Builders were implementing a general spatial typology for houses as one or two rooms above or next to a barn and an entrance space[10] (S. Taşkın, personal communication, 2016). Sometimes, if the home owners were able to understand, they would join the planning process (S. Taşkın, personal communication, 2016).

Builders	Carpenters
Rums from Birgi and Alaçatı	Fahri Ersan
Albanian migrants from Gülbahçe	Bahaddin Yaka
Bekir	Tolanay Barış (1934)
Nabi Yusuf	Suat Taşkın (1936)
Ömer Ece (Hafız Ömer)	
Hasan Uz (Eşref usta)	
Ali Taşkın	
Tolanay Barış (1934)	
Ahmet Koşfur (Kara Ahmet) (1935)	
Suat Taşkın (1936)	

Figure 3. *Builders and carpenters of Barbaros.*

Unskilled workers were carrying materials to the builders. Two builders were working interactively face to face while building the stone masonry (A. Koşfur, personal communication, 2016). Unskilled workers (*amele*) were carrying stone and earth mortar to them. The ones who were carrying earth mortar (*çamur*) were called *çamurcu* and the workers who were carrying stone were called *burgoz* (S. Taşkın, personal communication, 2016). According to Taşkın, the word is probably Greek/Romaic. On the other hand, İlhan Ece defines *burgoz* as the ones who were helping the builders, making mortar, carrying it on their shoulders up a stairway. He also proposes that *burgoz* is a Romaic word. A *burgoz* would be able to work as a builder later on as he became experienced (İ. Ece, personal communication, 2016).

According to the narratives of the interviewees, the oldest builders of Barbaros were Rums from Birgi and Alaçatı. Then, when a group of Albanians came to the Gülbahçe, Urla, they built in Barbaros and became instructors for local builders at the same time (T. Barış, personal communication, 2016). In the 1950s, carpentry courses were held in Barbaros and thus developed a group of local artisans experienced in woodwork. Biographical information about these local builders and carpenters (Figure 3), their sources of knowledge, and missions in construction tradition will be shared in the following sections.

Ömer Ece (*Hafız Ömer*) was doing varied kinds of work including agriculture, rifle repair, clock repair, management of the watermill in Barbaros, serving as imamate –he received education at a madrasah in İzmir-, tinsmithing, and masonry (İ. Ece, personal communication, 2016). Ömer Ece learned to build from his father Nabi Yusuf who was also an imamate (İ. Ece, personal communication, 2016). He built many

houses in Barbaros, Kadıovacık, and other nearby villages. Ömer Ece's wife's grandfather Bekir also possessed building skills (İ. Ece, personal communication, 2016). He remade the millpond including building a wall around the pond and altered the mill structure by adding one more millrace (Figure 5).

Tolanay Barış was born in 1934 in Barbaros. He attended the seven months carpentry course in 1951 in Barbaros[11]. The teacher was İlhan Ece and courses were conducted in the ateliers, which used to be located within the existing unused school building (Figure 4). The ateliers were built by villagers at the request of the state in 1945. Fahri Ersan, a carpenter, was one of the people who worked on the construction and built the roofs of the ateliers. After the carpentry course, in 1952, Barış started to work with Suat Taşkın. They did carpentry work for awhile and then started to build houses. Barış continued to work until he retired. From the early years of his work as a carpenter, he has a memory with coworker Eşref Usta (Hasan Uz). In 1952, they prepared a window including the window frame and glass for the house of Barış's family. This was the first use of glass windows for Barış's family. Before the construction of the glass window, if the shutters were opened, any weather conditions from outside would enter the house (T. Barış, personal communication, 2016).

Suat Taşkın was born in 1936 in Barbaros. His father Ali Taşkın was also a builder. Suat Taşkın states that his father did not have a master. When Suat Taşkın finished fifth grade, his father sent him to apprentice under the carpenter Bahaddin Yaka. Suat Taşkın finished four years of apprenticeship in his atelier, which is used as a coffee shop today (Figure 4). Later he opened his carpentry business, and his son continued his work (Figure 4). Today, this carpentry atelier building serves as a café.

Barış and Suat Taşkın's first building work was a house for Barış's father in 1963 (Figure 4). They demolished Barış's father's existing house to build a new one in its place, reusing the original stones and taking the necessary earth for the mortar from the area around the watermill at Barbaros. They plastered the house with lime. Barış stated that they generally worked in this way, demolishing old houses to build new ones and reusing their materials. Demolishing old houses was difficult since the earth mortar was strong (as long as it did not get wet from rain) (T. Barış, personal communication, 2016).

Ahmet Koşfur was born in 1935 in Kadıovacık, Urla. He is a builder who was still actively working as of 2016 when the interview was conducted. His father was also a builder, but he mentioned that he did not learn the work from him since they separated when Ahmet was young. He states he learned to build by self-education. He both built stone masonry houses and later reinforced concrete houses[12]. In that sense, he is an example of a traditional builder who changed his building techniques according to changing construction practices, material availability, and the desires of the employer.

İlhan Ece taught carpentry in Barbaros for seven months in 1951. His students included Tolanay Barış and approximately ten others. Ece received his primary school education in Çeşme, his middle and high school education in İzmir. He graduated from high school in 1947 and then worked as a teacher trainee at Karadeniz Ereğli Orta Sanat Okulu for five months. His next position was at Zonguldak Sanat Enstitüsü. After these, he began to give his seven-month carpentry course, which he taught in Menemen/Emiralem; Güzelbahçe; Urla/Barbaros; Karaburun/Eğlenhoca; Karaburun/Kösedere; and Karaburun/Mordoğan. This course was named the 28 Numbered Mobile Village Course[13] (*28 Numaralı Gezici Köy Kursu*) and depended on Mithatpaşa Erkek Sanat Enstitüsü[14]. İlhan Ece was teaching carpentry for seven months in the villages of his choosing and then returning to Barbaros for holidays. After teaching his course in Mordoğan, İlhan Ece resigned and rented an atelier in İzmir where he worked with five carpentry machines. Later, he constructed his own atelier in Karabağlar. Ece indicated that at that time, Karabağlar was a village and he was the one to get the electricity service connected there.

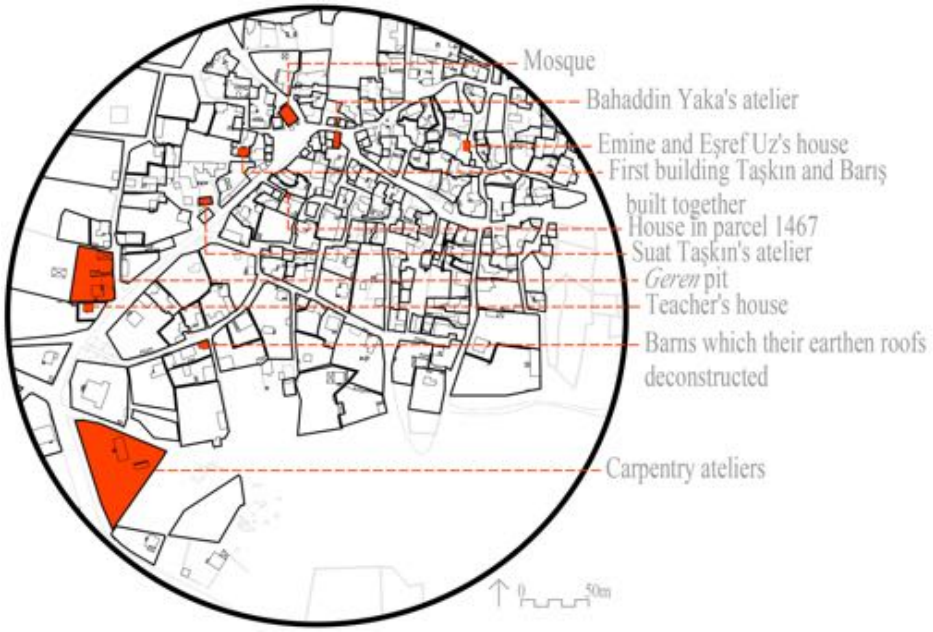

Figure 4. *Distribution of mentioned places.*

5.2. Building materials and their sources

For the masonry, Suat Taşkın and Tolanay Barış used fieldstone and a stone quarry in Barbaros. The stone quarry did not belong to one person or institution. It was open to public use and the process was handled by the workforce. However, a man nicknamed Köse Dayı was working there constantly to quarry stones and sell them. Quarried stones were carried by horse-drawn carriages or tractors. The quarry is not in use today and is filled with earth (Figure 5).

Earth was a building material used for different purposes. It was used as a covering layer for flat roofs, and to make mortar and plaster. Although none of the interviewed builders had built a flat earth roof, they knew about the necessary earth characteristics and its sources. The earth used for the roofs is called *geren* which is defined as the earth that cracks when it is dry, infertile, salty, and clay-like (Turkish Language Association, n.d.). Around Barbaros, when the soil is dug, *geren* earth can be reached; but in those days there was a commonly used *geren* pit close to the teacher's house (Figure 4) (S. Taşkın, personal communication, 2016). The next parcel of the teacher's house used to have a *geren* pit which is filled in today (Figure 5) (İ.Ece, personal communication, 2016). *Geren* was also supplied around the piney graveyard (Figure 5) (A. Koşfur, personal communication, 2016). While the traditional roof system was flat and the covering material was earth, in time roofs were altered to pitched roofs covered with tile. In the early alterations, over and under tiles were used. In time, they were exchanged for Marseilles tiles. Taşkın and Barış changed many houses *çöplem* tiles (over and under tiles) to European tiles (Marseille tile). Tiles were bought from Kilizman (which is formally named Güzelbahçe today) and from İzmir. For earth mortar, the earth should be *kayran*: sandy soil that does not crack in summers. Earth mortar was eroded by mice; lime was more durable (A. Koşfur, personal communication, 2016).

Figure 5. *Distribution of sources of building materials.*

Figure 6. *Lime kiln at the north of the settlement (on the left) and lime kiln at the west of the settlement (on the right).*

Lime was used for the buildings in Barbaros for the mortar, plaster, and paint. It began to be used commonly at the beginning of the 1950s with the opening of the lime kiln in Barbaros. Limestones were burned in the kiln, then chilled, and sold (S. Taşkın, personal communication, 2016). A hole was dug for boiling lime. Lime was placed in the hole, water added, and the lime slaked (S. Taşkın, personal communication, 2016). After this process, the lime was ready to use (S. Taşkın, personal communication, 2016). Taşkın did not have a ratio for lime and sand (S. Taşkın, personal communication, 2016). He would throw his mix on the wall, and if the mix stayed on the wall, it was ready to use. If the mix did not stay on the wall, more lime should be added (S. Taşkın, personal communication, 2016). Two lime kilns exist close to the Barbaros settlement (Figures 5, 6).

Wood, which was needed for the roof, structural elements, and constant furniture, was bought from a timber merchant in İtfaiye, İzmir by T. Barış and S. Taşkın (T. Barış & S. Taşkın, personal communication, 2016). The existing pine trees around Barbaros were not sufficient (S. Taşkın, personal communication, 2016). They bought the wood in İzmir and processed it in Barbaros by hand – without the use of machines due to the absence of electricity. In the past, chestnut wood was coming from Chios to Çeşme, İzmir by sea (T. Barış, personal communication, 2016) (Figure 1). Wood was taken from Çeşme with hinnies and carried by horse drawn vehicles to the construction sites (T. Barış, personal communication, 2016). There are still houses in Barbaros that maintain chestnut wood elements with no decay since as long as it is kept away from water, chestnut tree wood is a durable, rot-proof material (T. Barış, personal communication, 2016). Koşfur shares that he was buying wood both from Urla and İzmir[15]. He used pine and poplar tree woods but preferred poplar for roof structures since woodworms will not eat it.

5.3. Traditional Barbaros house: Spatial and construction characteristics

Traditional Barbaros houses are one or two storey. In two storey buildings, living spaces on the first level are reached via exterior stone masonry stairs (Figure 7). In both one and two storey houses, living spaces have similar spatial qualities. Under living spaces, barns exist. One storey houses have adjacent barns or separate barns placed in the same courtyard. The structural system is stone masonry (Figures 9, 10). The average wall thickness of the walls of one storey buildings is 50 cm, except for the wall with the fireplace. The fireplace wall thickness is 60 cm. Two-story buildings' ground-level wall thickness is 60 cm, and the first-level thickness is reduced to 50 cm. The recessed 10 cm is used to superpose wooden flooring (A. Koşfur, personal communication, 2016). The binding material of the masonry walls is either lime or mud mortar. The exterior wall surfaces can be unplastered, plastered, or partially plastered with lime only at joists. Interior wall surfaces are unplastered for barns and plastered with lime for living spaces. In some houses, wooden posts in the middle or at the sides next to the walls exist to support the wooden flooring. Posts at the ground level are placed on a stone base to separate them from the ground for waterproofing (Figures 9, 10). Posts either have Y shape tops embracing main wooden beams or flat tops and bolsters (Figures 9, 10).

Roof and flooring are composed of a one-way or two-way timber beam system (Figures 9, 10). The traditional

Figure 7. *A one storey house (on the left) and a two storey house (on the right).*

Figure 8. *Traditional earthen flat roof elements. 1. Main beam, secondary beams, lath, moss, and earth layers (parcel 1360). 2. Water spout (parcel 1468). 3. Post, main beam, secondary beam, and earth layer (parcel 1468). 4. Secondary beams, branch, bush and moss layers (parcel 1468). 5. Post, bolster, main beam, secondary beams, and sandalwoods as covering layer (parcel 1487). 6. Moss from the roof in the hands of Koşfur (parcel 1487). 7. Main beam, secondary beams, earth layer (parcel 1497).*

flat roof is covered with earth. From bottom to top, the traditional earthen flat roof includes a *düver* (main beam); *mertek* (secondary beams); *seren* (twigs) or sawn timber; bushes such as myrtle or *piren*; moss; earth with no specific quality to reduce the necessary amount of *geren*; and lastly *geren* earth. The moss used is called *kara saman* (İ. Ece, personal communication, 2016). Five to six cm thickness of *geren* is more than enough for waterproofing and it is necessary to ram it with a stone roller (A. Koşfur, personal communication, 2016). Flat roofs have a slight inclination for water flow (A. Koşfur, personal communication, 2016). The water is drained with the help of water spouts placed at the lowest level of the inclination.

Houses have fireplaces, niches, cupboards, shelves, and bathing cabinets as architectural elements (Figures 9, 10). For the back of the fireplace and *ocak kulağı*[16], slate stone (*kayrak*) was used (A. Koşfur, personal communication, 2016). Houses constructed by Rums had ornamentation (T. Barış, personal communication, 2016). Ceilings were the main elements that were ornamented (T. Barış, personal communication, 2016). Other types of ornamentations were also utilized depending on the economic condition and request of the owners. For example, Emine Uz's house was done by Rum builders from Birgi at the wish of her husband's grandfather (E. Uz, personal communication, 2016). The house had bird ornamentations at each corner

that turned according to the direction of the wind (E. Uz, personal communication, 2016). This house is the only one in the settlement which had a vaulted entrance to its courtyard. While these older houses of the settlement are ornamented, Barış stated he never constructed an ornamental element. This could be either because of the weakening economic conditions or Turkish masters lacking the related know-how. The architectural elements produced by Barış were all simple ones such as *yüklük* (cupboard); *ocak başı* (shelf on top of the fireplace to put oil, salt, a lamp, and so on); and *direk başı* (shelf on top of posts) (T.Barış, personal communication, 2016).

6. Evaluation as a conclusion

This paper aimed to decipher the actors of the building tradition, the process of knowledge transfer among builders, and the traditional construction know-how in Barbaros. The results of the study showed that building tradition in Barbaros was multicultural including the Rums from Alaçatı and Birgi, migrant Albanians from Gülbahçe, and locals of Barbaros. After the Rums left with the population exchange, Turkish and Albanian builders who learned from them transferred their know-how to the next generation. Thus, Barbaros is a place where the traditional building knowledge transfer was not interrupted. The local builders, local treasures of intangible cultural heritage, are introduced including a short biography, the story of how they became builders, and their professional experiences. It is observed that local builders used to gain traditional knowledge through master-apprentice transfer, or without a master, through varied working experiences with different groups. Later, formal education included this local process. Today, there are no traditional local builders in practice, and the knowledge transfer process has been interrupted.

The main materials of Barbaros's building tradition, which are stone, earth, branches, and bushes, were provided locally from the Barbaros landscape. Moss for earthen flat roofs was collected from neighboring coastal settlements. Wood for structural ele-

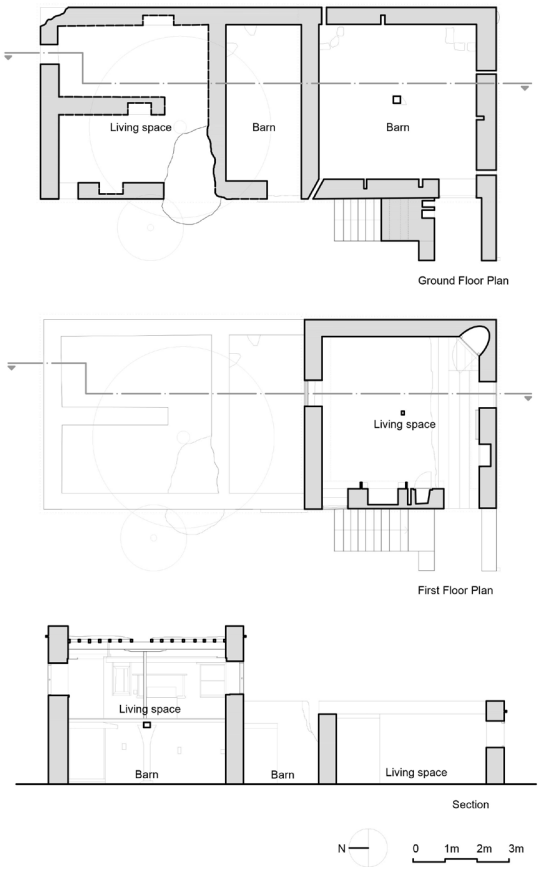

Figure 9. *Plans and section of the house in parcel 1497.*

Figure 10. *Photos of the house in parcel 1497. 1. West façade, lime plastered surface, exterior stair, slate stone eave, chimney. 2. South façade, partially plastered surface, slate stone eaves. 3. Entrance of the barn. 4. Post, main beam, and secondary beams of the barn. 5. Unplastered wall surface of the barn, niches. 6. Bathing cabinet (yunak), window, shelf, post, and, niche for water jug in the living space. 7. Door, cupboard, match niche, fireplace, post, window in the living space.*

ments was brought by sea from Chios, Urla, and İzmir city center according to the narratives. In time, with the opening of a lime kiln, lime took the function of the earth for mortar and plaster. The earthen flat roof tradition was left behind and tiles began to be used for pitched roofs. As a result, the now unused *geren* pits were filled.

Abandoning the traditional construction techniques in Barbaros, as in the whole world, meant the last builders did not transfer their know-how, an intangible cultural heritage, to younger generations. This study contributes to the conservation of intangible heritage in this respect by recording the know-how of the last bearers of traditional construction. This documented experience can be used in future restoration projects not only in Barbaros but also in surrounding settlements with the same traditional construction features. In addition, the results of this study are remarkable in terms of revealing the importance of oral history studies for the holistic documentation of intangible cultural heritage.

Endnotes

[1]Among these limited sources Davulcu, 2009; Davulcu, 2015; Davulcu, 2017; Eken & Kul Özdemir, 2019; Karakul, 2012, 2015a and 2015b can be mentioned. Davulcu shares the builders and building tradition of Sakarya as the result of site survey and interviews with builders (2009). Names and photos of five builders from four villages and one district are shared. Job descriptions of builders and various wokers working with them are provided. Process of being a builder is shared. Tools used by builders, yearly and daily working times for construction, basis of payment to builders, and rituals related to construction are mentioned. Other study by Davulcu handles stone masonry tradition in Ahlat and works of stone mason Tahsin Kalender from the Ahlat district of Bitlis (2015). This study includes rituals of construction, bibliographical information about Tahsin Kalender and his professional training and experiences. Davulcu's (2017) research on Ihlara Valley shares different actors of building traditions and their roles. Rums were active builders before the 1923 population exchange. He outlines the tranining and knowledge transfer of builders, payment of builders, construction season, working days and hours, tools used, construction process and undocumented rules of construction. Eken and Kul Özdemir (2019) share house architecture of Gölde Village of Manisa with the contributions of the last stone mason Osman Gür. Karakul's studies put forward approaches and methodologies for the conservation of the knowledge of traditional builders (2012, 2015b), and also share about implemention of the project named Living Human Treasures of Traditional Architecture (2015a).

[2] According to Kırcalı (2017), in Urla settlements traditional building culture is changing due to toursim in coastal settlements and urbanization in mountain and plain villages. While in rural areas there is the issue of all types of settlements' being destroyed, coastal settlements are being destroyed more rapidly than mountain and plain villages. Among plain villages, Barbaros and Kadıovacık are the ones that- more than other settlements in Urla- have kept their traditional buildings in use and have a strong bond between the people and the settlement. Moreover, Barbaros is the settlement that still has more earthen flat roofs in comparison to others. Among all fifteen settlements of Urla, only four still have earthen flat roofs, while three have just one building with the system. with the system (Kırcalı, 2017). In Barbaros, 14 earthen flat roof were still existing in 2020 (Sarıbekiroğlu & Kul Özdemir, 2020).

[3] The population exchange took place as a part of the Treaty of Lausanne in 1923 between Turkey and Greece.

[4] Living Human Treasures National Inventors of Turkey includes thirty people selected between the years 2008 and 2015. Among thirty people, there is only one building master, who is Tahsin Kalender, a stonemason from Ahlat, Bitlis (Araştırma ve Eğitim Genel Müdürlüğü, n.d.). He unfortunately passed away in 2020.

[5] The Ottoman Period census of 1842-1843 shares demographic and economic aspects of the settlements of Çeşme including Sıradam. According

to the census, there were one hundred twenty-nine people in Sıradam. Sixty-one men were farmers; one was a barber; one was a mukhtar and imam; one was an imam and hafız; two were soldiers (Bölükbaşı and Gulam). There were eighteen men named Mehmed, fifteen men named Mustafa, thirteen men named Ali, twelve men named Hüseyin, ten men named Ahmed, eight men named Hasan, five men named Bekir, five men named İbrahim, and five men named Yusuf. Family name related epithets were Bekir oğlu, Kaya oğlu, Koca oğlan oğlu, Sağrılı oğlu, Tiryaki oğlu, Yazıcı oğlu, Koca çoban oğlu, Kaba sakal oğlu, and Bacaksız oğlu. Hometown related epithets were Filibeli, Keşanlı, Kırcalı, Konyalı, Kulalı, Manisalı, Yeniceli, Trabzonlu and Torbalı. Religious epithets were Hacı and Molla. The census also gives information about physical qualities of people, such as beard, mustache and height. Age is also shared. People were aged between one to seventy-five years old with the avarage age being twenty-four years old.

[6] Birgi and Ildırı(Lithri) are two close settlements to Barbaros having a population of Rums.

[7] With law 6360, all villages of 27 big cities became neighborhoods.

[8] Efes-Mimas Road is the common name for the routes created by İzmir Metropolitan Municipaliy. It includes walking and cycling routes; and vineyard and olive theme roads.

http://rota.yarimadaizmir.com/

[9] Strawman festival organized by people who live in Barbaros. It includes stands for selling products, movie screenings, games, exhibitions, etc. https://www.facebook.com/barbarosoyukfestivali/ and http://www.barbarosoyukfestivali.com

[10] Taşkın mentions this space as *ev önü* in Turkish.

[11] Tolanay Barış is the only person who mentioned the financial source of the carpentery courses as the Marshall Plan. However, no source which confirms this claim could be found.

[12] He shares that he lived through many failures with reinforced concrete buildings. There were collapses. Koşfur shows the reason as his material source. He shares that he took sand from stream beds and it never became efficient. In these his last years of work, he only builds roof structures.

[13] In 1939, for men who lived in villages, forging and carpentery courses were opened; and for women who lived in villages, tailoring courses were opened (T.C. Milli Eğitim Bakanlığı, 2019).

[14] The history of Mithatpaşa Mesleki ve Teknik Anadolu Lisesi (Mithatpaşa Vocational and Technical Anatolian High School) goes back to İzmir Islahhanesi which opened in 1868 for providing education to abandoned children. They were taught shoe, sock, and undershirt making; carpentry; dictation; calculation; and religion. In 1891, the school name become İzmir Hamidiye Sanayi Mektebi. After the proclamation of the Republic the name become İzmir Sanatlar Mektebi. In 1974-1975 the education semester was named Mithatpaşa Endüstri Meslek Lisesi (T.C. Milli Eğitim Bakanlığı, 2019).

[15] Keskin Kereste was the exact shop where Ahmet Koşfur bought necessery wood for constructions.

[16] Small shelves at two side of a fireplace for lamps (A. Koşfur, personal communication, 2016).

[17] This paper is based on the master thesis entitled "Understanding Cultural Landscape Characteristics: The Case of Barbaros Settlement, Urla-İzmir" by Şeyma Sarıbekiroğlu under the supervision of Assist.Prof.Dr. Fatma Nurşen Kul at İzmir Institute of Technology in 2017.

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Deconstructing "original-copy" in architectural manifestos from 20th century to present

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Abstract

Architecture has been at the center of discussions on "originality" with the abundance and distribution of knowledge. The neologism "original-copy" now arises as a crucial clue in understanding the paradigm shift and as a path in the deconstruction of originality in architecture.

Architectural manifestos, which have dominated architectural thought for almost a century, provide a valuable source of texts for this deconstruction. The neologisms of evolving approaches to design are added to architectural jargon by architectural manifestos: the newly coined word "original-copy" is a recent example.

The purpose of this article is to deconstruct the neologism of original-copy, reveal its essential values to architectural thought, and unravel its layers of meaning. The methodology of the article consists of a discourse analysis that focuses on the words "original" and "copy" and is conducted through the texts of the 20th century architectural manifestos till today in order to stratify the neologism into its semantic layers.

The fact that "original-copy" is both an oxymoron and a neologism in terms of the bond it makes with Derrida's binary oppositions is a crucial foundation in the fulfillment of this deconstruction.

In the study, it has been noted how the words are modified in a way that leads to the formation of a neologism such as "original-copy," and the meaning of the "original" and the "copy" today is opened to discussion by recombining the data collected through discourse analysis.

Keywords

Architectural manifesto, Binary opposition, Neologism, Original-copy, Oxymoron.

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1. Introduction

"Originality" is the most important concept for all creative practices, especially art and architecture. With the proliferation and dissemination of information, the interdisciplinary fiction of production, which has transformed over time, sometimes specialized and sometimes anonymized, has changed the momentum of the debates on "originality". These debates may include literature, contemporary art, design, music, software, etc. mediated the glorification or vilification of works in many creative practices. Architecture has been at the center of these debates, especially in the pendulum of being original or copy.

Today we have the following questions in front of us: Do the debates on originality of the act of designing in the changing conditions of authenticity, publicity and media still have a significance? Accordingly, the definitions of "original" or "copy" still matter in architecture as they did in the previous century? Is it possible to discuss the situation of "originality" today within the realm of reproducible representations and the era of the spatiotemporal situations/breaks with the same terms of yesterday? Or are we on the verge of a new due diligence, a new conceptualization? As a neologism, the "original-copy" appears today as an important clue in understanding these transformations and as a path in the deconstruction of the originality in architecture.

As material for this deconstruction architectural manifestos which have leaded architectural thought for over a hundred years, provide a fertile source text. The reason why the texts of architectural manifestos were determined as a source in order to identify the semantic layers of the "original" and "copy" in architecture is that manifestos are privileged architectural texts that have the ability to structure "new" ways of thinking by pointing to these ruins that lead to paradigm shifts in architectural theory. The fundamental task of manifestos is that they are productions that try to demolish the logos of transcendent architecture -- desiring to replace it with something new-- and thus separate architecture into layers and reconstruct it in an almost new language and order. Generating a new discourse about architecture has brought about a loss of meaning or a reconstruction of meaning in the concepts that make up the language of the text. Architecture manifestos, which are themselves original-copies generated through the mainstream media, add to architectural jargon the neologisms of changing approaches to design: the changing meaning of "copy" and the newly coined word "original-copy" present contemporary examples of this.

All thresholds have met with the society through manifestos that are a call for the new and have the quality of to be a "letter for tomorrow". Manifesto texts came to life as conditions defining originality due to this existential structure. Another feature of the Manifesto that makes it a fruitful resource for discussing a neologism like the original-copy is that it is an example of the original-copy due to its oxymoron nature. As a synthesis of the past and the future, manifestos are half-truth, half-fiction literary texts.

The aim of this article is to separate the concept of original-copy into its components, to deconstruct its structure, to make its intrinsic values visible to architectural thought and to unfold its layers of meaning. In order to do that, it takes architectural manifestos as a source for their being texts that deconstruct the tradition of architecture. Although the aim of the study is to separate the oxymoron structure of "original-copy" neologism, which emerged from a binary opposition, into its semantic layers; such an action also includes the deconstruction of the manifesto discourses that gave neologism its meaning and the words "original" and "copy" which the neologism was consisted of.

2. Methodology

The methodology of the article consists of a discourse analysis that focuses on the words "original" and "copy" and is conducted through the texts of the 20th century architectural manifestos till today in order to stratify the neologism "original-copy" into its layers of meaning.

The discourse analyses which will use in the article reveals the deconstructive nature of the original-copy

word, which is made possible by its oxymoron structure. While the original-copy is construed in the study, the assumed meanings of the "original" and the "copy" are also goes into a deconstruction. In the realization of this deconstruction, the fact that the "original-copy" is both an oxymoron and a neologism in terms of the bond it establishes with Derrida's binary oppositions constitutes an important basis.

Using two opposing or contradictory concepts together to describe a reality or an object is called an "oxymoron" (Kongar, 2020). Original-copy is also a neologism in which two antonyms are used together in the same expression. Thus, original-copy points to a new reality, a need in language as a word born from an oxymoron noun phrase in which the latter can be interpreted to embrace the meaning of the former. With it, it is possible to speak of a copy which is an original.

Neologisms, are new words that are added to the language for a need arising in the language. Neologisms can be born as completely new words that have not been heard before, a word that is already extant can acquire a brand-new meaning or two existing words can be used together to describe a new meaning. In current times being able to produce the "new" or being a "creative" act, the word "copy" has undergone a similar transformation and evolved semantically. As an extension of these changes, "original-copy" is a concept is deemed a "neologism" insofar as it has been born of the combined use of contrasting words "original" and "copy".

The original-copy was first examined in the context of these linguistic tools (oxymoron, neologism) and its pendent creative aspect, which contains the contrast and the new at the same time, was revealed. Afterwards, the deconstructive structure of architectural manifestos, chosen as a source to deconstruct the meanings of the original-copy, and their active role in developing the vocabulary of architecture is revealed and discussed. In this context, selected discourses from the manifestos in the sources determined were analyzed in order to reveal the semantic changes of the original and the copy from the beginning of the 20th century to the present, while the findings were presented in a comparative graphic presentation, some discourses from the research included were opened for discussion in the last section.

The word original-copy is inherently "deconstructive". "Deconstruction", the tool Derrida has contributed to philosophy, is a quality inherent in the object or the text. Just as in original-copy as a neologism and an oxymoron. According to Derrida, deconstruction in architecture does not work as a metaphor to be used by simulating the structure of language (Derrida, 2014). That is precisely why the concept of deconstruction is fundamentally related to being an original-copy, due to its attitude that reveals the signs and signification of reality and the inflation of so-called essence. Thus, the logic of "deconstruction" is crucial in analyzing the neologism "original-copy" in architecture, as an oxymoron that emerged from a "binary opposition".

Within the scope of the article, architectural manifestos from the 20th century to the present were obtained based on three sources representing three time periods. The first of these is Ulrich Conrads's 1970 compilation "Programs and Manifestoes on 20th-century Architecture". Continuation to this source, which contains an important accumulation of the modernist period of the manifesto, Charles Jencks and Karl Kropf's 1994 edition of "Theories and Manifestoes of Contemporary Architecture", that represents the postmodernism of the architectural manifesto, constitutes a source of compilation representing the fate of the genre between 1955-1994. The third source that refers to the original-copy age of the manifesto are websites such as designmanifestos.org that aim to gather online architectural manifestos into a single platform, and publications such as Icon Magazine's 50th issue consists of 50 manifestos by 50 architects, exemplifies the oxymoron being of the contemporary manifestos as original-copies.

From the twentieth century to the present, comparative expansions have been brought to the meanings of words through the texts of the manifesto, which are thought to lead the transformation of the concepts of original and copy in architecture, and the discourses included in these texts. By recombining

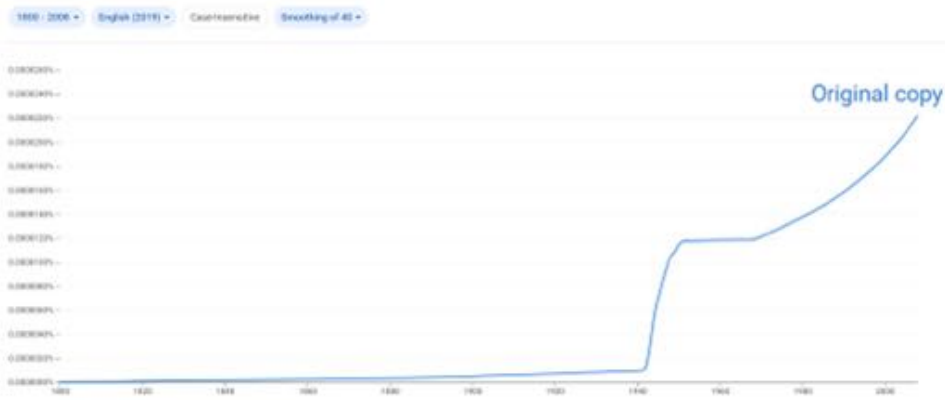

Figure 1. *Use of the term "Original-copy" in the English language in the Google Books registered English book archive. (Google Ngram Viewer, 2020).*

the data obtained through graphics, it is observed how the words are transformed in a way that leads to the birth of a neologism such as "original-copy", and the meaning of the original and the copy today is opened to discussion.

3. Original-copy as binary opposition: Neologism and oxymoron

According to Emecan "compound words" as a neologism are "new words" that have been derived from a main syntactic category: "The multi-word expression of concepts which, for various reasons, cannot be expressed with a single word and which, over time, merge into a single word. The term compound word describes structures in language that function as a single unit with a meaning different from the combined meaning of its parts"(Emecan, 1998). Emecan's definition gives an idea as to the birth of a compound word like original-copy. Two words, assumed to be contradictory, had begun to be used together and had assumed a new meaning.

Meanwhile, the words "original" and "copy" that make up "original-copy" still have a place in the language. According to Matore a neologism can be "the imbuing with different meaning of a word still in use" (Matore, 1953). That illustrates that the current transformation of the words "original" and "copy" can also be considered as neologisms. While the word copy contains contradictory meanings in contemporary usage, the word "original" has become associated with the concepts of "obsession, waste and exaggeration" (The Why Factory, 2018).

In addition to these definitions original-copy also fulfills all of the prerequisites for a linguistic neologism according to Cabre Castellvi's criteria. Cabre Castellvi proposes four important criteria for determining whether a new expression is a "neologism", that is, "a new element" (Cabré Castellví, 1999). The first of these is "diachrony". According to these criteria a unit should be current and recently emerged. The second criteria, "lexicography", dictates that what makes a word a new unit is the word's absence from any dictionaries at present. According to another criteria "systematic inconsistencies" in informational, orthographical, phonological and semantic uses of the word are signs that the word is a new element. Yet another criteria is the word's "psychological" effect. If a word creates the sense of a new unit and is perceived as such when used in a sentence, then the word is a new element (Cabre Castellvi, 1999).

The history of original-copy in the English language does not extend beyond the second half of the 20th century. (Figure 1) Its uses are directly related to cultural, technological, and social changes in the world during and after the post modern period. As a concept made possible through the effects of poststructuralism on language, it exists in a period that can be considered current in language.

Because it is so current, it has not yet been included in dictionaries. In accordance with another criteria, there exist "systematic inconsistencies" in the "morphological", "orthographical" and "phonological" aspects of original-copy. It is used to refer to a wide variety

of meanings in sentences. Different uses sometimes emphasize the degenerate and sometimes the creative effects of "original-copy". At other times it bears the neutral meaning of being the first copy that gives rise to subsequent iterations. This variety of uses is also reflected in the spelling of original-copy. For instance, in this study we have opted to spell the word separated by a hyphen, as "original-copy", because we believe it is a neologism, beyond the words "original" and "copy". Yet original-copy is not always spelled together. Oftentimes it spelled with a space in between, as "original-copy", a noun phrase. In English similar uses can be found such as "original imitation", "authentic fake" and "identical copy". Furthermore, there are widespread examples of the word "copy" being used alone to reflect the meaning of "original-copy". These variable uses and indefinite meanings both increase the meaning of the concept and indicate a "morphological" and "orthographical" inconsistency.

The word original-copy also shows semantic variation in its different uses. While in diverse disciplines original-copy is regarded as a multiplier of meaning, certain references may also qualify an inferior existence. For instance, according to Uz, who exemplifies the concept of "original-copy" through the Istanbul Hukukçular Apartment, original-copy is "inherent in every architectural object, a natural feature of the object that is visible on different levels. In other words, original-copy in architecture is seeing connections and identifying similarities through free association between two objects whose uniqueness and difference can only be discerned through in depth examination (Uz, 2014). Thus, defined by Uz, original-copy in architecture is a thought-provoking and creative element that makes us think about the references, archetype, meaning and value of an architectural product and continues to make references even after it leaves the hands of its manufacturer.

Another example is Linda J. Docherty's citing of Gilbert Stuart's Thomas Jefferson and James Madison portraits as an example of original-copy. Although these two famous politicians and thinkers have numerous portraits by Stuart wherein their posture and face expressions differ, it is known that they only posed for the painter once. In past letters, Stuart characterizes these individual portraits as "originals", whereas Docherty terms these unique creations, which the painter repainted from each previous portrait instead of from a real setting as "original-copies" (Docherty, 2010).

In contrast to these examples where neologism is interpreted as a creative act, Bianca Bosker, who sees the word as an ethically problematic uses "original-copy" to describe the replica cities that are becoming widespread in China. Bosker faces the fact that on the one hand these settlements produce a replica of what was built in the past, on the other hand they are products that are absolutely new and totally of their age (Bosker, 2014) and characterizes original-copies as forgery, deception and fraud (Bosker, 2013). According to Bosker original-copies are problematic also in cultural and social terms.

In addition to these contradictory approaches, there are situations in which the word original-copy is used in neither creative nor reductive terms. In the fields of law, science, library and museum sciences, or publishing original-copy conveys a neutral meaning. It is used to describe the copyrighted copies of a book or the first copy of a serially produced work. It is simply a first copy that is the basis of subsequent copies. It is an objective attribute. It simply describes without rendering superior or inferior.

A survey of the examples cited will show that as a current concept not yet found in dictionaries, original-copy also fulfills Cabre Castellvi's criteria for "systematic inconsistency." This broad semantic scope of the word original-copy can be attributed to the fact that it is comprised of antonyms. This aspect cannot be considered independent of the "psychological" effect the word creates on the hearer. The "psychological" effect of the word, as the last criteria of Cabre Castellvi's neologism, is related to original-copy's structure as an oxymoron.

Contrary to common belief, an oxymoron does not indicate lack of meaning. It is simply the combined use of

two contradictory words in language (Lederer, 1990). According to Çağlayan "oxymorons are structures that are generally clustered as phrases, sometimes used as literary art, sometimes to strengthen meaning, and sometimes to surprise the reader/listener and leave them in a dilemma, in the service of criticism or mockery" (Çağlayan, 2019). Ahmet Güngör defines oxymoron as "the hypothetical reflection of the semantic connotation of the contradictory aspects of reality in life based on action, object, event or situation in language" (Güngör, 2014).

Thus the main function of the oxymoron, as a literary art, is to provide, through the use of binary words containing criticism and mockery, a dramatic effect that requires reflection, sometimes to reinforce meaning and sometimes to leave the listener in a dilemma. Using antonyms together reveals a "new" meaning that is different from the previous meanings. As Güngör said, "Oxymoron compatibility draws the limits of meaninglessness in the meaning intended through the interaction of adjective, qualifier and the qualified. In this way, it increases and expands the quality of the object and forces the limits of language and thought in terms of the power of expression. One of the reasons for the birth of the oxymoron is the lack of words in using extraordinary, striking, and effective language and units of expression apart from traditional, standard uses" (Güngör, 2014).

Therefore, separating the oxymoron components from their relationship with each other in their historical development and treating them with independent and stable definitions destroys the productivity of this oxymoron structure from the very beginning. In order to understand the birth and structure of a concept such as original-copy, first of all it is necessary to accept the absence of definitions referring to absolute logos in which words are directly combined as a signified facet of pure intelligibility. As Derrida points out, it is not possible to attain a flawless intelligibility wherein signs point to a fixed meaning. For this reason, the first thing that needs to be done is to "reveal the systematic and historical unity of words and acts of thinking that are often naively assumed to be easily seperated" (Derrida, 2014: 24). To this extent, in the hope of perceiving the words together with their historicity, it is necessary to deconstruct their historical meanings from the relevant texts. Thus, in order to investigate a phenomenon like "originality", which constitutes one of the ideal canons of architecture, it is necessary to decipher the semantic development of these words through manifestos, generally viewed as the founding and pioneering texts that represent, oppose and invent the intellectual thresholds of the era and inform the "new" in architecture, and in this way analyze the semantic layers of original-copy.

4. Contextualization on the relationship of architecture and manifestos

Antony Vidler states that when we look at the etymological roots of the word manifesto, we can say it has ties with two contrary meanings. "Manifesto", which stems from Latin "Manifestus", has a connection to both the words "manus"(hand) and "infestare"(to attack) which is closely related with Latin "festum"(feast, celebration) (Vidler, 2011). In this sense manifestos are connected to both a devastation and a rejoicing. By nature, a manifesto supposed to contain first a dirge for the dominant view it demolishes and then a celebration announcing its revolution.

According to Wigley there are two significant qualities of a manifesto. The first is that the text of the manifesto is like an arrow, it must sharpen towards, and indicate a view. The second is that in order to put forth an avant garde view, that is, in order to dash forwards, manifestos must take a step back just like a runner: therefore, manifesto texts always contain a "historical" flashback, no matter its lenght (Wigley, 2011). Thus, to present an "original" idea or take a "new" stance, manifestos must agree on a common recognizance, an architectural memory, and then declare that they intend to change this ground with their own fictions/versions of reality. To recollect Derrida's words on writing, manifestos are also texts that are at once mnemonic technique and the power of forgetting (Derrida, 2014).

Beatriz Colomina says that "Manifestos are outlines of the future", to express that paradoxical aspects of manifestos, which contain both the new and the old. In other words, this type of text, with its powerful connections to both past and future, has a close relationship to the words "original" and "copy" since both are vehicles to present a "new" while reckoning with what has already been produced in the past. As Colomina says every manifesto is a rework of previous manifestos and this call for a new is minted from the previous (Colomina, 2014).

In these definitions, manifesto is a genre that can be called a dirge and a celebration, a fiction and a reality, a return of the past and an outline of the future. Despite these aspects, manifesto texts point like an arrow, and attempt to conjure the attention and authority they believe they deserve by sharpening their use of language, and applying the dominance of language with the help of wording.

Since many manifestos are presented to the public through readings and not through publication, their message is related to their communication method and not solely to their content, therefore it can also be claimed that the current transformation of the manifesto is related to the transformation of media tools and publicity (Artun, 2020). A manifesto turns into action, and the action turns into the movement in question. Thus, the authority of manifesto is not only a resemblance of its ideas but also its wording, choice of vocabulary, and the motivation to state, present, and turn these into action that are avant garde and part of its discourse.

As an effect of this manifestos both shape and represent the vocabulary of their publishing age. According to Charles Jencks, manifestos and theories, as practical outcomes of the Zeitgeist, become indicators of time and of how ideas develop through time (Jencks, 1997). In the context of this representation relationship, the manifesto, which was born in architecture in the 20th century, has been a genre fundamentally associated with Modernism, with its didactic language and imperative wording. As for the late manifestos that demolished and deconstructed this language have been interpreted as a representation of Postmodernism.

As Derrida claimed, "If modernism distinguishes itself by striving for absolute domination then postmodernizm might be the realization of the experience of its end, the end of the plan of domination (Derrida, 1997). Postmodernism regarded the loud voice of manifestos, which spoke with a desire for domination, as a reflection of Modernism and pursued its attack on Modernism primarily through language and rhetoric. After the 1960s we see the emergence of "gentle manifestos" and "retroactive manifestos". So, is it in fact possible for a manifesto ougth to be new to be "retroactive", like that of Rem Koolhaas? Or, can a genre that, in Vidler's definition, is expected to present its idea like a punch, create a "gentle" discourse just like Venturi stated? (Buckley, 2011). According to M.A. Caws a manifesto that is not new is an oxymoron (Caws, 2001). These oxymoron uses are fundamentally language plays directed towards deconstructing Modernism by tackling with the authority of words .

As an extension of these language plays, Jencks states that one feature of manifesto texts has been the use of neologisms that succeed in conveying their ideas through fewer words. With short expressions, architects have created compound words that turn into neologisms, (Jencks, 1997) These compound words, according to Jencks, are used consciously to almost hypnotize the readers. Neologisms in manifestos, depend on the psychological effect of neologism to impose awareness on the reader and in some cases the power of oxymoron to attract attention and create a dilemma. The neologisms engendered in language by architectural manifestos serve as compressed lexical units loaded with meanings representing a new idea. Biomimicry, cyborg, blobitecture, dublitecture, architectureproduction, copy-paste, etc. are examples of compound neologisms that have assigned new meanings. In addition to these, recent manifestos also bring "original-copy", which characterizes a new "copy" containing an original existence within architecture, to the discourse of architecture.

Recently, in accordance with changes in media and publicity, the manifesto genre has started undergoing a new change turning into its new oxymoron ways of being. Wigley asserts that a manifesto is fundamentally "a call for change", essentially, not a form of writing but an act. That is to say, it is not only the text itself but the act of writing and besides that it can also be the act of the text. This act can take place before or after the manifesto (Wigley, 2011). Therefore, even though a hierarchic bond is often assumed between the architecture and the manifesto, this relationship is often indistinct. Also, there is no sequence of origin and subordination where one triggers the other, the developments between manifestos, words and architecture are often anachronistic, or each can trigger the other.

As a result of major shifts in style, authority, action, and relationship with publicity, we are now at a stage where we question whether it is correct to define manifestos with terms of the past. Although the word manifesto has been emptied semantically, the production rate of manifestos has increased and they have come to be produced in groups.

As an extension of this, the genre that was, in Wigley's words, a "call for action" has now turned into "call for manifestos" (Wigley,2011). In the last 20 years, manifestos have created their own oxymoron existence within the public nature of the internet. Examples of this include the "Serpentine Gallery Manifesto Marathon" of 2010, and the call for manifestos issued by Icon Magazine in 2007, that featured 50 manifestos by architects for its 50th anniversary. To recall Caws' emphasis, just as a "manifesto" that is not "new" is an oxymoron, a "manifesto" that is part of a "plurality" also creates the impression of an oxymoron. For manifestos must essentially be "unique" and "exceptional" creations. Instead of making a "call for action", the manifestos that make up the "multiple manifesto" events mentioned here have become another product devised to attract attention in the "manifesto calls" of various media and institutions that their authors lined up to be a part of.

Today, the hierarchy between architecture and manifestos is anachronic, ambiguous and personal. The manifesto does not precede the action. Some manifestos are simply the soul-searchings of an architect and remain that way. At other times, the actions take place first, then are or are not reproduced in countless blogs, tweets, hashtags, stories, etc… Events and movemenents such as the "Occupy Gezi" is an example to that. Language and presentation of the current manifestos are now driven by platforms based on repeatability. The possibilities offered by these platforms are the ability to keep that action always in touch with other actions took place in the past, and to forget every single discourse in the multitude.

The loss of dominance in today's manifestos may have caused the language to become even sharper. Slang, curse words, and taunts appear frequently in recent manifestos are perhaps the genre's sarcastically grousing about its own plight. So, if the manifesto is dying and has evolved into a form completely other than itself, then what does the word manifesto mean anymore? There are existing lexical units that have already taken on the task of describing the state of contemporary architecture, which is laced with these contrasts. "Original-copy" is an important candidate for this which describes the radical mode of production particular of our age.

From this point on we have done a historical reading of architectural manifestos Thus we attempt to analyze what might be "original-copy" in architectural manifestos and why "original-copy" might be a candidate to call "architectural manifestos".

5. Deconstruction of original-copy through architectural manifestos

Manifestos that deconstruct the tradition of architecture and replace it with what they deem "new" have been the productions that assumed the founding role in hierarchies of "firstness" and "secondariness" in architecture. Manifestos first set up a historical framework and then announce how they push its boundaries. Establishing the new involves recalling the historical. Then the "new", produced through subversion of this historical origin, is declared a candidate for acceptance as origin.

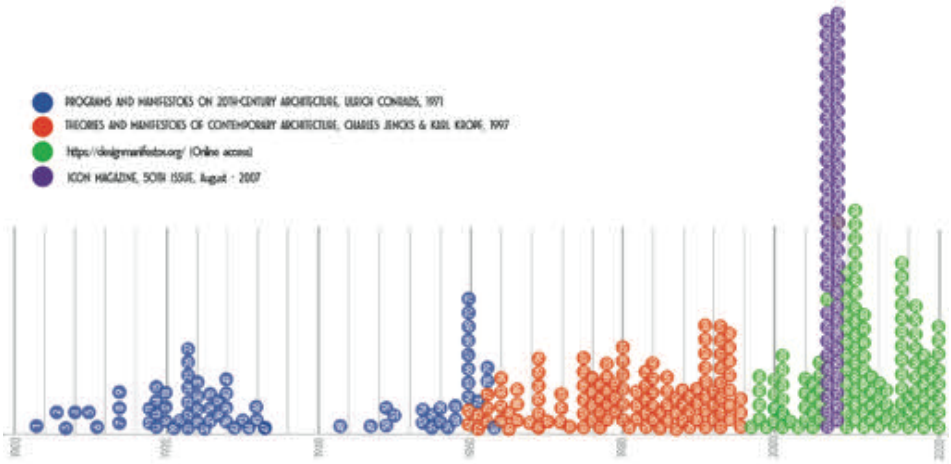

Figure 2. *Timeline of architectural manifestos included in the study. How "call for manifesto" events accelaretes the manifesto productions in numbers has been visualized.*

Contemporary manifestos, on the other hand, reveal "new" productions that contradict the etymological origins of the manifesto, while destroying and replacing the ideals and principles of Modernism with "copying".

In the Derridian sense, what these manifestos do is to acknowledge the 'originality' of originary difference. As Lucy says, imitation as a principle of art has already been interrupted in natural plenitude, substitution has already begun in itself (Lucy, 2012). While these manifestos reflect the understanding of the authenticity of the new age by going beyond the addition, substitution or so-called secondness, they also deconstruct the archaic concept of "origin" - including the meanings of words such as "copy" and "original".

Conducting this analysis requires a text scan over a long period. According to Atilla Yücel, it is rather mighty to attempt to gather in one work all of the manifestos that pioneered the architecture of the twentieth century, a period full of dizzying change and contradictions (Yücel, 1991). Therefore a more valid method is to resort to major studies that have attempted this in the field of architecture as primary sources. It is possible to mention of two important sources that compile manifestos published in architecture in the 20th century. The first of these is Ulrich Conrads' 1964 book "Programme und Manifesto zur Architectur des 20. Jahrhunderts". This book is a compilation of texts in the form of a manifesto written from the early 1900s to 1963.(Conrads, 1964) The second is Charles Jencks and Karl Kropf's 1994 edition of "Theories and Manifestoes of Contemporary Architecture", which presents a critique of Ulrich Conrads' handling of the manifesto and represents the Post-Modern era of the manifesto, containing the architectural manifestos published between 1955-1994. These two books are foundational and main sources that contributed to the study in terms of being indicators that allow observation of the wording and vocabulary of the manifesto, as well as the compilation they present about the period they covered. As for manifestos produced since Jencks' cut off point until the present, there is no single source of compilation, since the unifying platform for manifestos, have become the internet. Online magazines and websites, such as designmanifestos.org, which aim to collect all manifestos that are being written in the field of design and architecture in a single address, or manifesto events such as Icon Magazine's "50th issue" served as the source for the inventory of the architectural manifestos produced since 1994 for the study (Figure 2).

Within the scope of the study, manifesto texts that touch on the concepts of original and copy from the twentieth century until today were determined and the meanings of these words were analyzed through them. The study also includes the words "origin", the root of the word "original", and "originality", which was derived from it. As for the word "imitation", it has been included in the scan of texts due to its deep

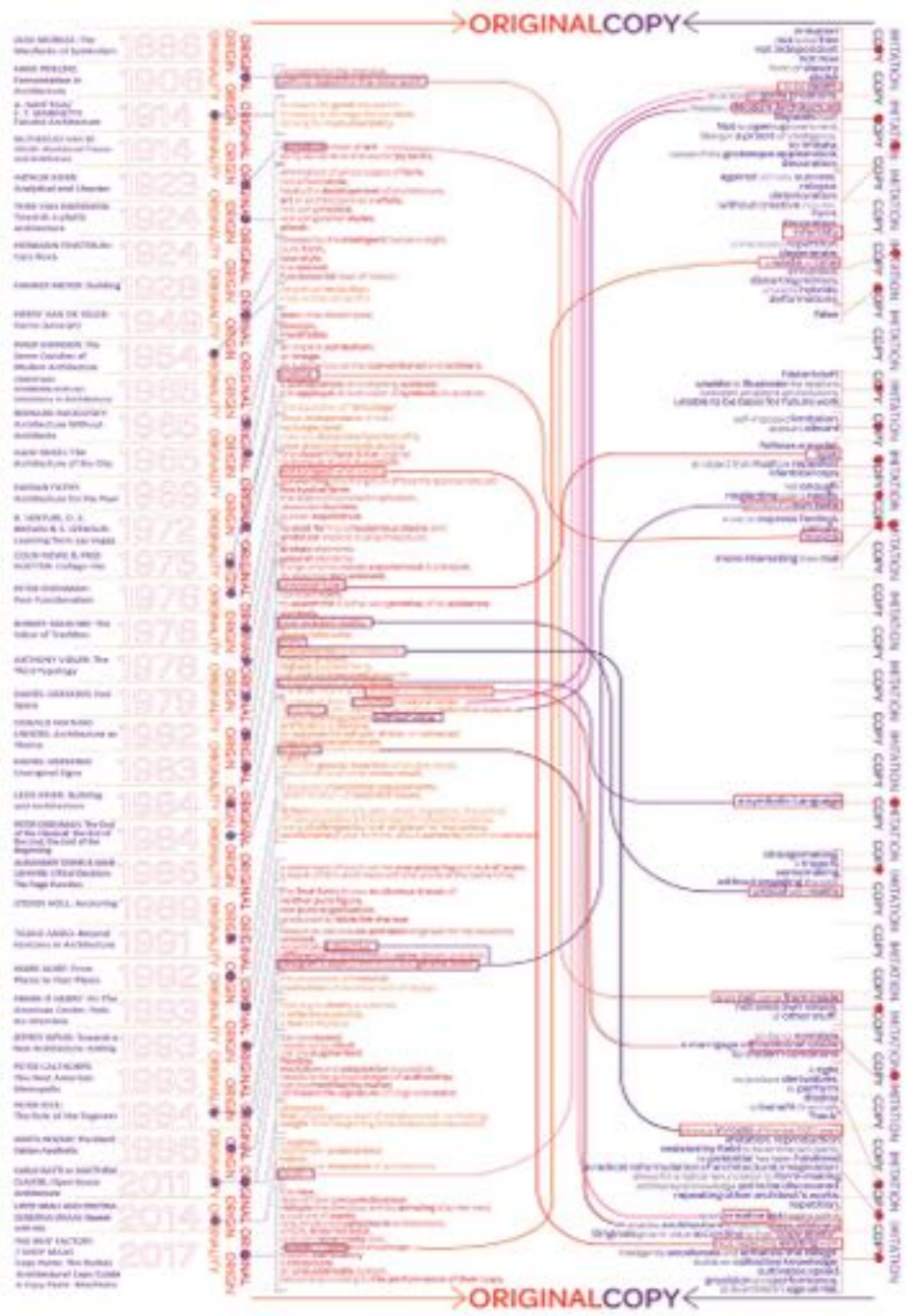

Figure 3. *Reversal of definitions of "original" and "copy" in architectural manifestos and semantic area of "originalcopy".*

historical ties to the word "copy". The meanings of these words in manifesto texts have been through a discourse analysis and their changes over time presented comperatively in a graphical format (Figure 3). In the article, which is an outcome of a phD study, the architectural manifesto discourses examined throughout the study could be given as a graphic presentation, and explanations of some of these discourses are included in the article in detail.

For example, in the early 1900s, Hans Poelzig, in his manifesto "Fermentation in Architecture", says that architecture produces "from Gothic via the Renaissance... generally with no regard for the inner spirit of the forms, with no regard for the material from which these forms originally sprang" (Poelzig, 1906:14). Here we seize architects lack of correspondance to an existing spirit of originality. Similar to that, In Deutche Wekbund's manifesto, "Werk-

bund Theses and Antitheses", which laid the early foundations of Modernism at the beginning of the 20th century, Muthesius and Van de Velde accepted the foundations laid so far as strong foundations and gave the architect his new task "not to imitate". In this sense "any relapse and deterioration into imitation would today mean the squandering of a valuable possession" (Muthesius & Van de Velde, 2014:28). In the manifestos put forward by the Modernist architectural movement at the beginning of the twentieth century, it is seen that the original signifies an absolute good, while imitation and copying signify an inferior, or bad situation. Such examples can be multiplied. Arthur Korn, one of the active Modernist actors in Berlin in the 1920s, wrote in his 1923 manifesto text "Analytical and Utopian" that the architect's duty and fundamental issue is to create the architectural work "in a completely original way, as though it had just come into the world" (Korn, 1923:77). Korn defined being "original" as "a creative idea" regarding art. Here the architect's deific role is made clear. The productions put forth by the genius of the architect subject are tasked with being created in a divine manner by human hands, and a search for superiority, purified from worldly things. Outside of the manifesto, these transcendent connotations regarding the word "original" can be traced back to the 18th century. It seems definitions of the original in architecture have not changed much almost 200 years after Edward Young's article "Conjectures on an Original Composition" written in 1759. According to Young "An original… rises spontaneously, from the vital root of genius; it grows, it is not made" (Young, 1759). In this approach, the role that Young ascribes the artist as a creator is quite similar to the one that Korn ascribes to the architect who "creates originals". Korn's use of the expression "as though it had just come into the world" for "original", contains within it the sense of "being created without human hands" and of "being born", much like its meaning in the 18th century. Thus, it is possible to say that whatever semantic change the word "original" has undergone, it has happened in the last century. For despite Young, Korn, Poelzig, Muthesius and Van de Velde, and the aforementioned trancendental meanings embedded in memory, the 2017 "copy-paste" manifesto by Winy Maas contrastingly came far as to clearly present "original" as a "waste" and this time by depending on a language play "the copy" as "the beginning of every creative act" (The Why Factory, 2017).

This contrast in meanings may thought to be appeared throughout years. However, a search on discourse have shown that "original" and "copy" can be used in contradictory meanings even in contemporaneous manifestos, and that they sometimes show semantic intersections. For example, in the first half of the twentieth century, the subjects of "form" and "type" contained their own contradictions tied to use of "original" and "copy". While Theo van Doesburg claimed that not to use earlier styles as models and not imitating them was essential for elimination of all concepts of form in the sense of a fixed type in "Towards a plastic Architecture" in 1924 (Doesburg, 1924), Henry van de Velde advocated in "Forms (excerpt)" that reaching "...back to the original tradition created by intelligent human insight...pure forms coincided with those that an avand-garde of pioneers of a 'new style' were seeking to bring into being" (Van de Velde, 1949:152). So imitating what is archaic in architecture was appreciable since it conveyed an original meaning, on the other hand, sticking to a static form or retaining a fixed type was questionable in terms of imitating ancient forms.

Other discoursive shift "copy" semantically has been through is that it no longer connotes "a form of slavery", but rather a liberation from slavery, that is, a "radical abandonment of the compulsion to create a form". Whereas at the beginning of the century, in 1914, in Sant'elia and Marinetti's "Futurist Manifesto" "copy" represented a state of imprisonment such as "not opening one's mind", exactly one hundred years later, for Urtzi Grau and Cristina Goberna ironically "copy in architecture" is behind the bars as a trapped, hidden gem and "architectural knowledge yet to be discovered" (Grau & Goberna,

2014:199). Beside this implicit criticism on ethics of copy in architecture, in 2014, "copy" for Grau and Goberna deconstructively is "the beginning"(-origin) of every creative movement, while for Muthesius and Van de Velde the "copy" was condemned to be nothing more than an act "without creative impulse" in "Werkbund Theses and Antitheses" in 1914 (Muthesius & Van de Velde, 1914).

As another example out of the study, it has been seen that the copy defined in Maas's, Goberna and Grau's or in Ratti and Caludel's manifesto texts, is a new copy that "intelligently accelerate and enhances design", "obvious in the 600 years roots of architecture" and that is regarded economically as a "financial benefit" and legally as a "right". It is an original-copy that contains an originality free of "an obsession", "a taboo", or "the fear of falling into repetition."The deconstruction of the meanings of the words "original" and "copy" in architectural manifestos of the twentieth and twenty-first centuries shows how far the words original and copy are from the precise meanings we believe them to have. One of the rare presumptions that all architects interestingly agree upon has been that "imitation" is bad in architecture (Tanyeli, 2001). The study shows us that the words that we think are unambiguous and easily discernible and the signifiers that we believe to signify opposite meanings are acts of thought based on an unbreakable historical unity.

This reminds us of the view that as Derrida put it, the importance of origin in terms of existence essentially produces ethical and political decisions rather than being a purely philosophical concept. If these signs are variables that cannot be fixed by their political existence, it is also pointless to decide between the purity of an origin and the impurity of an imitation (Derrida, 2014). Just like the text of the manifesto, the act of the manifesto, the act of writing it, and all other actions and manifestos that trigger it. That is, "the origin of the origin is constituted by a breach within 'itself'" (Lucy, 2012:88). According to Derrida firstness is this lack, or breach in the structure of the sign. And this both precedes firstness and constitutes the foundation of why we cannot speak of the purity of firstness. As Niall Lucy explains, "firstness, begins in its difference from itself, and not in its difference from secondariness; from the start it already comes second. Différance, and not presence, is originary. So, for Derrida there is no origin except originary difference" (Lucy, 2012:88).

6. Conclusion

The historical deconstruction of the words reveals that the meanings of the words copy and original have almost enhanced large enough to embrace their antonyms in architectural manifestos from the start of the twentieth century until the present. The adjectives and phrases that qualified the word copy at the start of the twentieth century are nowadays associated with the word original. On the other hand, the modern uses that qualify the word copy recall the meanings of the word original at the beginning of the twentieth century. The "copy" mentioned in recent architectural manifestos is a new copy, in contrast to the ones written at the beginning of the twentieth century. It is a "copy" that can produce the "new", that is fruitful, rife with new solutions and most importantly, able to face the realities of the age. The style and vocabulary of the Manifesto are a cultural representation and result of the media tools of each period. If, with metaphor, oxymoron expressions and imitation, the Post-Modern period prepared the end of the architectural manifesto, which is a manifestation of the despotic language of Modernism, then the digital era, with endless reproductions, anonymous productions and free-floating images where all kinds of signs are "copy-pasted", has created a contemporary representation of "original-copy" and, as a consequence of the disappearance of any kind of hierarchy between action and manifesto, brought about the end of the manifesto as we know it.

As a result of the study, it has been observed that the texts of the manifesto play an active role in the incorporation of new words into the jargon of architecture or the evolution of existing words into new meanings. In the current period, the contribution of the manifesto

genre, both as a written source and as an example, to the birth of a neologism like original-copy in architecture has been revealed.

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The influence of architecture of the surroundings on the form of the new building - on the example of a chapel from the beginning of the 20th century

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Abstract

In 1901, a brick chapel was built near the Church of St. Casimir the Prince in Cracow, which was a monastic church of the reformed congregation of the Order of Friars Minor. The decision was motivated by the need to establish a sanctuary for the painting of Christ the Sorrowful, which had been associated with the previous church of the reformed congregation and placed in a separate chapel of the monastery's ambulatory. Due to the spreading worship of this image, the new chapel became the church's most significant section, as expressed by its architectural form that is one of the more interesting examples of Romanesque Revival architecture in Cracow and a result of the blending of the Revival style layout into the church's Baroque silhouette. Due to utilitarian reasons, a section of the chapel was also adapted to act as a boiler room intended to heat the entire church. The aim of the study is the analysis of the principles of shaping the form of a chapel built in direct contact with the existing structure. The main basis of historical research and conclusions were archival materials as well as contemporary and past publications. The auxiliary element was a 3D reconstruction of the original form of the chapel, made on the basis of an architectural inventory and historical data. The research has shown that the chapel's architecture is the result of efforts to formally coherent with the historic architecture of the surroundings, but expressed in an innovative Romanesque Revival style.

Keywords

Churches of the reformed congregation, Historicism, Religious architecture, Romanesque Revival.

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1. Introduction

The architecture of the turn of the twentieth century is associated with a period of pursuing new stylistic layouts on the basis of the experience of artists from previous ages. Situations when a new building was to become a closely-tied element of an existing structure were encountered quite often. This was typical for the construction of chapels alongside already existing churches. Their historicising form took on a slightly different expression, as architects used not only patterns from previous periods, but also the form of a given church or even its immediate architectural surroundings as a design basis. The chapel under study was built in 1901 at the Cracow church of the reformed congregation and is the outcome of this type of approach, based on the assumptions of historicism and the need to adapt the new building to the structure of the church and to the character of the city's architecture. Another hindrance its designer had had to face was the necessity of providing a boiler room, a function that is difficult to include in a religious building.

The aim of the research is to determine the sources of inspiration used by the architect and the methods of shaping the form of the new chapel and the principles of its integration with the baroque temple. The important issue is to what extent the existing spatial limitations in combination with the architectural context have left their mark on the structure of the chapel and to what extent the adopted model of activities is universal and appropriate also for our times.

2. Methodology

This article was created as a result of the analysis of archival materials in the library of the Krakow Reformed Congregation Monastery as well as selected contemporary and past publications. Due to the stylistic connections of the chapel with the old forms of local architecture, visible at the beginning of the research, historical monumental buildings of Krakow were analysed. Among them, the ones that turned out to be most consistent with the nineteenth-century Romanesque Revival form of the chapel under study were selected, and therefore could certainly serve as important models for design activities by the artist. For the needs of historical analysis, a 3D model of the object was built on the basis of own inventory measurements, which allowed for direct contact with the object and a clear representation of its geometry and structure.

3. An image of Christ and the first monastery of reformers

An image of Christ the Sorrowful, called Lord Jesus in the Well by the faithful, was placed in front of the former church of the reformed congregation of the Order of Friars Minor, which was built in 1640. The painting was donated to the monastery by a professor of the Cracow University, who had commissioned its painting to an unknown artist. The decision of the university teacher was probably motivated by the desire to highlight the links between the Church and the university, as both professors and the academic youth often visited the temple while going to the university (Janicki, 1901).

During the Swedish invasion of Poland towards the end of 1655, the enemy reached Cracow. The defender of the city, Stefan Czarniecki, ordered the surrounding suburbs to be burned down, religious buildings included, to uncover the field around the fortifications to make the defence easier. The church of the reformed congregation, situated very close to the city's western walls, was burned down as well (Petrus, 2012). Immediately before this destruction, Gottfried Libalt, a German painter, produced an incredibly picturesque and detailed panorama of Cracow from this side, on which we can see the upper part of the ridge turret of the first church of the reformed congregation (Gwiazda, 2018).

4. The chapel in the second monastery of reformers

The construction of a new church, following the advice of king John Casimir, was performed inside Cracow (Wilczyński, 1893). Despite royal support, attempts to obtain the permission of the city council to site the convent in the vicinity of the defensive walls lasted

five years (Bieniarzówna, 1984). Construction concluded in 1669 (Pasiecznik, 1978, 34, 108). The previously mentioned painting of Christ was relocated to the church during this time and placed in a chapel built in a part of the ambulatory. This place was a wider fragment of a corridor on the first floor, which abutted the presbytery that is currently called the monastic gallery (Pasiecznik, 1980). The chapel was accessible through the sacristy, which featured a set of stairs towards the upper storey of the monastery. The worship of the painting that spread among the faithful led to the need to close off this part of the ambulatory from the rest of the monastery in 1855. In subsequent years, the chapel was supplemented with new elements: stained-glass windows, doors and organs (Janicki, 1901). The chapel in the sectioned off part of the ambulatory operated for over 230 years.

5. Planning to build a new chapel

Due to the growing number of the faithful and difficult access to the painting, which was located within the monastic enclosure, a decision was made to build a separate chapel around the turn of the twentieth century. This task was taken up by Fr Zygmunt Janicki, the monastery's guardian. As the superior of the congregation, he was also the administrator of the facilities, who initiated all the works related to the necessary renovations, interior decoration, all alterations and extensions (Pasiecznik 1978, 94, 96). The design of the chapel was developed in 1901 by Cracow-based architect Janusz Rawicz Niedziałkowski, a graduate of the Technical Institute in Cracow and the Berlin Bauakademie, who held the post of the head of the Office of Municipal Building in Cracow, and who later operated his own engineering practice (Czech, 1908; Janusz Niedziałkowski, 1907; *Österreichisches Biographisches Lexikon* 1815 – 1950, 1978; Purchla, 1979). The chapel was built in the same year. On documents and drawings related to the construction, next to the architect's signature, the guardian's signature often appears, which proves his participation in the project, probably also with an advisory voice in architectural solutions.

The courtyard that abutted the church from the east offered free space that could be developed. The options considered included an extension only in the area of the northern span of the nave, as the remaining part of the facade was obscured by an infirmary, while the wall of the presbytery was abutted by a low storage building. Opposite the church there was another obstacle in the form of a wall that encircled the monastery's garden, which limited design potential. Work began after a meticulous survey of the church's foreground, using the simple yet sufficiently precise and effective triangle method. This measurement shows that the architect had at their disposal a free space 15.5 by 18.5 metres in size—in the daylight of the outline of the surrounding walls. The available space was even smaller, as a sufficiently wide peripheral pathway had to be provided along the outer walls of the chapel.

Due to compositional considerations, one of the axis of the nave's span could have been a justified planning basis, yet the architect also devised a different solution—with the axis of the planned chapel oriented at the extension of the external surface of the chancel wall. This would entail the demolition of the southern end of the storage building and adopting an asymmetrical placement of the entrance to the chapel from the presbytery and, most importantly—the necessity to move the altar deeper into the presbytery. In the variant that included adapting the plan of the chapel to the axis of the northern span of the nave, the architect assumed the construction of a chapel with a wide bay, considerably elongated towards the east. To this end, one would have to relocate a fragment of the garden wall so that a peripheral walkway with a width of two metres would remain around the chapel, and to demolish a part of the outbuilding located to the south. In this scenario, the proposed chapel nave would have three spans (Figure 1).

The design featuring the axial placement of the chapel relative to the northern span of the nave was selected for construction. This solution was also

often used in previous centuries, particularly in extending churches. This caused the emergence of a structure with the character of an almost separate transverse church with its own presbytery and nave partially integrated with the previous body of the church exactly at the previously mentioned location, immediately near the chancel wall (Czechowicz, 2018).

In order to link the chapel with the nave, a proper arcade had to be built in the eastern facade of the church. Because the Baroque church had been built using a wall-and-column system, the place of the connection with the chapel was a self-supporting infill in the form of a narrower wall between massive columns supporting the barrel vault of the nave. The distance between the columns here was 4.9 metres, which allowed for building an arcade with a width of 3.2 metres. This wall did feature a semi-circularly topped window, one of two that illuminated the nave from the east, yet the construction did not lead to its removal, as it remained in the area underneath the arch of the barrel vault, above the cornice encircling the interior of the chapel.

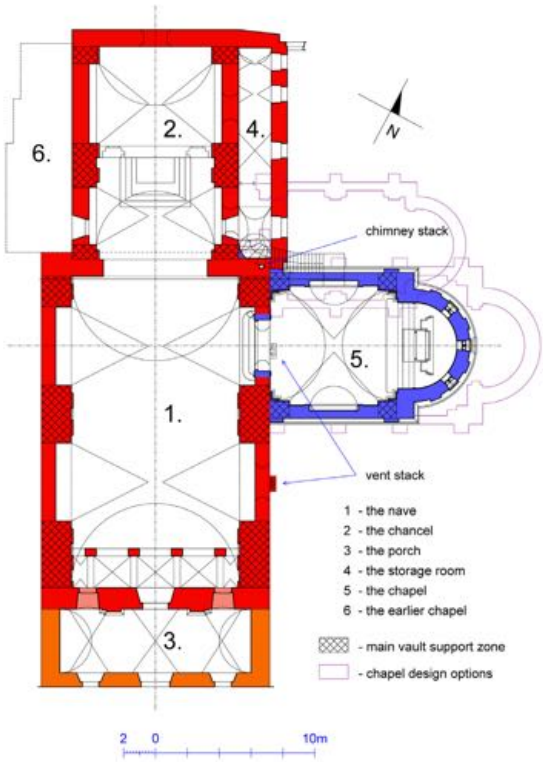

Figure 1. *Cracow, church of the reformed congregation, stratigraphy featuring the design alternatives of the chapel, according to: Niedziałkowski, J. (1901, April). Projekt sytuacji kaplicy przy kościele OO. Reformatów wystawić mającej. Plany i szkice dotyczące kaplicy Pana Jezusa Miłosiernego (sygn. 2/IV/1901). Archiwum klasztoru reformatów w Krakowie, Kraków; Niedziałkowski, J. (1901, April). Budowa kaplicy przy kościele OO. Reformatów w Krakowie. Plany i szkice dotyczące kaplicy Pana Jezusa Miłosiernego (sygn. 9/12/IV/1901). Archiwum klasztoru reformatów w Krakowie, Kraków (Source: Czechowicz).*

6. Architecture and construction of the chapel

J. Niedziałkowski designed the chapel in the Romanesque Revival style, designing its general layout as adapted to the Baroque church. Due to these assumptions, the new structure became stylistically separate, but also proportionally linked with the main church, which defined the integrity of the religious complex. Modelled after small Romanesque churches, the chapel was built from two parts: a nave with a shape resembling a square and a semi-circular presbytery. The church of St John the Baptist, built in the middle of the twelfth century in Siewierz near Cracow, is built in this way (Świechowski, 2000). The monastic rules of the reformed congregation required them to erect modest monastic buildings, churches included, which were to follow a unified pattern (Błażkiewicz, 1961). The prefect of the fabric diligently ensured this rule was adhered to (Błachut, 2011). Likewise, the Cracow monastery was built following these rules. This was expressed in counting the Cracow church of St Casimir the Prince among the group of 'churches without facades', i.e. without proper exposure and a rich ornamentation programme (Klein, 1913). Niedziałkowski probably acknowledged the source Romanesque form, designed in a more modernised fashion, as adequate to the reformed congregation's assumptions of simplicity and modesty.

In structural terms, the architect used the wall-and-column system, which had been already used in the church. However, he adopted a different form of enclosing the space between the columns, as he filled it with a wall of narrower columns that were a quarter of the width of the main columns (in the church this relationship is ½), with an arcade niche with a smaller width than the spacing of the columns (in the church the width of the niche is confined to the distance be-

tween columns). The columns near the presbytery were extended beyond the interior outline of the nave, including the wall that supported the semi-circular chancel arch; this wall then extends into the semi-circular oval of the apse. The nave of the chapel has a barrel vault crossed by two lunettes with a width equal to the spacing between structural columns, while the presbytery apse is covered by a dome vault. The wall-and-column system made it possible to avoid the construction of a foundation wall with strip footing along the church wall, as the load of the barrel vault above the nave and the wall plate of the roof truss was borne solely by the longitudinal walls of the chapel. This made the chapel an independent system, structurally separate from the church's structure.

The chapel's interior is closer to the Baroque decoration of the church — it has geometrically polychromed walls with pilasters on bases and with capitols and arcade niches encircled with profiles. Above an elaborate cornice that encircles the interior of the chapel is the zone of the vault with a delicate polychromatic decoration, framed in geometric strips and frames in the form of shaded layouts of profiles, providing an illusion of depth (Kęder, Komorowski & Łepkowski, 2018, 439). The polychrome has the character of a firmament suspended on the vault, which appears to rest almost effortlessly in the space above the contour of the upper profile of the cornice that encircles the interior. This cornice frames the scenery depicted on the vault, supported on shifting pilasters in the four corners of the nave. The meticulousness of this composition attests to an understanding of the overarching need to use an appropriately rich symbolism associated with the sacred element of this place, which is also addressed to the faithful, despite the austere rules of the reformed congregation. It can also be an indication for contemporary designers as to the need to enliven church interiors with symbolism and scenery that gives them the rhythm followed by the community of the faithful (Grabska, 1989).

Figure 2. *Church of the reformed congregation, reconstruction model of phase III, view from the north-east (Source: Czechowicz).*

The decoration of the chapel, which references the interior of the Baroque church, does not correspond to the external Romanesque Revival style. When shaping the architectural form of the new chapel, the architect followed *rohbau*, a trend of building with raw brick that had been widespread in Europe at the time (Majdowski, 1985). The distinct colour and modular pattern of the brick walls clearly set the Romanesque Revival building apart from the uniform, plastered facades of the Baroque church, communicating the independence of the chapel as a separate temple associated with the worship of the image of Christ (Figure 2). In the presented reconstruction, made on the basis of the author's inventory measurements, the original architectural elements were restored: the salmon color of the church walls and wooden windows painted green, a cross on a turret, tiles of the church and chapel and stone pinnacles at the base of the chapel's gable. The former ground level was also restored. Some elements, such as windows or plaster colors, have partially preserved to this day, while others reveal archival photographs (Kęder, Komorowski & Łepkowski, 2018, 410).

The architectural detail of the external facades was built out of modular compositions of brick arches, cornices, friezes and blendes. The breakaway from the uniform ceramic face structure of *rohbau*, made using the header bond pattern, are elements made from bright stone that act as linear or point accents against the background of other brick layouts. These stone inserts are currently not fully legible, as they are covered by a dark grey coating, which

could be removed by a comprehensive renovation of the facade. Stone pinnacles at the base of the gable, which are highly decayed, likewise require conservation. The initial character of the stone and brick structure, covered with a ceramic roof, can only be displayed by reconstruction models, as shown in figures 5 and 7.

The chapel was skilfully incorporated into the layout of the Baroque church. Two criteria were the deciding factors here: siting the chapel in the axis of the span, further highlighted by a sleek ridge turret, as well as the application of the silver ratio, as found by an analysis of geometrical dependencies. The silver ratio, expressed by a ratio of the side of a square to its diagonal, is also featured in the geometry of the church of the reformed congregation and was an often-used tool of designing proportions in Polish architecture (Vogt & Nassery, 1995).

The side walls of the chapel can be inscribed into a rectangle whose sides follow the silver ratio, while the arms of the triangle of the gable of the chancel wall have an incline of 54.74º, which is formed by the diagonal of this rectangle with its shorter side. The size of the chapel was designed so that, while maintaining the silver ratio, the top of the main body would not be located higher than the cornice of the nave, but instead rest underneath its lowest profile. The eave of the apse and its extension in the form of the brick strip of the frieze on the side facades further underscore the principle of composing architectural form following the silver ratio (Figure 3).

The walls of the apse were placed on a tall base comprised of four rows of stone pieces, of which the upper one is the eave, while the lower—the strip of the wall plinth. The two intermediate rows are comprised of long stone pieces with a deep cut along their outline, which imitates the presence of a wide bond. The plinth of the chapel base was made differently: twelve layers of brick were laid on a massive, stone base, and were covered with a stone cap receiver.

The facades were divided by brick lesenes that extended from the plinths and which reached the lower rows of cornices. In the apse, brick and stone arcade frieze modules were placed, which

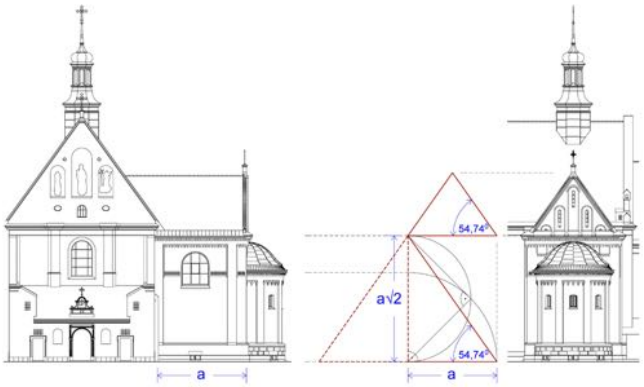

Figure 3. *Analysis of the chapel's proportions based on the silver ratio. Drawing by the author, based on survey.*

is a loose interpretation of original Romanesque designs. Every arcade of the frieze is comprised of a segmental arch and stepped cantilevers. Appropriately shaped stone blocks were inserted in places where the arcades connected. In the nave section, no arcade arches were placed, leaving only the stepped cantilevers of the cornice layers. At the level of the apse's cornice, the facade of the nave is divided by a frieze belt that is four layers wide, made from vertically and diagonally placed bricks, referencing 'toothed' medieval friezes, with bricks laid in a diagonal, soldier or diagonal soldier pattern (Płuska, 2009; Wiśniewski, 1911).

The spaces between the lesenes are where windows were placed, two in the nave body and three in the apse. The shape and size of the nave windows corresponds to the nearby arched Baroque windows of the church's main body. The apse has smaller windows, whose proportions are much closer to Romanesque originals typically found in these church sections. They are covered in a segmented brick arch and divided by a stone post, which supports the smaller segmental arches of narrow bifora. This layout is modelled after the geometry of the lintel section of the ground-floor windows of the nearby Renaissance Revival building of the Cracow Scientific Society (Figure 4). Stone parapets with small inclines with gorges cut into their undersides form the bases of all of the chapel's windows.

The gable of the chancel arch, whose outline reflects the geometry of the silver ration that is so clearly visible

Figure 4. *Form comparison. To the left: ground-floor window of the building of the Cracow Scientific Society from 1857-1866, to the right: the Romanesque Revival window—a bifora—in the apse of the chapel (Source: Czechowicz, 2018).*

Figure 5. *Krakow, St. Mark street, view towards the Reformed Congregation monastery. In the further perspective of the street, there is a visible top of the Romanesque Revival chapel in the form similar to the eastern gable of the nave of the Gothic Church of St Mark – visible on the right (Source: Czechowicz, 2018).*

throughout the church, is an essential element of the architectural composition of the chapel, while the manner of the organisation of the internal field is an expression of accounting for historicising references considered adequate during the historicist period. The triangular top is a proportional, smaller copy of the gable of the church facade; it is filled with rhythmically spaced and arched blendes with a double-stepped outline, featuring narrow, arched windows in the form of slits that illuminate the attic. The outlines of the blendes and windows were made out of perforated brick, cut into wedges so as to form arches. The style of the top of the chancel arch of the chapel has the character of a simplified layout of the blended gable featured on the façade of the nearby Church of St Mark. The likewise stone elements placed in the three corners of the gable and along the line of the cornice resemble similar designs in the cornice corners and at the bases of the gables of this church (Figure 5).

The outline of the chapel gable has a specific character. Its composition is supported on both sides by elaborate stone elements incorporated into the corners of the horizontal cornice, from which extend sections of stone profiles with a cross-section similar to the brick cornice layouts that follow them. The stone blocks also feature additional accents in the form of a simplified pinnacle base—in the shape of a house with a gabled roof. Due to the considerable destruction of the material, the original structure of both top sections of the base of the gable is not fully legible. A stepped layout of bricks, with alternating protruding bricks, frames the slanted edges of the gable. The top of the gable was marked

Figure 6. *Comparison of the forms of gable corners. To the left: the chapel—present-day state and reconstruction model, to the right: the late Romanesque northern fragment of the Church of St. Francis of Assisi (Source: Czechowicz , 2018).*

by a stone piece that is modelled after the break in the profiled cornice. Above this element is a brick post covered by a stone cap, above which there is an ornamental, openwork metal cross. The manner in which the gable is framed, along with the support, is a Revival Style interpretation of similar solutions visible in thirteenth-century parts of the Church of St Francis of Assisi in Cracow (Figure 6).

Above the body of the chapel is a gable roof with copper cladding, which had initially been covered with tiles, while the apse has a copper dome roof. The area of the point of contact between the dome and the gable points to there being a change in the concept of the roof, as in this area the surface of the roofing randomly intersects the brick frieze underneath the cornice along with the corners of cantilever-tipped lesenes. Initially, the apse was to be covered by a conical roof that would not require cutting into the brick elements of the top of the gable wall. This solution is displayed by a perspective drawing of the church with the chapel added, made by J. Niedzialkowski in 1901 (Janicki, 1901). The comparison of both alternatives demonstrates that the architect, as in the case of the biforas, the arcade frieze and the blendes or the framing of the gable, had sought a new interpretation of historical models choosing the domed option in place of a typical, conical roof of Romanesque apses (Figure 7).

Adopting the Romanesque Revival style was aligned with the trend of the re-emergence of these types of forms in Polish architecture at the start of the twentieth century. The character of designs built in this spirit was a result of pursuing simplification and transformation that followed modernising tendencies based on inspirations with English and German architecture (Stefański, 2002). However, it should be stated that Niedziałkowski, by breaking away from this tendency, geometricised Revival layouts searching for sources to reference in the immediate surroundings. Thus, the new chapel was excellently integrated with a specific place, becoming a its fitting and coherent structure—as an element of order in the urban fabric, that religious space has been since the earliest times (Solska, 2006).

Figure 7. *Conical (designed) and domed (built) form of the roof of the chapel apse. Reconstruction model (Source: Czechowicz).*

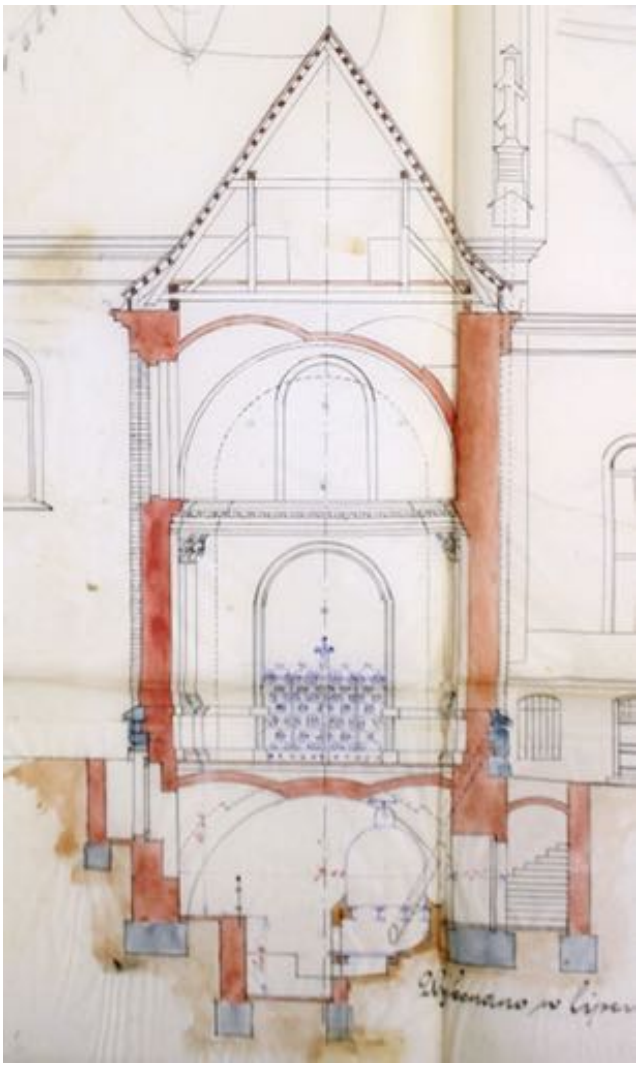

Figure 8. *Transverse cross-section of the chapel with a view towards the church. Design drawing from 1901, according to: Niedziałkowski, J. (1901, July). Przekrój poprzeczny. Budowa kaplicy P. Jezusa Miłosiernego 1901-1902 (sygn. K.69-135, 16). Archiwum klasztoru reformatów w Krakowie, Kraków.*

Figure 9. *Chimney located in the lower corner of the chancel wall gable of the church (Source: Czechowicz, 2018).*

Figure 10. *To the left: passage into the boiler room from the church storage building, to the right: stairs leading to the furnace floor level (Source: Czechowicz, 2018).*

7. Technological zone

Apart from a religious function, the chapel was to play an additional, technical role, maximally separate from the sphere of religion. The design of the transverse cross-section through the nave body presents a division of the entire structure into four levels of roughly equal height: the cellar, the nave section, the vault section and the roof truss (Figure 8) (Niedziałkowski, 1901). The cellar was entirely occupied by a boiler room, which operated using a low-pressure steam system. The massive base of the apse featured three elongated, rectangular windows: the fourth window was placed half-way along the plinth of the nave from the south. At present, it is built up with a low, single-storey building covered by a shed roof. The windows provided sufficient illumination to the boiler room, as well as ventilation, while allowing fuel to be delivered to the space. The cellar was covered with a vault and a half-dome, while appropriate lunettes were made above the windows and the entrance. The wood-fired furnace was placed near the church wall, in a narrow space, located around 1.5 metres below the remaining floor level of the boiler room.

Installing the boiler room required a chimney that would meet gravitational ventilation requirements, an element that is difficult to include in the architecture of a religious building. However, an optimal solution was found, both compositionally, functionally and technically. The chimney was placed outside of the chapel, at a corner of the church nave, and thus a site compliant with the typical location of a clear marking of the base of the gable that had been encountered in the Middle Ages, and which took on the form of a pinnacle, turret or lower merlon. The chimney was constructed entirely from brick, giving it the shape of a column shrine (Figure 9). From a technological point of view, this placement enabled the easy installation of a smoke duct leading from the furnace located in the nearby boiler room.

Other technical and functional problems were associated with vertical circulation. The boiler room required an entrance, but building one from the outside while accounting for local climate condition would require an appropriate envelope, which would have had an adverse effect on the facade's external appearance. It was probably for this reason that the boiler room was connected to the church's storage building. An appropriate opening in its existing wall was made in its

southern end. A set of brick spiral stairs were delineated through this opening, which led into a straight, vault-covered run below ground level, along the external wall of the chapel. This layout enabled the creation of an entrance to the boiler room that was invisible from the outside and without interfering with existing structures. The second set of stairs, that led from the main floor level of the boiler room to the recess underneath the furnace, was given a distinct shape, as its treads were formed as alternating wedges. This optimally shortened the run, freeing up the maximum possible amount of space for the remaining interior of the boiler room (Figure 10). The purpose of the boiler room was to heat not only the chapel, but also the entire church. To this end, eight decorated cast iron radiators were shipped from the Vienna-based factory of Wilhelm Brückner. Two of them were placed in the chapel, while six were placed in the church.

8. The chapel in contemporary times

The chapel was consecrated on the 13th of December 1901 by cardinal Jan Puzyna in the presence of J. Niedziałkowski and the craftsmen who cooperated with him (Nowa kaplica, 1901). The chapel was acknowledged by Cracow's reformed congregation of the Order of Friars Minor as the most important part of the church of St Casimir and has remained so until today (Janicki, 1901). At present, the boiler room no longer functions and an expansive underground space with a functional entrance from the inside of the church to the storage room now remains under the temple.

Ever since its erection, the chapel has been located within the monastery, itself surrounded by a tall wall without openings, located far from the major streets of the Old Town. Along Reformacka Street, one can only observe a sequence of monastic buildings with the set back front of the church preceded by a porch (Fabiański & Purchla, 2001). From the side of Pijarska Street, the only element one can see above the monastery wall is the upper outline of the brick gable of the chapel, filled with arched blendes. This gable is also visible from a large distance at the perspective culmination of Św. Marka Street. For this reason, the Romanesque Revival architecture of the chapel is not fully known to Cracow's residents. However, after entering the Church of St. Casimir the Prince, the monumental decoration of the Baroque Revival interior of the chapel, enriched with polychromes, spectacularly highlights its key significance as a sanctuary of Lord Jesus the Merciful with an unbroken tradition that has lasted for almost four centuries.

9. Conclusions

The Romanesque Revival chapel of Lord Jesus the Merciful, designed by Cracow-based architect Janusz Niedziałkowski and built at the start of the twentieth century, is an isolated example of Historical Revival religious architecture from Cracow. Its Revival style character was shaped as a result of being connected to a Baroque church of the reformed congregation of the Order of Friars Minor via a coherent geometry of compositional layouts and an appropriately shaped scope of formal references, primarily to the historical architecture of Cracow. Attempts at linking individual elements with the most important objects from earlier epochs located in the immediate vicinity are very transparent and legible. Particularly clear is the connection of the brick perimeter of the gable to the late-Romanesque top of the Franciscan church and the creation of a blende system adequate to the filling of the gables of the Gothic church of St. Mark. Giving the Romanesque Revival character was probably dictated by the Romanesque form of the church of St. John rebuilt almost at the same time. The architect also drew attention to the then innovative Renaissance Revival edifice of the Krakow Scientific Society, whose double windows on the ground floor inspired him to give biforas a similar geometry. Thus, the chapel became an architectural testimony to the history of Krakow and another element of its continuation.

Aware of the significance of the chapel as an important sanctuary of a worshipped image of Christ, the architect subtly highlighted it against the background of the Baroque massing of the church, using stone and brick and

striking a careful balance in operating with the Romanesque Revival style. He also skilfully delineated an additional technical space, as he designed a boiler room that did not conflict with the building's religious function. The means of expression, constrained by the monastic rule of the reformed congregation, defined the relatively modest external form of the chapel, almost perfect in its proportions and clear composition, which makes this small building particularly notable as an intriguing testimony to the pursuit of both beauty and harmony at the start of the twentieth century and as an outcome of a desire to highlight cultural identity as expressed by architecture.

The above considerations are not the sole formulation of another contribution to the study of a specific chapter of history or the expansion of knowledge in the field of the typology of architectural form. An equally important issue is recognizing the ways of arriving at a specific concept, based on the analysis of the intentions of the architect, although from the beginning of the last century, but operating within his contemporary realities. His attempts to create a new or even innovative facility can certainly be related to our present day.

The author of this article, being one of the research and teaching staff of an architectural university, tries to draw the attention of students, who are rightly fascinated with contemporary achievements of artists, to the need for a broad look at the context of architecture. The possibility of looking for paths for inspiration in the future profession also in previous periods is a significant support. The scope of formal references in an architect's work may include radically different time and territorial ranges. The achievements of artists in previous epochs show that the influence of architecture from different historical periods and cultural circles can have a significant impact on the nature of the forms created in extremely different regions of the world. However, thanks to the conscious need to preserve the national identity in architecture, the understanding of the historical context and the constant need to study history, architects were able to continuously fit into the traditions of the national culture, becoming its expression. Thanks to this attitude, traditional architecture was harmoniously connected with the influences of imported styles (Kim & Luchkova, 2018).

Janusz Niedziałkowski did a bit differently. He made a successful attempt to import architectural solutions from the local area, but as a result of the search for wide stylistic references, both from earlier and contemporary eras. This creator was aware of the existence of a wide inspirational potential for creating forms that could contain both avant-garde solutions and solutions well-established in tradition.

His work is the result of the necessary elements of the decision-making process: recognizing the scope of the available space for architectural activities, establishing the rules of linking to the existing layout in terms of construction, functionality, spatial and style, and looking for the possibility of introducing new compositional values. The reference to the immediate surroundings is a manifestation of respect for tradition and cultural identity.

The adopted mode of operation can therefore be an important transmitter for contemporary architects and, at the same time, a valuable teaching material for students of this discipline. It draws attention to the essence of the architectural context and allows the possibility of its influence on design decisions and gives an unambiguous answer to the question of whether both historical and contemporary interpretations can be used to create a form rooted in tradition, but having its own expression and unique, innovative character.

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Exploring usability tests to evaluate designers' interaction with mobile augmented reality application for conceptual architectural design

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Abstract

Architectural design could be defined as a process in which the information about various aspects of a design object is produced at different stages, then shared between relevant stakeholders. For the early stages of the architectural design, in order to carry out an efficient and productive design process, and create comprehensive solutions to design problems, novel digital tools have to be developed. Digital become omnipresent in the contemporary architectural practice. Even though very complex design ideas could not be realized without the help of the Computer-aided Design (CAD) tools, some may argue that the idea generation is hindered by the employment of them during the early phases. With the idea of containing the essence of analogue tools, we propose an Augmented Reality (AR) application for architects to explore 3D mass geometries in a similar immediacy and ease of designing with a pen-paper. In this paper, we present and discus the validity of two chosen usability scales System Usability Scale (SUS) and Handheld Augmented Reality Usability Scale (HARUS) measuring comprehensibility of the developed AR application (MimAR). The results of the preliminary study shows that the chosen measurement methods provide a similar tendency of scores. The findings of this study suggests that the comprehensibility of the MimAR application still needs improvement, and yet the usability of the application could be considered above the acceptable threshold.

Keywords
Architectural design, Mobile augmented reality, Usability tests.

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1. Introduction

Early phases of the architectural design process, also called the conceptual design phase, is the foundation of any building design. Even though, data generated during this phase is not more precise and comprehensive than the data required to manufacture / build the design artefact at the end, most of the major decisions are made in the early phase. Nowadays architectural design projects that are complicated and big in scale could be completed in a short time by several design teams collaboratively working together without being limited to space or time. This new type of workflow has become essential to be able to work in the architectural practice in the digital era. Apparently, using analogue architectural tools and methods have already been outweighed by the benefits of using Computer Aided Design (CAD) tools and methods in terms of data storage, simulation, precision, time, and effort. Thus, digital become omnipresent in the contemporary architectural practice giving designers new ways to think, collaborate, design, build and fabricate. Evidently, digital tools have continued to be an essential part of the design practice over the years, and their influence on both theory and practice is going to increase in the coming years. Naturally, being proficient in using at least one CAD tool as well as being familiar with additional rendering and image-video editing programs became a requirement for a new graduate.

As a continuing process, to harness the potential and fully benefit from the recent advancements of digital era, and enhance the architects' ability to develop artefacts, new digital modes of design need to be defined. Based on lessons learned from previous studies, there is a consensus on the inherent characteristics of the analogue design tools such as speed of articulation, ambiguity and familiarity that make them preferable in the conceptual design phase. Any proposed new tool for the conceptual phase should at least have a combination of those characteristics. With this motivation, the very promising and rapidly growing field of advanced digital technologies is investigated to propose a new digital design mode for enhancing, in a way "augmenting", common working environment of the conceptual designer, we named the proposed system as MimAR. MimAR is an Augmented Reality (AR) application where designers overlay the virtual design artefact on the site plan to study 3D mass geometry of a building in easy and fast manner. The development of the MimAR and the results of the pilot study with the participation of expert and novice designers are presented in this paper. In order to find a suitable method for evaluating the usability of the MimAR and gain the necessary insight into the various methods for assessing the computer/digital applications, the field of Human Computer Interaction (HCI) is reviewed.

The main contribution of the paper is to define and adapt a reliable evaluation method to be used in the development process of AR applications. The findings of this research can be used to measure the usability of a system and make necessary revisions to AR applications in order to increase their comprehensibility and efficiency.

2. Views on analogue vs digital tools and methods in design

Defining design activity as a problem-solving strategy and understanding the employment of different design environments and their impact both on designer's cognitive processes and on design artefact are well studied (Cross, 2011; Kalay, 2006; Simon, 1995; Simon, 1996). Design process described as the evolution of design ideas (Goel, 1995) and during the course of design process, several representation methods expressing the design idea as well as containing the information for building and manufacturing of the design artefacts are used (Akın & Weinel, 1982; Goldschmidt, 2004; Gül 2018).

The focused body of the work could be examined on the comparison between digital and analogue design media and tools. In terms of the types of design representation, almost every other design tool has something different to offer to its users, summarized as follows:

First, the advantages of using analogue design over digital design methods and tools in the conceptual design phase are stated by Gross & Do (1996); Aliakseyeu, Martens and Reuterberg

(2006). In the early phases of the architectural design process, expressing design ideas by using freehand sketches is the frequently preferred method for designers. Because using freehand sketches provide speed, flexibility, ambiguity, and instinctive interaction with them. Additionally, the use of those traditional design methods and tools allows designers to reflect in action (Schon, 2008) to make new connections, and re-interpret their design ideas, and finally formulate new solutions by fostering creative thinking with ambiguity (Goel, 1995; Goldschmidt, 1991; Suwa, Purcell, & Gero, 1998). Sachse, Leinert and Hacker's (2001) study on the effects of sketching on design problem solving shows that sketching improves the quality of design solutions, and reduces the overall time spent on design. Won (2001) studied cognitive visual thinking by comparing designers' behavior in conventional and digital media and reported that even though designers' cognitive behavior was much more complex while using computer media to generate concepts or ideas, they could generate more concepts while using conventional media than using computers. Although it was done in the context of graphical design, Stones and Cassidy's study (2007) also showed that the paper-based sketching was proved to be a more productive environment for the exploration of design solutions than the digital environment. Here, the immediacy, speed and ambiguity of the used tools become particularly vital to facilitate design thinking. Thus, we consider that the proposed systems for design activity should provide such speed, flexibility, and ease.

Second, several studies stated the advantages of simultaneously or sequentially using both design environments (Chen, 2007; Ibrahim & Rahimian, 2010; Shih, Sher, & Taylor, 2017). Even though, it was reported (Tang, Lee, & Gero, 2011) that using either environment would not make a difference in terms of cognitive activities of designers, Chen (2007) suggested that the employment of analogue and digital media and tools simultaneously could foster a more productive design environment in terms of creative thinking and cognitive activities, and improve the quality of the design in the conceptual design process. Ibrahim and Rahimian (2010) stated that the designers using both traditional sketching and CAD modelling tools produced significantly higher quality design solutions, and spent less time on formulating design solutions compared to the subjects using either the analogue or CAD modelling tools. Shih et al. (2017) also reported that both analogue and digital design media and tools play very similar roles in design process.

Lastly, several studies addressed and challenged the established notion of necessity, and the superiority of using analogue design media and tools in the early stages of the design process over the use of digital design media and tools (Boeykens, Santana Quintero, & Neuckermans, 2008; Reffat, 2007). During the design process, design ideas are represented in various scales. Using digital design media and tools in the design process make it possible for architects to work on a drawing in various scales without the need to reproduce the original drawing from the scratch. In addition, digital design tools make it possible to create clear and understandable design documentation by eliminating imperfections resulted by working with analogue tools such as inconsistent drawing quality, imprecise registration and low graphic quality (Mitchell & McCullough, 1995). Apart from the flexibility, detail and precision in the drafting process, many current digital tools such as Rhino and AutoCAD also provide spatial comprehensibility by fostering a suitable environment to evaluate design ideas from different viewpoints on the fly. Traditional architectural design methods and tools, albeit proven to be very effective in other facets of the design process throughout the time, are not considered as a suitable method to be used in the formation, evaluation and representation of complex forms (Lin, 2001). Studies show that students who were working with the Computer Aided Architectural Design (CAAD) tools had a better grasp of the quality of the internal spaces, on the contrary, students who were working with the analogue tools rarely explored their designs in 3D (Knight et al., 2005). Thus, thinking about CAD not only as a tool to produce technical drawings, but also as

the conceptual tool to develop new design ideas become very common (Salman, Laing, & Conniff, 2008). In the conceptual design phase, employing digital media and tools also improves designers' spatial cognition compared to using analogue media and tools (Rahimian & Ibrahim, 2011). In addition, some studies also shows that different digital design environments afford different types of ideation and design actions in relation to the tools in the environment (Gül, 2008, 2018).

Based on above review and considering continuing advancements on technology, clearly the debate on the use of tools and technology on architecture would exist in future. There would be a constant need for research projects, which confront the established tools and technology with developing new systems that incorporate the strength of analogue design tools. With this idea in mind, an AR application that can augment its users' ability to be able to create meaningful spatial layouts of 3D geometries as fast, easy, and intuitive as manipulating forms with the analogue tools is developed.

3. MimAR for conceptual architectural design

Augmented reality is an advanced information technology that first developed by Sutherland (1968) and coined as "Augmented Reality" for the first time by Caudell and Mizell (1992). Even though AR technologies had been studied since the early 70's, due to their reliance on technological advances in the hardware and software, the progress on the AR research has been slow and limited. The recent advances in the computer technologies have made it possible for the end user to afford very powerful mobile devices with internal sensors. Azuma (1997; 2001) explained AR as a technology that makes it possible for an artificial image to be generated in the real environment while allowing both embedding the artificial image into real environment and interacting with it at the same time. The interaction with the system can be through intangible gesture based (Ens et al., 2017; Funk, Kritzler, & Michahelles, 2017; Hürst & van Wezel, 2011) or with wearable display devices (Gruenefeld et al., 2017; Zimmer et al., 2017).

We argue that AR is beneficial to use in developing design support tools that could incorporate useful features of analogue design media and tools such as flexibility, speed, intuition, and ambiguity in design. In addition, in the early stages of the architectural design process, a fruitful design process in which designers define massing proposals and evaluate their spatial relationships could be performed by using the AR application (Gül, 2018). MimAR allows users to work on and evaluate virtual 3D geometries that could be superimposed in a real-world environment. The inherent ability of AR allows its users to be able to work with virtual objects within a physical environment providing a conceptual design environment where mostly 'massing studies took place' (Gül, 2017).

The main aim is to develop a user-friendly AR application for architects so that they could quickly learn how to operate the system and able to create mass design and evaluate it in the conceptual phase of architectural design through a mobile device. However, developing the MAR application with just architecture graduates in mind would mean excluding the tech friendly new generation of potential architects, a large group of people who are still in the process of completing their education. Therefore, it was decided to develop the MAR application for both novice and expert architects. Some of the basic operations of MimAR includes generating pre-defined 3D geometries, copying, deleting, moving, rotating, and scaling objects. Additionally, the MimAR makes it possible for its users to visually inspect the spatial layout and relationships of design mass in a fast, effective, and economical manner in a way that is motivating, fun and familiar for the users.

3.1. Graphical user interface, application components, and interaction modes of MimAR

A typical augmented reality system consists of four main components such as trackers, computational devices, display devices as outputs and lastly data input devices (Figure 1). Since it

Equation 2. HARUS Calculation

Contribution Score = CS
User Response = UR
Final Usability Score = FUS

CS (PositivelyStatedQuestions) = UR-1
CS (NegativelyStatedQuestions) = 7-UR
FUS = $((CS_1 + CS_2 + \ldots + CS_n) / 48) \times 100$

Figure 1. *Augmented reality system components (Adapted from (Wang, 2009)).*

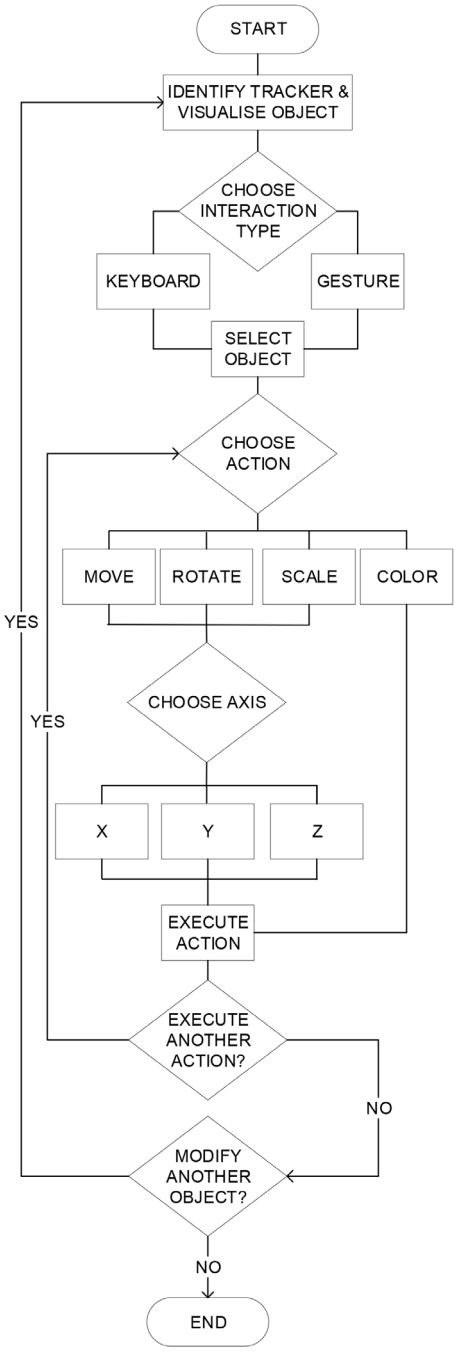


Figure 2. *Flowchart of the MimAR application.*

is developed for smart mobile devices, MimAR uses the computational, display and data input capabilities of the smart mobile devices, given that the device meets the minimum system requirements listed in the section 3.2. To be more precise, MimAR uses device's camera to identify and track virtual objects in the physical environment; the touch screen to display virtual objects and to input data via the application's Graphical User Interface (GUI). In addition, QR based trackers are used to keep the computational load low and give users a physical anchor related to the virtual objects.

The real world and the virtual objects can be seen through MimAR's interface on the smart mobile device's screen. To create geometries with MimAR, first, 4x4 cm QR trackers, which have the information required to visualize predefined 3D objects, such as the type, initial color, size, and orientation, must be scanned through the camera of the mobile device. Virtual objects that are introduced to the scene could be further manipulated after users choose an interaction type. Users could choose either the virtual keyboard or touch screen gestures to use the application. After the interaction type is chosen, the sub-menu box that houses manipulation commands such as rotate, move, and scale, becomes visible. A relevant axis that the manipulation would be implemented on should also be selected after users select a manipulation command. When users are satisfied with the results of the manipulation a new action could be implemented on the selected object or users could select another object to manipulate (Figure 2).

The application "MimAR" provides its users the ability to visualize their massing proposals in different visual viewpoints as well. Additionally, it allows users to inspect and evaluate their massing proposals in the real world with its familiar and intuitive interaction methods and interface. MimAR's GUI is designed to be visually as clear as possible in order to minimize the possible confusion and frustration that the users might feel while using the application. MimAR's GUI basically consists of an always-visible main menu ribbon

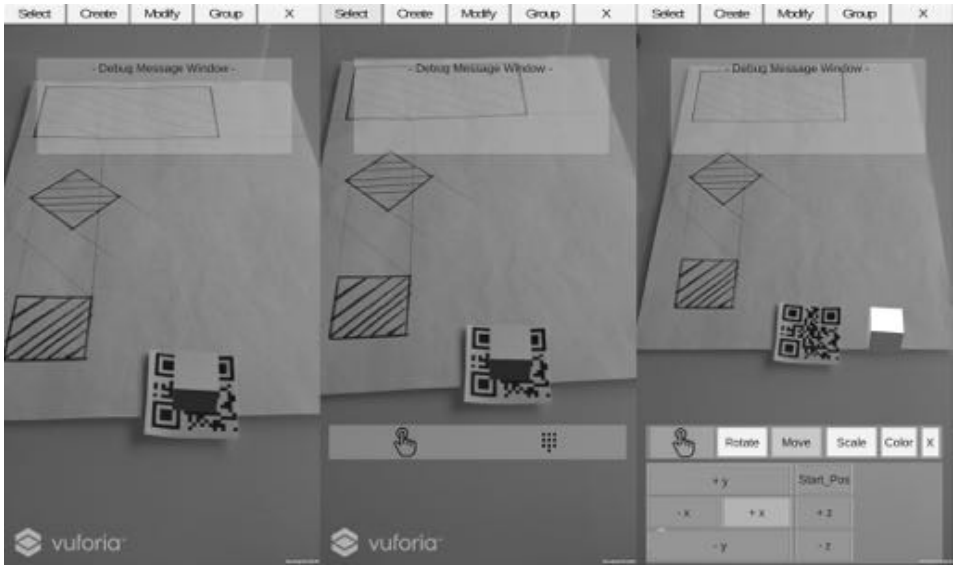


Figure 3. *Graphical user interface of the MimAR application.*

and a sub-menu box that only becomes visible when needed. Commands such as select, create, modify, group and exit could be found on the main menu ribbon located at the top of the screen (Figure 3). The sub-menu box, which is invisible in its inactive state, is located at the bottom of the screen. After users introduce a virtual object to the system and select it, the sub-menu box, in which commands that are related to the selected object such as interaction type, rotation, scale, and move could be found, becomes visible.

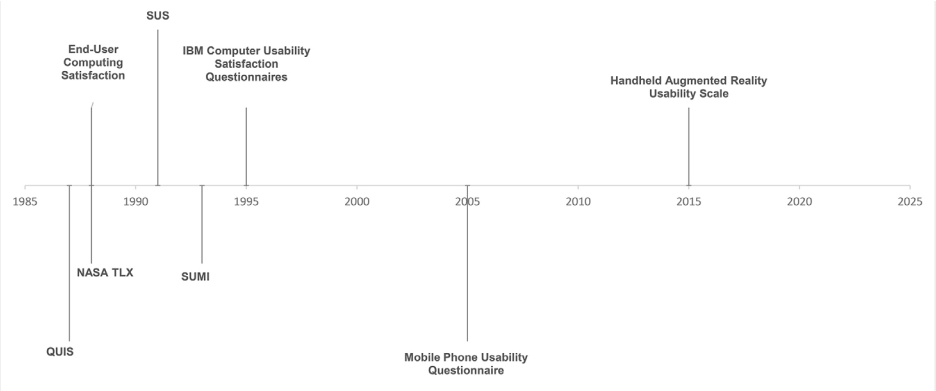
3.2. Hardware and software features of the application

"MimAR" was developed for smart mobile devices, which are known to be user friendly and economically reachable. The system requires a minimum Android 4.0 operating system with a functional back camera. During the usability studies, a smart mobile device that has a screen resolution of 1080x1920 pixels, 5.0' touch screen, a back camera with the resolution of 13.1 Megapixels, with Android 5.1.1 operating system was used. The AR application was developed by using the 2017.3.0f3 build of the Unity Game Engine with Vuforia add-on, which is widely used in the industry to develop 2D and 3D games and simulations. In addition, Visual Studio 2015 Community Edition and C# programming language was used to implement some of the behavioral features to GUI components and virtual objects.

4. The concept of usability and usability studies

The broader concept of usability is developed within the field of Human Computer Interaction. In order to evaluate systems, usability tests are generally implemented to applications to decide whether they meet certain requirements such as ease of use, user satisfaction, not having distracting components, keeping the users' motivation and performance at a certain level. Participants of the usability tests are expected to evaluate the system according to user experience and the results are usually collected via interviews or questionnaires. However, thorough observation of the participants' actions and experience during the tests could also yield supplementary data for the researchers. The results of the usability tests and the insight gained from these experiments are used to make the necessary revisions to the developed systems. To find out a reliable method to evaluate the usability of the MimAR application, several tests are utilized with the participation of users with different levels of expertise.

A detailed literature review into the field of human computer interaction shows that several evaluation methods were developed in various research projects over the years (Figure 4) such as Questionnaire for User Interface Satisfaction (Chin, Diehl, & Norman, 1988), Software Usability Measurement Inventory (Kirakowski & Corbett, 1993), System Usability Scale (Brooke,



Year	Researchers	Name of the Scale	Num. of Questions	Categories	Scale	Focus of Evaluation
1987	Chin, Diehl, Norman	Questionnaire for User Interface Satisfaction	27	5	Likert (10)	Software
1988	Doll & Torkzadeh	End-User Computing Satisfaction	12	5	Likert (5)	Software
1988	Hart & Staveland	NASA Task Load Index	6	6	Bipolar	Hardware & Software
1991	J. Brooke	System Usability Scale	10	-	Likert (5)	Software
1991	Lewis	After Scenario Questionnaire (IBM - ASQ)	3	3	Likert (7)	Software
1992	Lewis	Post Study System Usability Qestionnaire (IBM - PSSUQ)	19	4	Likert (7)	Software
1992	Lewis	The Computer System Usability Questionnire (IBM - CSUQ)	19	4	Likert (7)	Software
1993	Kirakowski	The Software Usability Measurement Inventory	50	-	Mult. Choice	Software
2005	Ryu & Smith-Jackson	Mobile Phone Usability Questionnaire	72	6	Likert (7)	Hardware
2015	Santos, Polvi & Taketomi	Handheld Augmented Reality Usability Scale	16	2	Likert (7)	Hardware & Software

Figure 4. *Timeline of usability studies.*

1996), Mobile Phone Usability Questionnaire (Ryu & Smith-Jackson, 2006), Handheld Augmented Reality Usability Scale (Santos et al., 2015; Santos et al., 2014). These evaluation methods differ from each other by several aspects. First of all, most of the evaluation methods have different number of questions ranging from 72 (Mobile Phone Usability Questionnaire (Ryu & Smith-Jackson, 2006)) to 3 (IBM's After Scenario Questionnaire (Lewis, 1995)). Second of all, apart from SUS (System Usability Scale) (1996) and The Software Usability Measurement Inventory (Kirakowski & Corbett, 1993) questionnaires, all of these questionnaires have explicitly defined categories such as; content; accuracy; ease of learning/use/task completion; efficiency; system capability etc. In addition, most of the early methods were specifically developed to evaluate only the software without any consideration given to capabilities of the hardware these systems operate on. Because around 1990's when most of these methods were first developed, the hardware that these systems operated on were cumbersome and had similar processing capacity. Users of those systems had limited options in terms of input, output, and display devices. For example, technological capabilities of the past made it possible for users to interact with only mouse or keyboards as input methods and use stationary computing and display devices.

Aforementioned methods are investigated in order to make an informed decision about choosing the right evaluation method to test MimAR and then, SUS and Handheld Augmented Reality Usability Scales (HARUS) are decided to be used within the scope of this research.

4.1. SUS and HARUS questionnaires: The why and the how?

The main goal for using these two methods to evaluate the usability of the Mobile Augmented Reality (MAR) application is to ensure the reliability and validity of the application's usability. In addition, comparing the overall results of the usability scores of the same application according to two different usability evaluation methods and reporting the differences (if any) would provide useful insight regarding usability evaluation methods for future research projects. For example, an application might get acceptable usability scores when it was tested with an evaluation method that has a generalized approach to usability. However, that result alone should not be considered as the absolute usability score of that application. As mentioned at the beginning of this section, usability depends on various aspects. Therefore, evaluating the application by using more than one method, and using methods that were able to isolate and evaluate various aspects of the application would

Table 1. *Sample questions from the SUS and HARUS questionnaires.*

System Usability Scale - Sample Questions	Handheld Augmented Reality Usability Scale - Sample Questions
• I found the various functions in this system were well integrated. • I think that I would need the support of a technical person to be able to use this system • I needed to learn a lot of things before I could get going with this system. • I feel very confident using the system.	Comprehensibility Scale Sample Questions • I think that interacting with this application requires a lot of mental effort. • I thought that the information displayed on the screen was confusing. Manipulability Scale Sample Questions • I found it easy to input information through the application. • I think the operation of this application is simple and uncomplicated.

be beneficial in getting a better idea about the usability of the application. Moreover, being able to identify which aspects of the application needs further improvement would be invaluable in the development process.

One of the methods that was chosen to be used in the evaluation of the application, SUS questionnaire, was formulated in the mid 90's. Other than being the one of the earlier evaluation methods, SUS differs from the other evaluation methods by its scope and ease of application. On the other hand, HARUS questionnaire was developed specifically for evaluating mobile augmented reality applications and, has sub-scales for evaluating the comprehensibility and manipulability of the applications. Getting similar results from both questionnaires would indicate that the SUS, even though it was originally designed to evaluate software that was much more basic compared to HARUS questionnaire, could be used as an indicator of usability in research projects when time is an issue. Furthermore, utilizing an evaluation method such as HARUS, which offers valuable insight into different facets of the application i.e., comprehensibility and usability of the system, would made identifying problems easier.

The data gathered from the results of the usability studies is planned to be used in the future development cycles of the application to pinpoint the necessary areas that needs to be revised according to the user's feedback. The cyclical approach, where user's feedback is integrated, is expected to be resulted in defining novel ways to the development of the AR based design tools. Sample questions from both HARUS and SUS questionnaires are shown in Table1.

Based on the recorded responses of the participants to the SUS and HARUS questionnaires, the usability scores of the application "MimAR" were calculated as instructed in the related studies (Brooke, 1996; Santos et al., 2015). An application's usability score according to SUS questionnaire was calculated by first finding the contribution value of every item on the questionnaire. The contribution value of an item was found by subtracting 1 from the scale value of an item when the item was the odd number in the questionnaire i.e., 1, 3, or 5. When the item has an even number, i.e., 2, 4 or 6, the contribution value of that number was found by subtracting the scale value of that item from 5. The final value of usability was found by multiplying the sum of contribution values by 2.5 (see Equation 1).

MimAR's usability score according to HARUS questionnaire was calculated in a similar way. For positively stated questions, contribution score for the question was found by subtracting 1 from user response. For the negatively stated questions the contribution score for the question was found by subtracting the user response from 7. The overall HARUS score was calculated by dividing the sum of final scores from every question to the highest possible score of 48 and multiplying the result by 100 (see Equation 2).

The results of usability questionnaires could be used as a source to measure the overall usability of a system. Keeping in mind that the overall scores should not be taken as a definite sign of perfect user experience, an application's SUS score should be between 0 to 100

Contribution Score = CS
Scale Value = SV
Final Usability Score = FUS

CS (OddNumbers) = SV-1
CS (EvenNumbers) = 5-SV
$FUS = (CS_1 + CS_2 + \ldots + CS_n) \times 2.5$

Equation 1. *SUS Calculation.*

Contribution Score = CS
User Response = UR
Final Usability Score = FUS

CS (PositivelyStatedQuestions) = UR-1
CS (NegativelyStatedQuestions) = 7-UR
FUS = ((CS_1 + CS_2+…+CS_n) / 48) x 100

Equation 2. *HARUS Calculation.*

points. Brooke (2013) also suggested that these results should not be interpreted as percentages just because SUS uses a margin between 0 and 100 points. SUS scores could be interpreted according to acceptability ranges (Bangor, Kortum, & Miller, 2008), grading scales (Lewis & Sauro, 2018) or adjective ratings (Bangor, Kortum, & Miller, 2009). Three classification types in acceptability ranges could be explained as unacceptable (below 50 points), marginally acceptable, which consists of a low (from 50 to 63 points) and a high end (from 63 to 70 points), and acceptable (from 70 points and above). SUS scores could also be interpreted by using grade scales. After analyzing data from 241 industrial usability studies, Lewis and Sauro (2018) created a curved grading score that has 11 grades in which a SUS score of 68 is at the center of the range. A SUS score of 68 points seems critical because it is also close to the threshold where an application stops being considered as marginally acceptable and becomes acceptable. Furthermore, SUS scores between 80 to 90 points could be considered as an above average (better than acceptable) while scores above 90 points are considered as the best. Therefore, even though an application with a SUS score between 50 to 70 points could be considered as marginally acceptable, that means the application still needs further improvement.

4.2. Setup of the experiment

The convenience sampling (Creswell, 2012) method was used as the sampling method for the usability studies that includes expert and novice designers (N:5). Having small number of participants are common in user studies to run preliminary tests in the early stage of product development (Nielsen, 2012; Nielsen & Landauer, 1993). The usability study was designed as having two groups of participants that differ from each other in terms of their experience to maintain the credibility of the study. Conducting the study with only expert designers would have resulted in getting high (biased) usability scores because of participants' experience and familiarity with CAD programs and concepts. Having both novice and expert designers in the study would made it possible to determine if the expert designers' expertise in design give them an advantage over novice designers in terms of handling of the application. Additionally, it would also be possible to identify any usability problems that users with different experience levels could encounter.

In the beginning of the experiment, participants were given training about how to operate the AR application based on its two distinct interaction modes: the first one is virtual buttons and the second one is the gestures performed on touch screen. Later, they were asked to design the mass of a building. Once the task completed, participants were asked to answer both HARUS and SUS questionnaires to evaluate the system in order to ensure the validity and reliability of these usability tests and to be able to compare them in the future for any inconsistency (Table 1). Additionally, the duration of the tasks completion times, error rates and the number of task resets were also noted and recorded with the audiovisual devices to obtain the quantitative data during the tests.

The first part of the usability study consisted of several modelling tasks such as, manipulating the virtual object by implementing translation, scale, and transformation operations. The modelling tasks could be classified from the easiest to hardest, such as translation, scale, and transformation operations. Later, available interaction modes and selection operations have been practiced to try out the different features of the application. There was no time limitation set during the experiment, and the participant was allowed to start, stop, resume, or finish the tasks at any given time. After this introduction, the design brief was given to the participants who were reminded the focus of the study, that is the interaction with the application's interface and not their ability to design or the quality of their proposed design

solution. The participants of the study were given site plan and brief and asked to develop massing design solutions for a mix-use communal space that would be situated in an area surrounded by artificial lakes and dense foliage, single-family houses and a house complex consisting of row houses. The communal space was expected to have a restaurant, which has closed and semi-open spaces, multi-purpose studios and a gallery space that would be used for exhibitions.

Experiments were conducted in a confined space that has optimal artificial lighting. Participants used a desk as a workspace and other necessary equipment such as the site plan, the brief, QR trackers, drawing paper, rulers, and pens/pencils. Researcher was present at all times as an observer in every session, and each session was recorded with an audio-visual recording device for future reference. The setup of the experiment can be seen in Figure 5.

4.3. Experiment with an expert architect

The expert participant has a PhD degree in architecture, considerable experience with the smart mobile devices, knowledge in information technology concepts and CAD tools. The expert was asked to complete the design tasks by using both interaction methods, respectively: interacting with the virtual objects by using virtual buttons as a data input mode and interacting with the virtual objects by using touch screen gestures (Figure 6). Then, the expert architect completed the HARUS and SUS questionnaires.

The result of the SUS questionnaire with the expert user shows that the interaction mode with the virtual buttons (87.5) was scored higher than the interaction mode with the touch screen gestures (40). When the application was evaluated using the HARUS, a similar tendency in results was also recorded: the interaction mode with the virtual buttons (85.41) was scored higher than the interaction mode with the touch screen gestures (68.74) (as shown in Figure 7). The supplementary data that was collected during the experiment also showed that the expert's satisfaction declined drastically when the gesture-based interaction mode was used. The reason for the expert's dissatisfaction could be due to the several object selection problems that the expert designer encountered in touch-screen gesture mode which increased the expert's task completion time.

MimAR was rated with high scores

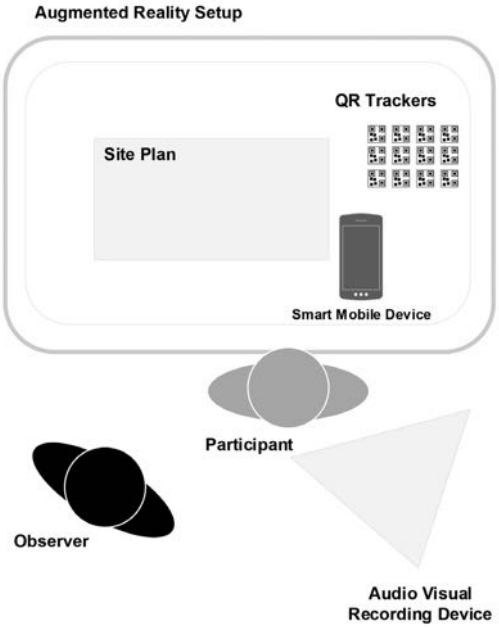


Figure 5. *Setup of the experiment.*

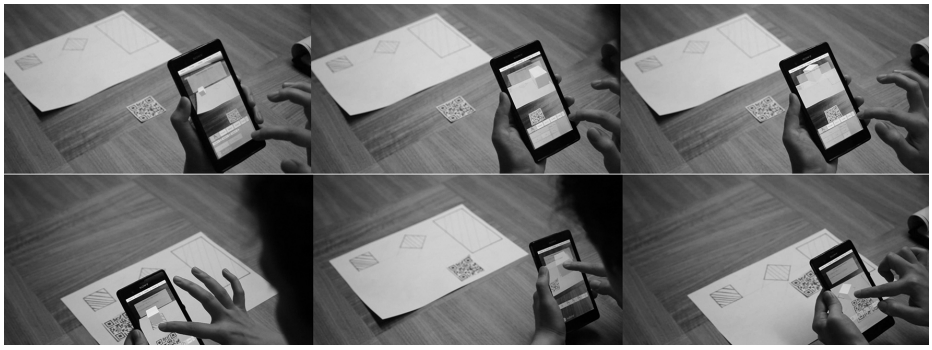
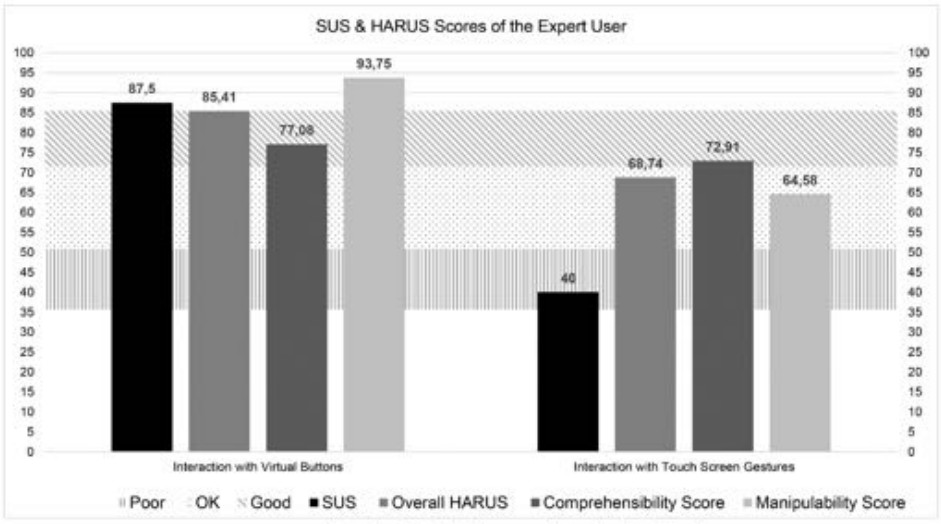


Figure 6. *Still images from the usability study conducted with the expert user.*



	Interaction with the Virtual Buttons	Interaction with the Touch Screen Gestures
SUS Score	87,5	40
Overall HARUS Score	85,41	68,74
Comprehensibility Score	77,08	72,91
Manipulability Score	93,75	64,58

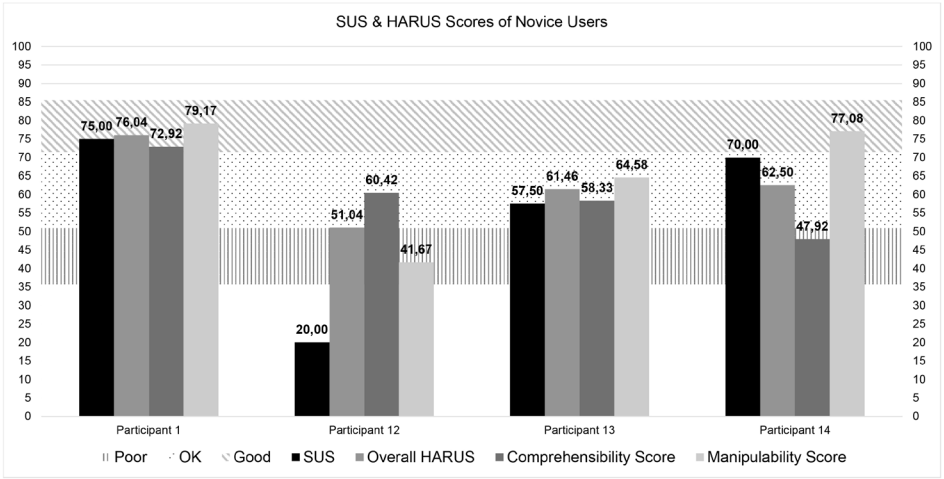
Figure 7. *SUS and HARUS scores of the expert user.*

Figure 8. *Still images from the usability study conducted with the novice users.*

on both HARUS (85.41) and the SUS (87.5) questionnaires while the virtual buttons were used as an interaction mode. The application was evaluated with more than one evaluation method in order to increase the reliability of the chosen methods by comparing those results. As the application was rated with such high scores when either of the evaluation methods was used, MimAR could be considered better than acceptable in terms of usability.

4.4. Experiment with novice architectural design students

The second usability study was carried out with the participation of the four first year architecture students at the X University, Department of Architecture. The participants, in this case consisted of novice designers, were asked to develop design alternatives to a massing design problem using the AR application. Similar to the expert study, with the completion of



Participant Nr.	SUS	Overall HARUS	Comprehensibility Score	Manipulability Score
1	75,00	76,04	72,92	79,17
12	20,00	51,04	60,42	41,67
13	57,50	61,46	58,33	64,58
14	70,00	62,50	47,92	77,08
Score Means	55,63	62,76	59,90	65,63

Figure 9. *SUS and HARUS scores of novice users.*

each design session, the participants were expected to evaluate the perceived usability of the application, as shown in Figure 8.

The result of the second user study showed that mean HARUS score was 62.8 points, and the mean SUS score was 55.6 points (Figure 9). Based on HARUS scores the results show that the mean score of the usability of the application was higher than the mean score of the comprehensibility of the application. Some of the participants reported when they first started to use the application it felt a little overwhelming to use it. They mentioned that it was because of the pressure they feel about using the application successfully. However, they concluded that the feeling dissipates after a couple of minutes of using the application. In addition, one participant reported heating and battery life problems about the hardware at the end of a session. Nevertheless, it was expected to encounter some hardware related heating problems after back-to-back experiment sessions. In order to increase the understandability of the application and to cater the needs of the novice students, several upgrades were planned for the next iteration of the application.

5. Discussion and the conclusion

In this paper, the results of an experiment that was conducted to investigate the usability of an AR application, which was developed as a part of an ongoing PhD study at the X University, is presented. SUS, the older nevertheless a faster method to evaluate usability, and HARUS, relatively recent and more device-oriented method, were chosen as the usability evaluation methods.

Bai et al. (2013) and Hurst and Van Wezel (2013) mentioned the fun factor that the participants experienced while exploring the geometry with gesture based interaction modes. This might be the reason why the current research into the interaction modes in AR applications are shifting towards interactions made with gestures. However, the usability study with the expert participant demonstrates that a more precise mode of interaction is still preferred for completing certain tasks efficiently in the AR environment.

For the intents and purposes of this study, the advantages of using gesture-based interaction do not outweigh the disadvantages such as the requirement of high computing power, high power consumption (Hegde et al., 2016), high monetary and time cost of respectively device and development. The results of the usability study with the expert user show that the usability of the application is rated with high scores in both SUS and HARUS questionnaires while the expert user is using the virtual keypad. According to the results of the HARUS questionnaire, while the comprehensibility of the system is scored

similarly with both interaction modes, the usability score of the application is scored considerably lower when the touch screen gestures are used as an interaction mode. In addition, the supplementary data suggest that the expert user's usability ratings and satisfaction with the application decrease as the task completion time is increased while using gesture-based interaction mode.

Despite the gesture-based AR interfaces' rising popularity, an interaction mode that utilizes device's touch screen still seems like the better choice for an effective MAR application for design purposes. Moreover, it is evident in the usability study with the expert user that the gesture-based interaction mode has low accuracy (Hürst & Van Wezel, 2013) and does not provide the precision that the users need in a design activity as Gül (2018) also suggested. The results of the usability study also supports Henrysson et al.'s findings (2007) as the application has acceptable usability scores when evaluated with both SUS and HARUS methods while an expert is using the application with the virtual keypad as an interaction method.

The usability study conducted with the novice users resulted in confirming two points: the first one regarding the reliability and the validity of the chosen evaluation methods, and the second one regarding the possible differences between expert and novice users. Both novice and expert usability studies showed the application was scored with similar scores regardless of the evaluation method. Therefore, it can be said that the chosen evaluation methods are proved to be consistent and could be safely used to evaluate the usability of an AR application.

As mentioned before in the previous sections, potential users of the MimAR are identified as architects. Therefore, conducting this experiment with architects who have certain expertise would have been a valid choice. However, this choice would have been resulted in excluding novice users (architecture students), who could have benefitted from this study as much as the expert users. In addition, it was assumed that the expert users' experience with digital media and CAD tools and their knowledge regarding some of the concepts and terms used in the development of the MAR application might give them an advantage in using the application over novice users. Furthermore, expert users could have found the application familiar and easy to use and evaluated the application's usability accordingly. Thus, results of the study might have been biased. Therefore, it was decided to conduct the experiment with participants who have different levels of experience to increase the credibility of the study and underline the possible differences between users by comparing expert and novice users' evaluations regarding the MAR application's usability.

According to Dünser and Billinghurst (2011) knowing the potential users, their expectations and understanding of a system is one of the key factors in developing and evaluating a system as smooth as possible. Because the differences between users' characteristics are directly related to the various ways they interact with those systems (Preece, Rogers, & Sharp, 2015). Even though identifying MimAR's potential users and their unique traits significantly helped in development process, developing a MAR application for more than one group of users with different characteristics such as varying levels of experience presented its own challenges. First of all, developing MimAR in a way that even users that have limited exposure to digital media and other 3D drawing and modelling tools could easily use, was a laborious undertaking. Secondly, because MimAR's user base consists of architects with varying experience degrees, these users' understanding of the MAR application and the way they interact with it also varies. Therefore, in order to cater to the needs of every user and be able to provide an acceptable user experience across the board, even though it took more time in the development phase, MimAR is developed by considering both novice and expert users' expectations.

The results of the usability study underline the difference between the novice and expert users' evaluations of the same system. The results of the comprehensibility sub-scale of the HARUS questionnaire shows that the novice users rated the application's comprehensibility considerably lower than the

expert user. That means novice users are not adequately familiar with some of the concepts and terms used in MimAR as much as expert users.

It was assumed that conducting the study with only expert users might lead to biased results. The comparison of the results of expert and novice users showed that expert's HARUS (85,4 points) and SUS scores (87,5 points) are indeed much higher than the mean HARUS (62,7 points) and SUS (55,6 points) scores of novice users. Moreover, novice users' mean comprehensibility score (59,9 points) clearly demonstrates that understanding the application had more effect on the overall usability score of MimAR than being able to use it. Based on these results, it was demonstrated that experts' experience and familiarity give them an advantage in using the application over novice users. In addition, the results show that if the experiment were conducted with just expert users, the results of the usability study would have been much higher. Furthermore, it would not be possible to report that the novice users might encounter more problems than the experts and issues related to the comprehensibility of the application were needed to be addressed. These results also supports that the users' satisfaction with the AR applications are depended on the users' knowledge as Xue Sharma and Wild (2019) suggested. While the expert user's familiarity with the computer aided design tools and the IT concepts might have a role in this result, other variables that might affect this outcome should be further investigated within a larger population of expert users. Apart from one participant's scores and the comprehensibility problems, the results of the usability study conducted with the novice users showed that the usability of the application is scored close to the acceptable threshold of 68 points. In conclusion, the results of the novice study showed although the novice users enjoyed the overall experience, the comprehensibility of the application is needed to be increased for novice users to effectively use the application.

The results of the study showed that even though the usability of the application could be considered above the acceptable threshold, revising some aspects of the application could increase the overall comprehensibility of the application. Revising the graphical user interface in terms of readability and integrating a more understandable user feedback module that could provide clear on-screen text messages, were identified as the most useful improvements that could increase the usability of the application. We believe that the conclusions drawn from the results of this study would be beneficial for researchers working on the development of the MAR applications for design activities. Especially getting insight regarding reliable evaluation methods for an application based on empirical data and user feedback might prove invaluable in the development cycle of these kind of MAR applications.

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