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Article

Theoretical and practical issues regarding relocation of monuments – The case of Arslanagić Bridge in Trebinje

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ABSTRACT

The treatment of relocation is always questionable not only because of the theoretical background and methods used but also because it is a force majeure intervention. Considered inappropriate by heritage professionals since the primary task of monument conservation is *in situ* prevention, there is a need for a better understanding of what relocation means, when it is allowed, how it should be done, and the criteria to determine how and which monuments qualify to be preserved. This paper reviews the aspects of material and structural authenticity when relocating Arslanagić Bridge, the connection with the historical context, and existing charters and terminology. In addition, it aims to contribute to a broader theoretical understanding of relocation. Two types of damage are inflicted on the monument during the relocation; one is that the monument is extracted from the environment in which it originated, and the historical continuity is broken, and the other is from the method of relocation. In the case of the bridge, maintaining a physical appearance becomes more important than material authenticity. During reassembly, the internal cohesiveness was violently disturbed, damaging the integrity of the infill at the structural level by introducing concrete. At the new location, it is articulating as a new element, a new historical layer in a new environmental context.

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INTRODUCTION

The salvage process of the Arslanagić Bridge[1] lasted from 1959 to 1972.[2] It was an important monument preservation event in the early days of integrated monument protection in the Socialist Federal Republic of Yugoslavia (SFRY).[3] The possibility of imminent damage to the Arslanagić Bridge due to the development of a large reservoir on the Trebišnjica River with the construction of the Gorica dam west of Trebinje[4] was highlighted in 1958 (Defterdarević, 1969).

The Institute for Protection of Cultural Monuments of Bosnia and Herzegovina created a special commission[5] of the most eminent preservation professionals from the SFRY to form opinions on protective measures for the endangered built heritage elements[6] in this area. During prolonged debates from 1960 to 1964, several alternative schemes were proposed to save the Arslanagić Bridge, even considering leaving the bridge underwater. Overall,

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the Arslanagić Bridge is said to be of "exceptional cultural-historical and artistic value," as such "one of the most important monuments of profane architecture," that "its significance crosses the borders of our country," and that its sinking would mean an "irreparable loss for the cultural history of our cities, the mutilation of our cultural heritage, and especially the cultural heritage of this region" (Defterdarević, 1969, p. 64).

Since the bridge could not be a physical or aesthetic continuation in the original environment with the newly imposed conditions – the construction of the hydroelectric power station at Trebišnjica River – technical and political mediation was needed to determine the salvage scheme and its relocation. The formal announcement for the relocation of the bridge was only made in mid-1964. The dismantling and transfer of the accumulated material (first phase) were carried out in the second half of 1966, while the entire reconstruction process (second phase) lasted from 1970 to 1972 (Gojković, 1978).

To contribute to a broader theoretical understanding of relocation as a monumental intervention, it is necessary to analyze the ethical and professional problems that arise during the process, share research findings, and provide data for future relocation.

This study aims to evaluate how the significance of Arslanagić Bridge was reinterpreted and presented in a new context through reconstruction, looking at the material and structural authenticity and the connection with the historical context. Within these criteria, we tried to answer important questions. Does the original form and appearance of the monument become more significant than material authenticity in the reassembly process? With its placement in a new environment, how is the relocated monument viewed as a new element and a new historical layer? In this context, the paper evaluates the concept of relocation and its place in conservation; the process of removing and rebuilding the Arslanagić Bridge and its results are then considered.

KEY ASSUMPTIONS OF RELOCATION

Dismantling and rebuilding a historic building are "a practice which may be justified to safeguard a monument, particularly one of paramount importance if protection cannot be achieved by other means" (Bold, 2018, p. 21). In the definition of relocation, the term "dismantling" refers to a vigorous or forceful disassembling of a structure, while monument interventions such as restoration or reconstruction refer to "destruction." Although relocation and reconstruction both entail "rebuilding," the way they are practiced should differ because they are not used in the same way. In general, the term "rebuilding" does not include the need to approximate the appearance of the lost original (Petzet, 1999). On the other hand, the term "rebuilding" in reconstruction is broader and refers to re-establishing a lost original building destroyed by accident or natural disaster based on pictorial, written or material evidence.[7] Both cases are about *in situ* rebuilding. The point is that relocation is usually marked as an "emergency solution" only. It deals with the "rebuilding" of the original visual exposure and appearance of the structure in a new environment, rebuilding based on technical drawings, photographs and photogrammetry, and a numbering scheme made before the dismantling. In relocation, "distance is at the heart of another strategy for heritage preservation" (Wong, 2017, p. 231) and by combining the prefix "re" with the word "location," an aspect of a building's new location is indicated and its reintroduction into a new setting (Table 1).

The manner of rebuilding in the relocation process is very close to reconstruction; therefore, we can say that "relocation is also reconstruction." It is important to note that "although in the conservation of ruins, the professional side is evidently stronger than the social one, in the rebuilding of demolished monuments, the social or political side will become conspicuous" (Toshikj and Zsembery, 2019, p.366); the same approach is also evident in the case of relocation. Professional criteria supported by research results have more objective verdicts than political or economic criteria, which attach subjective verdicts and are usually conclusive. Regardless of the professional's decision or even resistance, political or economic criteria always intervene without compromise and directly toward the achievement primarily because of the economic benefits. Therefore, relocation and reconstruction have the same background because the same ethical and professional problems arise in the processes. Due to building typology and morphology when considering relocation, Petzet (2004) argues, "the crucial requirement for a relocation is that the historic building can in fact be moved, that is, that the original fabric (or at least the majority of the most essential components) can be relocated" (p. 22) and that should be the main guideline.

Table 1. Comparison of terminology

		Rebuilding	
REbuilding	(accidental) destruction and rebuilding	It does not include the need to approximate the appearance of the lost original	*in situ*
RElocation	(forceful) dismantling and rebuilding	Includes the necessity of the original appearance based on pictorial, written or material evidence	*ex situ*
REconstruction	(accidental) destruction and rebuilding		*in situ*

RELOCATION IN CHARTERS AND OTHER GUIDING DOCUMENTS

During the 1960s, the Abu Simbel complex in southern Egypt was salvaged by cutting the temple into pieces and moving it higher up the Nile; for UNESCO's cultural offices, the project offered an opportunity to codify new international conservation criteria (Allais, 2013). The term "move" was supported by the primary document formulating recommendations, the Venice Charter (1964), Article 7 of which mandates, "A monument is inseparable from the history to which it bears witness and from the setting in which it occurs. The moving of all or part of a monument cannot be allowed." Article 7 further states, "except where the safeguarding of that monument demands it or where it is justified by the national or international interest of paramount importance" (International Charter For The Conservation And Restoration Of Monuments And Sites, 1964, art. 7) promoting an inclusive approach, although it does not focus on the actual process of relocating monuments. An important piece of evidence before the Venice Charter is The Athens Charter for the Restoration of Historic Monuments of 1931, which does not recognize the relocation of monuments, only the term "removal" in relation to the conservation of monumental sculpture, "the removal of the works of art from the surroundings for which they were design is, in principle, to be discouraged" (V. The Deterioration Of Ancient Monuments). This suggests that both of the recommendations mentioned above do not refer directly to "relocation," but rather by emphasizing the importance of the environment and placement of the monument or sculpture, and using the term "moving/removal" with questionable disapproval.

The terminology used for such an intervention is evidently different among Yugoslav protection professionals. For example, various authors refer to "rescue and reconstruction," "transfer," or "relocation" in their publications about the salvage of the Arslanagić Bridge. However, in the salvage of the Žepa River Bridge, which was carried out at approximately the same time and with the same methods as previously mentioned, Tahirović (1988) uses the term "removal." This suggests that professionals follow a different theoretical line regarding this type of intervention. This is a complex understanding of the Yugoslav expertise on the success of the salvage of Abu Simbel[8] in relation to the decision[9] to relocate the Arslanagić Bridge, which simultaneously initiates a suppression of the ethical/moral and scientific discourse. However, it should be emphasized that "The Abu Simbel temples were technically salvaged *in situ* (i.e., they were not, conceptually, relocated); they were fundamentally transformed by their movement" (Allais, 2013, pp. 13-14).

Later interpretations of conservations from around the world reflect a similar approach to the Venice Charter. The UNESCO "Recommendations concerning the Preservation of Cultural Property Endangered by Public or Private Works" (1968) indicate the consequences of operations to salvage or protect cultural properties from social and economic development, among other things, "(e) the construction of dams for irrigation, hydroelectric power of flood control." Priority is given to "measures required for preservation *in situ* of cultural property" in order to preserve "historical associations and continuity," not excluding the transfer of cultural property, to save and protect it from damage and destruction in "site or in a setting which resembles their former position and natural, historical, or artistic associations" (II General principles).

UNESCO's 1972 recommendation is for cultural and natural heritage threatened by unusually serious dangers. It aims at "preserving its traditional appearance, and protecting it from any new construction or remodeling, which might impair the relations of mass or color between it and its surroundings or even dissociating from its environment." Furthermore, should it be taken as a "homogeneous whole […] with a passage of time, acquired a cultural or natural value." As a protective measure, the harmony established by time and man between the monument and what surrounds it is emphasized, which is of the greatest importance, and consequently, its disturbance or destruction is prohibited. As a rule, "the isolation of a monument by demolishing its surroundings should not, […] be authorized; nor should the moving of the monument be contemplated save as an exceptional means of dealing with a problem, justified by a pressing consideration" (Recommendation concerning the Protection, at National Level, of the Cultural and Natural Heritage, 1972, V Protective measures) is highlighted.

The removal of any protected heritage, in whole or in part, is prohibited by the Council of Europe's Convention for the Protection of the Architectural Heritage of Europe (1985) with an exception "where the material safeguarding of such a monument makes removal imperative," (Article 5, Statutory protection procedures) provided that the competent authority takes the necessary precautions for its dismantling, transfer and return to the appropriate location.

The Australia ICOMOS Burra Charter, 2013[10] clearly states the importance of the physical location of a place of cultural significance in Article 9.1, provided that the "building, work or other component of a place should remain in its historical location. Relocation is generally unacceptable unless this is the sole practical means of ensuring its survival" (Burra Charter, 2013). In addition, visual settings and other relationships, such as historical connection, may contribute to the interpretation, appreciation, enjoyment or experience of that place, so that "new construction,

demolition, intrusions, or other changes, which would adversely affect the setting or relationships are not appropriate" (Article 1.2).

A slightly different approach is noticeable in the ICOMOS "Principles for the Analysis, Conservation and Structural Restoration of Architectural Heritage" (2003), highlighting the aspect of integrity in the following: "The value of architectural heritage is not only in its appearance but also in the integrity of all its components as a unique product of the specific building technology of its time. In particular, the removal of the inner structures maintaining only the façades does not fit the conservation criteria" (Article 1.3).

In terms of relocation, the ICOMOS New Zealand Charter (2010)[11] provides that a structure of cultural heritage value should remain in its original location because "the ongoing association of a structure or feature of cultural heritage value with its location, site, curtilage and setting is essential to its authenticity and integrity." Furthermore, the "relocation of a structure or feature of cultural heritage value, where its removal is required to clear its site for a different purpose or construction, or where its removal is required to enable its use on a different site, is not a desirable outcome and is not a conservation process." In exceptional circumstances where its current location is an imminent danger and when all other means of retaining the structure in its current location have been exhausted, "a structure of cultural heritage value may be relocated" (Charter for the Conservation of Places of Cultural Heritage Value, 2010, Article 10).

From the discussions, the terminology of architectural relocation is varied and has evolved from "moving/removal/movement" to "relocation." Compared to conservation and restoration, relocation and reconstruction are immature concepts because they are rare but still occurring procedures due to the problematic approach to authenticity and integrity. Table 2 summarizes the terms, definitions, and key concepts of international charters.[12] Significantly, most charters emphasize the importance of *in situ* preservation and the strong relationship between the monument and its environment.

THE ARSLANAGIĆ BRIDGE

There is no absolute certainty about the architect of the Arslanagić Bridge, but it is assumed to be from the school of Mimar Sinan (1490–1588).[13] Although the exact date of construction is unknown, it is certain that the bridge was built between 1563 and 1575,[14] during the time of Suleyman the Magnificent and Selim II, and was built with the funds of the Vizier Mehmed-paša Sokolović.[15] The uniqueness of the Arslanagić Bridge is largely related to its shape – an asymmetric mass consisting of six arch openings, two larger ones with a width of about four meters, which are in the middle, then four smaller ones, placed one on top of the other on each side. The bridge's total length is 92.55 meters,[16] with an approximate width of 3.50 meters. Its esthetic values, stylistic, and specific characteristics are "a consequence of the architect's effort to find the most functional solution in the existing conditions of the terrain and the course of the river" (Tihić, 1966, p. 112). Consequently, it is included in the group of large bridge structures in Bosnia and Herzegovina from the Ottoman period; as Lovrenović (1998) notes:

Functionally and esthetically, these structures are perfectly adapted to the water on which they stretch and to the banks with which they merge. Again, although they all belong to a recognizable common style, these bridges were not built according to a standard model but varied in a multitude of forms: From the dignified, monumental horizontal of the Višegrad Bridge with its 11 arches to the vertiginously daring, but perfectly calculated, fantastical arch of Mostar's Old Bridge and the unusual asymmetry of the design of the Arslanagić bridge over Trebišnjica. (p. 86) (Figure 1)

The characteristics of those bridges lead to the conclusion that they are exceptional structures with outstanding merits from strategic, economic, esthetic, and sociological aspects. The first systematic study to examine and complete the records, verifying the measurements of bridges from the Ottoman rule in SFRY, was carried out in 1953 by the Federal Institute for the Protection of Cultural Monuments (Katanić, 1971). This trend of adopting a methodological approach to record-keeping and sustained research activity on buildings from the Ottoman period was also noticeable in Hungary during the 1930s and 1940s and intensified in the second half of the 20th century (Kovács and Rabb, 2020).

Figure 1. Arslanagić bridge in Trebinje, western facade (the photo was taken by the authors in 2022).

Table 2. List of terms, definitions, and key concepts of international charters

	Materials	Integrity	Authenticity	Value	Setting	Location	Use and function
ICOMOS 1931 THE ATHENS CHARTER FOR THE RESTORATION OF HISTORIC MONUMENTS							
	Modern techniques and materials may be used in restoration work.[5.] Due to the appearance of different approaches among experts regarding the use of modern materials for the consolidation of ancient monuments, reasonable use of all the resources available to modern technology and especially of reinforced concrete is approved. [IV.]	With regard to the preservation of monumental sculpture, it is recommended to cautiously preserve the original models whenever they still exist and discourage the removal of works of art from the surroundings for which they were designed. [V.]	When restoration is necessary as a result of decay or destruction, respect for the historical and artistic work of the past is recommended, without excluding the style of any given period. [I.] In the case of ruins, scrupulous conservation is recommended, and anastylosis is applied whenever possible. In all cases, the new materials should be recognizable. [VI.]	A critical review of the proposed restoration project is recommended to identify factors that would cause the structures to lose their character and historical value. [2.]	Historical sites are to be given strict custodial protection.[6.] Attention should be paid to the protection of areas around historical sites.[7.] Recommendation to respect the character and external aspects of the cities during the construction of the buildings, especially the environment in the neighbourhood of ancient monuments. It is pointed towards the preservation of certain groupings and certain particularly picturesque perspective treatment. [III.]		It is recommended to retain the occupation of the buildings that ensure continuity of their life, but also to respect their historical and artistic character. [I.]
ICOMOS 1964 INTERNATIONAL CHARTER FOR THE CONSERVATION AND RESTORATION OF MONUMENTS AND SITES (THE VENICE CHARTER 1964							
	To use modern conservation and construction techniques in the consolidation of the monument, the effectiveness of which has been proven by scientific data and proven by experience and where traditional techniques prove inadequate. [Article 10.]	It is not recommended to move all or parts of the monument because it is inseparable from the history it bears witness to and from the environment in which it occurs. [Article 7.]	The restoration of the monuments is not carried out on assumptions, and any unnecessary additional work must differ from the architectural composition and bear a contemporary stamp. Any restoration must be preceded and followed by an archaeological-historical study of the monument and must preserve and reveal its aesthetic and historical value. It is based on respect for original material and authentic. documents [Article 9.]	Conservation of the monument is recommended by preserving the setting which is not out of scale and, wherever it exists, retaining the traditional setting. It has to allow for new construction, demolition or modification that will change the mass and color ratio. [Article 6.]	It is recommended that the concept of a historical monument, the great works of art and the more modest works of the past that have acquired cultural significance over time, be understood as an architectural work together with the urban or rural environment in which there is evidence of a particular civilization, significant development or historical an event. [Article 1.]	It is recommended to use the monuments for some socially beneficial purpose, thereby facilitating their conservation. The layout or decoration of the building must not be changed; only modifications within limits with a change of function are allowed. [Article 5.]

Table 2. CONT.

	Materials	Integrity	Authenticity	Value	Setting	Location	Use and function
ICOMOS 1999 THE BURRA CHARTER: THE AUSTRALIA ICOMOS CHARTER FOR PLACES OF CULTURAL SIGNIFICANCE							
	Traditional conservation techniques and materials are recommended, but modern techniques and materials that offer significant conservation benefits may be appropriate. [Article 4.]	The contents, devices and objects that contribute to the cultural significance of a place be kept *in situ*. Their removal is unacceptable unless it is for well-justified reasons (detailed in article 4.2) and should return where circumstances permit and it is culturally appropriate. [Article 10.]		To identify and take into account all aspects of cultural and natural significance in the conservation of a place without undue emphasis on one value at the expense of others. [Article 5.]	To retain an appropriate visual setting and other relationships that contribute to the cultural significance of the place. New construction, demolition, trespassing or other changes that adversely affect the setting or relationships are not recommended. [Article 8.]	The building, work or other components of the site should remain in the historic location because the physical site is ultimately part of the cultural significance. Relocation is not recommended unless it is the only solution to ensure survival. [Article 9.]	Where the use of a place is of cultural significance, it should be retained. A place should have a compatible use. [Article 7.] If any building, work or other component is moved, it is recommended that it be moved to a suitable location and given a suitable use. [Article 9.]
ICOMOS 2003 ICOMOS CHARTER PRINCIPLES FOR THE ANALYSIS, CONSERVATION AND STRUCTURAL RESTORATION OF ARCHITECTURAL HERITAGE							
	It is recommended that the choice between traditional and innovative techniques be taken on a case-by-case basis, and preference is given to those that are least invasive and most compatible with heritage values, taking into account safety and durability requirements. [3.7] The removal or alteration of any historic material or distinctive architectural features be avoided wherever possible. [3.14]	Removing the internal structures while maintaining only the facades does not meet the conservation criteria. The value of architectural heritage is not only in its appearance but also in the integrity of all its components as a unique product of the specific building technology of its time. [1.3]	The value and authenticity of architectural heritage should not be based on fixed criteria. Different cultures and its physical heritage is considered in the cultural context to which it belongs. [1.2] Any intervention be kept to a minimum to guarantee safety and durability with the least damage to heritage values. [3.5] To respect the concept, techniques and historical value of the original or previous states of the structure in any intervention and to leave evidence that can be recognized in the future. [3.12] Dismantling and reassembly should only be undertaken as an optional measure required by the very nature of the materials and structure when conservation by other means is impossible or harmful. [3.17]		It is recommended that they not be destroyed - the characteristic qualities of the structure and its surroundings in their original or previous state. [3.11]		It is recommended that all preservation and security requirements are carefully considered when proposing any change of use or function. [1.4]

Table 2. CONT.

Materials	Integrity	Authenticity	Value	Setting	Location	Use and function
ICOMOS 2010 NEW ZEALAND CHARTER FOR THE CONSERVATION OF PLACES OF CULTURAL HERITAGE VALUE						
To give preference to the preservation of traditional methods and materials. Repairs of a technically higher standard can only be justified where the stability or life extension of the site or material is at stake, the new material is compatible with the old, and the value of the cultural heritage is not diminished. [18.]	It is recommended to respect all forms of knowledge and existing evidence, both material and non-material values, which are of essential importance for the authenticity and integrity of the place and during conservation, they should not be disturbed. [5.] A structure or feature of cultural heritage value should remain in its original location because the continued association of a structure or feature of cultural heritage value with its site, location, compartment, and placement is essential to its authenticity and integrity. [10.]	The conservation of a place identifies and respects all aspects of its cultural heritage value without unduly emphasizing one value at the expense of others. [5]	Preservation of the setting in situ is recommended as the setting is an integral part of its cultural heritage value. If the setting no longer contributes to the heritage value of the site and reconstruction of the setting can be justified, any reconstruction of the setting should be based on an understanding of all aspects of the heritage value. [9.] Relocation of a structure or feature of cultural heritage value, where its removal is required to clear its site for a different purpose or construction, or where its removal is required to enable its use on a different site, is not a desirable outcome and is not a conservation process. [10.]	It is recommended that where the use of a place is an integral part of its cultural heritage value, that use should be retained, while when a change of use is proposed, the new use should be compatible with the cultural heritage value of the place and have little or no negative effect on the value of cultural heritage. The use of place value facilitates its preservation. [8.]

THE MAIN OBJECTIVES, METHODS, AND TECHNOLOGY IN THE RELOCATION OF THE ARSLANAGIĆ BRIDGE

The adoption and adaptation of new technology and not preserving past architectural technologies, although controversial to many conservationists, created a range of alternative schemes and methods. We can distinguish between moving the monument, as a whole or in parts, to a higher place and keeping the same context of the monument's historical location, and moving the monument, as a whole or in parts, to another location with the same attributes as the historic one. Monument typology, available technology, new permitted materials, and location are critical determinants of the "move decision."

In the case of the Arslanagić Bridge, the relocation method involved dismantling the larger sections, such as the main pillars, followed by the larger bridge piers and stone blocks. From a conservation perspective, it was overseen as follows, "This work will be more difficult and responsible masonry, but it will be guaranteed better conservation and better final success" (Гојковић, 1963, p. 32). This method required a major organizational operation and lengthy disassembly. Therefore, a method was adopted to dismantle all the stone blocks individually. The main objective was to retain the visual exposure and appearance, while concrete infill was used for the internal structure (Figure 2). This broke the strong bond between the historic crushed stone infill and the stone cladding of the same consistency; the Arslanagić Bridge was reformed by transforming the elements of the facade and the structure.

The Material Strategy

Before disassembly, photogrammetry was used,[17] and the numbering scheme and scaffolding were applied. When the numbering scheme during reconstruction was not legible for any reason, technical drawings,[18] photographs, and photogrammetry obtained before disassembly enabled a reenactment of the visual experience of the monument (Gojković, 1973). The numbering scheme of the bridge's facades, noticeable even today, is no longer seen as a sign of deconstruction but as a reconstruction and represents a "visual codification" of the relocation. These instruments and methods, including the scaffold, were the main components aiding the reassembly and visual reconstruction of the bridge.

The operational technologies, especially mechanical drilling, which directly intervened in the masonry construction and violently disrupted the internal cohesiveness, were combined with the technologies that scanned the visual appearance, such as photogrammetry, numbering scheme, and scaffolding. This successive interconnection was systematically used to achieve a delicate balance between the authentic representation of

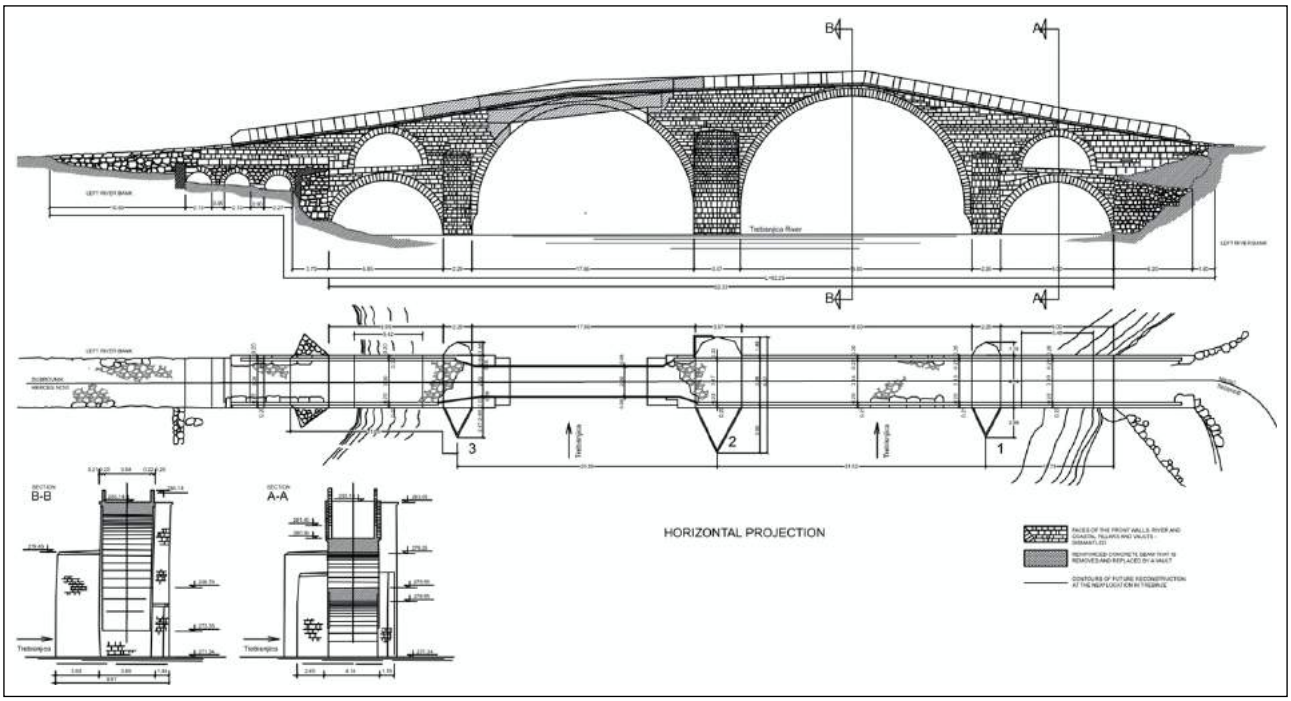

Figure 2. Horizontal projection of the upstream side façade of Arslanagić bridge before the relocation. A drawing made according to the technical data of the Institute for the Protection of Cultural Monuments in Mostar (redrawn by the authors after Милан Гојковић (1963)).

the bridge's architecture and giving it a new contemporary esthetic meaning, together forming a conservation narrative. The project's strategy for visualizing the formal qualities of the bridge was of particular importance and an integral part of the material salvage. This implied an opposite notion of integrity, similarly theorized by Cesare Brandi in his 1963 theory of restoration: "The degradation of the monument, dismantled, and rebuilt elsewhere, to a fake of itself, obtained using its own materials, so that it is even less than a mummified corpse would be compared to a living person" (Brandi and Basile, 2005, p. 95).

Reinforced concrete was used to form the foundations and construct the coastal piers. This abandoned the Ottoman-era bridge foundation technique, a multi-layered wooden grill placed on a stone base in the river bed. Furthermore, at the structural level, the concrete infill was combined with reassembled original stone blocks and cement mortar injected into the outer material layer, which became the bridge's facade.

The stone elements of the arches, like all similar constructions of the bridge, were made of hewn stone, while the inner part of the bridge was filled with crushed stone. In this way, the cohesive mass of the historic bridge was formed. Larger pieces of stone were regularly placed closer to the bridge's abutments and fastened with lime mortar from slaked lime, coarse alluvial sand, and metal elements filled with lead as a structural reinforcement. However, those metal elements were not applied during the reconstruction, as concrete was used as infill for the bridge. This established a new connection between concrete and stone, especially the construction and stability of the arches, in turn creating a new perspective of the accepted principles in conservation (Gojković, 1973).

The disassembled visual material or "facade" was stored until its assembly. It consisted of blocks of processed and cut stone, especially "the railing and the cornice, the wall surfaces of the spandrel and river piers, the elements of the arch construction and some roughly refined stone elements of the small arches of the bridge" (Gojković, 1973, pp. 74-75).

The integrity of the reconstructed Arslanagić Bridge, in a structural sense, was achieved with concrete in combination with the disassembled pieces of stone. With that, the concept of material strategy was reformulated. Concrete became the most important element in the bridge's reconstruction due to its wide use as a construction and building material.

Local labor was engaged and directly connected with the reconstruction of the bridge, as masonry was the native construction method. Missing parts resulting from damage during World War II[19] were replaced using stone from a local quarry to give cultural authenticity to the architecture and keep the original appearance following the reconstruction. However, it was believed that the color of the new stones should be patinated to integrate with the old ones. This idea was rejected due to the view that where new stones were used, they would be patinated in a short time due to favorable meteorological conditions (Gojković, 1973). The

reassembled masonry structure retained its values and authenticity after the relocation, although the lost patina can be seen at the joints of the reassembled stone blocks as they were of cement mortar; this can be understood as material disintegration, architectural discontinuity, and digression. The aim was first to preserve the visual characteristics of the individual elements and to preserve the bridge visually as a whole (Figure 3). In a constructive and material sense, the bridge's structural authenticity has been neglected by extending it 7–8 m to the left bank of the river to adapt the bridge to the terrain and the traffic connection that was considered possible at that time (Gojković, 1978).

Structural Strategy

The most significant damage to the Arslanagić Bridge was in 1943 during World War II when the smaller of the two main arches were destroyed by bombing. The damaged section was initially replaced with a wooden structure, and then in 1956, a reinforced concrete beam that rested on the remains of the arch was added; this remained until the bridge was relocated. The reinforced concrete beam can be understood as a modern crutch and temporary support for integrating old and new materials and the main outline of the bridge. This intervention is considered in relation to Article 12 of the Venice Charter: "Replacements of missing parts must integrate harmoniously with the whole, but at the same time must be distinguishable from the original so that restoration does not falsify the artistic or historical evidence."

However, in the relocation project, this solution was questioned following the Mehmed paša Sokolović Bridge in Visegrad, whose arches were also destroyed in the War[20] and reconstructed with stone material from the old quarry, cement mortar, and concrete infill (Гојковић, 1963). It is evident that for the reconstruction of the Arslanagić bridge, the same procedure as the destroyed vaults was applied in this case. This has led some professionals like Milan Gojković to consider the decision to restore the Arslanagić Bridge with a reinforced concrete beam as unacceptable; the cost of restoring the bridge with a concrete beam was not much less than the cost of restoration using stone blocks that could even be found in the river bed. In addition, if the bridge was restored to its original appearance, as implied by Gojković, later in the relocation project, how could this be approached as a relocation of the bridge to its original appearance?

In the relocation project, the concrete beam was discarded as the goal was to reconstruct the entire bridge to its original appearance. During the reconstruction of the bridge facades, special attention was paid to the structural and architectural aspects. Two concentric rings formed the main structure of the vault; the lower one consisted of dismantled stone pieces and joints in cement mortar, while the upper one consisted of crushed aggregate and cement. The rough and uneven stone surfaces of the lower ring allowed an intimate connection with the concrete, resulting in a massive, vaulted structure.[21] Concrete was also used as a substrate for the reconstructed surfaces and the new foundations[22] (Figure 4).

The new concrete infill, which replaced the existing aggregate stone infill, led to a change in the cohesiveness of the internal structure, changing the integrity of the infill at the structural and material level. The original structural approach of the bridge lies in its nature as a stone aggregate; consequently, interventions in monuments made of small stones, is as Nenadović (1974) suggests, an act of demolition "their dismantling is only a kind of systematic and controlled destruction." Referring to the method of retaining the historical facade and making the internal structure from concrete, he points out that "the

Figure 3. Arslanagić bridge in Trebinje after relocation, eastern upstream façade and paving (the photos were taken by the authors in 2022).

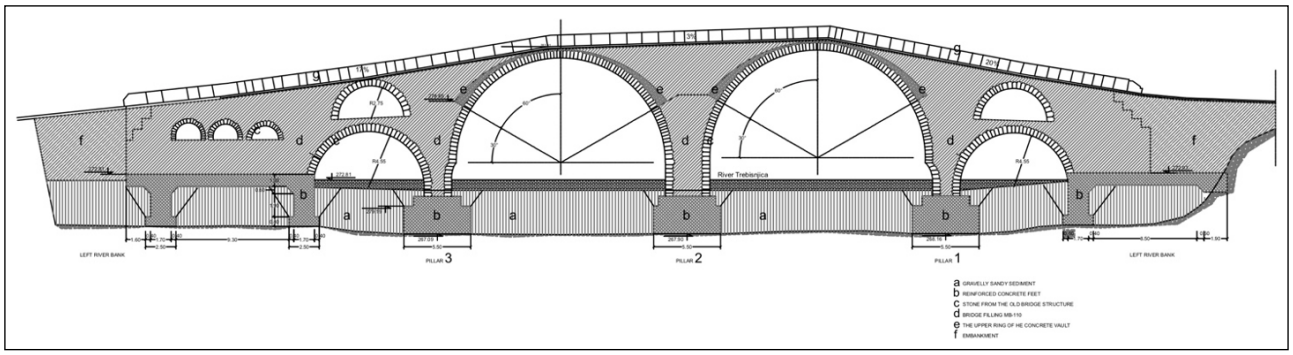

Figure 4. Structural integrity section of the reconstructed Arslanagić bridge (redrawn by the authors after Milan Gojković (1973)).

monument loses its monumental value at the very least and as a monument of culture has no more meaning […] a new building, which has the old appearance/shapes, is totally lost to science and history. That monument is not preserved by moving it; it is destroyed" (p. 18).

A similar approach can be seen in the theoretical reflections of Bruno Zevi and, later by Stefano Gizzi, who concluded each monument has an internal history (besides the external one), which coincides with the history of its structural behavior and its static model, which should not be altered. (Zevi, 1959; Gizzi, 1988, as cited in Roca et al., 2019, p. 62)

Site Planning Strategy

The bridge was relocated 3.5 km from its original site, along the Trebišnjica River, north-west of Trebinje (Figure 5). A favorable cross-river profile was identified, determined by the municipal authority's requirements, Trebinje's housing issues, urban and touristic needs, and the opinions of the professionals who worked on the relocation to find the optimal spatial integration of the structural elements of the bridge and their integrity. Gojković (1973) observed, "the newly chosen site has special qualities and benefits to accommodate the orthogonal projection of the bridge; it emphasizes the bridge's construction and its aesthetic value in an asymmetrical cross profile and open space – like the old site, providing ideal opportunities to create a unique urban motif in the further urbanization of this part of the city of Trebinje" (p. 77).

However, a whole series of circumstances, events, and needs preceded the appearance of the Arslanagić Bridge in its historical location that cannot be conveyed by relocation, let alone its historical progression. The patronage of transport architecture and infrastructure was vital to the success of undeveloped areas, even from Roman times: "The remains of the Roman road were on the right bank of the Trebisnica River, most likely in the place of, or near the Trebinje settlement of Mosaći" (Samardžić and Popović, 2020, p. 12). Based on archaeological findings, there is an evidence for a Roman bridge "over the Trebišnjica, somewhat upstream from the Arslanagić Bridge" although "in the Middle Ages and in the first decades of Turkish rule, there were no bridges on the Trebišnjica; there is no trace of them on the ground, nor are they mentioned in written sources" (Čelić and Mujezinović, 1969, p. 24).

Settlements connected to or located around this communication system of essential roads; examples include Ragusa Road or "Via di Ragusa," one of the most strategically and economically significant land axes between the

Figure 5. Map of Trebinje and surroundings showing the relocation distance and position of the historic and new Arslanagić bridge locations (the drawing was prepared by the authors in 2022).

Ottoman capital and the Adriatic coast, and the Tsarigrad Road, which, passing through the Balkans, was the shortest connection to Vienna and Venice in the 16th century. The Arslanagić Bridge in Trebinje was built on the old road connecting the Adriatic coast[23] with the Tsarigrad Road. To meet the needs of caravan travellers, the bridge was built as part of a complex that included a caravansary and a public fountain (Howell, 2018). The area's history illustrates the convergence of the achievements and evolution of the road network, from Roman times to the Middle Ages, from the era of the Ottoman Turks and to the present day. It is the most convincing evidence of the compatibility of the bridges with their historical location, considering that they were purposely built to fulfill a role on these sites. Once a series of points on the map, the Arslanagić Bridge was part of the Ottoman road network, and where it gets its identity.

Before the relocation, the historic road on which the bridge was built was inactive. In addition, the bridge had an unfavorable slope and was narrow, with other negative characteristics such as sharp curves. Consequently, it was impossible to fit it into the modern road network (Gojković, 1973); over time, it fell out of use, and the road lost its meaning and became abandoned. The relocation of the bridge from a remote place to an urban settlement caused temporal and spatial discontinuities. The environment no longer corresponded to its natural features; as Brandi states, "Apart from being insolubly linked to the monument from the spatial point of view, the environment may be a monument in itself, in which the building becomes an element" (Brandi and Basile, 2005, p. 94).

In its new location, the bridge has become confusing in the urban infrastructure, creating historical inaccuracy and uncertainty on the map and with the observer. Furthermore, when the reservoir at the original site drains, the bridge foundations are revealed as a visual impression of the former existence of the bridge and simultaneously act as traces of the historic road.

THE FACTORS AND RESPONSES RELATED TO THE RELOCATION OF THE ARSLANAGIĆ BRIDGE

Since the decision to relocate the Arslanagić Bridge resulted from the construction of the hydroelectric power station between 1959 and 1964, we can only estimate[24] that the entire relocation process was based on already existing conservation charters and the restoration of monuments at that time. Specifically, the Athens Charter of 1931 with additional arguments favoring the later proposed Venice Charter of 1964. There are difficulties in the professional interpretation of some points of the Venice Charter regarding terminology, environmental importance, the setting, and the relationship with the monument. Consequently, it results in different opinions and theoretical contradictions among conservation professionals.

An example given shortly after the bridge's relocation is Nenadović's (1974) criticism[25] of Article 7 of the Venice Charter, which does not recommend relocation, "except where the safeguarding of that monument demands it or where the national or international interest justifies it and is of paramount importance" (p. 17). He points to the limitation and suggests complete exclusion, or at least the rewording of this part of Article 7, because it creates conditions to justify the moving or relocation of a monument, even if there were no national or international interests. He considered it unconvincing and encouraged a proposal to adopt the opposite recommendation. Nenadović (1974) also states that monument protection professionals recognize the relocation of monuments only as a method of rescue. The Venice Charter recognizes and supports this, specifying that "A monument is inseparable from the history to which it bears witness and from the setting in which it occurs" (Article 7).

The question is whether the relocation of monuments can be accepted as a method of rescue (valid and applied continuously) or is it a "necessary evil" (invalid and prohibited, but necessary).

Nevertheless, it points to the awareness of Yugoslav conservation experts about the inadmissibility of relocation, even though monument protection regulations in the SFRY had not yet been standardized on this issue nor established a legal basis for taking such legal action.[26] This contributed to the difficulties arising from differences in the attitudes of the various parties to the relocation.

The financial resources for the Arslanagić Bridge's relocation were provided by the investor in cooperation with the Institute for the Protection of Cultural Monuments from Sarajevo. The conflict of social interests arose, on the one hand, from the negative attitude of the investors of the hydropower plant toward the endangered monument fund and, on the other hand, the passive attitude of other parties (Defterdarević, 1969). Due to the long process of financial and rescue decisions, the bridge flooded during the Gorica reservoir filling trial in 1965 and remained submerged until August 1966. This became the decisive turning point for the continuation of the relocation. The 2 months after the reservoir was emptied became the period for dismantling the bridge and saving it from complete disappearance.

In the latest published reports on the relocation of Arslanagić bridge (Čelić et al., 1972), the entire process of relocation was recognized as a complex and multifaceted collaboration between the municipality as a representative of the Bosnian people, the investor-HPP Trebišnjica, in the form of composite companies that financed and carried out the entire work,[27] and professionals from various disciplines such as consulting engineers, heritage professionals, and architects engaged in the planning and preparation of the entire project with auxiliary supervision.[28] Each contender

represents a thoughtfully coordinated system: From local labor to Yugoslav conservationists and engineers to local, state, and federal regulations. This cooperative effort can be understood as a project that majorly reconfigured the Trebišnjica valley to a new landscape that the report noted as a coexistence between "cultural heritage and […] progressive movements of our time" (Čelić et al., 1972, p. 2).

CONCLUSION

Examining the relocation of the Arslanagić Bridge covers both broader issues attached to the conservation approach and specific points related to the bridge;

Authenticity or Credibility: Authenticity is a primary measure of any monumental intervention and contains two crucial aspects: The authenticity of the restoration of tangible and intangible assets. In the case of relocation, since it is not an intervention *in situ*, only the original material "relocated" can carry credibility.

An important architectural tool for ensuring authenticity is distinguishing between original and newly installed materials and structures. It is a difficult task in the case of monuments with various and small building materials because, as we saw in the case of the bridge, the binding materials or the hidden auxiliary structures cannot be reused. When choosing new materials during reconstruction, it is necessary to consider that the original and new materials can differ only for a certain time, and over time the new will equalize the original.

Eternity and contextuality – the relationship between the new environment and the monument: The monument cannot be separated from its environment, so its integration into the new environment inherently devalues it. As seen in the example of the Arslanagić Bridge, even in the case of the most carefully prepared relocation, essential parts of the building remain in the historic location, such as the foundations, which cannot be moved in a technically feasible and economically viable way. Integration in the new environment is not easy because adopting the relocated monument requires adding new elements, which in turn enter into a new architectural relationship with the original. Whether visibly recognizable or integrated into the original, the old concept has changed; the monument's original appearance cannot be fully conveyed. As pointed out in the question of authenticity, a monument placed in a new context over time acquires its original role, new materials acquire a patina similar to the old, and the former place is slowly erased from public consciousness. The aspect of social integration should be taken into account when preparing works for relocation, and the context should be noted in a permanent and public form, such as a plaque.

The role and limits of scientific methods in relocation: With careful technical preparation, the primary task of research is to document in detail the original monument and the historical layers that have been added since its construction. Despite all efforts, these layers are lost forever, and after relocation, a new life begins for the building, where all errors are eliminated. Integration in a new urban context also implies a new functional demand, especially for a transport structure. Therefore, scientific methods can be of the greatest help in the design phase so that the monument can be rebuilt as close as possible to the original while meeting new, generally increased needs. However, rebuilding the monument at a new location cannot be seen as a new contemporary layer of the monument as it might be in the case of a monument rebuilt *in situ* from its ruins.

The place of relocation in the context of the monumental environment: Considering all aspects, it can be concluded that relocation, like other forms of architectural reconstruction, is challenging to consider as a *par excellence* monumental intervention. Unlike conservation and restoration, in the case of hypothesis-based reconstruction, ensuring authenticity is a complicated task. In the case of relocation, which can be considered an "*ex situ* intervention," this is almost impossible. The only legitimate way to save a monument from being moved is to refrain from moving it; otherwise, heritage conservation can only seek to minimize losses.

[1]*English: Arslanagić Bridge, Serbo-Croatian: Arslanagića ćuprija, Serbian Cyrillic: Арслангагића ћупруја; Turkish: Arslanağa Köprüsü, also known as Perović Bridge (Serbo-Croatian: Perovića most).*

[2]*It refers to the entire rescue period, from the announcement to the completion of the reconstruction project.*

[3]*The Socialist Federal Republic of Yugoslavia (SFRY) refers to the territory of the federation consisting of six republics – Bosnia and Herzegovina, Croatia, Macedonia, Montenegro, Serbia (including the regions of Kosovo and Vojvodina, as autonomous provinces in Serbia) and Slovenia, which lasted until the beginning of its dissolution in mid-1991, caused by the Yugoslav wars.*

[4]*It is located in the southern part of today's Republika Srpska, Bosnia and Herzegovina.*

[5]*After the establishment of this commission, the second republican commission of experts was established by the investor of the hydropower plant, which dealt with the conditions of the memorial fund of the entire basin and fully adopted the opinions and conclusions of the Yugoslav commission.*

[6]*Including the Dobrićevo Monastery, see Kajmaković (1962) for more detail.*

[7]*For more examples of bridge reconstruction from the Ottoman period in Bosnia and Herzegovina, see Uluengin and Uluengin (2015).*

[8]*For a detailed explanation of the relocation, see Marasović (1985).*

[9]*Before the project, UNESCO's Executive Committee launched its international campaign to save Nubia's monuments, appealing for help from its member states. Yugoslavia, as one of them, along with other UNESCO members, helped Egypt in excavation and conservation efforts, see Guichard (2015) for more detail). The involvement of Yugoslav experts resulted in a phase of promotion and progress of Yugoslav expertise in the relocation of monuments.*

[10]*The Burra Charter was first adopted in 1979. Minor revisions were made in 1981 and 1988, with more substantial changes in 1999. Lastly, in the 2003 revision.*

[11]*ICOMOS New Zealand Charter for the Conservation of Places of Cultural Heritage Value revised 2010.*

[12]*More details on this topic can be found in Gregory (2008).*

[13]*Considered the greatest architect in the Ottoman Empire (see Čelić, 1969).*

[14]*Several authors indicate different data (Defterdarević, 1969; Гојковић, 1963; Gojković, 1973; Gojković, 1978; Gojković, 1989; Tihić, 1966; Čelić & Mujezinović, 1969).*

[15]*A famous historical figure held the position of the grand vizier. The archival book "Lettere e comissioni di levante XXXIII is registered in the Dubrovnik Archives (see Defterdarević, 1969).*

[16]*Several authors indicate a different length and width of the bridge; as relevant, we take Gojković (1973).*

[17]*For a more detailed explanation of the Arslanagić Bridge photogrammetry process, see Pandža and Pleško (2018).*

[18]*Technical drawing made by the Institution of Monument Protection in Mostar made in 1958. This is closely related to the aforementioned research of Katanić (1971).*

[19]*It is explained in detail in the following subsection 5.2. Structural strategy.*

[20]*For a detailed explanation of the implementation of certain bridge restoration measurements, see Ademović & Kurtović (2017).*

[21]*Exceptions with only crushed stone infill are noted in the section between pier "2" and the crown of the larger vault.*

[22]*Both the main piers and the shore pier foundations, due to their considerable length, were constructed as reinforced concrete beams (see Gojković, 1973).*

[23]*Two cities from the Adriatic were connected by this road, Dubrovnik and Herceg Novi (see Gojković, 1977-78).*

[24]*We use the word estimate because we found no evidence of the regulations that the expert took as relevant. There are no written sources.*

[25]*It refers to the relocation of the Arslanagić Bridge.*

[26]*For a more detailed explanation of the regulation for the protection of monuments in SFRY, see Бргуљан (2006).*

[27]*Dismantling of the bridge, transport of the deposited material and initial reconstruction, together with laboratory checks and photogrammetric records.*

[28]*All contributors are given in Čelić et al. (1972).*

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Article

Examining the effect of learning environment on student behaviour through comparison of face-to-face and online design studio

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ABSTRACT

Covid-19 pandemic has affected the field of education, and transition to the distance learning has led to changes in the learning environment and pedagogical transformations. In this process, design studios, which are the basis of architectural education, were also maintained on online platforms. The aim of this study is to investigate the effect of the rapid learning environment change in the architectural design studio due to the Covid-19 pandemic on student behaviour. Examining students' holistic perspectives and behaviours based on their experience in face-to-face design studios and online design studios, this research attempts to reveal the potential and challenges of face-to-face and online studios. In this study, students' behavioural changes regarding face-to-face studio and online studio were measured using the survey method, and these two learning environments were interpreted over six themes (peer learning, socially mediated learning, self-efficacy, self-regulation, motivation, and communication with the instructor) by using the survey results, the course structure and the theoretical framework. The findings reveal that change in the learning environment affects student behaviour and that face-to-face design studios and online design studios have different potentials and limitations. In addition, the course structure of the face-to-face studio and online studio, the tools and methods used in learning, the way of communication and collaboration vary depending on the structure of the learning environment. This study reveals that the face-to-face design studio is a learning environment where the social structure of the studio is developed, peer learning is supported, and methods such as physical model and hand-sketching are used as well as digital tools during communication with the instructor. It shows that the most important potentials of the online studio are that it offers a flexible learning environment, does not have time and place restrictions, allows for cross-cultural and inter-institutional collaboration, and supports self-study. As a result, the research shows that online studio experiences gained during the pandemic period can offer the opportunity to create blended learning environments by adding online features to the traditional face-to-face studio.

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INTRODUCTION

Learning is the occurrence of permanent behavioural change as a result of experience and practice from the cognitive learning approach (Schunk, 2012). Based on cognitive and behavioural perspectives, Pritchard (2009) refers to definitions of learning such as acquiring knowledge and skills through study, the process leading to behaviour change, and the process of developing understanding through experience. On the other hand, Illeris (2009) offers a modern definition and defines learning as a process that causes permanent capacity change.

Bandura's (1986) triadic theory of human behaviour claims that person, behaviour and environment are related and interactive. In the learning environment, the communication between the teacher and the student, what they do, what they say, the questions they ask, and their thoughts affect each other and the environment. During learning, this triple effect continues in a loop and affects each other (Schunk, 2012).

There are some common issues discussed in learning theories. These include the role of memory and motivation in learning, the way transfer takes place, self-regulation processes, and the effects of teaching (Schunk, 2012). According to constructivist theory, learning is possible by making new additions to existing knowledge and skills, resulting from an active construction process (Pritchard, 2009). The constructivist theory emphasises the importance of students' self-learning while encouraging collaborative learning (Pritchard, 2009). In addition to this, the social aspect of learning, which is one of the important parts of learning, is related to peer learning (Vygotsky, 1978), social interaction, authentic tasks (Kocevar-Weidinger & Cooperstein, 2004), communication with the instructor (Schunk, 2012) and socially mediated processes.

Architectural education is based on the design studio. Environment, pedagogy and student behaviour are important parameters that are interrelated and affecting each other in the architectural design studio similar to the concept of learning (Higgins et al., 2005; Oblinger, 2005; Oblinger, 2006; Radcliffe et al., 2008). The design studio is a learning environment, where peer learning is intense due to the group work and juries, strong communication is established with the instructor during the crits, and socially mediated processes take place. At the same time, design studio involves a learning system that motivates students for self-learning, contributes to the development of their self-efficacy and includes self-regulation, which is defined as the coordination of mental functions. Therefore, it is possible to examine design studio education through these dimensions.

Now-a-days, architectural design studio develops day by day and traditional representation methods change in architectural education. The development of technology, globalisation and the expectations of easy access to all parts of the world enables different learning environment experiences in the design studio. In addition, it has become inevitable to move the design studio to the online platform due to the requirements and mandatory conditions of the pandemic process. In short, the development of technology has created new learning environments, and the Covid-19 pandemic has accelerated this transformation (Dreamson, 2020; Yu et al., 2021). Design studios have started to be experienced in virtual environments, rather than physical environments where educators and students meet face-to-face. While the online learning environment creates a change in pedagogy, it also brings benefits and challenges (Alnusairat et al., 2021; Asadpour, 2021; Winters, 2021; Yu et al., 2021). Asadpour's (2021) research proposes new design pedagogy based on interaction and collaboration that see the teacher as a facilitator and focuses on students' self-learning. However, the change in the learning environment not only affects pedagogy but also changes student behaviours and the student's perception of the design studio.

In this context, the aim of this study is to investigate the effect of the learning environment change on student behaviour due to the acceleration of the transition from face-to-face design studios to online design studios resulting from the Covid-19 pandemic. Within the scope of the study, a survey was conducted to 3rd and 4th-year undergraduate architecture students, by accepting the dimensions in which learning was examined as the main topic. The survey was applied to students who have both experienced the face-to-face learning environment in the past and experienced the online learning environment during the pandemic and are enrolled in the 2020–2021 spring semester design studio course. This survey measures the behavioural and perception differences of students between face-to-face studios and online studios. The survey reveals these differences and evaluates them through the dimensions of peer learning, socially mediated learning, self-efficacy, self-regulation, motivation and communication with the instructor.

This study was designed due to the sudden transfer of architectural education from face-to-face environment to an online platform during the Covid-19 pandemic. In this process, it is important for the future of architectural education to evaluate the perspectives and behaviours of students about the change in the pedagogical structure of the design studio, the tools and methods used. The contribution of this article to the literature is to present a comparative assessment of the studio experience. Comparing two learning environments by the same group of students is important in revealing the advantages and difficulties of different studio environments. In this context, it is expected that this study will form a basis for future research on architectural education.

DESIGN EDUCATION

The design studio, being at the centre of architectural education, begins with the implementation of the atelier system in the École des Beaux-Arts in the 19th century (Carlhian, 1979). The traditional architectural approach has laid the foundations of architectural education by adopting an approach where the design studio is at the centre of education. Nowadays, design education is still based on studio-based pedagogy (Wragg, 2019; Fleischmann, 2020a).

Design Studio as a Learning Environment (Studio-Based Learning)

The pedagogical structure of design learning is supported by different theories such as learning by doing (Schön, 1987), concept development and test (Ledewitz, 1985), learning through the transformation of experience (Kolb, 2015), reciprocal exchange of ideas (Demirbas & Demirkan, 2007), problem-solving activities (Simon, 1973), interrelation between social practices and design problems in the studio (Brandt et al., 2013), developing skills non-verbal communication and solving ill-defined problems (Cross, 1982). Design studios are a form of project-based education in which students are intellectually and socially active, and tools such as modelling and drawing are used as thinking and representation methods (Oxman, 2001), sketching is used as a reasoning modality (Goldschmidt, 1991). According to Ledewitz (1985), it is possible for students to learn three basic aspects of architectural education with the help of a design studio. It is through the studio that learning and practicing representation and visualisation, acquiring a new language and grasping "thinking architecturally", are these three crucial aspects (Ledewitz, 1985).

It is thought that the design studio literature includes some basic concepts related to the pedagogical structure. It is possible to have a design studio discussion by categorising these concepts. Six concepts show different characterisations of the pedagogical structure of the studio, although this is not a complete list. These are communication with the instructor, peer learning, socially mediated learning, motivation, self-efficacy and self-regulation.

The first concept is communication with the instructor. Transfer and communication between instructor and student in the studio environment are critical. This structure, which Schön (1987) defines as a reflection in action, allows students to develop their critical thinking abilities and learn by doing in the studio (Schön, 1987). Instructors' coaching guides students to understand the design problem better and to grasp the design-thinking path during the design education process. The learning experience is facilitated through healthy communication, open discussions, assignments, directions, and learning takes place tacitly (Cennamo et al., 2011). In addition, the existence of equal power relations (Webster, 2005) in the studio and the rejection of hierarchy (Dutton, 1987) provide a more effective learning environment by improving social relations between tutor and student and supporting student-centred learning.

The second concept is peer learning and the third is socially mediated learning. The studies of Vygotsky, Bruner, and Bandura show that peer interaction is one of the foundations of learning (Pritchard, 2009). Peer-assisted learning includes methods like peer teaching, reciprocal learning, and collaborative learning (Schunk, 2012). Peer learning helps to support team working, develop self-assessment, manage learning because of collective perspectives, give opportunities to criticise others and transfer knowledge and ideas (Boud, 2001). Since interaction between peers is one of the crucial factors affecting the learning experience in design education (Güler, 2022; Yu et al., 2021), improving peer interaction and communication is one of the critical discussion topics. Many researchers (Vygotsky, 1978; Bandura, 1986; Pritchard, 2009; Schunk, 2012) emphasise the importance of social processes in learning. The social component of the learning environment has a critical role in increasing acculturation (Lave & Wenger, 1991) by influencing the learning process and collaboration (Sawyer & Greeno, 2008). The working environment of the design studio is also a social environment (Hart et al., 2011), which improves communication between students and supports peer learning. Disregarding social processes in design education causes a decrease in the exchange of ideas and the originality of the design ideas, as well as reduces communication and collaboration (George, 2017).

The fourth concept is motivation. Motivation refers to the process of initiating and maintaining a behaviour or attitude to achieve a goal (Schunk, 2012). The interaction-supportive structure of the social environment encourages participation and motivation (Kariippanon et al., 2017), increases the sense of belonging (Gee, 2006) and positively affects learning. The social component of the design studio is also effective in creating a sense of belonging and increasing the motivation of the students (Fleischmann, 2020a).

Two other concepts are self-efficacy and self-regulation. Self-efficacy describes one's beliefs about performing actions and meeting expectations for learning (Bandura, 1993). In addition, it is a factor that affects the choice of activity, starting a task, the effort put into this task, and therefore learning (Schunk, 2012). Bandura defined self-efficacy as *"people's judgements of their capabilities to organise and execute courses of action required to attain designated types of performances"* (Bandura, 1986, p. 391). On the other hand, self-regulation is defined as proactive processes to develop academic skills and it refers to *"the self-directive processes and self-beliefs that enable learners to transform their mental abilities, such as verbal aptitude, into an academic performance skill, such as writing"* (Zimmerman, 2008,

p. 166). Self-regulation refers to the processes by which students systematically use their thoughts, behaviours, and activities to achieve their goals. Adopting a more student-centred and flexible approach in universities affects the learning experience, changes communication methods, and increases students' responsibility for self-learning (Jamieson, 2003). Student-centred approaches improve students' self-confidence, allow them to express their ideas freely, and contribute to the development of their analytical and critical thinking skills. Inquiry-based learning aims to involve students in an authentic discovery process (Pedaste et al., 2015). According to Zimmerman's (2008) research, it is stated that there is a connection between students' self-regulation behaviours and their academic achievement, and that self-regulation processes and motivation are closely related concepts.

Contemporary design pedagogies still contain the traditional approach even though there are pedagogical transformations and innovations. The necessity of radical learning paradigm changes that will encourage students to be "critical thinkers", "active learners" and "knowledge producers" (Salama, 2016; Salama & Crosbie, 2020) in design studios is emphasised (Koch et al., 2006; Salama, 2016; Salama & Crosbie, 2020). AIAS's (American Institute of Architecture Students) report on design studio culture includes the critique of the current design studio, emphasising that the design process is as important as the design product, the necessity of interdisciplinary learning, the need to prioritise people, users and society while making design decisions. The report also claims that the studio culture should support collaboration over competition, healthy and constructive critiques, successful and clear methods of student assessment, innovative learning methodologies, leadership development, the value of time, and clear expectations and goals for learning (Koch et al., 2006).

In addition, new perspectives and new design education approaches that are different from the traditional method are emerging along with digital design thinking (Oxman, 2008). The educational paradigm transforms with the addition of digital learning to the curricula and adapts to today's conditions (Burdick & Willis, 2011). Perceiving Information and Communication Technologies (ICTs) as a multi-layered and comprehensive structure which is a way of thinking and a method of cognitive development rather than as a tool will contribute to the development of pedagogy and curricular structure. In this context, it is stated that digital learning encourages innovation, discovery and strategic learning, and improves collaboration, communication and group work (Burdick & Willis, 2011). Salama & Crosbie (2020) emphasise that the Covid-19 pandemic has brought up digitalisation discussions in architectural education more. This process is a temporary stage for building the post-pandemic design studio. Educators are investigating the future potentials of design for "an education-delivery system that aims to graduate students able to meet the needs of the profession to a teaching/learning process that produces people who can create opportunities" (Salama & Crosbie, 2020, p. 2).

In this study, research was conducted through the concepts immanent in the pedagogical structure of the design studio. Six categorisations of the design studio were determined as peer learning and socially mediated learning dimensions that focus on the interaction between students; self-efficacy and self-regulation dimensions that include learning experience, tools and skills used by students; motivation as an uninterrupted process in the studio culture; and communication with the instructor.

Online Design Studio

A virtual design studio is described as a learning space where the studio environment expands beyond the boundaries of physical space and time limits. This concept first emerged in the 90s with the development of technology (Pektaş, 2015). It was introduced by Wojtowicz (1995) as a result of a design exercise with various participants. Initial experiments with the virtual design studio are primarily aimed at improving the use of communication and network technology in the classroom and exploring the potential of online education (Maher & Simoff, 1999; Maher et al., 1999; Newman et al., 2018). The software used in these early virtual design studios combines the synchronous and asynchronous approaches (Kolarevic et al., 2000; Broadfoot & Bennett, 2003) and utilises multi-user dungeons (Maher et al., 1999).

Face-to-face and online studios are considered by some researchers (Broadfoot & Bennett, 2003; Saghafi et al., 2012) as different models that will support and improve each other since they have different potentials. It is seen that the online studio is more efficient in respect of self-study, research, and discussion (Saghafi et al., 2012), enriching cultural collaboration between different institutions (Bradford et al., 1994; Kolarevic et al., 2000), creating flexible environment (Kvan, 2001; Sagun et al., 2001; Yu et al., 2021) whereas the face-to-face studio has an advantage for supporting motivation, interaction, peer learning (Saghafi et al., 2012).

Online design studio, beyond being a concrete space surrounded by walls, expresses a dynamic environment where there is no time and space constraint, allowing interaction and communication between people from different time zones (Maher et al., 1999; Sagun et al., 2001; Newman et al., 2018). Moreover, online design studios can offer critiques and evaluations from professionals that students might not otherwise have access to (Gross & Do, 1999). Collaboration in a multicultural environment and the opportunity to work on the same design without being physically together have the potential to contribute to the

development of students. It has been observed that online education contributes to the development of students in sociocultural terms (Kvan, 2001), and provides ease of access due to the absence of time constraints (Kvan, 2001; Li & Murphy, 2004). In addition, it improves students' understanding and enables them to focus on the design process due to its data storage feature (Sagun et al., 2001). These positive contributions provide clues about the future potential of online studio learning.

Many researchers have concerns about the online studio as well as pointing out its advantages. The main limitations of the online design studio are the technological constraints (George, 2017), the lack of cost for the development of new technologies (Newman et al., 2018), the inability to transfer the social components of the studio to the online environment (George, 2017; Wragg, 2019; Fleischmann, 2020a; Iranmanesh & Onur, 2021), the lack of informal background learning (Iranmanesh & Onur, 2021). Insufficient opportunities for peer connections (George, 2017; Fleischmann, 2020a), lack of dialogue between instructor and student (Dreamson, 2020; Fleischmann, 2020a), difficulties in mentoring students and criticising their work (Saghafi et al., 2012; George, 2017; Newman et al., 2018) are related to the social structure of the studio. Wragg (2019) states that it is necessary to design the social environment of the online studio and "the social aspect of the studio cannot be left to evolve by chance" (Wragg, 2019, p. 5).

Many online design studio initiatives have been tried, although the conditions of studio-based learning pedagogy challenge online studios. Technology-enabled active learning environments (TEAL) have been created, and the importance of online participation has been emphasised with technology-supported programs such as "bring your own device" (Fisher, 2016). Virtual design studios such as The Kumamoto-Kyoto-MIT Collaborative Project (Yee et al., 1998) and CoOL Studio (Zimring et al., 2001) have explored the possibilities of the online studio by evaluating the advantages and disadvantages of online platforms as a result of the active virtual studio process. There have been many studies on the research of the potential of the online studio, the implementation and evaluation of innovative models, although the historical background of the virtual studio does not go back to the past.

Emergency Online Design Studio

While the change in the education system as a result of the Covid-19 pandemic is addressed by some researchers as a shift to online education (Yorgancıoğlu, 2020), others define it as "emergency remote teaching" (Hodges et al., 2020), "crisis distance education" (Al Lily et al., 2020), "transitional emergency model" (Salama & Crosbie, 2020), "sink-or-swim situation" (Flesichmann, 2021). Online education debates have been going on for decades by proposing innovative methods and pedagogical infrastructures. However, a sudden change occurred during the pandemic period and distance education discussions accelerated. Post-pandemic debates in architectural education have generally focused on the design studio. These studies reveal both the potentials and challenges of the online studio as a result of studio actors' feedback, analysis of the studio environment, and interpretations of the pedagogical framework.

Some studies (Alnusairat et al., 2021; Al Maani et al., 2021; Ibrahim et al, 2021) examining student perception of the online studio reveal that students' online learning experiences are challenging and need more guidance. Although students' overall satisfaction with the online studio experience is measured as low (Alnusairat et al., 2021; Al Maani et al., 2021), there are positive pedagogical contributions, such as students taking more responsibility, using the software more actively, discovering more educational resources, re-watching review recordings (Al Maani et al., 2021). In addition, the online studio has the advantage of providing a more flexible environment (Al Maani et al., 2021) and encouraging inter-institutional learning and international collaboration (Ibrahim et al, 2021). According to Iranmanesh & Onur (2021), the online studio supports self-learning and the success of instructor-student communication depends on how the studio is designed. However, peer learning is one of the shortcomings of the online studio.

Conversely, other studies focusing on student behaviour (Ceylan et al., 2021; Jones et al., 2021) claim that the online studio supports social learning, positively affecting student achievement (Jones et al., 2021), and distance studio is efficient if appropriate tools and necessary environment are provided (Ceylan et al., 2021). Güler (2022) proposes a guide for effective design education in the online environment. In addition, Iranmanesh & Onur (2021) states that online studio pedagogy is more suitable for 3rd and 4th grades because of "encouraging them to become more independent" (p. 263). On the other hand, the transition to the online studio during the pandemic period is an emerging concept that offers a preliminary experience of the future of architectural education (Dreamson, 2020; Marshalsey & Sclater, 2020; Ceylan et al., 2021). Dreamson (2020) states that "online design education is not the next best alternative but an emergent design studio" (p. 495). It is possible to perceive this process as an opportunity to evaluate online learning in detail instead of interpreting it as a radical change in the design studio pedagogy (Yorgancıoğlu, 2020).

Many researchers (Fleischmann, 2020a, b; Ceylan et al., 2021; Fleischmann, 2021; Megahed & Hassan, 2021; Varma & Jafri, 2021) address that blended learning, designed by combining the advantages of face-to-face and online education, has the potential to be a suitable system for the design studio. Fleischmann (2020b) claims that the blended

design studio pedagogy supported by technology while maintaining the essence of the design studio, provides an effective studio experience by allowing for more flexible study opportunities. However, the blended approach is not a replacement for the face-to-face studio experience (Megahed & Hassan, 2021), it can be considered as a transitional environment for a fully online design studio (Fleischmann, 2020a, b). The learning styles of students have changed during the pandemic with the use of new technological tools and methods. Accordingly, the need for new pedagogical frameworks has increased. Megahed & Hassan (2021) proposes a blended studio model in which the sustainability of learning in architectural education can be achieved. Some studies (Fleischmann, 2021; Varma & Jafri, 2021) obtaining data from instructors during the pandemic also agree that blended learning has significant potential for the future of the design studio. Even educators, who had a negative view of the online studio prior to the pandemic, think that blending online and face-to-face approaches can improve design studios (Fleischmann, 2021).

It is necessary to evaluate the design studio structure and curriculum under changing conditions and to develop appropriate pedagogical frameworks for the future of architectural education. The integration of online platforms, which will strengthen the face-to-face design studio, with design education is one of the critical breaking points that accelerated with the pandemic, and it will also affect the future of architectural education (Fleischmann, 2021; Varma & Jafri, 2021).

This study is essential in terms of evaluating student behaviours and learning the student expectations in face-to-face and online design studios by comparing face-to-face and online studios through students who have experienced both studios. In addition, this study includes question sets that measure students' behaviours related to both individual learning and collective learning. Since the architectural design studio is an environment where individual and collective learning coexists, examining student behaviour in a multidimensional way provides a broad perspective for the future trajectory of architectural education.

RESEARCH METHODOLOGY

This study explores the effect of the change in architectural design studios on student behaviour due to the rapid transition from face-to-face learning environment to online learning environment as a result of the Covid-19 pandemic. Student behaviour changes and perception differences in face-to-face and online studios are compared through six defined categories (peer learning, socially mediated learning, self-efficacy, self-regulation, motivation and communication with the instructor) in order to understand the impact of the learning environment.

A mixed research approach is used when conducting this inquiry. While the self-reported survey is evaluated qualitatively through statistical methods, open-ended questions and comments based on observation constitute the quantitative part of the study.

Research Sample

Within the scope of this study, a questionnaire was applied to the students enrolled in the 2020–2021 spring semester design studio course. A structured online survey was used because of its ease of data collection and access to large audiences. The questionnaire was applied to 3rd and 4th-year undergraduate architecture students because both had experienced the face-to-face learning environment in the past and they experienced the online learning environment during the lockdown. In total, of the 93 students who participated in the survey, 39 were in the 3rd grade and 54 were in the 4th grade. The sample consists of 58 female and 35 male students.

The survey was applied to students who attend online studio education due to the Covid-19 lockdown. The students had three semesters of experience in an online design studio. In addition, these students had at least 2 years of experience in face-to-face design studio. Therefore, this study measured students' holistic perspectives and behaviours based on their total experiences in face-to-face and online design studios.

Course Structure

This study examines students' experiences from four different design studio sections, all 3rd and 4th grades. Although the content and subject of the studios change, the course structure does not differ fundamentally. The studio courses in the university where this study was conducted consist of eight studio courses in total, 12-hour courses per week, with different expectations and outcomes. In all design studio courses, students are expected to produce solutions for architectural problems of different scales. This course structure was applied in online design studios as well. Although online design studios are fundamentally similar to face-to-face design studios in the host university, there are differences in the tools and methods used.

After the Covid-19 pandemic, in the university this study was conducted, online design studios were organised through the Microsoft Teams platform. Microsoft Teams is an online platform allowing students and teachers to meet and discuss through synchronous lessons. This platform enabled students and instructors to transmit audio and video, share files and screens, establish dialogue, and exchange ideas. On the other hand, it is possible to share files between students and teachers, upload jury and final projects, share examples, and communicate asynchronously by commenting on each other's projects. It also allowed students to follow the course recordings after the lesson.

Students at the host university preferred digital programs such as AutoCAD, Archicad, Google SketchUp, Rhino, Revit, Lumion, Adobe Photoshop for modelling and drawing, apart from the Microsoft Teams platform. In addition, while google drive was used for sharing the large-size file, WhatsApp group was preferred for instant communication and example sharing between instructors and students, and extracurricular feedback was provided via e-mail. It has been determined that the use of techniques such as hand sketching and physical modelling, which are widely used in face-to-face design studio, is infrequent in the online design studio. The reasons for this situation are that it is difficult for students to communicate through these tools on the online platform and the limited access to materials for physical modelling and hand sketching during the pandemic.

While the studio duration remains the same in face-to-face and online design studios, the hours that students will receive feedback are predetermined in order to facilitate the operation in the online design studio. Besides, while instructors generally use the hand sketching method when giving feedback in face-to-face design studios, this situation has also changed with the transition to online platforms. Instructors started to make instant interventions through 3D programs and continued to give feedback with hand sketching using digital tablets. Online design studios have also affected the way instructors give feedback to students. As well as the online critiques, the juries were held online without any change in their schedule. The online jury provides an advantage as it allows the participation of instructors from different countries or universities. In addition, the possibility of recording the jury sessions and watching them later also contributes to the students.

Considering the design studio as a social environment, it was not sufficient to transfer the social component of the studio to the online environment. Students used tools such as e-mail, Discord, Zoom, Google Docs, and social media channels for reciprocal interaction and online collaboration outside of class hours to support the social structure of the studio.

Research Instruments

A questionnaire based on literature analysis was designed to measure the effect of learning environment changes on student behaviour in the architectural design studio. The questionnaire was designed to consist of a self-reported survey and open-ended questions. Behaviour change resulting from a change in the learning environment is a parameter that can be measured by individuals' self-evaluation. For this reason, the issues that cause behavioural changes were determined, presented to the students in sets of questions, and they were expected to be evaluated by scoring in the questionnaire. In this way, it is possible to evaluate the subjects for which behaviour change is expected in a comparative and qualitative manner. In addition, open-ended questions provide more general data on learning practice and behaviour change. It provides the opportunity to obtain the change in the general structure of the studio with the observations of the students.

The self-reported survey which includes 25 statements, consists of six sets of questions (Table 1). These are peer learning, socially mediated learning, self-efficacy, self-regulation, motivation and communication with the instructor. Each statement was asked to be evaluated for face-to-face and online learning environments. Student behaviour was measured using a 5-point Likert scale ranging from "strongly disagree" to "strongly agree" in order to compare face-to-face studios and online studios.

The concepts of peer learning and socially mediated learning as the main dimensions were determined by quoting from Vygotsky (1978), and the notions of self-efficacy, self-regulation, motivation and communication with the instructor by quoting from Schunk (2012) while constructing the questionnaire. The 25 items from this survey were adapted from various studies (Cho & Cho, 2014; Fleischmann, 2020a; Grover & Wright, 2020; Alnusairat et al., 2021; Ceylan et al., 2021). Appropriate expressions were selected from these studies, these items were classified according to the determined categories, and a self-report questionnaire was created by adding the necessary items.

Each of the question sets in the self-reported survey measures a different kind of behaviour. While self-efficacy, self-regulation and motivation question students' individual learning practices and behaviours, peer learning, socially mediated learning and communication with the instructor give information about behaviour change in collaboration and interactive learning. Since the architectural design studio is a learning environment where the student learns both individually and collaboratively, it is important to continue the questionnaire in two different directions.

Cronbach alpha, which gives a reliability scale, was calculated to evaluate whether the questions and statements had internal consistency. For the general satisfaction scale of 25 items, Cronbach alpha was measured as 0.891 in the face-to-face learning environment and 0.924 in the online learning environment (Table 2). This shows that the items form a scale with good internal consistency and reliability.

For the second phase, three open-ended questions were asked in order to get the general ideas of the students about the architectural design studio and to investigate the communication and collaboration methods in online education. Open-ended questions allow one to obtain data from a wider perspective without limiting the person. In this study, open-ended questions were asked to acquire observations from the students about the design studio beyond the determined sets of questions.

Table 1. Structure of questionnaire

Dimensions	Questions
Peer Learning	PL1. I know the projects/designs of my classmates
	PL2. I know the projects/designs of students in other sections/years
	PL3. I can get ideas from other students
	PL4. I think group work is easy
	PL5. I have face-to-face communication with my classmates for group works
Socially Mediated Learning	SML1. I have social contact with my classmates
	SML2. I have social contact with students in other sections/years
	SML3. I work together with my classmates for assignments and juries
Self-Efficacy	SE1. I think learning experience is well designed
	SE2. I can design successful and creative projects
	SE3. I think design course and assignments are difficult
	SE4. My workload is too much
	SE5. I use time efficiently during my design studies
Self-Regulation	SR1. I can clearly express my design ideas
	SR2. I have the opportunity to improve my software (CAD, Photoshop, etc.) skills
	SR3. I have the opportunity to improve my hand sketching skills
	SR4. I have the opportunity to improve my physical model making skills
Motivation	M1. I can easily focus while the instructor gives feedback
	M2. I have no problem with understanding learning contents, materials, requirements, instructions, etc.
	M3. I can achieve learning outcomes/objectives of design course
	M4. I attend all course hours of design studio
Communication with the instructor	C1. I can easily reach instructors and communicate with them during studio hours
	C2. I can easily reach instructors and communicate with them out of studio hours
	C3. I can easily interact with professionals and instructors out-of-university
	C4. I feel comfortable with sharing my design projects during studio and juries

Table 2. Cronbach's alpha analysis

	Cronbach's Alpha	Number of Items
Face-to-Face	0.891	25
Online	0.924	25

Data Analysis

This study measures students' perspectives and behavioural changes based on students' holistic experiences in face-to-face and online design studios and presents a comparison of these two different studio environments. While conducting the study, students were asked to rate each statement for the face-to-face and online studio using a 5-point Likert scale. Student behaviours and perceptions in face-to-face and online environments are evaluated by examining the data of the survey participants. A paired sample t-test method was used by transferring the data to SPSS to evaluate the students' responses to the six dimensions (peer learning, socially mediated learning, self-efficacy, self-regulation, motivation, and communication with the instructor) and to compare the face-to-face and online learning according to these dimensions. Since the same questions were used for both behavioural conditions, a paired sample t-test was used to investigate whether there are statistically significant differences among the predefined categories in the face-to-face and online studio.

RESEARCH FINDINGS AND DISCUSSION

The design studio education, which was intensively conducted face-to-face until the Covid-19 pandemic, was changed due to mandatory conditions. During this process, students and instructors learned to use new interfaces, developed new methods and gained new communication skills. The rapid transformation, which was mandatory due to the pandemic, required adaptation to the new process. The comparison of the face-to-face and online studio experience in this study

shows that students and instructors adapt more easily to some themes, while they adapt more difficult to others.

Design studio differs from other courses with its unique pedagogical approaches and differences in the learning process. The change in the design studio environments, which are based on communication and cooperation and where learning continues in a social environment, directly affects the structure of learning and the student's behaviour. The results of this study revealed that there are significant differences in student behaviour between face-to-face and online design studios.

The survey outcomes addressed the mean differences in students' perceptions of face-to-face and online studio and their behaviours in these environments. Student behaviours in two different environments were compared over the categories of peer learning, socially mediated learning, self-efficacy, self-regulation, motivation, and communication with the instructor. Comparison results are presented in Table 3. While each theme was analysed under a separate heading according to the differences in the learning environment, it was evaluated by making use of the course structure and theoretical framework, as well as the survey results.

Table 3. A paired sample t-test between face-to-face and online studio

	Face-to-Face		Online		t	Sig (2-tailed)
	M	SD	M	SD		
Peer Learning	**3.78**	**0.72**	**2.56**	**0.84**	**8.67**	**0.000**
PL1	3.94	0.96	3.04	1.20	4.48	0.000
PL2	3.55	1.09	1.90	1.06	9.34	0.000
PL3	3.86	1.07	2.66	1.22	6.07	0.000
PL4	3.45	1.07	2.66	1.42	4.17	0.000
PL5	4.11	0.94	2.53	1.16	9.20	0.000
Socially Mediated Learning	**4.14**	**0.60**	**2.27**	**0.91**	**14.08**	**0.000**
SML1	4.40	0.66	2.45	1.07	13.70	0.000
SML2	3.88	0.97	1.91	0.92	13.61	0.000
SML3	4.13	0.92	2.45	1.22	9.58	0.000
Self-Efficacy	**3.80**	**0.43**	**3.27**	**0.67**	**6.32**	**0.000**
SE1	3.75	0.90	2.44	1.04	8.99	0.000
SE2	4.02	0.72	2.78	1.25	7.59	0.000
SE3	3.69	0.91	4.03	1.09	-2.59	0.011
SE4	3.83	0.77	4.49	0.83	-6.09	0.000
SE5	3.71	1.01	2.61	1.34	6.13	0.000
Self-Regulation	**3.92**	**0.56**	**2.63**	**0.83**	**11.59**	**0.000**
SR1	3.95	0.68	2.67	1.20	8.62	0.000
SR2	3.67	0.78	3.74	1.04	-0.55	0.584
SR3	3.91	0.80	2.28	1.09	10.98	0.000
SR4	4.16	0.77	1.85	1.16	13.86	0.000
Motivation	**4.03**	**0.55**	**2.96**	**0.98**	**8.99**	**0.000**
M1	4.12	0.75	2.75	1.25	7.90	0.000
M2	3.88	0.81	2.68	1.22	8.06	0.000
M3	3.92	0.63	3.05	1.08	6.95	0.000
M4	4.19	0.68	3.34	1.29	5.96	0.000
Communication with the instructor	**3.63**	**0.66**	**3.18**	**0.96**	**3.30**	**0.001**
C1	4.22	0.67	3.46	1.21	5.09	0.000
C2	3.62	0.93	3.46	1.13	0.93	0.356
C3	3.06	0.93	3.06	1.17	0.00	1.000
C4	3.60	1.10	2.75	1.38	4.60	0.000

Peer Learning

A paired sample t-test on peer learning reveals significant differences between face-to-face (M: 3.78, SD: 0.72) and online learning environments (M: 2.56, SD: 0.84). According to the survey results, it is observed that one of the most significant differences between face-to-face and online studios emerged in the dimension of peer learning. The most important reason for that may be the difficulty of adapting the social structure of the studio to the online environment. Many studies (George, 2017; Wragg, 2019; Fleischmann, 2020a; Iranmanesh & Onur, 2021) also claim that the difficulty of transferring the social component of the studio to the online environment negatively affects online learning.

Peer learning is measured by knowing the projects/designs of classmates (face-to-face M:3.94 SD:0.96, online M:3.04 SD:1.20), knowing the projects/designs of students in other sections/years (face-to-face M:3.55 SD:1.09, online M:1.90 SD:1.06), getting ideas from other students (face-to-face M:3.86 SD:1.07, online M:2.66 SD:1.22), thoughts about group work (face-to-face M:3.45 SD:1.07, online M:2.66 SD:1.42), and communication with classmates for group works (face-to-face M:4.11 SD:0.94, online M:2.53 SD:1.16). Based on the survey results, it can be deduced that the low level of communication between students in the online studio, the decrease in the time they spend together, and the lack of common working environments negatively affect the social learning process and peer learning. Due to the fact that informal interaction and spontaneous encounters between students are less in online studios than in face-to-face studios, peer-to-peer dialogue, learning experience and environments for communication might be insufficient.

Likewise, it can be concluded that another reason for the less positive perception of peer learning is the nature of the online environment. While students can meet and discuss easily and sometimes spontaneously in a face-to-face environment, certain conditions must be completed beforehand, such as organising meetings in order to create a discussion environment in an online platform. This process can be challenging for students with less online experience. In fact, online platforms have the potential to allow students to communicate without time constraints and openly share their ideas and comment on each other's projects, thanks to asynchronous interaction. However, it is observed from the survey results that students are not familiar with the online platforms and tools required by the post-pandemic mandatory conditions, which makes peer-to-peer interaction and sharing of ideas difficult. Because of this, the online studio is perceived as less efficient than the face-to-face studio. Besides, spending a long time to understand the structure of the platforms, and the inability to use the platforms beneficially negatively affects peer learning.

The results of the open-ended questions show that students use additional tools besides Microsoft Teams to support peer interaction and increase collaboration in the online studio. Students stated that they frequently use social media channels (54%) and e-mail (45%) for extracurricular collaboration and group work. Many studies (Pektaş, 2015; Fleischmann, 2020a) claim that social media platforms have a supporting role in online learning and online collaboration. In this study, it is one of the results that social media tools are widely preferred by students for online collaboration. Due to the nature of the online studio, it is observed in the research outcomes that a single platform is insufficient for cooperation and that different tools should be used for different purposes.

Socially Mediated Learning

A paired sample t-test on socially mediated learning shows significant differences between face-to-face and online learning. This study shows that the socially mediated learning dimension has the highest mean value (M: 4.14, SD: 0.60) in the face-to-face environment and the lowest mean value (M: 2.27, SD: 0.90) in the online environment compared to other dimensions. The results reveal that students evaluate the online environment as less effective for collaborative study than the face-to-face environment and have fewer social contacts in the online learning environment.

Socially mediated learning is examined in terms of social contact with classmates (face-to-face M:4.40 SD:0.66, online M:2.45 SD:1.07), social contact with students in other sections/years (face-to-face M:3.88 SD:0.97, online M:1.91 SD:0.92), and working with classmates (face-to-face M:4.13 SD:0.92, online M:2.45 SD:1.22). Based on these results, it can be concluded that the online design studio is insufficient in promoting social interaction between students and group work. The reason for the negative perceptions of the students in this study regarding the socially mediated learning dimension can be seen as the low level of socialisation in the online studio. While the face-to-face design studio is a social environment, it allows "unstructured and momentary activities" (Ceylan et al., 2021), the immediacy of communication and the possibility to receive direct feedback from instructors and peers (Fleischmann, 2020a). Therefore, face-to-face design studios support an interactive and social learning environment, unlike online design studios.

According to the results of open-ended questions, 86% of the students stated that they use additional tools such as social media platforms for social contact and online collaboration in order to maintain the social structure of the studio. However, the social structure of the design studio needs to be restructured in order to adapt to online environments, and online design studios have the potential to develop in this regard.

Self-Efficacy

The results of a paired sample t-test show that the mean value differences between face-to-face learning (M: 3.80, SD: 0.43) and online learning (M: 3.27, SD: 0.67) in the self-efficacy dimension are less than the other dimensions. In other words, when evaluated in terms of self-efficacy, it is seen that face-to-face learning and online learning have similar attributes. It can be concluded that learning environment changes do not substantially affect students' self-efficacy behaviours, since self-efficacy is related to one's own cognitive capacity.

With regard to self-efficacy, a paired t-test demonstrates significant differences in the learning experience (face-to-face M:3.75 SD:0.90, online M:2.44 SD:1.04), designing successful and creative projects (face-to-face M:4.02 SD:0.72, online M:2.78 SD:1.25), workload (face-to-face M:3.83 SD:0.77, online M:4.49 SD:0.83) and time management (face-to-face M:3.71 SD:1.01, online M:2.61 SD:1.34). However, no significant differences are found in terms of the difficulty of design courses and assignments. The results show that students view the workload in online learning as higher than face-to-face learning, but they view face-to-face learning as more effective in terms of a well-designed learning experience, designing successful and creative projects, and time management. In addition, it is concluded that the change in the learning environment does not affect the perception of the students that the design courses and assignments are difficult.

According to this study, student behaviours are similar in terms of self-efficacy in online and face-to-face design studios due to the structure of the online learning environment that supports self-study. Many studies in the literature (Saghafi et al., 2012; Newman et al., 2018; Iranmanesh & Onur, 2021) also state that online learning supports self-study and self-dependent research. In the online studio, students can independently conduct their work, without the time and place restrictions. They can also improve their learning experience with the opportunity to rewatch jury and critique recordings. The flexible learning experience offered by the online design studio is effective in creating a positive perception in students about self-efficacy.

Self-Regulation

A paired sample t-test on self-regulation reveals significant differences between face-to-face (M: 3.92, SD: 0.56) and online learning environments (M: 2.63, SD: 0.83). The self-regulation dimension results align with the general results because student behaviour has a lower mean value in the online environment than in the face-to-face environment.

Regarding the self-regulation dimension, a paired sample t-test show significant differences in terms of expressing design ideas (face-to-face M:3.95 SD:0.68, online M:2.67 SD:1.20), improving hand-sketching skills (face-to-face M:3.91 SD:0.80, online M:2.28 SD:1.09), and improving physical model-making skills (face-to-face M:4.16 SD:0.77, online M:1.85 SD:1.16). However, no significant differences are found between face-to-face and online studios in improving software skills. Based on these outcomes, it can be concluded that while students actively use communication tools such as physical model-making and hand-sketching in the face-to-face studio, these methods cannot be transferred into the online environment during the rapid transition. On the other hand, it can be stated that digital tools are widely used since the communication in the online studio is based on technology-based tools, and therefore the students' software skills increase.

In the online design studio, using 3D models instead of physical models and CAD programs instead of hand drawing allows students to develop their software skills. However, physical model-making and hand-sketching methods are also essential tools in the development of students' perception of space. Since not using these tools in design education will cause negative results in design learning, adapting sketching and physical model-making to the online environment will be necessary for the success of online design studios. In the literature, there are thoughts that the future design of online studios where hand sketching and physical model making will be used more actively will benefit architectural education (Ceylan et al., 2021).

Motivation

In the motivation dimension, it is noteworthy that there is a big gap between face-to-face and online learning environments. The mean value in the face-to-face studio is M: 4.03, SD: 0.55, and the mean value in the online studio is only M: 2.96, SD: 0.98. The survey results show that the students have difficulties adapting to the online design studio in terms of motivation dimension. The most important reason for that may be attributed to the student's experience of the online studio as a "transitional emergency model" (Salama & Crosbie, 2020) due to the Covid-19 pandemic. The rapid change in learning environments and accordingly change in tools and methods have made it difficult for students to adapt to the new system and has caused a loss of motivation. In short, it is possible to perceive the online studio negatively due to the lack of experience with the applications in the online learning environment and the traditional education habits that have been going on for years. Similarly, it is claimed that students who have previously experienced online studios have a more positive perception of online collaboration in Cho & Cho's (2014) study.

Motivation is measured in terms of focusing while the instructor gives feedback (face-to-face M:4.12 SD:0.75, online M:2.75 SD:1.25), understanding learning contents, materials, requirements, instructions (face-to-face M:3.88 SD:0.81, online M:2.68 SD:1.22), achieving learning outcomes/objectives (face-to-face M:3.92 SD:0.63, online

M:3.05 SD:1.08) and student attendance (face-to-face M:4.19 SD:0.68, online M:3.34 SD:1.29). According to the results, it is seen that the students evaluate the online learning environment as inadequate compared to the face-to-face environment in terms of understanding the learning content and obtaining the learning outcomes, and they do not prefer the online environment when receiving feedback from the instructor. In the face-to-face studio at the university where this study was conducted, students are encouraged to stay in the studio all day, listen to peers' feedback and participate in the discussion. However, based on the survey results, it is stated that participation and motivation are lower in the online studio. The fact that each student has the assigned time for critiques and the difficulty of collaboration and discussion on online platforms can be explained as the reasons for lower motivation.

In fact, the online design studio has the potential to increase student motivation. The possibility of recording and re-watching synchronous sessions, uploading all course materials, presentations to the Microsoft Teams system, communicating with the instructor during out-of-studio hours allow students to adapt to the studio and contribute positively to student motivation. Rather than setting time for each student, adapting architectural education pedagogies to the online environment and creating a learning environment, where students discuss together can improve students' motivation in the online design studio.

Communication with the Instructor

The results of a paired sample t-test on communication with the instructor indicate the least mean value differences between face-to-face (M: 3.63 SD: 0.66) and online learning environment (M: 3.19 SD: 0.96). The survey results reveal that there is not much difference between the two different learning environments in terms of communication with the instructor. Since the online studio and the face-to-face studio have different potentials to communicate with the teacher, it can be deduced that the dimension of communication with the instructor is one of the easily adapted themes in the transition to the online studio.

With regard to communication with the instructor, a paired sample t-test show significant differences in reaching instructors during studio hours (face-to-face M: 4.22 SD: 0.67, online M: 3.46 SD: 1.21) and feeling comfortable with sharing design projects during studio and jury (face-to-face M: 3.60 SD: 1.10, online M: 2.75 SD: 1.38). However, no significant differences are found between face-to-face and online studios in reaching instructors during the non-studio hours (face-to-face M: 3.62 SD: 0.93, online M: 3.46 SD: 1.13) and interacting with professionals and instructors out-of-university (face-to-face M: 3.06 SD: 0.93, online M: 3.06 SD: 1.17). The results reveal that students prefer the face-to-face studio rather than the online studio to share their design ideas comfortably and receive feedback during studio hours. One of the reasons for this may be that students cannot express themselves adequately and cannot directly observe the instructor's reactions due to the limitations of the online environment. In addition, although 67% of the students prefer the manual sketching feedback according to the results of the open-ended questions, the limitation of the feedback method in the online studio increases the students' negative perceptions. Similarly to this research, many studies (Howland & Moore, 2002; Vonderwell, 2003) in the literature emphasise that students' satisfaction with the online learning environment is directly related to constructive communication with the instructor.

Nevertheless, based on the survey results, it is concluded that the opportunity to reach the instructor during non-studio hours and the opportunity to communicate with professionals from out of the university in the online design studio positively affect the perception of the students. It is observed that online studio positively affects student performance by providing students with time flexibility to communicate and work with the instructor, the opportunity for extracurricular feedback via e-mail and sharing of examples via WhatsApp. In addition, inviting architects and educators from different institutions to the sessions and juries of the online studio at the university where this study was conducted offers students the opportunity to get ideas from professionals they would not usually reach.

Moreover, it has been observed that students who are not familiar with the tools and dialogue style of the online design studio initially had a negative perception of the online learning environment. Therefore, instructors have a great responsibility to overcome the limiting factors of the online environment through actions such as involving students in online education and increasing reciprocal interaction with students. Changing the way of feedback to students and starting to use new tools and methods specific to the online platform, such as digital tablets and extra cameras enable improved communication with the instructor in the online design studio.

CONCLUSION

The structure, learning methods, pedagogies and learning environments of the design studio are constantly changing and evolving. The rapid and unplanned transition from traditional teaching methods to online platforms due to the Covid-19 pandemic has brought along inquiries about architectural education. This article focuses on the comparison of students' perceptions and behavioural changes in face-to-face and online studios. These comparisons and evaluations of previous studies can form a basis for future studies on design education by revealing the potential and challenges of face-to-face and online studios.

This study shows that the most important potentials of the

online studio are that offers a flexible learning environment, has no time and place restrictions, allows for cross-cultural and inter-institutional collaboration, and supports self-study. On the other hand, it is revealed that students have difficulties adapting to the online studio in terms of social interaction, peer learning, group collaboration, and instant feedback from the instructor. Although the traditional design studio is thought to have a face-to-face pedagogical framework, it has completely shifted to digital platforms during the pandemic. The online studio experiences gained during the pandemic period can present an opportunity to create flexible and blended learning environments by adding online features to the traditional face-to-face studio.

Blended learning environments can be created with a holistic perspective of the design studio, by evaluating learning methods, tools and platforms, communication techniques and adapting them to face-to-face and online learning environments. The blended learning environment has also been discussed in the context of architectural design studios in recent years, and many studies (Fleischmann, 2020a, b; Ceylan et al., 2021; Fleischmann, 2021; Megahed & Hassan, 2021; Varma & Jafri, 2021) are conducted on this subject. The blended studio pedagogy, which will be designed considering the potential of the face-to-face and online studios, will include the advantages of both studio experiences.

This study has some limitations regarding the sample group, as it only reflects students' perspectives in a single university. For future studies, it is essential to use a larger sample group from different universities to obtain more detailed results. In addition, the educators' experiences and perspectives about the learning environment of the design studio are among the factors that will contribute to further studies.

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Article

Re-thinking group work in basic design education: A quantitative analysis of adapting exquisite corpse and decision tree approaches

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ABSTRACT

In design education, especially in the first-year design studio, different approaches ranging from artistic to analytical and abstract to concrete have been used. This paper attempts to study one of those approaches namely "Exquisite Corpse (EC)", which is an art-stemmed approach, employed in the architecture's first-year design studio. In addition, decision-tree (DT) approach was used, which like EC, requires dialogue among students and helps foster problem-solving abilities by giving more structure to the educational medium as well. This paper uses quantitative methods to analyse the design process in the search for distinct methodologies in design research. The main purpose of this article is hence to evaluate the use of EC and DT in basic design education and to provide empirical implications for the development of the basic design teaching methodology. Descriptive statistics and a Pearson's chi-square test of independence were performed to examine the relationship between students' use of the exquisite corpse approach and their grades. The paper highlights the need for distinct methods for the scientific analysis of design research. The analysis used in this paper provides scholarly information to other design educators in higher education. The initial aim is to incorporate EC and DT in the final project were to help novice designers in guiding their design processes better. The research model of this study can help exemplify analytic research for design-related disciplines for future research studies.

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INTRODUCTION

The basic design course of the first year is a pivotal course that helps students to solve design problems. In this course, a wide variety of approaches with epistemological and content differences have been utilised over space and time. These discrepancies relate on one hand to artistic-intuitive, and on the other to rationalistic-analytic perspectives of the educators. Also, within these applications, there have been significant differences in the levels of abstraction (abstract-conceptual vs. concrete-environmental).

Design education requires improvement and constant re-evaluation (Noël, 2020). Perspectives in design education continuously change such that the field requires further studies providing information and empirical evidence on

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the validity and success of such distinct methods in use. Also, the area of teaching and learning is argued to remain undocumented to the academic community (Antman and Olsson, 2007), which in fact could be useful for many if they were scholarly discussed in scientific environments. This argument is extended by using an empirical study for knowledge in the architectural design studio in the search to identify how architectural design studios deal with and teach the aesthetic aspects of architecture (Young Cho, 2013). As such, introducing our curriculum in basic design education and presenting the empirical findings of its effects is argued to be fruitful for many design scholars.

This paper attempts firstly to analyse the inclusion of an art-stemmed approach "Exquisite Corpse" in architecture's basic design course and evaluate its repercussions. "Exquisite Corpse" is a surrealist art perspective that was developed around the 1920s. Previously, Exquisite Corpse (EC) has been applied in design education in several other universities, at different levels.[1] Yet, all had distinct conceptualisations and therefore ended up in different results. In our case, EC was incorporated in the design problem to enable students to make intuitive decisions as a group.

Additionally, this paper deals with decision making processes of novice students. The design problem of the final project enforced students to develop Decision Trees (DT) where they picked from pre-determined sets of concepts. This enforcement aimed to clarify the choices groups make in their design processes. As such, decision trees might help to control design processes. In previous terms, formal algorithms (Sarıoğlu Erdoğdu ve Orbey, 2017) were rigorously used in the studio where students were asked to write down their design decisions step by step through their design processes. Hence, when compared to EC, DTs are attributing more to the rationalistic aspects of the design process.

Based on this context given, both approaches are then analysed by pure statistical approaches –namely, descriptive statistics and chi-square analysis. At the end of the semester, an online survey was distributed to the students to understand how students worked as groups in the basic design studio and to address the benefits of EC and DT in the design processes. Most of the questions aimed to enhance our understanding of students' managing design processes and to analyse the role of EC and DT in students' success. The empirical study of this paper relies on the findings of this survey.

BACKGROUND: DIFFERENT APPROACHES IN BASIC DESIGN EDUCATION

The basic design course is one of the key courses in Design Education where students are introduced to basic concepts of design and abstract thinking. Basic design course is one of the key courses in Design Education. In this course, students are introduced to basic concepts of design and abstract thinking. Basic design, in different curriculums, may be offered either as a separate course that supplements the design studio of the associated term or, as an individual studio course.[2] In the former and relatively less common option, it serves as a supporting course to the First Design Studio, which is the case for this study.

In basic design courses, paper-based design thinking, and analogue tools are dominant. However, digital technologies have been occupying design studios while bringing their own unique logical thinking ways and changing methodologies (Oxman, 2008) since the beginning of the 2000s. No matter with soft or hard media, the logic behind the course remains almost the same.

Basic design course had been first developed and implemented as a primary element of Bauhaus and Modernism in the 1920s, leading to significant changes in the related disciplines afterward (Sarıoğlu Erdoğdu, 2016), continued to innovate and influence globally (Droste, 2019). According to White-Hancock (2023), Bauhaus's educational philosophy integrates the hitherto disparate sectors of the arts, crafts, business, mathematics, engineering, and industry.

Also known as "Vorkurs", the foundation course was a framework in which the elementary study of form and material was introduced in the workshop through the hands-on activity of doing and making at Bauhaus (Ozman, 2008). It is also referred to as "The Basic Design Movement" which represented the dissemination of educational ideas of Bauhaus against the Impressionist realism of the era (Yeomans, 1992). Inherited from Bauhaus, where Modernism was a pedagogical model (Oxman, 2008), apprenticeship relations are utilised which means students learn from peers and implement what they have grasped so far. The teachers be referred to as "masters" and the students as "apprentices" and "journeymen", eliminating the academic term "professor" (Lerner, 2005). Such a pedagogical approach is widely known as "learning by doing" and is applied in design studios to a great extent, including basic design course. This method allows the designer whether novice or senior to explore the alternatives so that design decisions can successfully be made depending on those trials and errors. Further, the activity of learning in this method is more lasting than a didactic process, as the students engage actively in the process and would more probably remember their personal experiences in the long run.

Depending on the ontological position of the University and the instructors, a variety of different perspectives could be employed in this course (Sarıoğlu Erdoğdu, 2016). Among a bulk of basic design approaches, the first difference stems from *an art/science point of view*. This is an epistemological difference that has already been shaping the discussions

around art and architecture across time and space. Another difference depends on a distinction on the *abstract-concrete level of the course* which also has repercussions on the problem definitions, products, materials used, and representation techniques of the exercises.

Epistemological Differences in Design Education

Design thinking is generally considered as the ability to combine empathy, creativity, and rationality to analyse and fit solutions to contexts, and more recently, it has been closely related to innovation (Wrigley and Straker, 2015: 375). Hence, one can argue that design stands at the point of multi-disciplinary approaches and epistemological discussions.

Artistic and Intuitive vs. Rationalistic and Analytic

The two oppositional epistemologies, namely "technical rationality" and "pragmatism or phenomenology" (Ghajargar and Bardzell, 2019) can be applied in design education. Roughly speaking, architecture and design education had been under the influence of Fine Arts in many countries (Tekeli, 2001; Yürekli, 2021) until the birth of Bauhaus. In this art-based view, the subjectivity of intuition had been welcomed and considered the sole way to design (Orbey and Sarıoğlu Erdoğdu, 2021). Certain skills such as learning materials by giving them form, learning geometry, colour, space, and structure through drawing, painting, and model making, were used to gain information from the Beaux-Art perspective (Pasin, 2017).

For some, the first group of scholars and designers follow anti-methodological approaches (Jormakka, 2014). Aalto can be a good example where Jormakka views his designs as "play", rather than employing scientific methods (Jormakka, 2014). The followers of this understanding were characterised by "accidentalism" in their design perspectives (Jormakka, 2014). Similar methods were also applied in the 20th century by the surrealists, who adopted a parlour game, "Exquisite Corpse". In this "game", rather than an individual, a group of designers works together. The first designer draws something on paper and then folds the paper so that the second designer does not see what has been drawn. Without knowing what is on the paper, the second designer continues the design. In the end when the paper is unfolded "the whole" can be seen. This method was argued to be a perverse assembly-line and mechanisation in the industry (Foster, 1991). Especially for developing the form of the buildings, such irrational and random techniques of surrealism were utilised by some architects like Wolf Prix and Helmut Swiczinsky (Jormakka, 2014).

The collage principle was argued to be the fundamental structure of the 20th century in aesthetics, social, scientific, and philosophical thought (Adamowicz, 1998). Through collage and accidentalism, new concepts of space were added to non-Euclidean geometry (Adamowicz, 1998). Hence, the dialectic between the rectangle and the free form, between the grid and the kidney shape, was of great significance (Sorkin, 1991).

At the Bauhaus, an opposite approach was developed which focused on rational thought and objectivity (Jormakka, 2014). Beginning as a spontaneous attempt, an open-ended and experimental mode of designing was introduced (Yeomans, 1992:72). Meyer, the director at the Bauhaus in the 1920s, argued that as architecture is not one of the fine arts, then subjective intuition has no place in the architectural design process (Jormakka, 2014). Following this argument, architecture as an observable, measurable, and scientific activity finds its place in the modern world such that students are enrolled in architecture schools according to their mathematical backgrounds and analytical knowledge.

A similar categorisation was made in the display of basic design at Tate Britain in 2013, regarding Basic Design Teaching: Rational Process, Science and Nature, and Intuition (Crippa and Williamson, 2013). However, Bauhaus became so globally dominant, established, and prescriptive in time that this dominant position was against to its unique and utopian character (Boellen, Botha and Sacchetti, 2018). They argue that Bauhaus was once a pioneer and differentiating approach, and yet its current dominance is all but contrary to its initial perspectives (Boellen, Botha and Sacchetti, 2018).

Another component to this duality, technology is added (Findeli, 2001), as he finds the adoption of the two design paradigms, namely applied art, and applied science, outdated. Since the beginning of the 2000s, digital technologies have been occupying design studios while bringing their own unique logical thinking ways and changing methodologies as it is denoted although, in basic design courses paper-based design thinking and analogue tools are dominant (Oxman, 2008). In this sense, design education is argued to need a wider restructuring regarding the information age, towards complexity (Uysal and Topaloğlu, 2017). As it is denoted that studio cultures aim for collaborative and participatory skills in individual creativity with computational methods since the reasoning processes of design and new opportunities arise for open and liable cultures of design (Hysa and Özkar, 2020: 343).

However, shape grammars and parametric design methods which were developed since the 1960s could not promise much though, as the computer cannot replace the designer totally (Goldschmidt, 1988). The use of computational precedents is counterproductive with respect to design creativity (Goldschmidt, 1998), and without sorting or evaluating possibility the generative program is of little value (Jormakka, 2014).

In sum, perspectives on design thinking have evolved from an artistic point of view to firstly a rationalistic and scientific approach at Bauhaus, and then finally to a complexity sciences approach where technology plays the

primary role (Orbey and Sarıoğlu Erdoğdu, 2021, Mennan, 2008). This has not been an "all black" and "all white" type of distinction, though. All design perspectives have both artistic and scientific components in different weights and their relative significance has gained different positions throughout the ages and places.

Differences in the Level of Abstraction in Basic Design Education (Abstract-Conceptual vs. Concrete-Environmental)

The second difference in basic design education stems from the level of abstraction in the course. In some universities Euclidean space and abstract conceptualisations dominate the basic design course while in some other ones, environment (place) and concrete perspectives are utilised (Sarıoğlu Erdoğdu, 2016). When studying in Euclidean space, the relations with the characteristics of the place/ site and/or environment are not included in the design process as a primary concern. This also aligns with the fact that first-year students are not yet accustomed to building science, construction technology, and site analysis. As such, an abstract basic design course provides students with skills to manage the design process rather than focusing on the details of a site (like geographical and climatic data; demographic features of the population, financial issues related to construction, construction materials, and methods, etc.) as novice designers are not aware of what and how they act while designing yet (Gürer, Özkar and Çağdaş, 2014). Correspondingly, basic design studio remains abstract both in problem definition and products and deals with abstract tasks that are segregated from real-life architectural issues (Gürsoy and Özkar, 2015).

Also, representation techniques and the materials used in the studio may differ. In abstract basic design courses, more process-oriented and relatively conceptual designs are produced whereas the concrete-based basic design courses might engage mostly with finished and detailed projects. You may come across freehand sketches and conceptual diagrams quite often in abstract basic design courses whereas scaled and more detailed drawings may be more often employed in site-specific and concrete basic design courses.

On this basis, the basic design course can be considered in a matrix of five categories: artistic/scientific/technological aspects (epistemological position) and abstract/concrete position (level of abstraction). Such a framework is suggested in this paper to provide a better explanation of understanding basic design education.

BASIC DESIGN COURSE AT DOĞUŞ UNIVERSITY AND EXQUISITE CORPSE (EC) FINAL PROJECT

Although first-year design education recalls the basic design of Bauhaus, not all follow the basic design perspective. Further, not all of them are studio-type courses, sometimes basic design is a supporting course given separately but assumed to be in parallel with the studio as in the case of Doğuş University. Here, in the Department of Architecture, design is viewed more as a scientific activity that requires analytical thinking following the Bauhaus approach and the basic design perspective. Hence, the basic design course, as one of the pioneering courses for freshmen students, is formulated to provide an environment where abstract and conceptual designs are made which depend mostly on the Gestalt principles and Bauhaus methods. Mostly, students were allowed to use only basic geometric forms in many of the exercises and free forms were not permitted. However, to increase students' abilities to design with free forms, EC was then employed as a thematic/ umbrella term in the basic design course. Such a diversion in the curriculum also aimed to increase the conversation skills and capacities of students within group work. Both of the approaches depend on learning by doing, yet EC is a group work so the game understanding is dominant.

The 3 relief designs at the upper row are includes designs developed by two students according to EC. The lower row of Figure 1 demonstrates student works from previous terms where relief models are mostly with basic geometric forms. Determining triangles/squares as the basic unit works in the second row are more harmonious and unified and hence can easily be described with Gestalt/Bauhaus terms like harmony and unity. Also, as the designer is solo in the whole process, the so-called eclecticism problem of EC is not an issue in the lower row works. On the contrary, in the first row, works represent two clearly differentiable design perspectives of the students designing in an EC game and seem to have a more complex structure.

Even though the basic design course is an abstract course at Doğuş University, where standard geometries are prioritised, the final project is developed to include EC, an opposite design perspective that recalls more artistic components. This was possible as for the final project, the development of a more complex formal language was a priority rather than incorporating functional, geographical-environmental, and economic concerns of architecture. Also, the rationality of the Bauhaus Ecole does not contradict the collaboration brought by EC. As declared by Mostafavi (2019), the Bauhaus seeks out collaborative pedagogy and tries to incorporate conversation into the process of knowledge creation.

As EC requires at least 2 persons at play further enabled and required to develop dialogue between the group members. The aim of incorporating "Exquisite Corpse" into the curriculum was to encourage students to explore alternative forms that allow them to produce complex design solutions and non-standard geometries. It is suggested that first-year students display discouragement in discussing their

Figure 1. Student works in basic design course at Doğuş University.

works and design processes (Özkar, 2011). The inclusion of EC, by definition, required group work at all phases of the design and hence enabled discussion among students about their designs. Furthermore, a curriculum based on an art stemmed approach, EC promised qualitative and quantitative increases regarding formal explorations. This process of form development is mostly known as formal explorations in the literature and as such, students deal with diversified solutions in the search for better fits to the given design problems with the help of EC. Group work and the "game" understanding behind the Exquisite Corpse approach facilitate the form development process of novice designers is facilitated.

In addition to EC, Decision Trees (DT) were developed by students as a compulsory submission in the final project. 4 clusters of concepts were given to students for the Decision-Making Process where they picked one from each cluster. Students needed to develop their own methods to utilise the benefits of both EC and DT in their design processes.

Final project: Exquisite Corpse Architecture: Abstraction, Geometry and Morphology

For their final project which was titled "*Exquisite Corpse Architecture: Abstraction, Geometry, and Morphology*", students worked as a group of two and were first asked to create a "decision tree" by selecting one item from each cluster listed below (Table 1) and then design compositions

Table 1. Clusters given to students for the decision-making process

1st Cluster Gestalt Principles	2nd Cluster Concepts	3rd Cluster Form	4th Cluster Spatial Properties
- **Continuation**	- **In between**	- **Orthogonal**	- **Boundary elements:** *such as a wall, column, and beam*
- **Solid-void**	- **Transformation**	- **Diagonal**	- **Orientation and way finding elements:** *such as corridor,*
- **Visual Balance**	- **Transition**	- **Curvilinear**	*point, and continuity elements*
- **Hierarchy**	- **Still/stable**	*(Basic geometric forms and*	- **Focal points:** *such as entrances and nodes, which are distin guished from composition*
- **Order**		*free forms can be chosen)*	
- **Repetition**			

to convey the expression of concepts of an abstract morphology model according to the decision tree that they created as a group in the first phase. The first cluster was based on Gestalt psychology, which involves the mind's simplification of the environment during the act of perceiving. The second cluster was based on the concept of visual inertia which reflects the degree of concentration and stability of a form that is related to the third cluster, form, and geometry. The last cluster, spatial properties, was based on the elements that help define a space in architecture.

The process, which is summarised in Figure 2, required both solo and group works where two design perspectives are combined into the final model.

In steps 1 and 2 (Figure 2), students are solo whereas in step 3 they start working together. Integration and collaborative gaming that EC requires to start in step 3.

The Participants and the Procedure

A total number of 73 students took part in the study. The study group consisted of 39% female and 61% male students. All students were from the Department of Architecture in the Faculty of Fine Arts and Design at Doğuş University. Students received course credit for their participation.

1st Week: Research, decision tree, and poster design: The instructions for each task were explained to the participants in the first week by the same two instructors. Verbal definitions of the concepts were also described briefly before starting the design phase, but the instructors did not show any visual displays. The students were first to do research on the concept of *"Exquisite Corpse Architecture"* and prepare a poster that includes both verbal and visual information including their research on the concepts of EC, morphology, and topography. In this poster, they were also asked to prepare three alternative decision trees, three design rules (algorithm), and three 2D abstract designs (30 × 30 cm) accordingly. The compositions were told to be designed as plan views through black and white compositions and only red colour were allowed for expressions. Vertical posters (50 × 70 cm) were asked to be prepared to complete this phase of the study (Figure 3: only visual parts are shown in the image, title blocks are cropped).

2nd Week: Physical modelling: Design alternatives of each group from the previous week were discussed based on the course curriculum for their originality and creativity and were dropped to one design alternative. It was expected that the task of thinking about the decision tree and combining one item from each cluster involved bringing out the harmony and/or distinctiveness of each concept in relation to the other and reaching *unity* in their overall design. Based on the chosen 2D design alternative, 3D abstraction and physical model production on a 30 × 30 cm work area with no height limit were asked to be done as a group. Students were told to use 2 mm white photo blocks, transparent materials, and red-coloured materials for model production.

Group Design vs. Solo Design

The students were first asked to think about the design concept as a group but then also asked to work individually by taking turns during the design phase as the concept

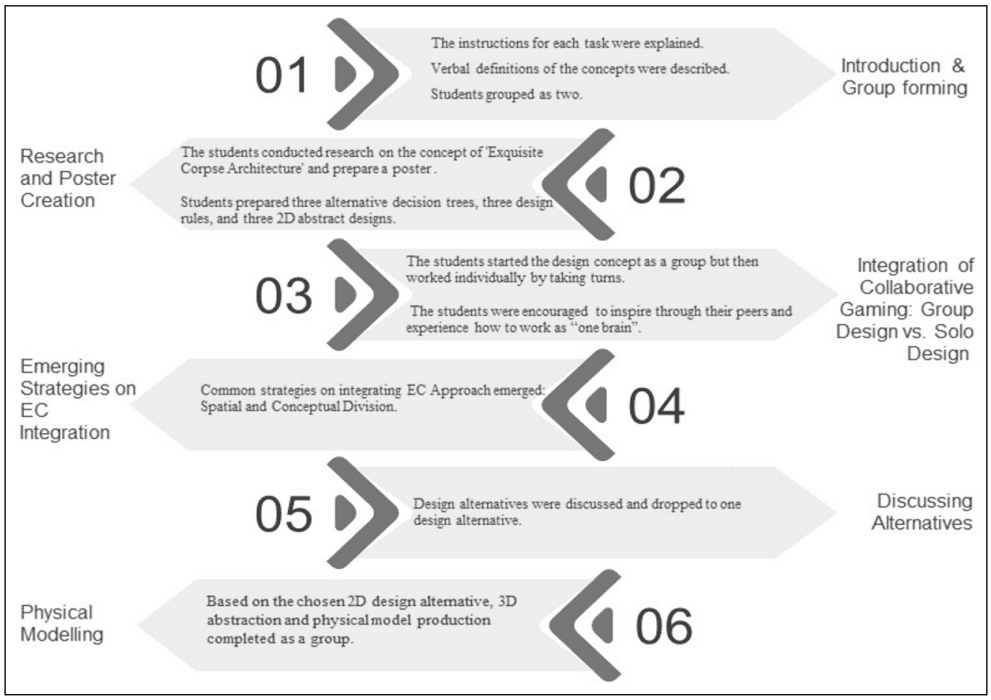

Figure 2. Design process: From solo to group work.

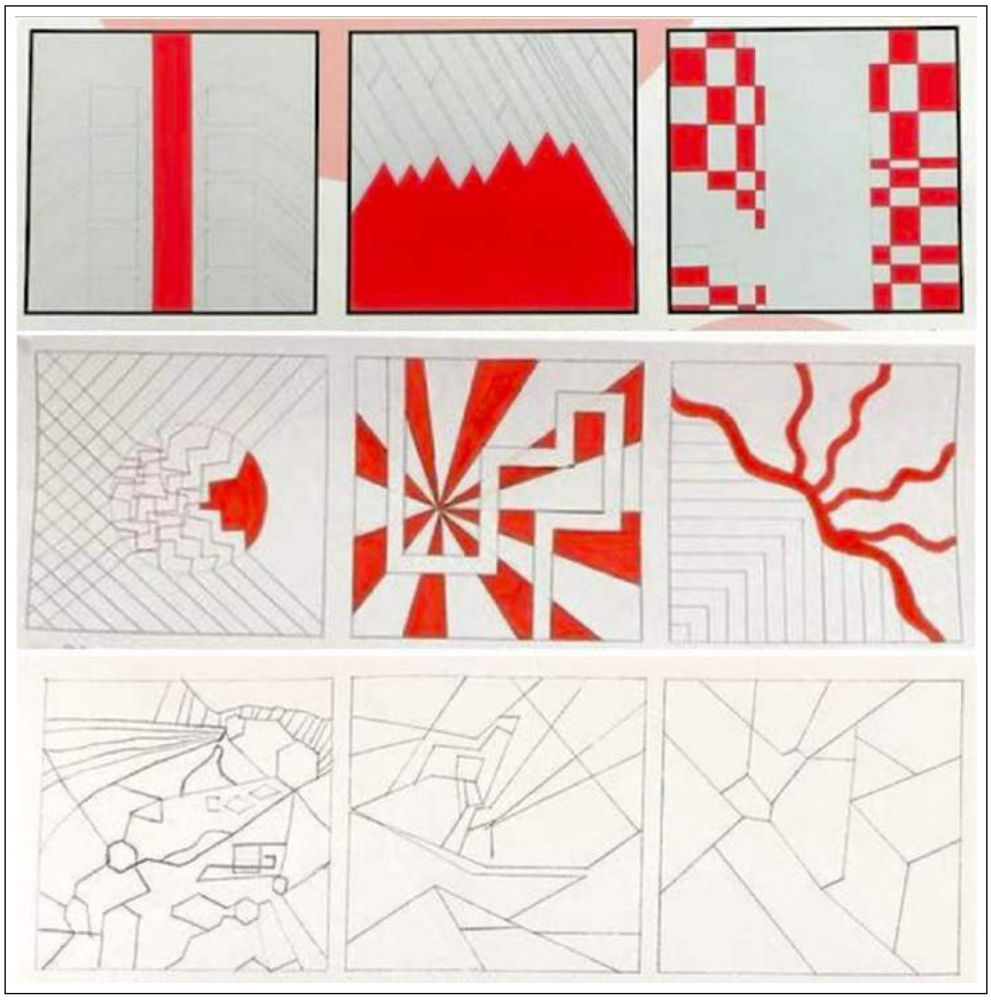

Figure 3. Exemplary student works: Posters.

of EC Architecture is based on the idea of *collaborative gaming*. Therefore, students were asked to come up with their own game rules in terms of how they "*collaborate*" within their design process. The expectation behind this process was to expose students to the opportunity in which they could achieve fresh inspiration through their peers and experience how to work as "one brain".

Eventually, in terms of the collaboration type among the groups, two main strategies emerged. The first common strategy used by groups was that each participant drew on a folded page, concealing each turn from the next until a cumulative design was formed. The second common strategy that emerged among the students was based on the idea that the participants divided the clusters among themselves and worked on the same page individually by taking turns (without folding or concealing) yet only using the clusters that they selected. Regardless of the strategy type, students were expected to examine and question the conventions of authorship, coherency, predictability, individualism, and composition inspired by the concept of Surrealists' cadaver exquisite.

Another result of incorporating EC in the design process stems from its artistic grounds as the course is given in an architecture department. In the first-year design studio, this has not been perceived as a problem but as a valuable input that could increase the creativity and abstract thinking of the students. As the design problems of the studio did not involve functional aspects, both creativity and abstract thinking brought by EC were welcomed.

Obviously, the final project based on EC ended up with the anticipated visual results: two clearly differentiable design attitudes which barely form a unity in the final product (Figure 4). The joint sections especially emphasised the inclusion of EC in the design problem, which can be referred to as eclecticism. A similar issue was raised in a study of EC where the authors argued that an emergent criterion for the evaluation of Exquisite Corpse images, is compositional unity and that the final product can be read like the work of four individual artists, each with their own technique and idiosyncrasies (Weir et al., 2018).

This was however also the expected benefit of incorporating EC in the final project. As the Exquisite Corpse is argued to

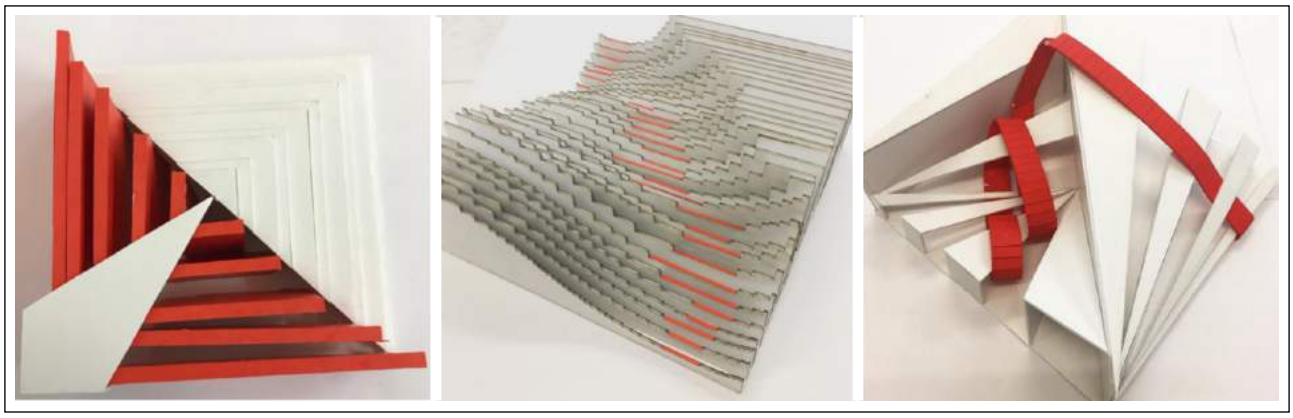

Figure 4. Exemplary student works: Models.

lead to "disturbing" and "arbitrary" designs (Dali, 1932) where the end-product frequently has remarkably beautiful details notable for their distinct juxtapositions (Weir et al., 2018).

METHODOLOGY

Method

Architecture's multi-disciplinary structure affects not only its theoretical foundations but also its methodological approaches. Although it is stated that the main qualitative data types employed in architecture studies are texts, pictures, maps, and drawings, there are studies that employ quantitative methods even when artistic and more subjective elements are the focus. (Habib, Etessam, Ghoddusifar, Mohajeri, 2021). For instance, in a study, an analytical tool to quantitatively evaluate qualitative features such as aesthetic value of facades is employed (Meddahi and Boussora, 2021). In another study, both qualitative and quantitative methods are utilised to enhance the understanding of the design process in architecture, which is a subjective aspect (Orbey and Sarıoğlu Erdoğdu, 2021). Numerous studies reviewed the changing methodological perspectives and highlighted the need for mixed approaches that combine distinct research methods for better understanding (Berta, Bottero, and Ferretti, 2016; Cieslikowska, 2020; Orbey and Sarıoğlu Erdoğdu, 2021; Pietrzyk, 2022).

In this study, in order to summarise the data in an understandable and meaningful way, descriptive statistics were employed through quantitative descriptions of the sample (Sommer & Sommer, 2002). Particularly, descriptive statistics were useful to describe the characteristics and patterns of the subjects. Contingency tables (or frequency tables) were used to tabulate categorical data. The unit of analysis used for the study is students. All statistical analyses were conducted with the SPSS software program with a priori level of significance of 0.05.

In the literature, there are challenges in determining definitive approaches to design research due to various factors. According to Maxwell (2010), distinguished qualitative researchers such as Howard Becker and Martyn Hammersley have advocated for the incorporation of "quasi-statistics" to enhance the accuracy of statements using terms like "some," "usually," and "most." These counts offer precise information on how frequent, typical, or substantial particular occurrences are. However, it is also acknowledged that this precision comes at the expense of excluding non-quantitative details. Therefore, numerical data should complement qualitative information rather than replace it. This study identifies several significant reasons for utilising numerical analysis, including:

- Quantitative data can reveal patterns that are not immediately obvious from the qualitative data alone.
- It enhances the internal generalisability of qualitative research findings. This refers to the ability to generalise the themes or findings identified within the specific setting or group studied, establishing that they are representative of the entire population studied. This is particularly important for case studies, as the validity of the conclusions depends on their internal generalisability to the participants or the case as a whole.
- Quantitative data allows for the identification and accurately describing the diversity of actions, perceptions, or beliefs in the setting or group being studied.
- Individuals often have limited knowledge of broader patterns beyond their immediate experiences, and quantitative data can complement their perspectives by providing a more comprehensive understanding of what is happening in a particular setting or for individuals belonging to a specific category.

Also, quantitative data serve as valuable evidence to support interpretations and helps in evaluating the amount of evidence in the data that supports a specific conclusion (Becker 1970; 1990).

Therefore, in this study, the discussions on research methods

as such are evolving and an alternative basic design course curriculum is first presented and secondly its effects are analysed by carrying out a quantitative method (descriptive studies (frequency charts and cross-tables) and correlational investigation (chi-square tests)). Grades of the students (A+-F) are used as a categorical variable and are included in the analysis in this context to measure the success of the students. Rubric matrixes were employed to guarantee fair grading across instructors, where models and posters were equally important in terms of their "consistency", "on-time submission" and "design quality".

Data and Research Questions

At the end of the semester, an online questionnaire was distributed to students. After missing cases were omitted, the raw data consisted of 73 cases. The aim was to enhance our understanding of the design processes of novice designers and more specifically, the use of EC as a guiding instrument in a design problem, and its effect on students' grades. Secondly, the use of decision trees (DT) in design processes was investigated as a part of design processes. As such, primary research questions were formulated as follows:

1. How did the students' employment of EC in their design process (i.e., either by "*areal-spatial division of labour*" or by "*conceptual division of labour*") affect their success?
2. How did the students' employment of "decision tree" in their design process (i.e., "*first design then decision tree*" or "*first decision tree then design*") affect their success?

RESULTS AND EVALUATION

Descriptives

EC

Two primary ways have been used by the students to employ EC in their work. They either selected certain parts of the models (denoted as "*areal-spatial division of labour*" in the Tables and Figures) or alternatively, they picked from their selection of "concept cluster" (denoted as "*conceptual division of labour*" in the Tables and Figures) and designed according to these concepts individually.

Regarding the first research question on how EC has been incorporated into the final designs, *spatial division of labour* has been the far most preferred approach among students by 70%. In other words, 70% of all students shared certain parts of the model and carried out their designs separately in those pre-determined specific areas (Figure 5).

Apart from being the most frequent choice, this approach in the end led to slightly higher grades on average (75 compared to 72 over 100). Almost 25% of all students in this group (spatial division of labour) received A or A+ while the very same ratio for the other group (conceptual division of labour) is 20% (Table 2).

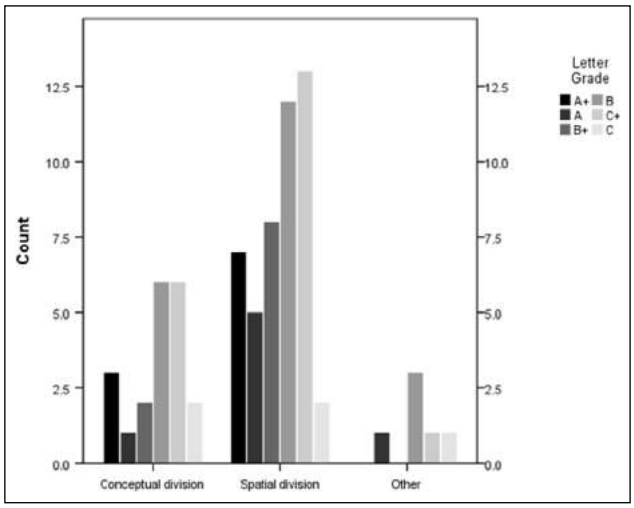

Figure 5. Frequency distribution of EC approach (count) and grades.

Accordingly, one can argue that depending on the grade differences between the two groups, the spatial division of labour could have been facilitating/orienting the design process better than the conceptual division of labour only slightly. This approach, namely sharing the workload over the physical model, could be more practical in group work where individual creativity could have been utilised the most. Also, spatial division of labour might be, by definition, a more suitable way of adopting an EC approach in design.

Only 6 students stated that they employed another approach to employ EC in their design and represented in Figure 1 and Table 1 as "other". Although low in score, they have explanatory power. One student said:

"*One by one, we added individual forms to the design*",

Revealing that they preferred to use their beforehand designed modules/units as a basis, or they developed new formal explorations at each step. In any case, they had worked inductively on a formal axis. This is in fact another way of the spatial division of labour where the designers felt comfortable working incrementally and mostly on smaller parts of the model.

Another student denoted that

"*During the design process, we changed our way of EC employment more than once*".

Meaning that they employed EC in different ways at different times in their design which emphasises the dynamic and cyclic nature of the design process where EC is used as a leverage point.

In summary, EC has been employed in a variety of ways in design processes, and those who made spatial labour of division in model-making received barely higher grades.

Table 2. Cross-tabulation between EC approach and letter grades

	EC Approach and Letter Grade Cross-tabulation						
	Letter Grade						Total
	A+	A	B+	B	C+	C	
EC Approach							
Conceptual division							
Count	3	1	2	6	6	2	20
% Within EC Approach	15.0	5.0	10.0	30.0	30.0	10.0	100
% Within Letter Grade	30.0	14.3	20.0	28.6	30.0	40.0	27.4
% of Total	4.1	1.4	2.7	8.2	8.2	2.7	27.4
Spatial division							
Count	7	5	8	12	13	2	47
% Within EC Approach	14.9	10.6	17.0	25.5	27.7	4.3	100
% Within Letter Grade	70.0	71.4	80.0	57.1	65.0	40.0	64.4
% of Total	9.6	6.8	11.0	16.4	17.8	2.7	64.4
Other							
Count	0	1	0	3	1	1	6
% Within EC Approach	.0%	16.7%	.0%	50.0%	16.7%	16.7%	100.0%
% Within Letter Grade	.0%	14.3%	.0%	14.3%	5.0%	20.0%	8.2%
% of Total	.0%	1.4%	.0%	4.1%	1.4%	1.4%	8.2%
Total							
Count	10	7	10	21	20	5	73
% Within EC Approach	13.7	9.6	13.7	28.8	27.4	6.8	100
% Within Letter Grade	100	100	100	100	100	100	100
% of Total	13.7	9.6	13.7	28.8	27.4	6.8	100

Decision tree

The second research question was on the decision tree that students had to develop in the design process. About 75.3% of all students developed their decision trees *before* they started designing which aligns with the aims of planning tree in the first place (Table 3). "Decision tree" was meant to be a facilitator for novice designers in their first final design projects and hence was a part of the final submission list.

And yet, as Figure 6 visually indicates, those students who developed their decision trees in advance received lower grades. Of the whole A+ and A grade receivers, almost 60% stated that they developed their decision trees *after* their design was completed.

This supports that decision trees was not used as facilitators by the students, contrary to the initial aim. Rather, they were developed mostly because it was a compulsory item in the submission list. Grades of the students revealed an opposite trend: when decision trees are prepared after the design is completed, they received higher grades on average (83 vs. 71 over 100).

Chi-Square Analysis

In addition to the descriptive analysis, in this paper, a chi-square analysis was further carried out between the grades of the students and their EC incorporation and decision tree approach. To answer relational questions, correlational analysis was used as a tool in this study. Since the research questions of the study aimed to examine associations between variables rather than predicting the outcome variables, Chi-square tests were the preferred method. To investigate correlations with non-continuous and/or frequency/categorical data, relationships between variables can be found that contain frequency data using a test called the chi-square test (χ^2) for independence (Wan, He and Tu, 2012).

Since the independent variables of the study (students' decision-making process: use of decision tree (use of decision trees before or after) + choices on clusters of the decision tree, and use of exquisite corpse method (spatial or labour division)) were nominal categorical, Pearson's Chi-square test was used to test for independence between the nominal and ordinal categorical variables of the study.

Table 3. Cross-tabulation between "Decision Tree" and "Grades"

	Cross-tabulation						
	Grades						Total
	A+	A	B+	B	C+	C	
Decision-making Process							
First design then decision tree							
Count	8	3	1	2	3	1	18
	44.4	16.7	5.6	11.1	16.7	5.6	100.0
% Within Grades	80.0	42.9	10.0	9.5	15.0	20.0	24.7
% of Total	11.0	4.1	1.4	2.7	4.1	1.4	24.7
First decision tree then design							
Count	2	4	9	19	17	4	55
	3.6%	7.3%	16.4%	34.5%	30.9%	7.3%	100.0%
% Within Grades	20.0%	57.1%	90.0%	90.5%	85.0%	80.0%	75.3%
% of Total	2.7	5.5	12.3	26.0	23.3	5.5	75.3
Total							
Count	10	7	10	21	20	5	73
	13.7	9.6	13.7	28.8	27.4	6.8	100.0
% Within Grades	100.0	100.0	100.0	100.0	100.0	100.0	100.0
% of Total	13.7	9.6	13.7	28.8	27.4	6.8	100.0

When more than 20% of cells had values lower than 5, the Likelihood Chi-square test was used as an alternative to Pearson's chi-square test as it does not require to have values of more than 5 in each cell (Agresti, 1996). Besides looking at the chi-square significance value, the strength of association was also calculated when there was significant evidence found of a relationship between the variables. In terms of measuring the strength of associations between the independent and dependent variables, Cramer's V, as a measure of strength, was calculated to measure the strength of the association between one nominal variable either with another nominal variable or with an ordinal variable reported. When calculating Cramer's V, both variables can have more than two categories. It applies to either nominal × nominal crosstabs, or ordinal × nominal crosstabs, with no restriction on the number of categories (Agresti, 1996). On the other hand, to measure the strength of association between ordinal categorical variables (i.e., to examine the interactions between the individual-level variables of the study), gamma, as a measure of association for ordinal variables, was calculated and reported. The gamma ranges from -1.00 to 1.00. A gamma of 0.00 reflects no association with a gamma of 1.00 reflects a positive perfect relationship between variables. A gamma of -1.00 reflects a negative perfect relationship between those variables (Agresti, 1984).

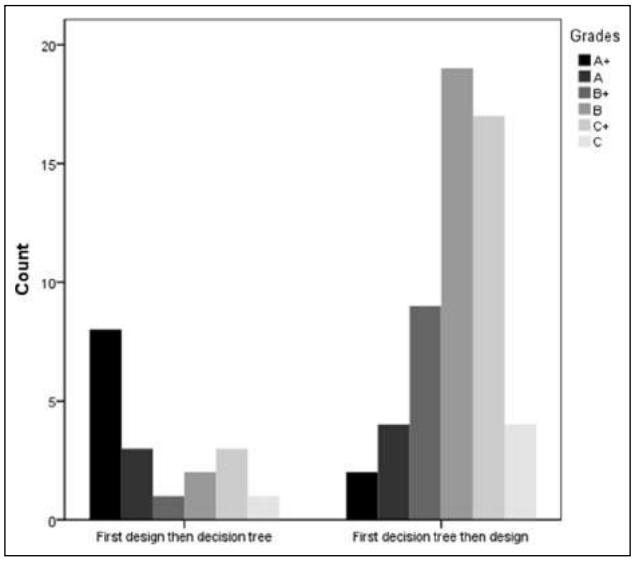

Figure 6. Decision-making process in relation to grades.

Use of EC Approach (Spatial vs. Conceptual Division) and Grades

A Pearson's chi-square test of independence was performed to examine the relation between students' use of the exquisite corpse approach (spatial × conceptual division) and their grades. There is no significant evidence found of a relationship between these two variables, Pearson χ^2 (2, N=73) = 0.410, p=0.815.

As the grades of the students did not vary significantly depending on the EC approaches (Figure 5), chi-square analysis did not find a significant relationship.

Decision-Making Process (Use of Decision Tree) and Grades

A likelihood chi-square test of independence was performed to examine the relation between students' use of decision trees and their grades. The tests between these two variables were found to be statistically significant at the 0.05 significance level for the following:

χ^2 (5, N=73) = 20.35, p = 0.001, with a moderate (Cramer's = 0.55) effect size.

Hence, use of decision trees before or after was found to be significantly affecting the grades of the students which was already pointed out in Figure 5.

Evaluation

The descriptives and chi-square analysis carried out for EC and DT were an attempt to enhance our understanding of the design process of novice designers. Incorporating both EC and DT in the final project aimed to help freshman students guide their design processes. Yet, the results demonstrated a different perspective.

Employment of EC in the design process, apart from its formal and creative capacity, proved to serve as a facilitator only when a spatial/areal division of labour was made. The results allow the conclusion that the incrementalist nature in EC (that designers must work one by one) is more suitable for the physical separation of the product (in our case the model). Attempting to separate the conceptual thinking and assigning different ideas/concepts to different designers -which can perhaps be accepted as the philosophical background of the design- ended up in less successful designs in terms of grades received.

Analysis on employment of decision trees revealed that developing the decision tree in advance received lower grades on average. This might suggest that obeying a set of predetermined decisions in a design process is hard to carry on for novice designers. In such cases, rather than facilitating, decision trees turned out to be limiting the design capacity of the students and their problem-solving skills. On the contrary, developing decision trees afterward meant to be just the preparation of a graph of which the details had already been decided. Also, not spending time developing a decision tree in advance, this group of students started designing before and hence found more time on solving design problems faced during the process.

This finding is broadly consistent with the previous works in the design literature suggesting its cyclic nature where designers must go back and forth to make necessary changes in a design process (Schön, 1983; Sarıoğlu Erdoğdu and Orbey, 2017) and by rule, design cannot begin with a preconceived idea (Rand, 1946). Hence, "decision trees" as a guiding instrument, prevented such movements of novice designers adversely either because of time constraints created or their inability to modify pre-given decisions of themselves. From the other side of the token, this finding suggests that the use of DT in a design process does not guarantee successful process management.

CONCLUDING REMARKS

Many perspectives in design education require scientific methods for enhancing it. The analysis used in this paper provides scholarly information to other design educators in higher education. The initial aim is to incorporate EC and DT in the final project were to help novice designers in guiding their design processes better. As a more heuristic approach, EC was more effectively used by the students. The findings suggest that Exquisite Corpse is a powerful method for novice design students to learn and implement in their design processes even in abstract types of basic design studios. However, the use of a more rationalistic way, namely DTs, in the design process did not yield successful results in terms of grades.

EC was used in a variety of ways by the students, two major paths being spatial division of labour (1) and conceptual division of labour (2). When the grades of the students are compared as an indicator of successful design, EC is proved to be an alternative way of facilitating/orienting the design process if the former path has been chosen by the students, namely the spatial division of labour. If EC is utilised by students for a separation in the conceptual level (a conceptual division of labour), however, the grades were significantly lower. In terms of DT, using it as a guiding instrument in the design process was not found to be an effective approach. Rather it can be argued that it adversely limits the design movements of students especially when prepared in advance.

The paper highlights the need for distinct methods for the scientific analysis of design research. In this context, a path is introduced based on a quantitative analysis of design-based research questions. However, like every study, this study has some delimitations. Other than "grade of the students" as the dependent variable, there were no further statistical analysis options in the available data set. Also, how to combine qualitative and quantitative methods will be still on the agenda as there is a need for developing innovative ways for analysis for multi-disciplinary research areas of design, architecture, and urban design. Our model is an attempt to exemplify analytic research for design-related branches that may be accepted to be another future research of the paper.

[1]*Rotterdam Academie van Bouwkunst (RAvB) https://landscapearchitecturetudelft.nl/cadavre-exquis-20/ Accessed 13.06.2020; Robotics Research and Advanced Manufacturing*

research group at the Sydney School of Architecture, Design & Planning and Gosford Quarries (https://sydneydesign.com.au/2019/event/exquisite-corpse-catenary-vaults/) Accessed 15.07.2020; A symposium held by The Berlage Center for Advanced Studies in Architecture and Urban Design entitled "Exquisite Corpse: Architecture Assembled". http://www.theberlage.nl/events/details/2016_06_03_exquisite_corpse_architecture_assembled Accessed 15.07.2022; a master's thesis entitled "Exquisite Corpses: an architectural mystery" at Massachusetts Institute of Technology. Department of Architecture by Canizares, Galo http://hdl.handle.net/1721.1/89939 Accessed 10.03.2022.

[2]At Yıldız Technical University, in the Department of Architecture as a separate course and, at Middle East Technical University, in the Department of Architecture as an individual studio course, for instance.

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Article

Optimization of the room acoustics parameters values depending on auditory sensitivity distinctions

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ABSTRACT

Elderly individuals may experience hearing difficulties for various reasons. The most common of these is age-related hearing loss called presbycusis. Due to these changes in auditory sensitivity, it is difficult to hear and understand speech at certain frequencies. Due to the acoustic design based on the auditory sensitivity of the younger ear, elderly listeners may have hearing difficulties, especially in conference rooms without a sound system. The objective of this research is to provide acoustic comfort conditions in conference halls that can be suitable for all listeners. In this context, new optimum reverberation times were determined for three different age groups to eliminate the negative effects of auditory sensitivity distinctions on speech intelligibility. The obtained results were compared to the reference values determined for the objective room acoustics parameters in various standards (ISO, DIN, JIS, etc.) for young and elderly listeners. A 3000 m3 (volume) conference hall was chosen as an example to support the research with a listening test and a survey. Following the completion of the listening test studies for a receiver point located approximately in the center of the hall, the data were analyzed in a statistical program. Based on these evaluations, it seems evident that the subjective and objective data overlap and that the intelligibility values can be improved by applying the new reverberation times determined by the study's method to the halls. It is thought that the research will make significant contributions to the improvement of acoustic comfort in conference rooms.

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INTRODUCTION

Various standards have been developed as a result of the studies that were carried out so far to evaluate the listeners' acoustic comfort in conference halls. The DIN standard, (German Institute of Standardization, 2005) which was first published in 1968 by the Deutsches Institut für Normung, is one of these. In the standard titled "Acoustic quality in small- and middle-sized rooms," the acoustic criteria required for the spaces used in daily life are summarized and made available as a basic resource for planning and design. A hall's acoustic quality indicates its suitability for a particular acoustic performance, such as speech communication or musical performance. In this context,

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the rooms were divided into two categories, A and B, in the version of the standard published in 2004. Category A includes areas where acoustic comfort is provided in terms of intended room use (speaking - music) over average and longer distances, as a result of the adjustment of the reverberation time and directivity of the sound source. Category B, on the other hand, specifies the criteria for appropriate absorption regulation in situations where short-distance speech communication is crucial. The five usage types determined for Category A are labeled as A1-A5. It is recommended that music (A1), speech/presentation (A2), education/communication (A3), education/special communication (A4), and sports (A5) functions should be evaluated separately. Room types in this category are as follows; conference and meeting rooms, courts, training and seminar rooms, group rooms in children's daycare facilities and elderly care centers, religious venues, ball and festival halls, gymnasiums, and indoor pools. A4 usage type states that in cases where improved conditions are needed in terms of speech intelligibility, the reverberation time given for A2 and A3 usage types (education/communication) can be reduced by up to 20%. A4 "special" use, in particular, aims to meet the needs of people with hearing impairments (Nocke, 2018). As a result, various formulas have been created to determine the required reverberation times in rooms. Ttarget (target reverberation time) varies depending on the size of the room and the type of use. The headlines of the International Organization for Standardization (ISO) standards, which include various evaluations in terms of room acoustics criteria, were also examined as a literature source within the scope of the study. The primary one is the ISO 7029 standard, (International Organization for Standardization, 2017) titled "Acoustics-Statistical distribution of hearing thresholds related to age and gender," which examines age-related changes in auditory sensitivity. The standard describes the expected mean values of hearing thresholds and the method developed to calculate the statistical distribution around this mean. This calculation is possible for frequencies in the 125-8000 Hz range. (Kurakata&Mizunami, 2005) To establish the standard, a comprehensive study and an additional formula study were carried out by various researchers. (Robinson&Sutton, 1978; Shipton,1979). As individuals age, their sense of hearing gradually changes in various aspects. One of the most obvious effects of aging is an increase in hearing threshold. This is more noticeable at higher frequencies than at lower frequencies. In aging societies, there is a need for accessible designs that can be used by as many people as possible, including the elderly. (Kurakata&Sagawa,2008). For this purpose, the standard ISO/TR 22411 has been developed. The standard titled "Ergonomics data and guidelines for the application of ISO/IEC Guide 71 to products and services to address the needs of older persons and persons with disabilities" provides various guidelines to use in practice by addressing ergonomics data in the ISO/IEC 71 guide and the needs of people with disabilities (International Organization for Standardization, 2008; International Organization for Standardization, 2014). It is intended to guide the accessible design of products, services, and environments by providing ergonomics data on people's sensory, physical, and cognitive abilities. One of the topics examined in this context is the hearing capacity of people of various ages. The Japanese Industrial Standard (JIS) titled "The standards for auditory and visual functions in the guidelines for the elderly and people with disabilities" (Japan Standard Association, 2011) was used in the development of the international standard. Based on the importance of frequency, sound pressure level, and time-dependent changes in the perception of auditory signals, it was proposed by the Association for Electric Home Appliances in 2002 to adjust the frequency and time model. (Japan Standard Association, 2002) At the same time, various studies on sound levels have been conducted taking into account the effect of declining hearing due to aging, background noise, and individual differences. Afterward, different studies were carried out to develop auditory signals that can be heard easily by both young and elderly people, and the JIS S 0014 standard. (Japan Standard Association, 2013) was established as a result. In this context, hearing ability in the presence of background noise was measured for old and young individuals. As a result of the experimental research, it was confirmed that when the sound level reaches a certain value, elderly individuals perceive the sound as loud as young people. (Sato,2006). The majority of JIS guidelines are based on research done in collaboration with the National Institute of Technology and Evaluation. There is another standard for speech intelligibility (STI) calculations, which is a different room acoustics parameter. The standard BS EN 60268 has been published with the title of "Sound System Equipment Part 16: Objective Rating of Speech Intelligibility by Speech Transmission Index." (British Standards Institution, 2011). The purpose of this document is to standardize the STI methodology in a more comprehensive, clear, and complete approach. A new method for the estimation of the auditory masking effect is presented. The standard also includes explanations about age-related hearing loss and its effect on speech intelligibility. In determining the reference values of the room acoustics parameters evaluated within the scope of this study, the standards mentioned in this section were used and comparative analyzes were carried out.

METHODOLOGY

With longer life expectancies, the proportion of elderly people in the adult population is increasing. Although it is incorrect to label older people as disabled, it is well known that the natural aging process causes a variety

of physiological changes in people (Figure 1), including different types of hearing loss.

People with hearing difficulties may not be able to hear the auditory signal due to the frequency of the signal, the effect of background noise (including echoes), fast speech, and reduced volume. (Stephanidis 2009, 3-3)

Hearing loss can cause cognitive confusion and negatively impact people's quality of life. According to statistical research, one out of every ten people have a significant hearing impairment. (Newell & Gregor, 1997) Figure 2 illustrates the ISO 7029 graphs that were generated by calculating hearing threshold deviations based on the listener's age and frequency parameters.

Hearing threshold change is defined as "the expected mean value of hearing thresholds for a given age relative to the average threshold of an 18-year-old listener." For example, for 90% of 70 years old to hear a 2000 Hz signal as well as 18-year-old adults, the signal must be at least 30 decibels louder. Hearing thresholds in ISO 7029 standards are given in separate charts for male and female listeners of different ages (Figure 2). Based on these findings, the following steps were taken to evaluate auditory comfort in conference halls for listeners with varying auditory sensitivities.

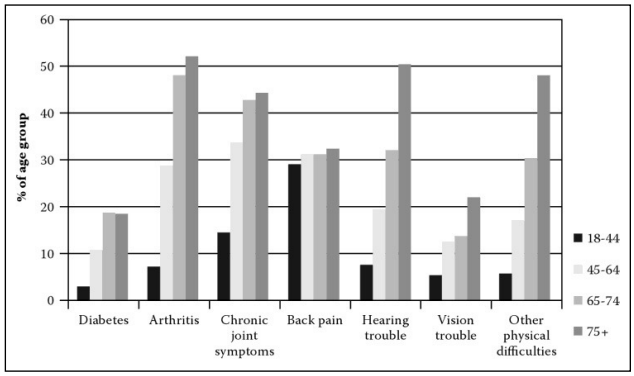

Figure 1. Physical disabilities as function of age (Stephanidis 2009, 3-3).

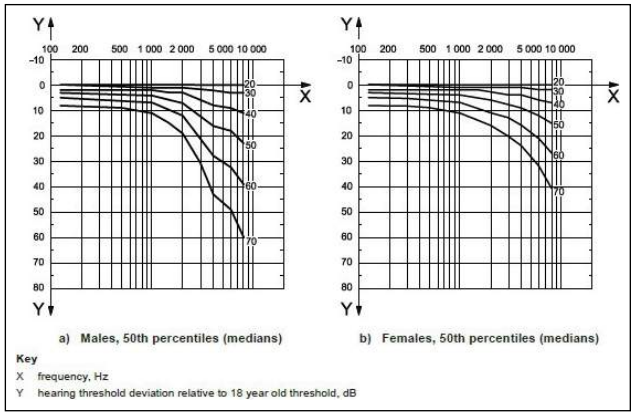

Figure 2. Hearing threshold as function of age-50th percentiles (ISO 7029).

- Determining the parameters for the research (such as listeners room, etc.) based on the literature and standards.
- Conducting studies through the simulation program to evaluate different halls with reference to predetermined criteria
- Evaluation of the results obtained by considering the auditory sensitivity distinctions
- Explanation of the method to be used to improve intelligibility values and application of the new reverberation times (that obtained as a result of this method) to the hall
- Performing an auralization study in a selected hall and completing listening tests with participants of various ages to support the simulation data with fieldwork
- Comparison of subjective and objective data with statistical analysis

Determining the Parameters and Standards to be Used in the Research

The following figure summarizes the studies conducted in this context.

Simulation Studies

The room acoustics parameters shown in Figure 3 were calculated in the Odeon simulation program for various receiver points in three different halls of 1000, 3000, and 5000 m^3 size. The criteria and standards specified in Figure 3 were used to determine the reference values. The studies were primarily conducted according to the values

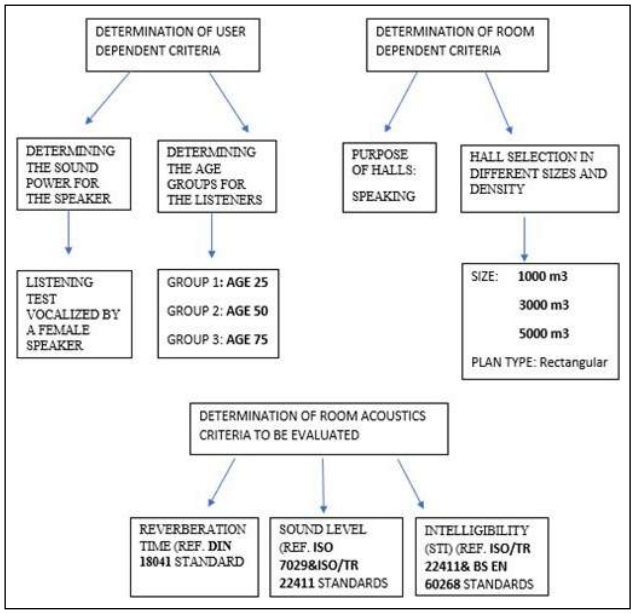

Figure 3. Parameters and standards evaluated within the scope of the research.

determined for the young ear, and the auditory comfort conditions of different age groups were examined in these conditions. European scale was used to determine the dimensions of the conference halls. (Rettinger 1988, 160) Table 1 shows the width, length, and height values calculated for the halls, and the locations of the receiver points are given in Figure 4 additionally.

The equation determined in the DIN 18041 standard for "classrooms and seminar rooms, group rooms in kindergartens and nursing homes, conference, and meeting rooms" was used to determine the reverberation times in halls depending on frequency. Accordingly, the reverberation time is calculated as (Ttarget) = 0.32 lg V-0.17. Depending on the room size, the mid-frequency reverberation times determined for speech are 0.79 s for a 1000 m^3 hall; 0.94 s for a 3000 m^3 hall, and 1.01 s for a 5000 m^3 hall. Afterward, the graph given in the DIN standard was used to determine the frequency-dependent distribution of target reverberation times. Table 2 shows the optimum values calculated for the halls by multiplying the coefficients in the graph with the mid-frequency reverberation times.

As a result of the background noise description research, it was decided to use the NC25 curve in all halls. (Schroeder vd., 2007; Bradley, 2002; Barron, 2009). The BB93_NORMAL_NATURAL file in the Odeon simulation program is used for the sound level parameter, which is the average of the sound levels of male and female speakers. (Odeon Application Note, 2014).

Evaluation of Simulation Results by Considering Auditory Sensitivity Distinctions

The standards mentioned in Chart 1 were used in the evaluation of the results obtained through the simulation program for conference rooms of different sizes. For this purpose, as a starting point, sound levels should be arranged according to the auditory sensitivity distinctions determined in ISO 7029 for the age groups (25, 50, and 75) to be evaluated. Male listeners have more hearing loss than female listeners, especially at certain frequencies. For this reason, changes in hearing thresholds expressed as "values not exceeded in 50% of male listeners" in the standard were taken into account. The results were analyzed in terms of "Sound Level" and "Intelligibility (STI)" parameters.

Sound Level

Vocal effort is defined as the A-weighted speech level that occurs 1 m in front of the speaker's mouth (International Organization for Standardization, 2003). As a result of the examination of the ISO/TR 22411 standard and various studies in the literature, it has been concluded that a minimum speech sound level of 50 dBA is needed for both young and elderly listeners (Sato vd., 2011; Akdağ, 1995).

Table 1. Room specifications for three different halls

Hall Number	V (m^3)	Height (m)	Width (m)	Length (m)	Number of listeners
I	1000	6	10.14	16.22	143
II	3000	8.65	14.45	23.10	320
III	5000	10	16.7	26.7	480

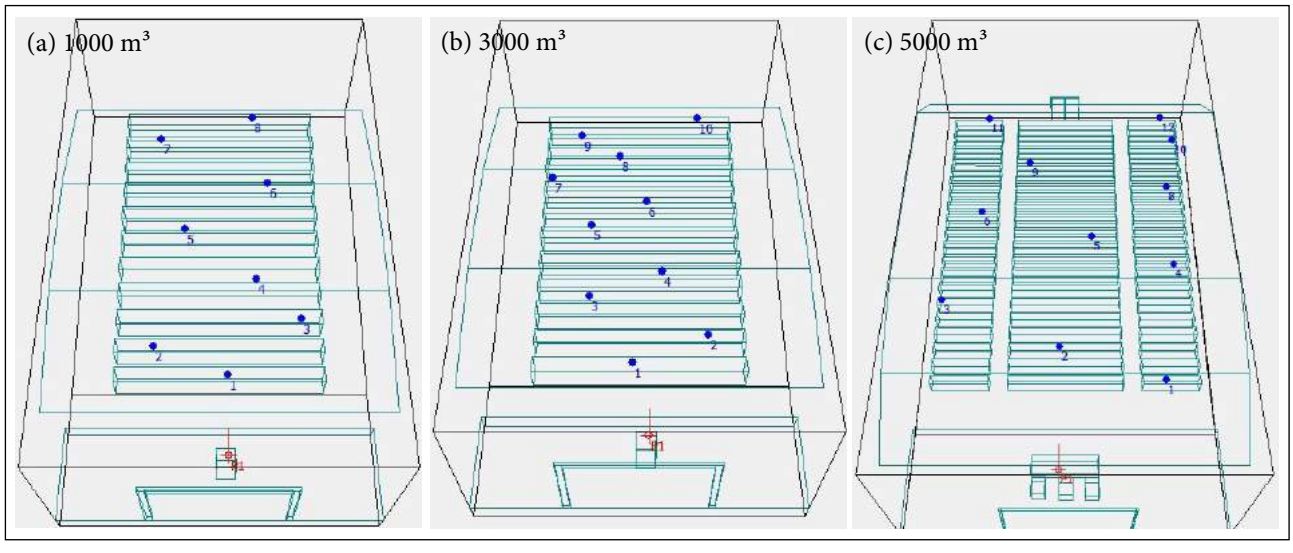

Figure 4. Sample images indicating the placement of source and receiver points in the acoustic simulation program.

Table 2. Optimum reverberation times for speech based on hall size

V (m^3)	Frequency (Hz)	125	250	500	1000	2000	4000
1000	Topt. (s)	0.79	0.79	0.79	0.79	0.79	0.79
	T30 opt. max	0.95	0.95	0.95	0.95	0.95	0.95
	T30 opt. min	0.54	0.60	0.60	0.60	0.60	0.50
3000	Topt. (s)	0.94	0.94	0.94	0.94	0.94	0.94
	T30 opt. max	1.13	1.13	1.13	1.13	1.13	1.13
	T30 opt. min	0.65	0.70	0.70	0.70	0.70	0.60
5000	Topt. (s)	1.01	1.01	1.01	1.01	1.01	1.01
	T30 opt. max	1.21	1.21	1.21	1.21	1.21	1.21
	T30 opt. min	0.70	0.76	0.76	0.76	0.76	0.65

Intelligibility (STI)

The "adequate intelligibility" tables prepared for "young listeners and people with hearing loss over the age of 60" in the ISO/TR 22411 standard were used in the evaluation of speech intelligibility (Table 3).

According to Table 3, the STI parameter should be at least 0.6 to provide adequate speech intelligibility. Table 4 presents an analysis of the results obtained from the calculations completed for three different halls in this context. During the calculations made in the Odeon program, which is used for simulation studies, the speaker's volume is adjusted according to the auditory sensitivity of different age groups. While making these arrangements, both sound levels and background noise levels should be reduced at the same rate using the average hearing loss values specified in the ISO 7029 standard. Since the distinction between background noise and sound level is taken into account in STI (speech intelligibility) calculations, there is no change in STI results for different age groups, since both values decrease at the same rate. Table 4 shows the reduced values of sound levels reaching different receiver points after the adjustment for age-related differences in auditory sensitivity.

When the results are examined; it is seen that the acceptable intelligibility values are provided at all receiver points in the 1000 m^3 hall. When the results are examined in terms of sound level, it is observed that sufficient sound levels cannot be achieved, particularly for the audience in certain age groups. Since it will be possible for the speaker to raise her/his voice only to a certain level in rooms that do not have a sound system; hearing difficulties will be noticed especially for elderly individuals who experience decreases of up to 30–40 dB in hearing thresholds at high frequencies. As a result, sound systems are recommended in halls larger than 1000 m^3. Studies done to increase intelligibility (STI) values were explained in the next section.

Determination of New Reverberation Times to Increase Intelligibility in Conference Halls

To increase the intelligibility values to the desired levels, the method in a doctoral thesis was implemented. (Akdağ, 1995) The method in the thesis was developed on the assumption that speech sounds are masking each other like background noise. For this reason, it was concluded that the 2000 Hz frequency, (French&Steinberg, 1947) which is considered the most important frequency in the intelligibility of speech in the literature, should not be masked by the sounds at lower frequencies. A formula was developed based on the assumption that new optimum reverberation times should be calculated to prevent masking (Figure 5).

Accordingly, the following equation was used to determine the reverberation times:

60/T60= b(1,2,3,4,5)-(b5-B)/0.070

T60=Reverberation time b(1,2,3,4,5)= Total sound levels at each frequency

Table 3. The relationship between intelligibility degree and STI for normal hearing young and hearing-impaired elderly persons

STI Label Category	Normal Listeners (Standartd STI)	Older Listeners PTA = 15 dB	Older Listeners PTA = 20 dB	Older Listeners PTA = 30 dB
Bad - Poor	0.30	0.42	0.47	0.51
Poor - Fair	0.45	0.57	0.62	0.66
Fair - Good	0.60	0.72	Cannot be achieved	Cannot be achieved
Good - Excellent	0.75	Cannot be achieved	Cannot be achieved	Cannot be achieved

Table 4. Calculation results using the reverberation time given in the DIN standard for three different halls

		Parameters			
		STI	Sound pressure level (dBA)		
V(m^3)	Receiver No:		25 years	50 years	75 years
1000	1	0.73	60.4	56.8	45.7
	2	0.66	58.9	55.3	44.0
	3	0.70	59.2	55.6	44.3
	4	0.66	58.2	54.5	43.3
	5	0.65	57.8	54.2	42.9
	6	0.66	57.6	53.9	42.6
	7	0.66	57.1	53.5	42.2
	8	0.69	57.6	54.0	42.7
3000	1	0.65	58.3	54.6	43.1
	2	0.64	55.1	51.4	40.1
	3	0.59	53.1	49.4	38.0
	4	0.60	51.5	47.8	36.4
	5	0.56	51.7	48.0	36.6
	6	0.59	51.3	47.6	36.2
	7	0.60	52.0	48.3	37.1
	8	0.60	51.1	47.4	36.0
	9	0.61	50.4	46.7	35.4
	10	0.61	51.8	48.1	36.7
5000	1	0.63	53.1	49.4	38.2
	2	0.63	53.1	49.4	38.0
	3	0.57	51.4	47.7	36.3
	4	0.55	51.2	47.5	36.1
	5	0.56	51.9	48.1	36.7
	6	0.56	51.8	48.0	36.6
	7	0.57	51.6	47.9	36.5
	8	0.57	51.6	47.9	36.5
	9	0.58	51.7	47.9	36.5
	10	0.55	51.1	47.4	36.2
	11	0.58	51.2	47.5	36.3
	12	0.61	51.8	48.0	36.7

Target value provided; Target value not provided

b5-B= The level distinctions required between frequencies to avoid masking, it is calculated over the frequency-dependent distributions of speech and background noise at the same level (Table 5).

Since the study focused on different age groups, total sound levels were arranged according to decreases in hearing thresholds, and different reverberation times were calculated for listeners aged 25-50-75. In Table 6, the frequencies that need to be intervened are framed.

Curves were created for three different halls depending on their size to compare the new optimum reverberation times that were calculated for three age groups with the target range given for speech in the DIN standard (Figures 6-8). To determine the target range; target values calculated

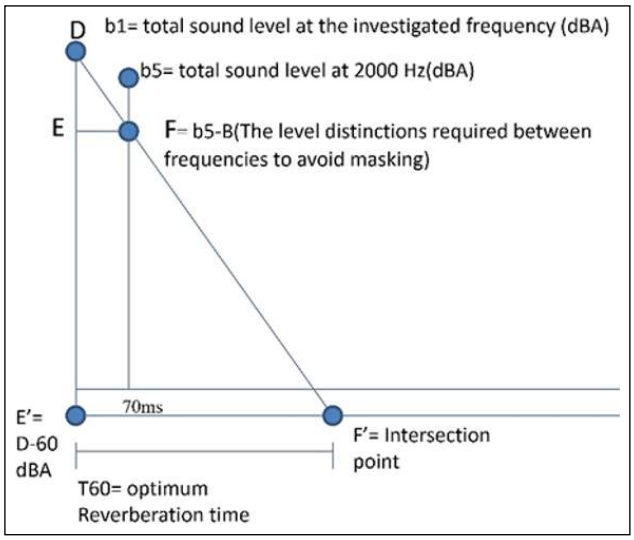

Figure 5. Illustrative explanation of the method.

b1' = the total sound level at 125 Hz.

b2' = the total sound level at 250 Hz.

b3' = the total sound level at 500 Hz.

b4'= the total sound level at 1000 Hz.

b5 and b5' = represent the total sound level at 2000 Hz.

It has been accepted that the sounds follow each other with an average of 70 milliseconds time intervals.

according to the formula given in the standard are multiplied with the limit values in the reference curve. For the 1000 m^3 hall, 0.79 s reverberation time was multiplied by the coefficients. According to the study's methodology, the curves in red represent the new reverberation times that were determined by considering deviations in the hearing threshold mentioned in ISO 7029 for listeners of various ages.

To determine the target range in the DIN standard for the 3000 m^3 hall, the 0.94 s reverberation time was multiplied by the coefficients in the table.

To determine the target range in the DIN standard for the 5000 m^3 hall, the 1.01 s reverberation time was multiplied by the coefficients in the table.

When the reverberation time parameter is evaluated in terms of the DIN standard, it is seen that the new reverberation times determined for the 25 age group are within the range given in the standard, while the reverberation times calculated for the 50 and 75 age group are below the curve at some frequencies. Therefore, it is advised to provide shorter reverberation times for certain frequencies in conference halls. Intelligibility values were improved at different receiver points for all age groups by applying the newly calculated optimum reverberation times to the halls (Table 7).

Table 5. The sound level separations that must be found to avoid masking

Level distinction required for 2000 Hz not to be masked by 125 Hz	0.6 dBA
Level distinction required for 2000 Hz not to be masked by 250 Hz	1.3 dBA
Level distinction required for 2000 Hz not to be masked by 500 Hz	1.8 dBA
Level distinction required for 2000 Hz not to be masked by 1000 Hz	2.6 dBA
Level distinction required for 2000 Hz not to be masked by 2000 Hz	4.5 dBA

Table 6. Optimum reverberation times calculated according to the auditory sensitivity of different age groups

V (m^3)	Frequency (Hz)	125	250	500	1000	2000	4000
1000	Reverberation time:						
	Calculated for 25 years	0.80	0.80	0.65	0.65	0.80	0.80
	Calculated for 50 years	0.80	0.60	0.55	0.65	0.80	0.80
	Calculated for 75 years	0.50	0.40	0.40	0.40	0.80	0.80
3000	Calculated for 25 years	0.90	0.85	0.70	0.80	0.90	0.90
	Calculated for 50 years	0.90	0.65	0.55	0.70	0.90	0.90
	Calculated for 75 years	0.45	0.40	0.40	0.45	0.90	0.90
5000	Calculated for 25 years	0.95	0.95	0.70	0.70	0.95	0.95
	Calculated for 50 years	0.90	0.70	0.60	0.65	0.95	0.95
	Calculated for 75 years	0.45	0.45	0.40	0.40	0.95	0.95

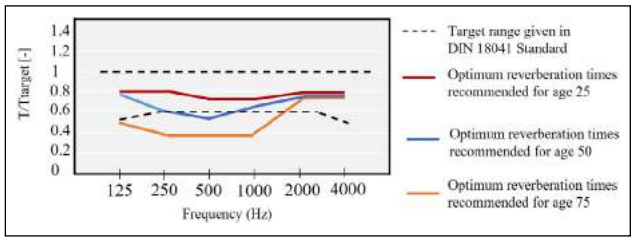

Figure 6. Comparison of the recommended optimum reverberation times (according to the age of 25, 50, and 75) with the target range given in DIN 18041 standard for the 1000 m^3 hall.

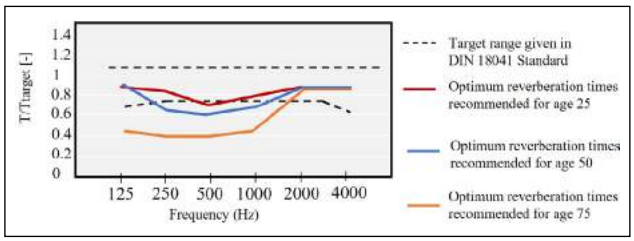

Figure 7. Comparison of the recommended optimum reverberation times (according to the age of 25, 50, and 75) with the target range given in DIN 18041 standard for the 3000 m^3 hall.

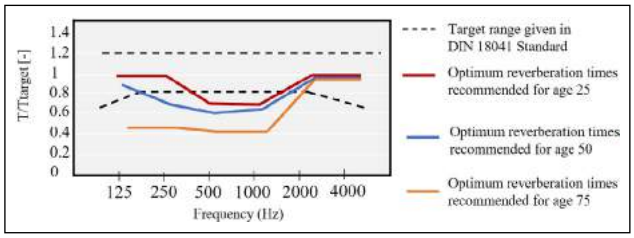

Figure 8. Comparison of the recommended optimum reverberation times (according to the age of 25, 50, and 75) with the target range given in DIN 18041 standard for the 5000 m^3 hall.

Questionnaire and Listening Test Studies

To compare the objective results obtained through the simulation program with subjective data, a listening test and questionnaire study were conducted with participants at various ages. In this context, it was decided to examine the 3000 m^3 hall to make a general assessment. Among the new optimum reverberation times determined in the study, the values calculated based on the auditory sensitivity of the 50 age group (which is considered the average listener age) are thought to provide suitable conditions for all listeners. As a result, these values were used in the auralization study conducted in the Odeon simulation program for the listening test. Receiver point 5, located in the middle of the hall, was taken as a reference. The sound recording used in the study was recorded in the anechoic room of TUBITAK UME laboratories by a female speaker, using meaningless words (Ilgurel & Akdag, 2017). The record contains 52 words in total. Two recordings were presented to the audience. The first recording was prepared by applying the target reverberation times specified in the DIN standard to the hall (current condition), and the second recording was prepared using the new optimum reverberation times determined within the scope of the study (improved condition). The recordings were presented to the participants in a quiet environment through headphones and they were instructed to only listen to the each recording once and to write down the words they heard on paper. The volume of the recording was increased until the participants stated that they could hear. After the test, they were asked to answer a short questionnaire. The questionnaire includes questions about age, gender and hearing status, as well as questions about the sound level and intelligibility of the recording. The listening test and survey were completed mostly in 20 min and a total of 82 participants took part in the study. The average age of the participants, that include 54 women and 28 men, is 46. The results obtained by the questionnaire and listening test were analyzed in the SPSS statistical program. With the recording generated by applying the reverberation time specified for the 3000 m^3 conference hall in the DIN standard to the room, an average intelligibility value of 0.60 was achieved among the audience. For the receiver point taken as a reference for the listening test, this value was calculated as 0.56 in previous studies done with the simulation program. Within the scope of the study, the average intelligibility value increased to 0.70 according to the results of the second recording (obtained by applying the optimum reverberation times calculated by considering the auditory sensitivity of the 50 age group) to the hall. In the studies conducted for the same receiver point in the simulation program, this value was calculated as 0.61. In the comment section of the questionnaire, many participants stated that they heard the words better in the second recording. Following that, the participants were divided into four groups to evaluate the results based on age. The values calculated for the 50-year-old group were chosen as the optimum condition according to the age groups examined through simulation, because it is difficult to provide in the simulation setting since the reverberation times required for the older group are very low. However, for the participants of the listening test and survey in which these optimum conditions were examined, more groups were evaluated since there was no specific age restriction. The age ranges of the participants are 18–25 in the first group (11 people), 25–50 in the second group (32 people), 50–75 in the third group (35 people), and 75 and over in the fourth group (4 people). Table 8 lists the intelligibility values obtained under current and improved conditions for all age groups as a result of the listening test.

Within the scope of the questionnaire, the listeners evaluated

Table 7. Results of three different hall's simulation studies using new calculated reverberation times

V(m^3)	Receiver No:	Intelligibility (STI)		
		STI values when T_{30} taken by age 25	STI values when T_{30} taken by age 50	STI values when T_{30} taken by age 75
1000	1	0.74	0.75	0.79
	2	0.68	0.69	0.72
	3	0.71	0.72	0.75
	4	0.68	0.68	0.71
	5	0.66	0.67	0.69
	6	0.67	0.68	0.70
	7	0.67	0.68	0.70
	8	0.70	0.71	0.73
3000	1	0.68	0.71	0.74
	2	0.67	0.69	0.71
	3	0.62	0.64	0.65
	4	0.63	0.65	0.66
	5	0.58	0.61	0.62
	6	0.61	0.63	0.64
	7	0.62	0.63	0.64
	8	0.63	0.64	0.65
	9	0.62	0.63	0.64
	10	0.62	0.64	0.65
5000	1	0.65	0.66	0.69
	2	0.64	0.66	0.69
	3	0.60	0.62	0.63
	4	0.58	0.60	0.61
	5	0.58	0.60	0.61
	6	0.58	0.60	0.61
	7	0.60	0.61	0.62
	8	0.60	0.61	0.62
	9	0.61	0.62	0.63
	10	0.57	0.57	0.60
	11	0.60	0.61	0.62
	12	0.62	0.63	0.64

Target range provided; Target range not provided.

the sound level of the recording and the intelligibility of the words. Participants were asked to mark one of the options "Poor," "Adequate," "Good," "Very Good," or "Excellent" for both parameters.

The answers given by the participants were categorized and classified according to the number of people and age groups (Figure 9).

CONCLUSION

In halls where auditory perception is significant, auditory sensitivity distinctions between listeners must be taken into account in the acoustic design process to provide suitable auditory conditions for all listeners. When reference reverberation time values based on the auditory sensitivity of young people (18–25 years old) in the acoustic literature

Table 8. Comparison of intelligibility values for current condition and improved condition

Group Name	Age Range	Average Intelligibility in Current Condition T30 Avg. 0,94	Average Intelligibility in Improved Condition T30 Avg. 0,72
Group 1	18-25	0,65	0,75
Group 2	25-50	0,63	0,73
Group 3	50-75	0,56	0,68
Group 4	75 +	0,53	0,67
GENERAL	18-87	0,60	0,70

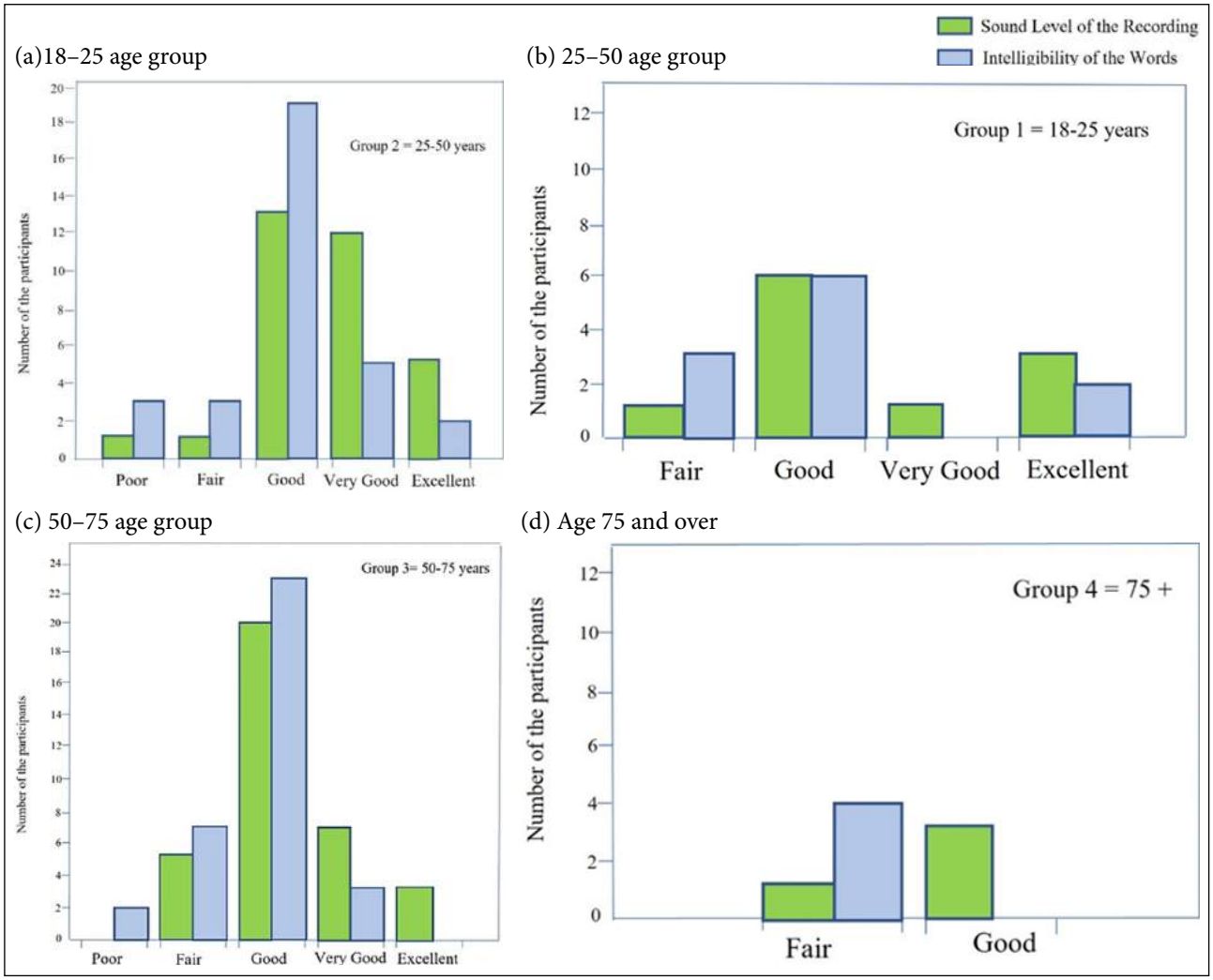

Figure 9. Evaluation of the sound level of the recording and the intelligibility of the words by participants in different age groups.

were applied to the halls, it was found that the adequate intelligibility for older listeners could not be fully achieved in the conference halls evaluated within the scope of the study. To ensure the optimization, acoustic evaluations were made with simulation and listening tests for the 25, 50, and 75 age groups under the conditions determined for the 50 age group, and it was observed that intelligibility increased for all age groups. The intelligibility values increased by around 20%, according to the average of the listening test findings. As a result of all the evaluations, it was determined that the subjective and objective data overlap with each other and that following the acoustic design specifications defined in the study (shorter reverberation times compared to DIN standard, calculated by considering age-related

auditory sensitivity distinctions) could increase the intelligibility values of the majority of listeners. It is thought that this study, which was carried out for conference halls with certain sizes and proportions, should also be carried out for halls of different functions, shapes, and sizes, to determine the optimum conditions that would be suitable for all audiences.

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Article

Participatory Urban planning – introducing and testing a 2D/3D visualization and AHP framework

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ABSTRACT

Participation in urban planning is important to increase accountability, transparency, and legitimacy of decisions. In this context, it is essential to establish the needs and priorities of stakeholders potentially affected by decisions. However, poor participation practices undermine the public's trust in decision-making processes and reduce the public's willingness to participate. The study aims to contribute to urban planning theory by discussing what participatory planning means. Furthermore, a systematic, objective-led, and negotiation-based decision support framework is proposed, based on a 2D/3D visualization and analytic hierarchy process for use in participatory urban planning. The framework aims to increase the legitimacy of decisions taken without ignoring the political dimension of planning. It was tested in a regeneration case study in Liverpool (UK). Testing shows that the framework enables technical issues to be addressed in a way that the public can understand. In the process, a systematic evaluation of participants' priorities is possible and negotiated participation is supported. The framework could support transferring stakeholders' priorities into plan decisions with online meetings and surveys, for example, when the possibility of physical meetings is restricted.

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INTRODUCTION

A key aim of urban planning is to establish urban policies for the future (Levend and Erdem, 2017). In this context, it is not only the responsible authority and other experts coming together but also various interest groups, including the general public. Procedural steps in urban planning include the evaluation of the current situation and anticipating future decisions and associated possible impacts. Participatory planning approaches allow interested parties to participate actively in decision-making, share experiences and expectations, and form shared visions (Healey, 1998a; Fischer, 2003; Ataöv, 2013). High-quality-of-life cities accommodate citizens' wishes regarding their social, environmental, economic, and cultural needs (Geray, 1998). Within this context, administrators and authorities

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as well as community leaders have come to accept the value of public participation in public decision processes (Bryson et al., 2013; Berntzen and Johannessen, 2016). Participatory spatial planning supports transparent and accountable decision-making that respects local discourses and values (Muthoora and Fischer, 2019).

While participation in public decision processes is a legal requirement in many countries (Innes and Booher, 2000; Creighton, 2005), it has been suggested that on many occasions, this is neither effective nor efficiently handled (Healey, 1992). Associated challenges have been said to include (Innes and Booher, 1999; Innes and Booher, 2000; Irvin and Stansbury, 2004; Involve, 2005; Ataöv, 2007b; NRC, 2008; Laurian and Shaw, 2009; Ataöv, 2013):

- Application of unsuitable methods causing distrust among participants
- Participation is seen as a fulfillment of legal obligations only
- Insufficient time is given to participants, leading to frustration and reduced enthusiasm
- Dominant interests dominate debates
- Participation being perceived as delaying planning processes.

If participants cannot express themselves and decisions are made mainly in line with dominating parties' interests, participation is perceived as a ritual designed to meet legal requirements. Decision-making situations in which technical aspects are expressed in a way that the public can understand them and where participants' ideas are systematically assessed (e.g., through impact assessment; Fischer, 2007) can help address issues of power and mistrust (Innes and Booher, 2004; Creighton, 2005; Nadeem and Fischer, 2011).

This paper proposes a systematic and negotiation-based decision support framework based on 2D/3D visualizations, and Analytic Hierarchy Process (AHP) approaches. The aim is to address the challenges discussed above. The approach is meant to enable the use of local information, negotiation, and social learning. First, what participatory planning means is elaborated on? Then, the 2D/3D visualization and AHP-based framework are introduced. Next, results from a case study where the framework was applied are presented. Finally, the advantages and shortcomings of the proposed framework are established.

PARTICIPATORY PLANNING

Rational planning was the central paradigm for much of the 20th century (Ataöv, 2007a). However, after 1980, participatory planning approaches, promising more democratic and negotiation-based processes, were advocated as they were seen as being able to support urban space according to people's preferences, applying the principles of transparency, accountability, and decentralization (Healey, 1996; Healey, 1998a; Ataöv, 2008; Blondet et al., 2017).

Participatory planning is based on a normative assumption that it is not just authority and other experts but also people affected by decisions that should have a say in decision-making. Participation means bringing people from different social groups together, exchanging information and producing more consensus-based, collective decisions (Creighton, 2005; Ataöv, 2007b; Michels and De Graaf, 2010; Berntzen and Johannessen, 2016; Kovács et al., 2017). The public will get to know technical and specialist issues that underlie decisions. Participation provides learning opportunities, enabling local knowledge production (Healey, 1998b; Friedmann, 1998; Ataöv, 2008; Ehn, 2008; NRC, 2008; Fischer et al., 2009; Boroushaki and Malczewski, 2010; Ataöv, 2013).

In a participatory process, mutual interaction and collective knowledge generation of stakeholders generate trust and help stakeholders to understand each other. A fair and open involvement of stakeholders (i.e., one in which no manipulation is attempted; Fischer, 2016) can increase the quality of decisions. People who are allowed to participate in decision-making processes feel that they are a part of society, making them more prepared to embrace transparent and balanced decisions thus made (Innes and Booher, 1999; Innes and Booher, 2004; Irvin and Stansbury, 2004; Creighton, 2005; Aksakoğlu, 2007; Ataöv, 2007b; Boroushaki and Malczewski, 2010; Ataöv, 2013; Berntzen and Johannessen, 2016). Participation thus increases the public consciousness and the fairness and legitimacy of the decisions made (Selman, 2001; Horelli, 2003; Fung and Fischer, 2017). It can support the development of social capital, potentially making the public more knowledgeable and competent (Laurian and Shaw, 2009). Furthermore, the reputation of planning overall might increase (Laurian, 2004).

However, problems can arise when participation is managed poorly. Importantly, distrust can arise when participation is perceived as a ritual designed only to meet legal requirements and in the presence of inequalities in representation (Sibale and Fischer, 2023; Innes and Booher, 1999). Another problem is a perceived waste of time and cost. The long duration of participatory processes can lead to perceptions that time is wasted. If participation processes are perceived to be lengthy, the enthusiasm of participants may be reduced. In addition, participation processes may occasionally serve more individual interests than the public (Newig and Oliver, 2009). Moreover, it can lead to accusations that the interests of those who cannot participate are being ignored (NRC, 2008). Finally, even in

the presence of public participation, decisions may still be considered questionable (Irvin and Stansbury, 2004).

While participation is part of the decision-making processes in democratic societies, different countries assign different roles to the public. In representative democracies, citizens are said to authorize representatives to decide on their behalf, giving them the authority to make and implement policies. Thus, administrators make decisions on behalf of the public (Healey, 1997; Ehn, 2008; Michels and De Graaf, 2010; Ataöv, 2013).

The setup of participation processes varies, not just from country to country but potentially also between different places in the same country. Furthermore, participation differs in terms of the level of influence (Arnstein, 1969; Bruns, 2003; NRC, 2008; IAP, 2014; Horelli, 2003; Archon, 2006; Mueller et al., 2018). In this context, the International Association for Public Participation suggests that all participation levels are legitimate and can be applied depending on the objectives of a particular decision-making process (NRC, 2008).

METHODOLOGICAL APPROACH

Decision-making is about identifying and evaluating alternatives to solve problems or achieve a goal by selecting the best alternative (Bhushan and Rai, 2007). Therefore, there is a need for analytical methods and tools that support learning and enable negotiation for a more democratic participatory process in urban planning (Diez-Rodriguez et al., 2019). An integrated approach is introduced within this context combining 2D mapping/analyzing and 3D visualization capabilities of computer-aided design software such as ArcGIS and SketchUp and the AHP's decision support methodology.

2D and 3D Visualization in the Decision-making Process

In decision-making processes, the main benefit of using computer technologies is increasing the quality of the interaction between experts and the public and contributing to determining the best decision alternatives (Wu et al., 2010). To support participants in understanding an existing baseline, and to help derive an understanding of the positives and negatives of different alternatives, 2D mapping/analyzing and 3D visualization computer-aided software such as ArcGIS and SketchUp can be used.

GIS-based software is widely used in public policy production as a computer program for mapping, analyzing, and visualizing spatial data using geographic information (Dunn, 2007; Kahila-Tani et al., 2016; González and Geneletti, 2021). In this context, GIS and AHP can be integrated for weighting and prioritizing options in land-use decision-making processes. For example, in selecting the most suitable area for a land-use decision, AHP decision-makers determine priority weights of criteria and alternatives. Then, they produce maps that show the appropriate site selection decision by using GIS techniques and procedures (Estoque, 2012; Malczewski, 2006; Malczewski and Rinner, 2015; Brown and Kyttä, 2014).

2D/3D visualization can be integrated into the AHP process with maps and animations generated by computer-aided software to increase participants' interaction and communication capacity. For example, GIS can map and analyze location-specific data in 2D or 3D. In addition, alternatives related to the project area can be visualized in a three-dimensional (3D) format using design software in the decision-making process (Oswald, 2004; Salter et al., 2009; Boroushaki and Malczewski, 2010; Zhang and Fung, 2013; Okumuş and Türkoğlu, 2017).

These capabilities of computer-aided software can simplify planning issues and increase the ability of participants to understand and interpret spatial data. In the subsequently proposed framework, 2D and 3D visualizations are integrated with the AHP process cording to a decision's nature.

AHP

The AHP method, developed by Thomas Saaty in the late 1970s, is a multi-criteria decision support model based on mathematical principles, enabling complex decision problems to be dealt with in a hierarchical structure. It makes paired comparisons between criteria using the eigenvalue approach, which determines the numerical priorities of the criteria affecting a decision. The AHP, which aims at providing a transparent way of transferring stakeholder preferences into the decision-making process, enables the creation of a systematic decision-support model in complex situations involving multiple factors. It handles a decision case in a hierarchical system, considering the primary target, factors, sub-factors, and alternatives. This hierarchical structure formed by the AHP reveals the general appearance of complex relations during the decision-making process. Thus, the AHP makes it possible to rank decision options and suggest an optimized solution after associating them with multiple criteria (Saaty, 1988; 1989; 1990; 2008; Saaty, 1987; Filipović, 2007; Saaty and Sodenkamp, 2010; de Luca, 2014; Gürsakal, 2015; Önder and Önder, 2015; Mu and Pereyra-Rojas, 2017).

AHP consists of various steps, including defining the problem or the purpose, the structure of a decision hierarchy, formation of pair-wise comparison matrices, calculation of relative weights of factors, checking the consistency of a decision, sensitivity analysis, and a final decision (Saaty, 1987; Saaty, 1990; 2000; 2003; 2008; Modarres and Zarei, 2002; Bhushan and Rai, 2007; Filipović, 2007; Bunruamkaew and Murayama, 2011; de FSM Russo and Camanho, 2015).

This allows participants to make pairwise comparisons between criteria and select the most appropriate alternative based on their priorities.

The most important advantage of the AHP method is its ability to integrate qualitative and quantitative information and evaluate criteria and alternatives according to priorities. The method enables the translation of participants' subjective opinions to convert into numerical values. In this context, the AHP considers participants' objectives and subjective judgments. This enables participants to reflect on their understanding of a particular case. An essential advantage of the AHP is that it is easy to understand and implement. Decision problems are evaluated within a hierarchical structure, consisting of criteria and alternatives that help to understand the current situation and support quick problem-solving. Furthermore, the AHP technique makes decision processes transparent. Scrutiny of the judgments made by stakeholders increases transparency and provides a platform for negotiation (Ananda, 2007; Bhushan and Rai, 2007; de FSM Russo and Camanho, 2015).

Since public decisions can affect many people, developing collective group opinions is a way to support participatory democracy. The AHP is a useful tool in obtaining a single verdict by discussing the opinions of individuals from different sections of society on a subject. It allows participants to express their preferences and objectives and reconcile them with those of others. Making a group decision means bringing individual judgments into a single judiciary representing the whole group and implementing a group preference (Saaty, 2000; 2008). In AHP, a negotiation environment is established through brainstorming, leading to a better understanding of the subject. Then, every judgment is discussed until a consensus is reached. The aim is to bring stakeholders together for an exchange of ideas and to reach a collective judgment.

If there is no compromise between values, a group preference can be created from individual preferences. In the analytic hierarchy method, a survey can be conducted to combine different people's judgments (Filipović, 2007). Those involved in decision-making can use the 1–9 scale of Saaty to express their priorities for each criterion and its sub-criteria. Through a pair-wise AHP comparison matrix, Saaty suggests that survey results should be combined with the geometric mean method and entered into the model as a single judiciary (Saaty and Vargas, 2012; Önder and Önder, 2015; Wanga et al., 2016). In this context, a single judgment is obtained by surveying all levels in the hierarchy and prioritizing the decision alternatives by evaluating all criteria. This increases the consistency of resulting matrices. Furthermore, all stakeholders have a say in the decision. Thus, there may be less conflict in the discussion of possible outcomes.

Another beneficial feature of the AHP technique is that it can be combined with different decision-support methods and techniques. For example, the AHP can be used with multi-criteria decision methods such as Topsis, Vikor, and Electre (Uludağ and Doğan, 2016). In such cases, the weights usually obtained with AHS are used as input in different methods. Furthermore, the AHP can be integrated with a SWOT analysis, which provides a systematic analysis of the opportunities and threats that are inherent to, for example, a residential area and the strengths and weaknesses of this area (Kajanus et al., 2004). While computer programs such as Expert Choice, Super Decision and MakeItRational have been developed to implement the AHP, Microsoft Excel can also be used (Ishizaka and Nemery, 2013).

Limitations of AHP include that decision-makers may find it challenging to interpret the comparison values between 1 and 9. Furthermore, AHP ignores the interaction between decision-makers. To overcome this issue, it is useful to organize meetings where opinions are exchanged between individuals, especially when group decisions are made (Ananda, 2007; de FSM Russo and Camanho, 2015).

The Proposed Framework

The standard planning process consists of preparation, evaluation of the current situation, design of a plan, implementation, and monitoring (Horelli, 2003; Ataöv, 2013; Brown and Kyttä, 2014). In our proposed decision support framework, 2D/3D visualisation and AHP methods are integrated while the stages of the standard planning process are preserved as the backbone. The aim is to judge the development and determination of alternatives. This means that the role of the people in the process is the level of collaboration which is the fourth level of the spectrum defined by the International Association for Public Participation (NRC, 2008; IAP, 2014). In this context, the literature on the participatory decision-making process was examined, and the fundamental principles for the proposed decision-support model were defined (Table 1). In line with these principles, the proposed decision support process stages are determined below (Figure 1).

Agenda-Setting

To determine issues to be considered in the planning process, problems and aims related to a particular planning area need to be determined at the agenda-setting stage (NRC, 2008). Therefore, the agenda text should provide information on the following issues related to the decision-making process (Horelli, 2003; Gregory et al., 2012; Ataöv, 2013; Lienert et al., 2015):

- Scope and limits of the decision
- Need for public participation
- Experts that manage the process and their roles
- Stakeholders and their roles

Table 1. The fundamental principles of the proposed decision support framework

Principle	Definition of the principle
Determination of scope	To clarify the limits of the model, the scope of the decision-making process needs to be determined. • The purpose: Participants should know the aim (Atlee et al., 2009; Mu & Pereyra-Rojas, 2017). • The public participation level: As the participation level in the selection of the tools and methods to be used in the accession process will play an important role, it should be determined which participation level to adopt from the public participation spectrum on the decision-making process (Horelli, 2003; Laurian & Shaw, 2009; IAP, 2014). • The representation level: In accordance with the principle that those affected by the decision have the right to be involved in the participation process (Laurian, 2004; Brown & Chin, 2013; IAP, 2014), par ticipants must include a representative sample of the population affected by the decision and the community from each part of the community (Rowe & Frewer, 2000; Irvin & Stansbury, 2004; Atlee et al., 2009; Kahila-Tani et al., 2016). Public authorities should use effective communication methods to increase people's awareness about the decision-making process within this scope. If necessary, an appropriate representation sample can be determined by methods such as mapping techniques or stakeholder analysis (Horelli, 2003). However, it is wrong to assume that more people are better, and the number of participants may vary depending on the qualification of the decision to be made (Involve, 2005; National Research Council, 2008). • Duration: In today's society, time is a precious issue for people. Therefore, time should be well planned and realistic until the final decision is announced (OECD, 2001; Involve, 2005). Process managers should determine how much time each stage of the decision-making process will be completed and allocate sufficient time. A timeline should be created for participants to allocate time and organise themselves.
Clarity	The administrator must clearly identify and publicise the roles and responsibilities of citizens and government (at what stages, how they will contribute) in the public participation process. The administrator must commit to sharing information in a complete, objective, reliable and comprehensible manner (OECD, 2001; Brown & Chin, 2013).
Early participation	The principle of participation is that people potentially affected by a decision should be involved in the primary decision-making stage at the beginning of the process (Involve, 2005). This is necessary for understanding the expectations of the people and for the emergence of more solutions (Rowe & Frewer, 2000; Ridder & Pahl-Wostl, 2005; Ataöv, 2007b; Hassan et al., 2011; Brown & Chin, 2013; Kahila-Tani et al., 2016). In addition, early involvement of people in the participatory process not only ensures the effective use of information but also increases the confidence of the participants in the process and strengthens their commitment to the decisions made (Innes & Booher, 2004).
Transparency and reliability	For a successful decision-making process, mutual trust must be built between participants. Designing a transparent and reliable decision-making process is essential to ensure that participants trust the decision-making process and establish lasting relationships (Irvin & Stansbury, 2004; Laurian, 2004; Ridder & Pahl-Wostl, 2005; Laurian & Shaw, 2009; Fung, 2015). Blondet et al. claim that creating mutual trust in the participatory process is of crucial importance (Blondet et al., 2017). In this framework, at each stage of the participation process, the administrator should share the summary report or final report with the public, explaining how decisions are made, how the roles are distributed, and how the opinions and suggestions of citizens affect the decisions (Rowe & Frewer, 2000; Brown & Chin, 2013; de Luca, 2014).n addition, it is explained how participants use the right of objection and appeal. If necessary, independent counsellors should manage the process.
Educational	Participation should give people and professionals meaning and increase public awareness (Laurian & Shaw, 2009). Participation in the decision-making process enables the public to learn about the purpose of the decisions made about the city and the professionals to learn about the problems and priorities of the people (Ridder & Pahl-Wostl, 2005; Wanga et al., 2016). Furthermore, listening to participants allows them to emerge new ideas and create new alternatives. This increases the learning capacity and participation motivation of the participants (National Research Council, 2008).
Fair and impartial	Participation should give equal opportunities to stakeholders to access information, consult and participate (Brown & Chin, 2013). The participatory process should be designed in such a way as to prevent influential groups (elites) from dominating the process, encouraging the participation of groups that are excluded from society or who have barriers to joining the process (Innes & Booher, 2000; Laurian, 2004; Bannon & Ehn, 2012). The participation process should be accessible to everyone with applications such as payment of transportation costs, provision of different participation options, and provision of nursery service. The information provided by the government in the participatory process should be objective, complete and accessible to stakeholders. Attitudes and behaviours that may cause polarisation should be avoided. If deemed necessary, an independent auditor should supervise the process.

Table 1. CONT.

Principle	Definition of the principle
Resources	In the decision-making process, sufficient human, time, financial and technical resources should be allocated to enable the information, consultation and policy-making process to succeed. At the start of the process, it is necessary to organise the places where the participants feel comfortable and provide adequate information materials (OECD, 2001; Irvin & Stansbury, 2004; Brown & Chin, 2013).
Human resources	The administrative and public officials should know their responsibilities in planning and managing participation. Professionals should have the tools and skills to encourage participation alongside their technical expertise (Fainstein, 2000; Laurian, 2004; Ataöv, 2007b). To prevent the negotiation from becoming a waste of time in the decision-making process, professionals are responsible for determining which issues should be negotiated and communicating the information produced to society so that people understand.
Influence	Influence is a reflection of the information agreed by the participants to the final decision in the decision-making process (Rowe & Frewer, 2000). Therefore, implementing a participatory process is to promise people that their ideas will be taken into account (IAP, 2014; Fung, 2015). For this reason, participants' contributions to the process should not be limited to official documents (Ehn, 2008), but it should be ensured that the people's will influences the decision made.
Result-orientation	If the participants see that their ideas affect their decisions, they tend to trust the decision-making process more (Ridder & Pahl-Wostl, 2005). Participants are motivated to participate in a similar participation process. Hence, the participation model should be result-oriented (Ataöv, 2007a)
Determination of methods and tools	Various methods and tools enable participants to negotiate and make collective decisions. However, since no single correct method applies to each participatory process, appropriate methods and tools should be determined to meet the stakeholder group's needs according to purpose and context (Creighton, 2005). • Determination of consultation methods: A negotiation method allowing an appropriate number of participants to express their opinions should be determined in the direction of the purpose (Brown & Chin, 2013). These techniques include participatory appraisal, focus group meetings, and community consultation meetings (Involve, 2005). • Determination of decision-making methods: In the decision-making process, an objective and analytical decision-making method in which the public can express their preferences and objectives to achieve the determined goal must be determined (Zhang & Fung, 2013). • Determination of communication methods: The appropriate communication techniques established with the participants increase the participants' confidence in the process and facilitate the construction of consensus (Wanga et al., 2016). It is usually the best communication way that people are invited as individuals into the participation process. However, according to the number of participants, methods such as mass mailing, brochure distribution, advertising to the press, informing various institutions and communities can be used to communicate with the participants (Involve, 2005). The important thing is to use a clear and comprehensible language when informing the participants.
Continuity	In order to spread the participation culture in society, information tools should be applied continuously, and the experiences obtained from each participation practices should be conveyed in a way specific to the following practical application (Creighton, 2005; Atlee et al., 2009).

- Negotiation methods, aims, dates, and places
- Decision-support methods
- Expected outcomes and success criteria
- Observation and evaluation system.

The agenda text should be shared with the public. Furthermore, it should be clearly indicated what kind of contributions are expected from participants. In this context, the first contact should be made personally (usually by mail). Furthermore, the agenda text can be announced by, for example, local radio and television stations, places of worship, schools, and others (Laurian, 2004).

Data Collection and Analysis

The success of the decision support function depends on an adequate analysis of the current situation. In this context, the experts who manage the process need to collect data, process them and produce a visual representation (such as a chart, graph, or map). Visual materials and analyses should be created using GIS' spatial analysis capabilities. Furthermore, a SWOT analysis can be performed in which internal and external conditions are evaluated, depending on the scale of the decision problem (Ataöv, 2013).

Determination of Criteria and Alternative Scenarios

It is necessary to identify criteria affecting the purpose

defined during the agenda-setting stage and the alternative scenarios of decisions. Two methods are used to determine them. First, experts identify possible criteria. Second, criteria are picked that reflect the wishes of those citizens affected by the decision. Since the aim is to ensure negotiation-based and open participation, the participatory appraisal[1] workshop method should be used as the consultation method (Laurian and Shaw, 2009). This participation method allows participants to express their opinions and encourage negotiation.

The workshop, led by a facilitator, should begin with informing people about the evaluations and analyzes prepared by experts for a project. Next, participants should express their opinions on the factors that should be considered. Each participant should be allowed to express themselves (Horelli, 2003; Mu and Pereyra-Rojas, 2017). At these meetings, participants should be able to freely express their concerns and make recommendations on the issues to be considered in the planning process. By assessing the opinions of the participants and the factors initially identified by experts, the criteria to be used in the AHP method are determined (Zhang and Fung, 2013).

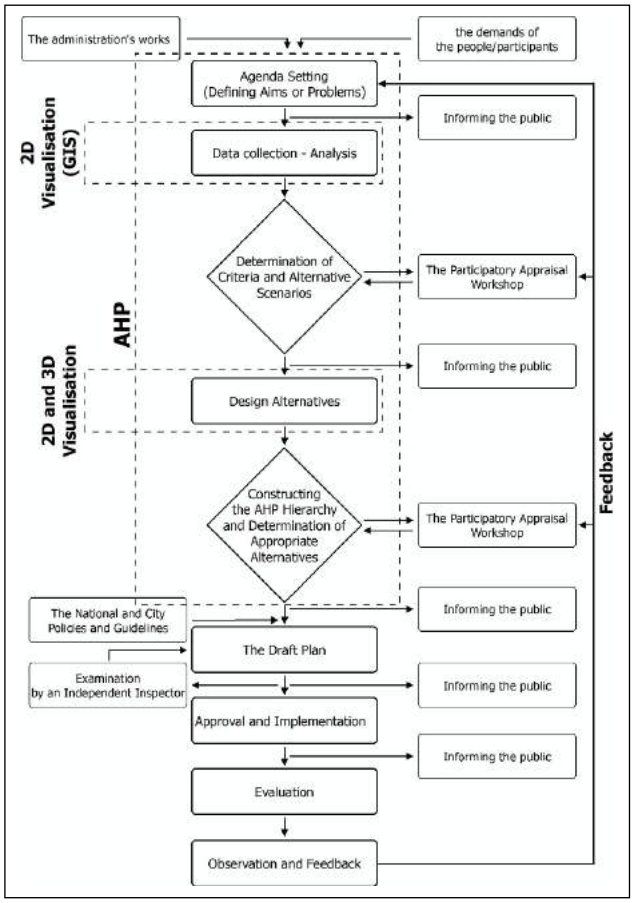

Figure 1. The Proposed Participatory Decision-making Process (adapted from the planning application process in the UK) (Liverpool City Council, 2023d).

Moreover, possible alternative scenarios should be identified to solve identified problems or activate present potentials at this stage. It is essential to produce alternatives to make the best decision and assess different perspectives. In the participatory appraisal workshop, participants should have time to state their opinions about possible alternative scenarios that help meet their needs (NRC, 2008; Lienert et al., 2015). For the decision hierarchy of the AHP to be established at a later stage, data obtained in the workshop need to be evaluated and criteria relevant to the purpose are determined (including possible sub-criteria) and possible alternatives. Factors that are similar to each other should be combined and unrealistic alternatives be eliminated to ensure that the decision hierarchy in the AHP is not too large. The opinions stated during the workshop, the experts' evaluations, and the outputs should be reported to the public.

Design Alternatives

Solution-oriented alternatives should be created to increase participants' interaction and communication capacity so that participants can comment. They should be compared by modeling them in a virtual environment by three-dimensional (3D) visualization techniques of computer-aided design software, such as ArcGIS, Autocad and Sketchup (Koramaz and Gulersoy, 2011). Thus, participants can easily compare possible alternatives using their priorities thanks to three-dimensional (3D) virtual urban models (Wu et al., 2010).

Constructing the AHP Hierarchy and Determining Appropriate Alternatives

At this stage of the decision process, the most appropriate alternative should be determined by making pair-wise comparisons of criteria and alternatives. In this sense, experts should establish a hierarchical structure composed of criteria, sub-criteria, and alternatives to handle the decision-making process systematically. Furthermore, experts should create pairwise comparison matrices for the participants to objectively evaluate criteria and alternatives (Gregory et al., 2012).

Since the aim is to determine the participants' priorities, an appraisal workshop should be organized for the participants to express their opinions. This should begin with introducing criteria and possible design alternatives and by explaining the workshop's objective. Then, participants should determine the importance of criteria and alternatives for the pairwise comparison matrices formed by the experts. Finally, a group decision will be made to determine the mutual ranking of factors and alternatives at the meeting. Two methods can be used at this stage:

1. A collective group decision, based on a discussion by participants. During each pairwise comparison, all participants are expected to agree on a collective value

between 1 and 9. It may not be easy to achieve a collective value because of participants' different priorities and opinions. However, not every participant needs to agree on each problem component (Filipović, 2007).

2. A survey for ranking the factors and alternatives from 1 to 9 (Mu and Pereyra-Rojas, 2017). A collective value for mutual comparisons can be obtained based on the participants' answers by applying the geometric mean. Subsequently, data lead to the calculation of the AHP, and the most suitable alternatives are determined. Furthermore, when people cannot come together physically, the process can be exercised by sending a questionnaire to the participants.

Experts determine the most appropriate alternative based on the results of the AHP. In the AHP process, administrators should share reports, including the decision hierarchy, the pair-wise comparison matrices, the priority and consistency calculations, and the outcome as soon as possible in the interest of a transparent decision support process.

The Draft Plan

At this stage, a draft plan should be prepared to integrate the most appropriate alternative design identified by the AHP method. An independent auditor should examine whether the draft plan conforms with the decisions taken in the accession process and with legal requirements.

Approval and Implementation

After evaluations of the draft plan and corrections are made, the plan is approved and implemented if necessary.

Evaluation

At the evaluation stage, whether the decision made has reached its stated objectives is established. At this stage, the opinions of participants should be taken into account. Participants are asked questions such as whether the process meets goals and objectives, whether the process meets the demands of the participants, whether the methods and techniques used and the level of participation are sufficient. Thus, some final thoughts on the success of the accession process are obtained. Furthermore, stakeholder feedback should be collected and analyzed at every stage of the participation process. Findings should be used to produce a decision and plan subsequent participatory activities.

Observation and Feedback

Whether the decision made leads to solving a problem and is suitable for the purpose determined at the beginning of the process is checked. If the problem is not solved or if the decision does not meet the aim, there is a need to investigate the reasons.

CASE STUDY

The proposed framework was tested in a decision-making process of a regeneration project; "Plot 10" in Liverpool. Plot 10 is located on the eastern edge of Liverpool City Centre, between the University of Liverpool and Edge Hill and Kensington neighborhoods (Figure 2). Here, Liverpool City Council is developing a project called Paddington Village (Liverpool City Council, 2023a) which includes Plot 10. While the project will affect the entire city, the main impact will be on surrounding residential areas. Plot 10 was chosen as the case study due to Liverpool City Council currently discussing changes to an existing plan decision.

According to Liverpool Local [Land use] Plan's policies, the site covering Plot 10 is a "Mixed Use Area" (Figure 3). *"The designation of Mixed-Use areas and Sites for Various Types of Development is intended to promote development which can make a significant contribution to the regeneration of the local economy, providing enhanced employment prospects and opportunities for environmental improvement."* (Liverpool City Council, 2023b). In line with this policy, Liverpool City Council aims to create an international development zone in the Paddington area to attract investment and increase employment opportunities. In addition, the plan is to create a place for trade, housing, technology, education, health facilities, and events. A standard participation procedure was applied in the decision-making process for Plot 10. The proposal plan decision was announced to the public via the internet and mail. However, as the owner of the Paddington site, Liverpool City Council cooperated closely with existing and potential investors (Liverpool City Council, 2023a). In this participation process, decision-makers and investors were the main actors rather than the local people.

For the purpose of testing the framework, focus group members who had a good understanding of the site were chosen. Due to its location next to the university campus, 12 doctoral students were appointed. Focus group members participated in the proposed model simulation. In addition, they provided feedback on whether they thought the approach would lead to the general public effectively participating in the decision-making process.

Ten focus group members participated in all phases of the process. First, an appraisal workshop (approximately 1 h) was held during the pilot participation process. At the beginning of the workshop, the case study area was introduced, using analysis maps prepared with GIS. After that, participants discussed what the plan decision of Plot 10 should be. The analytical infrastructure of the AHP is used in the proposed decision support process. In the appraisal workshop, which was led by a focus group member who was a PhD student in architecture and working in an architectural company, focus group members addressed two critical issues:

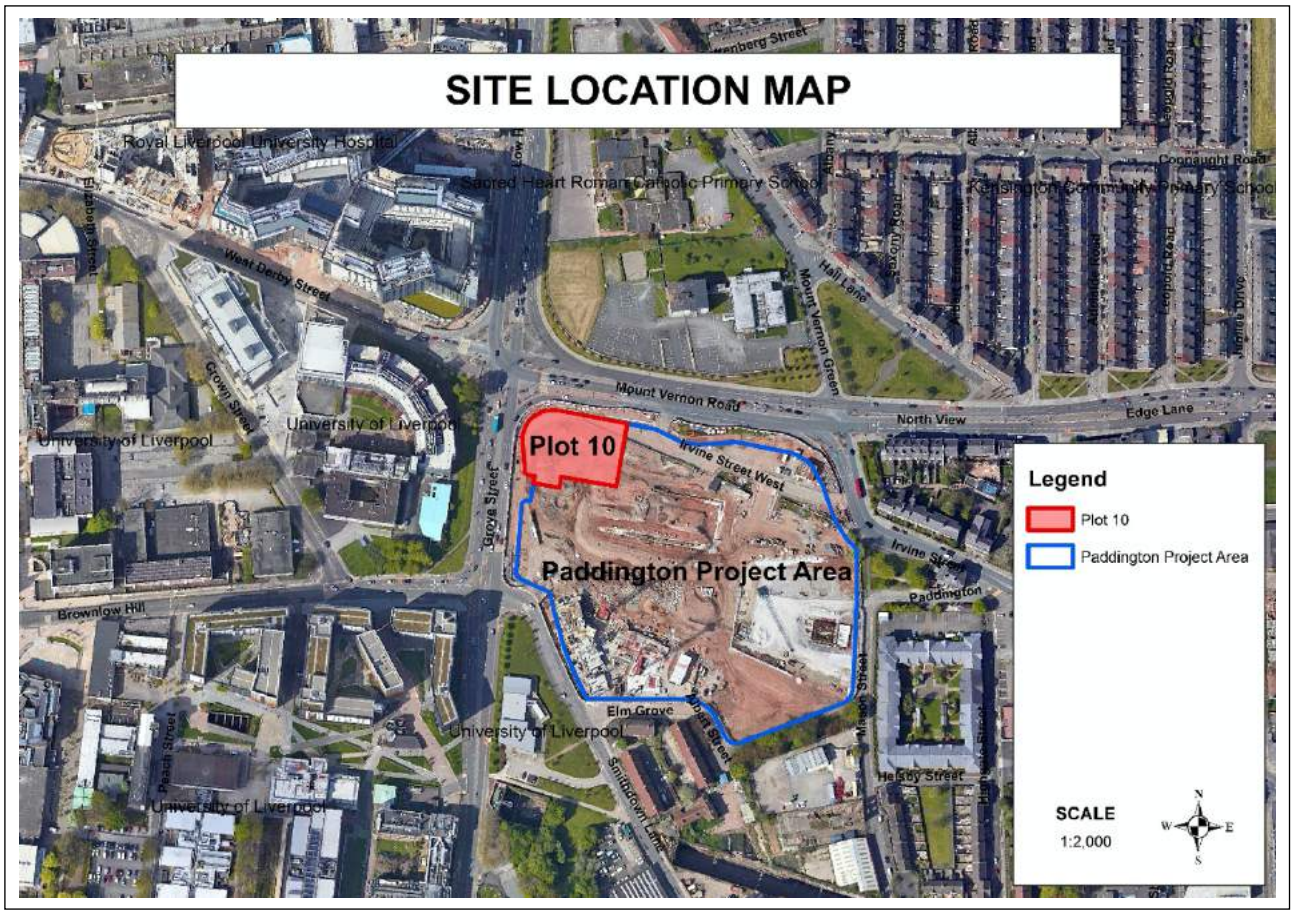

Figure 2. Location of Plot 10.

- Their opinions on the design criteria that should be considered in the case study
- Their opinions about possible alternative scenarios helping make plan decisions.

In the workshop, the participants listed the design criteria that should be evaluated. These include green space, accessibility, human scale, sustainability, identity (place-making), harmony (with surrounding buildings), transportation (such as junctions, cars, and parks), and income (from the sale of land by the council). The participants also listed the possible plan/design alternatives that should be considered, as follows; low-cost housing, sports center (activities), youth center, cancer care center, car park and top a green space, bicycle center, and multi-function space (such as public space/outdoor play area, market).

Next, to evaluate the design criteria and possible alternatives (determined by the focus group in the workshop), focus group members filled out a questionnaire based on the AHP. The questionnaire aimed to determine participants' priorities regarding the plan decision for Plot 10 by comparing each criterion and decision alternatives with each other. The survey consisted of two parts (Appendix). In the first part, the focus group members compared their priorities regarding the design criteria determined during the workshop. Then members compared their priorities for three-dimensional plan/design alternatives regarding each criterion (Figure 4).

Focus group members expressed their priorities regarding factors and alternatives for Plot 10. The different judgments of each member in the paired comparison process were combined with the geometric mean. Thus, consolidated priorities were obtained for each comparison. The questionnaire data were analyzed with the Super Decision program. Analysis results regarding the design criteria showed that the first priority of focus group members was transportation (such as the road junction-nearby, cars and parking) with a value of 26.30%. Their second priority was green space, with a value of 18.50% (Table 2).

When all the paired comparison data were evaluated, participants preferred Plot 10 to be planned as a multi-functional space with a value of 21.7%. The second preference was for Plot 10 to be planned as affordable housing with a value of 19.4% (Figures 5 and 6).

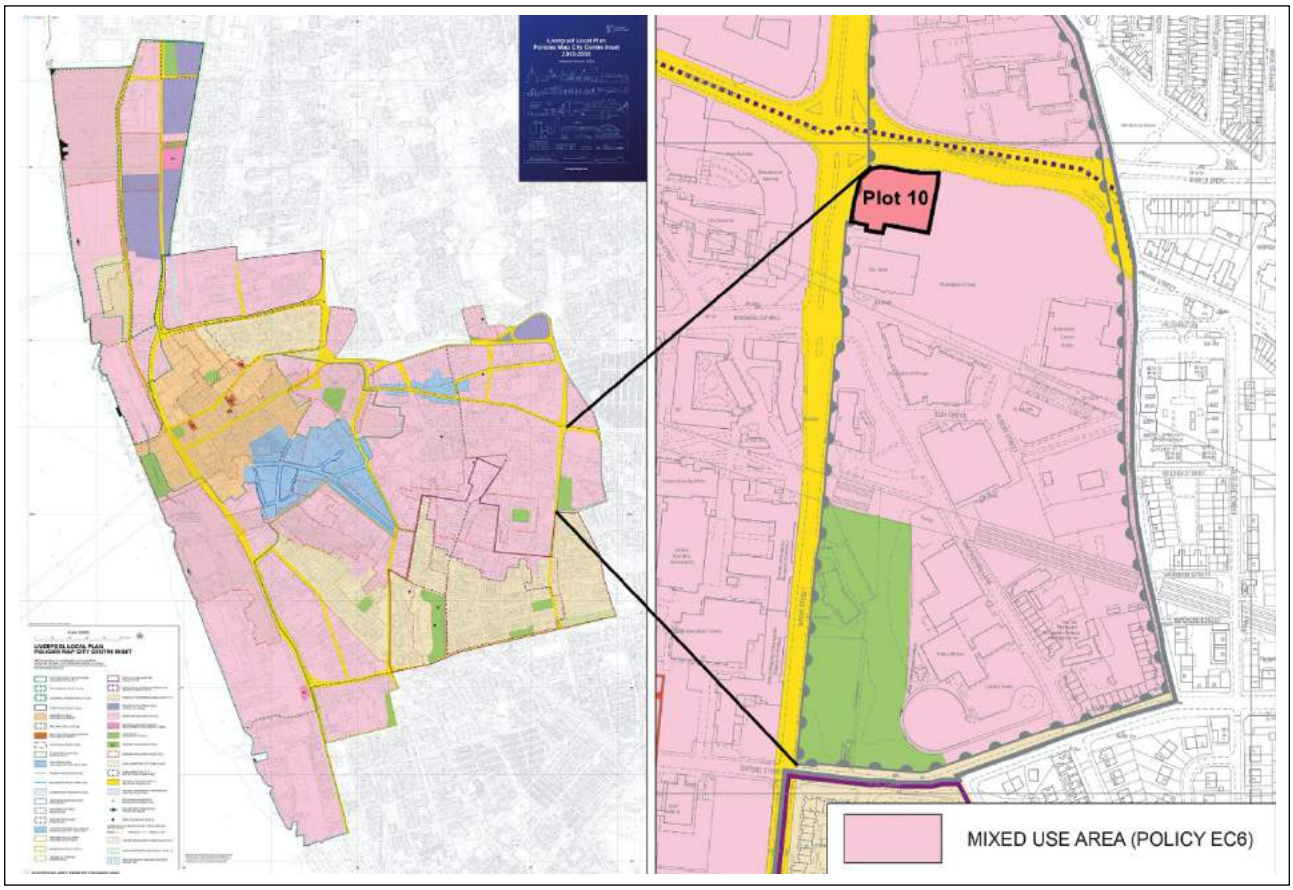

Figure 3. Liverpool Local Plan - City Center area (Liverpool City Council, 2023c).

RESULTS AND DISCUSSION

Following completion, focus group participants evaluated the whole process through a questionnaire. The purpose was to learn about focus group members' opinions on the proposed framework. Ten focus group members participated and the results are as follows:

1. *Do you believe your ideas are being included in the decision-making process? Do you feel your experiences and expectations have been considered in the decision-making process?*

All focus group members in the survey answered "Yes" to this question. Explanations given were broadly in line with the comment made by one of the members:

I believe my ideas are being included in the decision-making process as a scientific analysis with professional software was used to see the results. I feel my experiences and expectations have been considered in the decision-making process because I can see from the results that some of the chosen design alternatives are the ones I chose.

2. *Would you participate in the decision-making process if a council uses the proposed method?*

The rate of those who said "I would participate" to this question is 60%. The focus group members who said "I would not participate" stated that they could not attend because they were busy or did not have enough time. However, the most significant criticism regarding the proposed method among the members who said "I would not participate" was as follows;

Unlikely, because it was a very long and repetitive process ranking every characteristic of the site, I think that giving qualitative opinions is a better option.

3. *Can participants learn something during through the proposed process?*

All participants stated that they gained a new perspective from the decision process in general. They thought that the proposed participation method could bring a new perspective to the participants. One of the members expressed this situation as follows;

Yes, I do think there are things I could learn from this activity. Basically participants are architecture-related students but studying in different areas like in sustainability, design, culture, and social aspects, [so] it is interesting to learn to thinking from different points of view for the same project.

4. *Do you think the proposed participation process is usable in the current decision-making process?*

B. The Pairwise Comparison of 3D Models (you can see models at appendix) for each Factor.

1. The Pairwise Comparison of 3D Models according to GREEN SPACE

Select the option that has priority for you in the pairwise comparison, using the scale from 1 to 9 (where 9 is extremely and 1 is equally important), Please indicate (X) the relative importance of options A (left column) to options B (right column).

3D Models A Options	Extremely 9	8	Very Strongly 7	6	Strongly 5	4	Moderately 3	2	Equally 1	2	Moderately 3	4	Strongly 5	6	Very Strongly 7	8	Extremely 9	3D Models B Options
Affordable Housing																		Sport Centre (activities)
Affordable Housing																		Youth Centre
Affordable Housing																		Maggies Centre
Affordable Housing																		Carpark and Top A Green Space
Affordable Housing																		Bicycle Centre
Affordable Housing																		Multi-function Space (public space, play area, market etc.)
Sport Centre (activities)																		Youth Centre
Sport Centre (activities)																		Maggies Centre
Sport Centre (activities)																		Carpark and Top A Green Space
Sport Centre (activities)																		Bicycle Centre
Sport Centre (activities)																		Multi-function Space (public space, play area, market etc.)
Youth Centre																		Maggies Centre
Youth Centre																		Carpark and Top A Green Space
Youth Centre																		Bicycle Centre
Youth Centre																		Multi-function Space (public space, play area, market etc.)
Maggies Centre																		Carpark and Top A Green Space
Maggies Centre																		Bicycle Centre
Maggies Centre																		Multi-function Space (public space, play area, market etc.)
Carpark and Top A Green Space																		Bicycle Centre
Carpark and Top A Green Space																		Multi-function Space (public space, play area, market etc.)
Bicycle Centre																		Multi-function Space (public space, play area, market etc.)

Affordable Housing | Sport Centre | Youth Centre | Maggies Centre | Carpark and Top Green | Bicycle Centre | Multi-function Space

Figure 4. A Sample of AHP questionnaire.

The focus group members generally stated that the method could be used in current decision-making. However, some members emphasized that the pair-wise comparisons arising from the AHP method should be reduced.

5. *Did 2D/3D visualizations help you make your decision?*

Participants stated that the 3D models helped them better understand the space and the surroundings and to make decisions.

6. *Can a transparent and accountable decision-making process be achieved with the proposed decision-making model?*

Participants stated that the method could provide a more transparent and accountable decision-making process. However, the method and how the different votes are weighted needed to be explained more clearly to the people involved in the decision-making process.

7. *How does using the AHP method in the proposed model affect your choice?*

Most of the participants stated that using the AHP method within the scope of the proposed model was beneficial and efficient when comparing the criteria, as expressed by the following statements of three members:

I think, the AHP method is very useful and efficient to make a decision when facing many different factors which affects the results.

AHP model make the process more understandable and easier for me.

Using the AHP method gives us the freedom of showing our feelings and thoughts in a detailed manner.

Some members also thought constantly comparing the same criteria was slightly confusing. One member expressed this as follows:

It was so confusing. If I was not a well-educated person, I would not complete it. I believe, it can be more effective when it is designed simpler (Member 4).

8. *Do you think the proposed process is beneficial or a waste of time?*

About 90% of the focus group members who participated in the case study stated that the proposed participation process was beneficial. However, one member stated that the pair-wise comparisons take too long, and the public will not want to spend time on it:

I can see the value of it, however, it took far too long to rank every option and I don't think members of the public would be happy to do this (Member 2).

Table 2. A hierarchy with consolidated priorities

DECISION HIERARCHY									
	The Design Criteria (Determined at the workshop)		POSSIBLE PLAN/DESIGN ALTERNATIVES (Alternatives determined at the workshop and alternatives' priorities calculated according to focus group surveys in terms of factors)						
	Criteria	Criteria Priorities	Affordable Housing	Sport Centre (activities)	Youth Centre	Maggies Centre (health care)	Carpark and Top A Green Space	Bicycle Centre	Multi-function Space (public space, play area, market etc.)
GOAL (The Best Decision for Plot 10)	Green Space	18.50%	0.189	0.101	0.132	0.101	0.175	0.067	0.235
	Accessibility	14.20%	0.133	0.124	0.137	0.092	0.167	0.107	0.24
	Human Scale	7.80%	0.255	0.126	0.108	0.091	0.144	0.07	0.204
	Sustainability	15.30%	0.129	0.112	0.123	0.123	0.13	0.156	0.227
	Identity (place-making)	6.70%	0.173	0.15	0.134	0.123	0.111	0.085	0.224
	Harmony	11.20%	0.273	0.099	0.096	0.09	0.137	0.101	0.206
	Transportation	26.30%	0.22	0.154	0.11	0.101	0.127	0.095	0.194
PRIORITIES of ALTERNATIVES			19.40%	12.50%	12.00%	10.20%	14.30%	9.90%	21.70%

9. Did you have any difficulty in the participation process? If so, what did you find challenging?

While the majority of the focus group members were satisfied with the proposed participation process, some members also determined difficulties, as follows;

The questionnaire was so detailed and hard to understand.

The discussion was quite fluent and in an easy mood, so everyone shared idea from their own research background. I guess more pictures and videos may help participant's thinking.

10. Do you think the public would be able to understand the proposed participatory process?

About 80% of the focus group members stated that the process is useful and easy to understand. This was expressed by one member as follows:

The proposed participatory decision-making process would be a beneficial system that UK planning councils could potentially utilize. Unfortunately, government cuts in funding at national level have led to short staff areas and further COVID effected months have exposed a short fall of workers. I would be happy to see this scheme used more.

However, some members stated that the public would have difficulty in understanding the process and that the process should be simplified:

I think members of the public would struggle to understand the maths behind the process but you could make it simpler (Member 2).

The results show that the proposed framework allows participants to express themselves and supports decision-making. Furthermore, participants emphasized that it provided a transparent and accountable support process, mainly as participants had the right to speak at the workshop. Furthermore, their ideas were included through a questionnaire. Allowing people to express their opinions and influence the decision will increase their confidence in participating and ensure they do not see it as a waste of time.

Findings indicate that participants gained new perspectives on different issues. The main reason is that focus group members with different expertise could negotiate and bounce ideas off each other during the meeting. It is an essential aspect of any participatory planning approach that technical issues need to be dealt with at a level that the public can understand. In addition, 3D visuals of alternative designs help those participating. In the case study, learning during the participation process positively affected participants' willingness to participate.

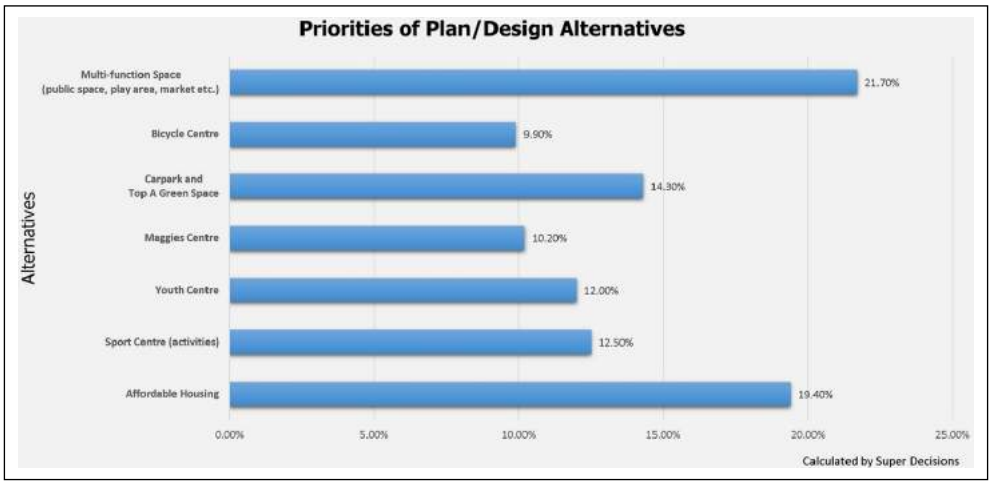

Figure 5. Consolidated Weights of Design Alternatives' Priorities.

Figure 6. Participants' first priority alternative is a multifunctional space (21.7%) for Plot 10.

The main reasons for members favoring the AHP method are that it offers an objective methodology, transparently transfers stakeholder preferences to the decision-making process, makes a single judgment by comparing the criteria, and systematically evaluates participants' opinions. Therefore, using the AHP method in decision-making increases people's confidence in the process. Furthermore, using the AHP method in the proposed decision-making framework can accelerate the process and enable people's priorities to determine the final decision.

A limitation of the AHP method is that the priority order is determined by a pair-wise comparison of all criteria. The resulting increase in the number of criteria to be compared causes the process to become long and confusing. For example, members were asked to compare eight design criteria and seven design alternatives for each criterion in the case study. Some members described this process as too long, confusing, and boring. Consequently, members of the public may not like it, and their willingness to participate may decrease. To eliminate this limitation, criteria and alternatives should be evaluated and reduced as much as possible at the first preparation stage or during the participatory appraisal workshop. Reducing the number of factors and alternatives in the decision-making process will reduce the number of pairwise comparisons, thus shortening the participation process.

CONCLUSION

Participatory planning focuses on reaching stakeholders affected by plan decisions and understanding their needs and priorities. Participation can occur in the associated decision-making process at different levels and methods. However, using inappropriate methods in the participation process can undermine the public's trust and reduce the public's desire to participate.

Meeting stakeholders' expectations are essential to increasing the decisions' legitimacy. In this context, this paper introduces

a deliberative framework that aims at handling technical issues at a level that can be understood by the general public and where the participants' priorities are systematically evaluated. The framework integrates visualization and mapping/analysis capabilities of computer-aided design software with the decision support methodology of AHP. The proposed framework aims to inform stakeholders, allow them to express their priorities, and make judgments about developing and identifying alternatives.

The framework was tested through a case study in Liverpool, UK. 12 PhD students from different professional areas formed the associated focus group, evaluating an inner-city regeneration project. Members participated in the case study process phases and expressed their views on the proposed framework. Subsequently, advantages and shortcomings were revealed.

Testing suggests that the proposed model can be used in a participatory planning process if the number of criteria and alternatives is reasonable. Participants were able to express their priorities and influence decisions. In addition, the framework can be applied through online meetings and surveys if physical presence is impossible.

A potential limitation of using the framework is the number of factors to be compared. If this is too high, the process can become long and confusing. However, this can be addressed through thoroughly evaluating factors and alternatives by the expert(s) managing the process, keeping their numbers reasonable. In this context, future studies should investigate how fewer factors can lead to a codecision by discussing their priorities.

[1]*Participatory Appraisal defines a set of approaches that enable people to make decisions about the future through self-expression and learning of new information. In order for people with different needs and thoughts to explore issues, the method aims to encourage people who are reluctant to participate in meetings by using visual tools in the production process (Involve, 2005).*

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Appendix: The focus group member list

The Focus Group Member Number	Profession
Member 1	Urban planner
Member 2	Town planner
Member 3	Water engineer
Member 4	Architect
Member 5	Architect
Member 6	Architect
Member 7	Cinematographer
Member 8	Biologist
Member 9	Physicist
Member 10	Interior designer
Member 11	MA in education
Member 12	Environmental researcher

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Article

Autonomous vehicles impacts on quality of urban life: A review

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ABSTRACT

Developing technology and changing lifestyles also change the expectations of the citizens from the quality of urban life (QOUL). However, today, the automobile-oriented transportation system causes a decrease in the QOUL, especially in crowded cities, due to some reasons such as traffic congestion, high individual vehicle ownership, lack of parking lots, number of accidents, loss of time in traffic, and air and noise pollution. Transportation is one of the indicators that directly and indirectly affect the QOUL. Transportation, which is sensitive to technology, can also directly affect urban space and affect mobility and accessibility in the city. In this context, new technologies such as autonomous vehicles (AV) can lead to significant changes in urban space, human behavior, and QOUL. Once these vehicles are launched, they can affect our lives in many ways: transportation, environment, urbanization, social, economic, and legal. This makes AVs a part of the social debate. Although there are many studies in the literature examining how AVs will affect the fields of transportation, environment, economy, and law, there are very limited studies on how AVs will affect the QOUL. Based on a literature review of the relationship between AVs and QOUL, this study aims to predict how AVs will affect QOUL. According to the findings, it has been observed that AVs will positively affect the QOUL life when they are operated with car sharing/ride-sharing, using electricity, and when they are integrated with public transportation. However, AVs can lead to congested and polluted complex urban centers, suburbanization, extrainfrastructure investment, and cyber threats. According to the study findings, the effects of these vehicles on the QOUL vary depending on the policies applied, the social acceptability of the vehicles, the preparation of the infrastructure, and the market share. With the right policies, know-how, and appropriate infrastructure, AVs can be an opportunity to improve the causes that reduce the QOUL in today's cities.

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INTRODUCTION

Developing technology and changing lifestyles have led to an increase in the expectations regarding the quality of urban life (QOUL) of individuals living in cities. In recent years, QOUL has remarked widespread in different fields such as sociology, economy, psychology, politics, and marketing. In addition, when considering QOUL, the elements that constitute the QOUL should also be evaluated in terms of spatial and local social (Bilgili, 2017). Transportation is also one of the factors affecting the city in terms of spatial and other fields. Transportation, which is sensitive to technological developments, directly and indirectly affects the QOUL. The change in transportation, which has had a great impact on the urban form throughout history, is one of the most basic tools that guide spatial development based on accessibility and mobility. The increase in the use of automobiles in the 1950s was the beginning of the wave of suburbanization, and today, the automobile-oriented transportation system causes a decrease in the QOUL, especially in crowded cities, due to some reasons such as traffic congestion, high individual vehicle ownership, lack of parking lots, number of accidents, loss of time in traffic, and air and noise pollution. With the developments in the automotive industry, the dream of driverless vehicles has become a reality and it is predicted that they can be a solution to today's transportation-related problems. Autonomous vehicles (AVs), which are planned to be launched soon, are expected to affect our cities not only in the field of transportation but also in many areas such as the environment, urbanization, social, economic, and legal regulations. Thus, they can affect the QOUL as well. This makes AVs part of a public debate.

In the construction of livable cities, it is important to predict the future to determine the appropriate policies. Although many studies have been conducted on the effects of AVs on traffic, transportation, and daily habits, very limited studies have been conducted on how AVs will affect the QOUL. This study aims to predict how urban transportation, which can directly or indirectly affect the spatial functions of the city, can be affected by AVs and how its projection to the urban space can affect QOUL. Within the scope of this study, QOUL criteria suggested in previous studies are evaluated with the content analysis method from the literature, together with the possible effects of AVs. In the study, the features of AVs, their effects, and spatial results are evaluated within the framework of QOUL indicators, and it is tried to predict how they would affect the QOUL as a result.

QOUL INDICATORS AND TRANSPORTATION

Simultaneously with the progress in communication and technology, physical and social transformations have been experienced in cities, especially in the past century. These transformations have also affected the way cities are handled, new methods and approaches have been adopted in urban planning and transportation. According to Wey and Huang (2018), urban planning and the development of transportation have a significant and positive effect on the construction of livable and sustainable cities. At the same time, this situation is related to the QOUL (Taki, et al., 2017; Wey, 2015; Wey and Chiu, 2013; Wey et al., 2016). QOUL is a complex concept as it includes variables and multidimensional aspects related to the urban built environment (Wey and Wei, 2016). Although there are many studies on the definition and measurability of QOUL, there is no common definition and standard indicators (Sarı and Kındap, 2018). QOUL concept means that each individual can benefit from the opportunities offered by the city in an equal, balanced, and proportionate manner and also has the opportunity to participate in educational, social, political activities, and processes (Yakin Inan and Ozdemir Sönmez, 2019). This concept is also explained as the ratio between the supply and demand of the city's need for urban services (Görün and Kara, 2010; Turgut, 2007; UN-HABITAT, 1996). The concept of QOUL, which first emerged with the Social Indicators Movement in the 1960s, includes both the natural and built environment, but is more concerned with urban equipment and comfort, and may vary from person to person.

Different indicators/categories have been suggested in studies to measure the QOUL of urban residents. For instance, in the study of Psatha et al. (2011), they suggested 12 general categories to determine the QOUL in European cities. These are economic environment, social environment, natural environment, built environment, urban and suburban green spaces, public spaces and public buildings, culture and leisure, demographic data, education, healthcare, democratic institutions, and traffic and transportation. In the study of Yakın Inan and Ozdemir Sönmez (2019), based on UN, OECD, and EU indicators, they proposed nine indicators to measure the QOUL, namely housing, education, environment, health, safety, transportation, information and communication, infrastructure, and culture, sports, and recreation. Vlasov et al. (2021) stated in their study that there are four indicators of QOUL and discussed them with the titles of urban transport, urban economy, urban social, and urban environment. In the studies, it was defined as the components of the transportation indicator such as traffic situation, parking area, access and effectiveness of public transportation, access to regions, time spent in traffic, transportation infrastructure, rate of business trips according to modes, smart transportation systems, Information and Communication Technology (ICT) support for transportation, and it was supported that these components would affect the QOUL (Psatha et al., 2011; Vlasov et al., 2021; Yakın Inan and Ozdemir Sonmez,

2019). Furthermore, some studies show that transportation will affect the QOUL in many ways (Bonaiuto et al., 2006; Forkenbrock, 2004; Michalos and Zumbo 1999; Senlier et al., 2009; Shafer et al., 2000; Turksever and Atalik, 2001). For example, Schneider's (2013) study for the state of Minnesota revealed that transportation will directly and indirectly affect the QOUL in the categories of safety, maintenance, infrastructure, accessibility, mobility, environment, energy, design, and transparency. In this context, it can be said that the transportation system affected by the changing technology can change with AVs, and this will affect the QOUL. Similarly, it has been claimed in the previous studies that AVs will increase QOUL (Hawes, 2017; Russell, 2015). From this point of view, in this study, how AVs will affect that urban life has been examined under 5 generalized indicators, and then how it will affect that the QOUL has been evaluated.

AVs AS A TYPE OF TRANSPORTATION

In the early 1900s, with the replacement of horse-drawn transportation by motor vehicles, it was seen how cities transformed the way cities functioned and human movements, and it was thought that innovative technologies could revolutionize the way we think, plan, and design cities (Duarte and Ratti, 2018). Today, city planners are working on many trends that will increase accessibility and mobility, such as 20-Min Cities and smart mobility (Calafiore et al., 2022; Toan, 2022). While AVs have been experimentally limited to traffic, transportation planners and urban planners agree that they can redefine urban mobility soon.

Although different from today's AVs applications, the first AV idea became reality with the Fantom-Autos moving with radio frequencies in the 1920s, followed by the vehicles moving with the automation placed in the infrastructure of General Motors in the 1950s (Duarte and Ratti, 2018). Today, it is seen that this science fiction element has become reality with the organization of Defense Advanced Research Projects Agency, where AVs are tested in the urban area (Buehler et al., 2009). With the knowledge of technology, it is observed that the production in the vehicle market has shifted to AVs. In other words, the auto industry is constantly incorporating algorithms and devices required by AVs into regular vehicles. Society of Automobile Engineers defined six different levels of autonomous driving: Zero, when drivers have full control of the car; one, when certain functions, such as steering and acceleration, are performed automatically; two, when some functions respond using information about the driving environment, but the driver must be ready to take control; three, when cars are fully autonomous under certain traffic conditions; four, they can operate in any driving scenario, when the cars perform all safety-critical driving functions within a certain number of driving scenarios; and five, when the vehicles are fully autonomous (Duarte and Ratti, 2018; SAE On-Road Automated Vehicle Standards Committee, 2014).

Conventional vehicles need a driver because they are incapable of sensing and controlling. However, the Advanced Driver Assistance System (ADAS) has long been widely used to improve the driving experience (Yan et al., 2016). They provide dynamic driving control with the data that they receive from the sensors of the AVs for driving control and, therefore, require almost no human intervention. The ADAS has many features that reduce the driving responsibility, such as parking assistance, traffic sign recognition, lane tracking system, blind spot monitoring, and emergency braking system (Kotori, 2018; Schwarz et al., 2013). The developing technology enables vehicles to perceive and make sense of the environment with sensors and cameras. Recently, AVs mostly use LIDAR (laser beams for object identification), Sonar (ultrasonic sound waves for obstacle identification), Radar (radio frequencies for measurement of relative distance, obstacle avoidance, and movement of vehicles on roads), and cameras; finally, the data are interpreted with artificial intelligence (Yan et al., 2016). For AVs to perform at their best, they must not only detect but also communicate with other devices and infrastructure (Duarte and Ratti, 2018). Therefore, AVs communicate with Vehicle-to-Vehicle (V2V), Vehicle-to-Infrastructure (V2I), Vehicle-to-pedestrian (V2P), Vehicle-to-Network (V2N), and all devices that allow wireless connectivity. These communications are generalized as Vehicle to Everything (V2X). Moreover, it is possible to determine the location of the vehicle with GPS and access to simultaneous maps (Kumar et al., 2012).

According to researches on who will own and share AVs when they are released, these vehicles can be used both privately (individually owned and used within the family) and commercially shared (car-sharing/ride-sharing) (Collingwood, 2017; Heinrichs, 2016; Silva et al., 2021). In addition, AVs can be used for commercial taxis or public transport (PT) (Fagnant and Kockelman, 2014; Krueger et al., 2016). Passenger behavior, attitude, social norms, trust, perceived ease of use, perceived risk, compatibility, perceived usefulness, price/performance ratio, mobility, and value of time relative to the person can be influential in the acceptance of AVs (Jing et al., 2020). The study by Moavenzadeh and Lang (2018) found that the acceptance rate of AVs in fast-growing megacities such as Mumbai and Beijing is higher than those in developed markets such as Osaka and Amsterdam. This is because heavy traffic and its consequences affect consumer preferences. It is estimated that the acceptability of AVs will increase as environmental concerns increase and the education level and income level increase in the young population

(Jacyna, 1998; Jacyna and Merkisz, 2014; Koul and Eydgahi, 2018; Silva et al., 2021). How AVs will affect our cities and transportation as they become part of daily life and the benefits/harms will undoubtedly depend on market penetration. It can be said that the first of the variables affecting this situation is social acceptability, how the vehicles will be used, and whether the urban infrastructure is ready for this.

POSSIBLE EFFECTS OF AVs ON THE CITY AND EVALUATION

From the historical perspective, the change observed in the development of urban settlements shaped based on transportation can also be experienced with AVs. AVs will impact urban space and urban life, and therefore on QOUL, as well as on the development and macro form of cities. The possible effects of these vehicles on cities will have many dimensions. Considering the previous QOUL studies, it is possible to collect the possible effects on cities under five indicators: transportation, urbanization, infrastructure, environment, and security.

Transportation

Transportation, and especially urban transportation, has a very wide expansion. Urban transportation is defined as all private or community, personal or public, and commercial or non-commercial transportation activities that occur in a city, and the infrastructure, superstructure, and organization (coordination, management, governance) elements used in fulfillment of these activities (Şenbil, 2012). It is estimated that AVs will have direct or indirect effects on many components of transportation, such as traffic, road capacity, travel demand, travel time, pedestrian-vehicle safety, vehicle ownership, parking needs, and PT.

The main effect of AVs is on traffic. Factors such as different headways, different gap acceptance values, different acceleration values, and different driver behavior (more aggressive or softer) can change the characteristics of the traffic flow and change the existing can cause serious changes in road capacity. In some of the previous studies, it is predicted that AVs will move with lower headways, which will increase road capacity (Friedrich, 2015; Tientrakool et al., 2011) or that lower headways will increase road capacity as AV penetration increases (Li et al., 2020; Mena-Oreja et al., 2018; Talebpour and Mahmassani, 2016). However, Ploeg et al. (2011) stated that headways <2.0 s cause imbalances in traffic flow when V2V and V2I communications are not available. In other studies, it has been claimed that V2V communication provides a safe following distance and stable traffic flow, and they can move on narrower roads due to both less lane use and sharing opposite directions, but this can trigger demand (Millard-Ball, 2018; Naus et al., 2010; Olia et al., 2018; Schlossberg et al., 2018; Swaroop et al., 1994; Swaroop and Rajagopal, 2001).

While it may seem unusual to share a personal vehicle with a stranger, ride-sharing practices have reduced the number of cars on the roads in various countries. In the study of Fagnant and Kockelman (2014), it is argued that each shared autonomous vehicles (SAVs) can replace ten conventional vehicles. Bischoff and Maciejewski (2016) showed that each SAV can replace 11 conventional vehicles, with 100% market penetration. Although using SAVs provides more equal mobility and lower costs, it is predicted that the increase in travel time by ghost trips, the use of different AVs by people sharing the same vehicle, and the demand created by low prices will increase VMT/VKT (vehicle miles /kilometers traveled) (Bahamonde-Birke et al., 2018; Bischoff and Maciejewski, 2016; Fagnant and Kockelman, 2014; Heilig et al., 2017; Levinson and Krizek, 2015; Lokhandwala and Cai, 2018; Martinez and Crist, 2015; Medina-Tapia and Robusté, 2019; Milakis et al., 2017; Moavenzadeh and Lang, 2018; Moreno et al., 2018; Pakusch et al., 2018; Plumer, 2013; Sivak and Schoettle, 2015; Smith, 2012; Spieser et al., 2014; Vosooghi et al., 2019; Zhang et al., 2015). Studies on the effect of SAVs on traffic congestion usually have two opposite views. On the one hand, it is believed that ride-sharing systems can cause an increase in congestion (Zhao and Kockelman, 2018); on the other hand, these systems will reduce congestion (Alazzawi et al., 2018; Martinez and Viegas, 2017). Narayanan et al. (2020) suggest that the positive effect of ride-sharing depends on various factors, such as average vehicle density, demand density, pattern, network topology, vehicle assignment, and location algorithms.

Salazar et al. (2018) suggest that SAVs and PT integration could reduce traffic, while Moavenzadeh and Lang (2018) claim that SAVs could replace individual vehicles and PT. While Stanford (2015) predicts that AVs will cause traffic congestion if they replace PT, Duarte and Ratti (2018) suggest that AVs can be used as a feeder mode for PT stations and corridors. Both Moavenzadeh and Lang (2018) and Litman (2018) stated that while the increase in the possibility of car sharing due to high demand density in the city causes a decrease in traffic, it will increase in the suburbs. In the study of Alessandrini et al. (2015), it is assumed that when people who are currently unable to drive (old, disabled, young, etc.) use AV, urban mobility will increase, in addition, the elimination of driving obligation and ease of use will trigger demand.

Vehicles spend most of their time in parks, and parking lots occupy large areas in the city center (Economist, 2015). In the studies on the parking needs of AVs, it is claimed that the need for parking of AVs will decrease,

and AVs can park in cheaper areas far from the city center as they can park without a driver (Bruun and Givoni, 2015; Keeney, 2017; Martinez and Crist, 2015; Yigitcanlar et al., 2019; Zhang et al., 2015; Zhang and Guhathakurta, 2017). In this way, urban centers can become more dynamic, but this can lead to denser urban centers. However, there are also studies showing that AVs will increase the need for parking (Duarte and Ratti, 2018; Grush et al. 2016; Stead and Vaddadi 2019; Zhang et al., 2015).

The greatest impact of AVs will undoubtedly be on transportation. It can lead to great spatial and mobility differences in the urban area, both by changing passenger/driver behavior and by changing road uses. Especially (even if there are opposing opinions, according to general belief), it can lead to more stable traffic flow and more effective use of the road network with its sensors, communication, and artificial intelligence. In this way, when applied correctly, they can solve traffic congestion, one of the greatest problems in cities.

Urbanization

The transportation networks, which cover the largest area use in urban areas (between 25 and 35%), are the main land use in cities (Yigitcanlar et al., 2019). It is believed that AVs will change their traveling behavior (including pedestrians), and thus, our cities will also change (Millard-Ball, 2018). Even if fully AVs are not noticed when they come out, the consequences for urban mobility and urban design can be enormous (Duarte and Ratti, 2018). It is predicted that accessibility and location selection, which may change depending on the change in travels in cities, may also lead to land use and street structure.

In some of the studies examining the effects of AVs on urbanization, it is predicted that the reorganization and redensification of city centers can lead to greener land use and increase the quality of the built environment, which can provide more pedestrian-friendly city centers (Duarte and Ratti 2018; Stead and Vaddadi, 2019). Programming AVs according to traffic rules and speed limits can make cities safer, and it is expected that with the elimination of man-made accidents, fatal accidents will decrease, but not completely due to machine failures (Duarte and Ratti, 2018; Fagnant and Kockelman, 2015; Keeney, 2017; Teoh and Kidd, 2017). According to Beraldi and Thomas (2007), it would be reasonable to allow only AVs to navigate in old settlements, areas with chronic traffic congestion, and narrow and difficult-to-navigate areas. With the platooning technology of AVs, it can create empty spaces for city planners using highways more effectively. It can offer better quality roads for both vehicles and pedestrians, more suitable for urban life (Yigitcanlar et al., 2017; Yigitcanlar et al., 2019). In their study, Zhang et al. (2018) simulated housing location selection with SAVs and concluded that SAVs will not cause urban unfretted sprawl, older people will move closer to the city center and the younger generation will move away from the city center in a limited way.

On the other hand, it is argued that the built environment can be reshaped in line with the needs of AVs and users, urban sprawl will increase due to comfortable trips and suburbanization will increase (Anderson et al., 2014; Meyer et al., 2017; Stead and Vaddadi, 2019). According to Guerra (2016) and Litman (2017), while AVs offer high comfort and road capacity when offered at low prices; it is predicted that they will increase accessibility, cause urban sprawl, and make PT unnecessary. Moreover, the minimum waiting time of SAVs in parking lots will not only reduce the need for parking in the city center but also increase urban density and increase real estate prices in remote settlements (Bagloee et al., 2016; Heinrichs, 2016; Levine et al., 2017; Rubin, 2016; Snyder, 2016).

Many conflicting results can be obtained from studies evaluating the possible effects of AVs on the city. It can reduce driving; it can offer greener, pedestrian-friendly, more accessible cities, offer higher built environment quality, and less traffic congestion, in other respects, it can increase urban sprawl and suburbanization by increasing passengers, increasing real estate prices, additional infrastructure costs, decrease in PT use, densely populated, and cities with increased air/water pollution and decreased livability can also present. While it causes denser urbanization in urban centers, it may lead to dispersed and low-density settlements in urban peripheries and suburbs.

Infrastructure

Urban infrastructure means the needs and tools necessary for fulfillment functions in a city. For the solution to urban problems, the city and urban infrastructure should be approached holistically (Şahin, 2018). The requirements and impacts of AVs, it is expected to change urban infrastructure in numerous ways after they are released.

In his studies examining the transportation effects of AVs, Litman (2017) predicts that AVs need special lanes for positive effects such as automation at intersections and reduction of traffic congestion and this will cause fairness and cost discussions. Glancy (2015) similarly claims that on roads, where automation and collaborative movement increase, additional infrastructure, such as antennas and roadside processing units will be demanded. Tachet et al. (2017) argue that AVs do not need traffic signaling. In addition, it is estimated that gas/petrol stations will be unnecessary, and charging stations will be needed in parking lots (Nunes et al., 2016).

When the studies are examined, it is seen that the urban infrastructure needs to be renewed/improved to run AVs in the most beneficial way for the city. However, although

the requirements such as antennas, charging stations, data collectors, and distributors are expected to improve the traffic flow, how to meet the cost, ownership, and financing continues to be discussed.

Environment

Environmental problems, which are one of the biggest problems of big cities today, are increasing due to the increasing population, traffic congestion, and production activities. In particular, air pollution caused by production, transportation, and traffic reaches a level that threatens life in some countries. There is a widespread perception that AVs will be less harmful to the environment due to the expectation that they will reduce traffic and be electrified.

Studies on the environmental effects of AVs are expected to reduce emissions, especially when they are used electrically (Fagnant and Kockelman, 2014; Greenblatt and Saxena, 2015; Lokhandwala and Cai, 2018; Martinez and Viegas, 2017; Martínez-Díaz and Soriguera, 2018; Pakusch et al., 2018; Salazar et al., 2018; Vleugel and Bal, 2018). In addition, it is predicted that autonomous driving, smart steering/motion control, and V2V and V2I communication will provide fuel savings (Anderson et al., 2014; Bullis, 2017; Snyder, 2016; Walker and Crofton, 2014). Moreover, it is expected that AVs will cause less air pollution with low greenhouse gas emissions, and they will be able to find parking spaces in smart cities in a shorter time (Medina-Tapia and Robusté, 2019; Moreno et al., 2018).

Integrating electric vehicles (EVs) and SAVs systems can significantly reduce energy consumption (Fagnant and Kockelman, 2014; Zhang et al., 2015). Integrating SAVs and PT can cause reduced emissions, less traffic congestion traffic, and a decrease in transportation costs (Salazar et al., 2018). In addition, reducing human safety measures to save more fuel, as traffic accidents will likely decrease; therefore, with a reduction in vehicle weight (for example, no longer using bumpers), passive measures may no longer be necessary (Capp and Litkouhi, 2014).

Being electric, being shared, and being able to make simultaneous route planning, AVs can both save fuel and reduce emissions. However, it should be noted that this technology, which seems to be environmentally friendly, can become waste that is harmful to nature when used in batteries of electric cars when they reach the end of their life. Furthermore, AVs can trigger traffic demand and contribute to pollution by increasing urban sprawl. In general, urban sprawl tends to have negative environmental impacts by increasing energy use and reducing water and air quality (Wilson and Chakraborty, 2013). Considering the possibility that the advantages offered by AVs may cause urban sprawl, it shows that AVs are far from being environmentally friendly if the right transportation/management policies are not applied.

Security

Promising safer traffic flow, AVs can radically change our perception of security in our transportation system today. Today, many vehicle manufacturers add features that increase automation to vehicles (Morando et al., 2018). Many studies examining the safety effects of AVs predict that accidents will decrease after the human intervention is eliminated (Fagnant and Kockelman, 2015; Sivak and Schoettle, 2015). Kockelman et al. (2016) suggest that because AVs are less aggressive than human drivers, they will increase road and intersection capacity in the long term, choose shorter routes, and take fewer risks. However, Koopman and Wagner (2016) and Morando et al. (2018) argue that AVs must have a high market share for the benefits of increased automation to be fully realized. It is also assumed that the platooning, communication, brake assist system, and sensors of AVs will reduce accidents (Hannawald and Kauer, 2004; Gavrila et al., 2003; Rosén et al., 2010; Rosén and Sander, 2009; Tian et al., 2016; Zhou et al., 2017).

In addition to the positive studies that all these AVs will increase driving safety, studies have been published that argue that they may require human intervention in case of failure (Dixit et al., 2016), cause security problems due to their communication may be a target of privacy sharing/malicious attacks, and the GPS data received/sent by the vehicle can be manipulated (Koopman and Wagner, 2017; Petit and Shlafover, 2014; Taeihagh and Lim, 2019).

AVs are expected to offer a safer driving experience with their technology, artificial intelligence, sensors, and communication features. However, at this point, discussions continue about who will be responsible for the accident, emergency behavior, how to communicate with the immediate environment, and data security. According to the studies, it can be said that AVs can reduce fatal/injury accident rates with high market share, appropriate infrastructure, and communication. However, especially the discussions on cyber security remain up to date.

Evaluation of the Impacts of AVs on Urban Space and Quality of Urban Life

Knowing the factors that can affect the QOUL of the citizens gains great importance in determining the policies to be followed in the city administration and the existence of livable cities. In this context, transportation connections that directly affect the urban space should be considered together with the changing technology. AVs may also deeply affect both urban transportation and urban space. It has been mentioned above that use of AVs, there may be a wide variety of effects on the QOUL within the framework of transportation, urbanization, infrastructure, environment, and security. The relationship and impact of these effects on

urban space and QOUL are evaluated in Table 1.

According to Table 1, when the transportation indicator is considered, AVs can positively affect the QOUL for each sub-title. It is seen that especially self-parking will improve the QOUL. However, not requiring responsibility, having no age and license restrictions, easy to use/access, and being an alternative to PT may negatively affect QOUL. The use of lower headways has the potential to both improve and deteriorate traffic. In addition, ride-sharing/car-sharing can reduce QOUL by increasing empty trips and travel demand, while reducing the number of vehicles in circulation can improve QOUL. When the urbanization indicator is analyzed, AVs can improve QOUL due to the lack of human intervention in terms of traffic safety, accessibility and land use, advanced sensing, and platooning, but they can also have the opposite effect due to low prices and automated mobility. They may also lead to a decrease in QOUL as there is no need for driver responsibility in the urban form and land value subtitles. In the infrastructure indicator, AVs cause the QOUL of citizens to decrease due to the need for new infrastructure investments, while making some infrastructure elements unnecessary can increase the QOUL by gaining space in the city. When the environmental indicator is examined, it is predicted that AVs can increase QOUL with advanced control strategies, integration with PT, working with electricity, and design in the sub-titles of air pollution and fuel consumption, but it will decrease QOUL in the built environment due to urban sprawl. Considering the safety indicator, it can be expected to adversely affect QOUL, especially in cyber security, and increase the QOUL by providing safer driving with ADAS and communication features in the pedestrian and traffic subtitles. However, it should be considered that in case of malfunction, it may decrease the QOUL in terms of pedestrian and traffic safety. As a result, it is seen that the widespread use of these vehicles in cities may lead to changes in travel and road infrastructure and sections in terms of transportation. At this point, it is thought that it may change some land use and density decisions at the urban scale and may affect the urban development and some site selection decisions at the regional scale.

CONCLUSION

It has been seen throughout history that transportation has had a great impact on the urban form. The increment of the automobile in the 1950s marked the beginning of the wave of suburbanization and innovations in transportation continued. It is expected that AVs, which are planned to be launched soon, will cause fundamental changes in human travel behavior, which will affect the social structure and urban form, and thus the QOUL. AVs can facilitate car-sharing/ridesharing, increasing limited accessibility and reliance on sharing systems.

Although AVs impact the city and citizens in various areas, it can be said that the greatest change in space can be seen in using roads and parking lots, as they use the urban infrastructure more effectively. For instance, if roadside parking areas are converted for cultural activities, commercial uses, and vendors, or used for different street improvements, and public space activities, it can contribute to the development of the local economy and overall QOUL of the area. Similarly, when the areas gained by the more effective use of infrastructure are used as green areas, it can serve the citizens and contribute to reducing air pollution caused by traffic.

However, besides all these positive possibilities, AVs may cause a tendency to develop in suburban areas. In this case, construction pressure may occur in natural areas and the protection-utilization balance may be endangered. They can cause urban centers to become more polluted, with high land prices, dense, and complex. In addition, rising demand may cause an increase in transportation-related problems today. Moreover, the need for infrastructure investments may arise. All of these can reduce the QOUL of citizens. When AVs are put into use, it is important to take human-oriented policies, prepare the appropriate infrastructure, make the necessary preparations, and take measures in order not to reduce the QOUL of the citizens.

As a result, all spatial effects that may affect the QOUL of AVs after they are put on the market may vary depending on the policies implemented by the management, the acceptability of these vehicles by the citizens, how well the infrastructure is arranged, and their market penetration rate. With the right policy, information, and infrastructure, AVs can turn into an opportunity by reversing the negative conditions that reduce the QOUL in big cities today. In addition, predicting the effects of AVs on space and QOUL will contribute to the urban planning discipline, which has an important role in space organization, in producing new solutions in the field of planning and design.

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Table 1. Possible effects of autonomous vehicles on urban space and quality of urban life

Quality of urban life ındicator	Subtitle	Autonomous vehicle features	References	Possible effects	Spatial results	Impacts on quality of Urban life
Transportation	Traffic	Communication	Naus et al., 2010; Swaroop et al., 1994; Swaroop and Rajagopal, 2001	More stable traffic flow	Cities with less traffic congestion	Positive
			Olia et al., 2018	Increase in road capacity		
		Lower Headways	Nowakowski et al., 2016; Schlossberg et al., 2018; Tientrakool et al., 2011			
			Nowakowski et al., 2016	Fuel Saving	Less air pollution	
			Millard-Ball, 2018	Increasing travel demand	Traffic jam Increased travel time	Negative
	Public Transport	Alternative to Public Transport	Stanford, 2015; Moavenzadeh and Lang, 2018	Reducing public transport use		
			Salazar et al., 2018	Decrease Traffic	Less traffic and air pollution	Positive
		Feeder to Public Transport	Duarte and Ratti, 2018	Increasing accessibility to areas without access to public transport lines	Higher accessible cities	
	Travel Demand, Travel Time	No age and license restrictions	Alessandrini et al., 2015	Transportation for the elderly, children, and the disabled	More urban mobility	
		No need for driver's liability	Duarte and Ratti, 2018	Increasing road use	Increased traffic congestion and time spent in traffic	Negative
		Easy access/use to vehicles	Alazzawi et al., 2018; Martinez and Viegas, 2017; Zhao and Kockelman, 2018	Increase congestion		
			Lokhandwala and Cai, 2018	Replacing the existing taxi system		
			Pakusch et al., 2018	Decrease congestion	Increase travel demand	Negative
		Ride-Sharing/Car Sharing	Bischoff and Maciejewski, 2016; Fagnant and Kockelman, 2014; Levinson and Krizek, 2015; Milakis et al., 2017; Ratti and Biderman, 2017; Spieser et al., 2014; Vosooghi et al., 2019	Decreased number of cars in circulation	Less traffic jam Reduction in air pollution Decreased time spent in traffic Reduction in individual travel fees	Positive

Table 1. CONT.

Quality of urban life ındicator	Subtitle	Autonomous vehicle features	References	Possible effects	Spatial results	Impacts on quality of Urban life
			Plumer, 2013; Sivak and Schoettle, 2015	Reduction in individual vehicle ownership		
			Medina-Tapia and Robusté, 2019	Decreased distance per vehicle		
			Bahamonde-Birke et al., 2018; Bischoff and Maciejewski, 2016; Fagnant and Kockelman, 2014; Martinez and Crist, 2015; Moavenzadeh and Lang, 2018; Moreno et al., 2018; Pakusch et al., 2018	Increase in VMT/VKT due to empty trips	Increased congestion Increase in the number of vehicles in circulation Increased emissions and environmental pollution With less space dedicated to vehicles (roadways and parking)	Negative
			Bahamonde-Birke et al., 2018	Increase in travel demand		
	Parking	Self-parking	Keeney, 2017; Martinez and Crist, 2015; Zhang et al., 2015; Zhang and Guhathakurta, 2017	Decreased parking space requirement	Gaining public space in the city center Cities with more compact uses	Positive
			Zhang et al., 2015	Making roadside parking redundant		
			Yigitcanlar et al., 2019	Finding cheaper parking spaces		
Urbanization	Traffic safety	No human intervention	Keeney, 2017	Fewer accidents	Safer and livable cities	Positive
		Perceiving the environment with artificial intelligence and sensors	Duarte and Ratti, 2018; Fagnant and Kockelman, 2015	Following the traffic regulations		
	Accessibility		Beraldi and Thomas, 2007	Less lane use and maneuvering space	Improving transportation in old settlements, narrow and difficult-to-navigate areas	
		Lower prices	Guerra, 2016; Litman, 2017	Improved accessibility	Urban Sprawl	Negative
	Land Use	Automated mobility	Grush et al., 2016	Increase in demand	Increase in the need for parking	
			Stead and Vaddad, 2019		Need for drop-off points	

Table 1. CONT.

Quality of urban life ındicator	Subtitle	Autonomous vehicle features	References	Possible effects	Spatial results	Impacts on quality of Urban life
		Platooning	Stead and Vaddadi, 2019; Yigitcanlar et al., 2017, 2019	Empty spaces in urban areas	Quality of the built environment will increase with the recentralization or reorganization of inner areas, re-densification, land use change to new green area	Positive
		No need for vehicle driving responsibility.	Duarte and Ratti, 2018	Decrease in trips	Pedestrian-friendly central business areas	
	Urban form		Anderson et al., 2014; Duarte and Ratti, 2018; Stead and Vaddadi, 2019	Site selection from suburban areas	Urban sprawl	Negative
			Wilson and Chakraborty, 2013		Increasing energy use, reducing water and air quality Increasing infrastructure investments and costs	
	Land value		Bagloee et al., 2016; Heinrichs, 2016; Rubin, 2016; Snyder, 2016		Rising real estate prices in the suburbs	
Infrastructure	Traffic signalization	Communication	Tachet et al., 2017	No need for traffic signaling	Extra urban area gain	Positive
	Highway operators	Automatic transitions	Glancy, 2015	Antennas and roadside processingunits' requirement	Requires additional investments	Negative
			Litman, 2017	Special lane requirement		
	Energy	Working with electricity	Nunes et al., 2016	Charging stations requirement		
Environment	Build Environment	Integration with infrastructure	Wilson and Chakraborty, 2013	Urban Sprawl	Expansion of infrastructure due to urban sprawl and its negative effects on the environment	
	Air Pollution	Soft acceleration/declarations, optimal control strategies, and energy management	Bahamonde-Birke et al., 2018; Martínez-Díaz and Soriguera, 2018; Pakusch et al., 2018; Wadud, 2017	Compact and mixed-use land use	Decrease in environmental pollution Lower emissions	Positive

Table 1. CONT.

Quality of urban life ındicator	Subtitle	Autonomous vehicle features	References	Possible effects	Spatial results	Impacts on quality of Urban life
		Communication	Fagnant and Kockelman, 2014	Platooning		
	Fuel Consumption		Anderson et al., 2014	Fuel-saving		
			Medina-Tapia and Robusté, 2019	Finding a parking area in a shorter time		
		Integration of Public Transport and SAVs	Salazar et al., 2018	Reduced emissions Reducing traffic congestion		
		Intelligent steering and movement	Walker and Crofton, 2014			
		Integration of EV and SAVs	Fagnant and Kockelman, 2014; Greenblatt and Saxena, 2015; Lokhandwala and Cai, 2018; Martinez and Viegas, 2017; Salazar et al., 2018; Vleugel and Bal, 2018; Zhang et al., 2015	Less fuel consumption		
		Design	Capp and Litkouhi, 2014	Reduction in vehicle weight		
Security	Pedestrian and Traffic Security	No human intervention	Dixit et al., 2016	Require human intervention in some malfunction situations.	The dangerous urban environment created by careless users	Negative
			Morando et al., 2018; Fagnant and Kockelman, 2015	Reduction of human-induced accidents	Reduction in fatal and severe injury accidents	Positive
		ADAS	Rosén et al., 2010; Sivak and Schoettle, 2015	Reduce collision severity		
			Gavrila et al., 2003; Hannawald and Kauer, 2004; Rosén and Sander, 2009;		Safer driving in cities	
		Communication	Tian et al., 2016	Platooning	Reduction of chain accident risk and accident severity	
	Cyber Security		Koopman and Wagner, 2017	Cyber-attack risk	Keeping vehicles in communication can cause major problems for cyber-attacks	Negative
		Storage and transfer of data	Taeihagh and Lim, 2019	Privacy sharing and malicious attack risks		
		Connection to Network	Petit and Shladover, 2014	Misleading and fake messages	Irregular and incorrect maneuvers due to the manipulation of maps and vehicle positions	

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Article

The effectiveness of status conflict in the conservation of Sultanahmet urban archaeological site

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ABSTRACT

Protecting and transferring the historical, cultural, and natural environment to future generations are recognised as one of the primary responsibilities of humanity. The immediate result of such a responsibility is to replace individual efforts and initiatives with joint ownership of the heritage and gradually with systems and policies with national and international dimensions and common language and concepts. The policies countries pursue in this direction are one of the critical factors determining the level of development in conservation policies. On the other hand, cultural and natural assets and historical environments are considered as a record that sheds light on the urban and architectural design, construction techniques, and social life of a certain period, and thus, in a sense, they undertake an instructive task. Therefore, today it is aimed to protect the underground, aboveground or underwater values, called "cultural heritage", as a component of local and universal culture and a record of civilisation with the help of the laws, international agreements, conventions, and regulations. However, behaviours and policies that are no based on scientific data and are not objective and universal cause destruction because they fail to exhibit a comprehensive approach that can integrate cultural heritage into social, economic, social, and cultural life. They also create interruptions and result in indefinite periods in the maintenance of urban identity and urban culture. The research area of this article is in the Historical Peninsula of Istanbul, where all the changes in the conservation policies of Turkey can be observed. This study examined the different conservation statuses attributed to the area over time and the spatial outcomes of these statuses. As a result, this study aims to discuss, despite all the laws, international agreements, and conflicts of status, and why we have not achieved the desired success in the conservation of urban archaeological conservation sites.

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INTRODUCTION

When the Ottoman Empire, which laid the foundations of Turkey's cultural heritage (especially in terms of architecture), entered the westernisation period, the legal regulations that were made in terms of conservation, in a sense, initiated the process of establishing conservation policies. The Asar-ı Atika Nizamnamesi of 1869, 1874, and 1884 adopted the principle that ancient artefacts were state property and covered the pre-Ottoman period. Additionally,

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in this period, museology studies were initiated under the leadership of Osman Hamdi Bey. While the last Asar-ı Atika Nizamnamesi (1906) remained in force for 67 years, with the establishment of the Asar-ı Atika Encümen-i Daimisi organisation in 1917, conservation efforts began legally and institutionally before the establishment of the Republic of Turkey. Established in 1951 with Law No. 5805, the Supreme Council of Immovable Artefacts and Monuments became a key institution that has made critical decisions in heritage conservation with minimal means and brought many conservation principles that are still valid today. While conservation efforts accelerated at the national level, the La Haye Convention of 1954 and the European Cultural Convention were signed internationally, and organisations such as the Council of Europe and UNESCO became active. One of the most important economic and political development in terms of conservation in the 1960s was the transition to the planned development period. Following that transition, another critical development that affected the conservation efforts was the adoption of the principle that stresses that cultural development should be holistic and planned according to the following statement that found its way to the constitution (Article 41): "It is the duty of the state to realise economic, social and cultural development through democratic means, to increase national savings for this purpose, to direct investments to the priorities required by the public interest and to make development plans" (Gözler, 2021).

In the international arena, the Venice Charter (1964) and the Convention Concerning the Protection of the World Cultural and Natural Heritage (1972) stand out, while institutions such as ICOMOS (International Council on Monuments and Sites) and ICOM (International Council of Museums) have been established. Turkey became a party to such international developments and enacted the Antiquities Act No. 1710 (1973), which was the first conservation law of the Republic that could be considered ahead of its time. The law shifted the conservation approach from a single building to area conservation, laid out the conservation principles in accordance with definitions such as monuments, complexes, sites, historical sites, archaeological sites, and natural sites, and emphasised that the historical artefacts were state property. It also assigned the Supreme Council of Immovable Artefacts and Monuments and the Ministry of National Education to decide on the conditions of conservation and use (Kejanlı et al., 2007). The 1980s marked the beginning of a new era that strengthened from the 1970s onwards for Turkey, in which the country started to adopt neoliberal policies in every sense, and efforts for integration with global capitalism accelerated. The era also witnessed a new understanding of governance; and significant changes in urban, urbanisation, planning, and conservation issues were made (Örnek Özden, 2005).

Article 63 of the new Constitution of this period (1982) stipulated that "The State shall ensure the protection of the historical, cultural and natural assets and wealth, and shall take supportive and promotive measures towards that end. Any limitations to be imposed on such privately owned assets and wealth and the compensation and exemptions to be accorded to the owners of such, because of these limitations, shall be regulated by law." (Gözler, 2021). Within the scope of this article, Law No. 2863 on the Protection of Cultural and Natural Assets was enacted in 1983. The most fundamental change in the law, similar to the Antiquities Act, is that the Ministry of Culture is authorised and responsible instead of the Ministry of National Education. "The Ministry of Culture and Tourism shall provide aid in kind, in cash and technical assistance for the conservation, maintenance and repair of cultural and natural property to be protected and owned by real and legal persons subject to civil law." On the other hand, Article 17 references to a comprehensive conservation approach as it stresses that conservation should be ensured through a conservation plan. However, in contrast with these positive developments, this period was also a harbinger of the emergence of problems in conserving both natural and cultural heritage. Especially the acceleration of the number of investments in coastal areas in line with tourism incentives and fragmented plans that include demand-based construction rights in cities, especially in Istanbul, can be considered an indicator of future urbanisation problems.

The 2000s followed a similar trajectory to the post-1980s period and were criticised for being far from comprehensive, as a series of new legal regulations were made in addition to many radical administrative changes, especially in the past decade. The most important of these regulations in terms of conservation were the amendments made to Law No. 2863 on the Protection of Cultural and Natural Assets with Law No. 5226 dated July 14, 2004. These amendments, in addition to the effort to formulate a policy on conservation, also included concepts that have long existed in some international documents on the conservation of cultural heritage but are new to conservation legislation in Turkey; such as archaeological sites, landscaping projects, management area, management plan, junction point (Çolak, 2015). During this period, "Law No. 5366 on the Conservation by Renovation and Use by Revitalisation of the Deteriorated Historical and Cultural Immovable Property" enacted in 2005 came into force. Article 1 of the Law defines the purpose of the Law as ". . . the areas registered and announced as conservation areas by the cultural and natural heritage conservation boards and protection zones of such areas which have been dilapidated and are about to lose their characteristics, create zones of housing, business, culture, tourism and social facilities in such areas, take measures against risks of natural disasters, renovate, conserve and actively use historical and cultural

immovable assets" (Çolak, 2015). With Law No. 5366, the concept of "renewal" was used for the first time in urban conservation areas. A second conservation board was established under the name of the renewal board to review and decide on planning and execution in these areas.

When approaching the 100th anniversary of the Republic of Turkey, it is thought-provoking that despite some positive efforts summarised here, an increasing number of construction projects and the destruction of our natural, historical, and cultural heritage unabatedly continue. The reasons for that could be as follows: the lack of awareness and the insufficiency and long durations of conservation plans, problems arising from decision-makers and implementers, the shortcomings of the economic situation of property owners, the inability to develop financing models, and the confusion of powers and duties regarding conservation areas in legal regulations. However, the main problem is the failure of all stakeholders to accept and internalise the necessity and universal responsibility of protecting our natural, historical, and cultural heritage and creating a conservation policy.

SULTANAHMET URBAN AND ARCHAEOLOGICAL CONSERVATION AREA

The areas that reflect the social, economic, cultural, and physical features and lifestyle of the period that show urban and rural features of that specific period, contain architectural examples and artefacts, and have a consistent urban fabric are defined as urban conservation areas. The importance of cultural assets and traditional housing that constitute the building stock in the city does not solely stem from the fact that they reflect the characteristics of the period they belong to. Throughout history, settlements have been built on top of each other. The archaeological assets that constitute the elements of urban layers and their accumulation produce the cultural continuity of that settlement. From this point of view, this archaeological data accumulation facilitates a multi-layered reading of urban history (Özcan, 2006). While archaeological sites are our memories below ground, urban conservation areas form our memories above ground. Urban archaeological sites, on the other hand, are areas that contain both above and underground values that need protection and, in this respect, require a particular form of planning (Yenen, Örnek Özden, 2007).

Today, according to 2022 data, 119,263 cultural assets in Istanbul need to be protected. When we look at the immovable cultural assets of Istanbul, civic buildings stand out (Republic of Türkiye Ministry of Culture and Tourism, 2022-a).

The Urban Archaeological Site in the Historical Peninsula of Istanbul was chosen as the research location that constitutes the article's subject and scope. This location provides a perfect opportunity to observe all the reflections of the changes in the conservation policies of Turkey (UNESCO World Heritage Site, Conservation Plan, Tourism Incentives, Site Management Plan, Renewal Area, etc.) Sultanahmet Urban Archaeological Site is the only place in Istanbul where the World Heritage, Urban Site, Tourism Site and Renewal Site decisions, which are the subject of the article, overlap. A similar area to this area is the Süleymaniye World Heritage Site. However, the decision of this area to become a tourism centre was cancelled in 2007 by the decision of the Council of Ministers.

As a result, Sultanahmet Urban Archaeological Site has been chosen as the research location, as it is the only representative of four crucial and opposing decisions that also have an impact on physical space (Figure 1).

Other reasons for this selection are explained below:

a. Looking at the distribution of conservation sites throughout Istanbul, the Ministry of Culture's data shows that archaeological sites (52%) account for the highest proportion (Republic of Türkiye Ministry of Culture and Tourism, 2022-b). According to the Ministry's data, out of the 32,854 cultural assets that need to be protected in Istanbul, 10,385 are in the Historical Peninsula, again showing the richness of the Historical Peninsula despite all its losses. However, the fact that only 20% of the approximately 55,000 buildings in Fatih District are registered buildings shows that all subsequent planning efforts, starting with the Prost Plan in 1936, have failed to achieve the desired success in protecting the cultural and historical richness of this area called the "Historical Peninsula."

b. In this specific area called the "Historical Peninsula," which has been included in the World Heritage List since 1985, all the planning efforts that started with the Prost Plan in 1936 and all subsequent plans have not achieved the desired success in the goal of protecting its

Figure 1. Status layers in the historical peninsula.

cultural and historical richness. The area has different conservation statuses; however, the same problems are voiced in almost all studies, even though the area has been the subject of all prominent studies, academic discussions, and examinations for many years. In this sense, discussing and evaluating conservation policies once again constitutes the aims and objectives of this article.

As a technique for the review, the plans that were implemented as a result of the various statuses brought to the region have been analysed. The decisions that have been made in order to provide the region with long-term protection have been assessed in light of the status provided. Which choices were made in the management and conservation plans were investigated.

The impacts of the tourism function on the current land use were questioned once the plan was carried with the decision of the tourism centre. Possible risks are highlighted since there is currently no plan in place for the failure area. The relationship between the choice, the plan, and the current situation in the direction of protection was therefore attempted to be ascertained. The study's findings opened up discussion over the main issue, which is whether or not the field's statuses are adequate.

CONFLICTS IN LEGAL STATUS AFFECTING THE SULTANAHMET URBAN ARCHAEOLOGICAL SITE

Sultanahmet Urban and Archaeological Conservation Area (part of Alemdar, Binbirdirek, Cankurtaran, Küçükayasofya neighbourhoods, and the entire Sultanahmet neighbourhood) is one of the oldest settlements in Istanbul. In addition to many architectural monuments of historical importance, such as the Sultan Ahmed Complex and the Sultan Ahmed Mosque, public spaces such as Sultanahmet Square and Park continue to maintain their importance from the past to the present[1] (Figure 2).

When we look at this area today, where there used to be single-family housing units, we see that the accommodation function decreased, and/or urban fabric deteriorated, and the scale was disrupted. Today, there are boutique hotels and hostels in high demand by tourists for their historical and archaeological values. The historical Arasta bazaar displays commercial use on the ground floors, most shops sell souvenirs and food and beverage serving tourism. Another land use form is Sultanahmet Square, an important open space for this area and the whole of Istanbul. The area is surrounded by public and educational institutions such as Marmara University, Suphi Paşa Trade and Vocational Technical Anatolian High School, Provincial Directorate of National Education, etc.

The study of the Historical Peninsula shows that the public uses in the area (open spaces and mosques, and museums)

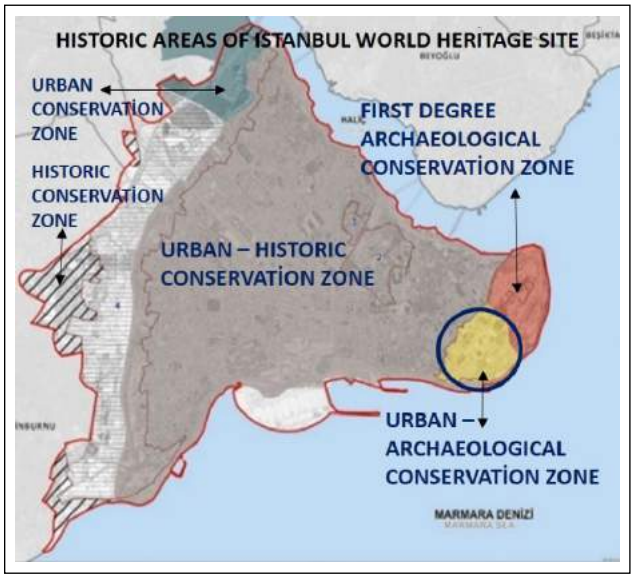

Figure 2. Historical peninsula site diversification. (Historical areas of İstanbul site directorate, 2018).

are protected in all plans because of their importance to the city. Sultanahmet Urban and Archaeological Conservation Area are highly accessible due to their central location. Public transportation is available from other parts of the city by sea and rail. The exit point of the Istanbul Strait Road Tube Crossing Project (Eurasia Tunnel Project) on the European side is south of the study area. When we look at the users, a significant portion of the resident population in the Cankurtaran Neighbourhood consists of low-income Roma. In Küçük Ayasofya Neighbourhood, Central and Eastern Anatolian families belonging to the middle and middle-lower income groups live. Most of the inhabitants of the Sultan Ahmet Neighbourhood are those who operate or work in small-scale trades in the neighbourhood (Historic Peninsula Management Plan, 2018, p.132). "Sultanahmet Urban and Archaeological Conservation Area consist of two different regions, namely Sur-i Sultani Region, where Topkapı Palace is located, and Sultanahmet Region. Sur-i Sultani Region, where museums such as Topkapı Palace Museum, Istanbul Archaeological Museums, and Hagia Irene Museum are located, was declared a Grade I Archaeological Site with the decision of Istanbul Cultural and Natural Heritage Conservation Board No. 1 dated July 12, 1995 and numbered 6848. Sultanahmet Region was declared an Urban Archaeological Site with its monumental buildings and partly residential, commercial, and tourism functions. Sultanahmet Urban and Archaeological Conservation Area represent a special quarter within the Historical Peninsula with outstanding cultural and historical value on a national and international scale in terms of the monumental buildings, above-ground ruins, and underground artefacts it hosts today. The Sultanahmet

Urban and Archaeological Conservation Area covers 140 hectares and has 992 registered monuments. 354 of the 992 monuments are monumental buildings. Of the 354 monuments, 347 exist, and seven are missing monuments. There are 505 examples of civil architecture, 446 of which are existing and 59 of which are missing" (Istanbul Management Plan Report, 2018, p: 44).

This study focuses on the Sultanahmet District and its multiple conservation statuses. The statuses attributed to the area over time are; Tourism Centre (1982), World Heritage Site (1985), Urban, Historical, Archaeological Site (1995), and Renewal Area (2005).

1. **Tourism centre (1982):** In the 1982 Law for the Encouragement of Tourism No. 2634, the tourism centres designated by the first wave of neoliberal economic policy interventions are among the most prominent examples of the fragmented and privileged zoning rights granted to increase the tourism activity of the Historical Peninsula. Two tourism centres are determined within the framework of Law for the Encouragement of Tourism No. 2634 and declared by the Cabinet. These are Sultanahmet Square Tourism Centre and Eminönü Barbaros Houses Tourism Centre. Sultanahmet Square Tourism Centre (17.74 ha) and Eminönü Barbaros Houses Tourism Centre (0.84 ha) are located within the Sultanahmet Urban and Archaeological Conservation Area (Figure 3).

Sultanahmet Square Tourism Centre is one of the first tourism centres announced in the Official Gazette of the Republic of Turkey dated 06.09.1982 and numbered 17804, together with the Çırağan Palace. Blue Mosque, Hagia Sophia Museum, and Sultanahmet Square form the majority of the area (Dinçer et al., 2011). **Eminönü Barbaros Houses Tourism Centre** was declared with the decision of the Cabinet dated 23.03.1989 and numbered 13900. Approved in 2005, the Conservation Plan proposed a "touristic facility area" for the part where the Armada Hotel is currently located and a housing function of 500 people/hectare for the other areas. In 2nd-degree conservation areas, the maximum height is 12.50 meters (Dinçer et al., 2011).

2. **World heritage area (1985):** The 17th General Conference of UNESCO convened in Paris between 17 October and 21 November 1972 and accepted the UNESCO Convention on the Protection of the World Cultural and Natural Heritage on 16 November 1972. Turkey decided to become a party to the Convention with Law No. 2658 dated 14.04.1982. The Law was ratified by the Cabinet with Decision No. 8/4788 dated 23.05.1982 and entered into force after being published in the Official Gazette No. 17959 dated 14.02.1983. With the submission of the necessary documents to UNESCO Headquarters, Turkey officially became a party to the Convention on 16.03.1983. According to the 1972 Convention for the Protection of the World Cultural and Natural Heritage and determined by the World Heritage Committee, Turkey has 19 heritage sites on the World Heritage List, 17 of which are cultural, and 2 are mixed (UNESCO Turkish National Commission, 2022). In 1985, Divriği Great Mosque and Darüşşifa (Sivas), Göreme National Park and Cappadocia (Nevşehir-Mixed Heritage Site), and the Historic Sites of Istanbul were also included in the UNESCO World Heritage List (Figure 4).
3. **Urban, historical, archaeological site (1995):** From 1983 onwards, legislative changes and new laws were introduced. This are the Law No. 2863 on the Protection of Cultural and Natural Assets. While the annulment and appeal against the 1/5.000 Conservation Plan for the Historical Peninsula (Suriçi) region were approved

Figure 3. Tourism centres in the historical peninsula.

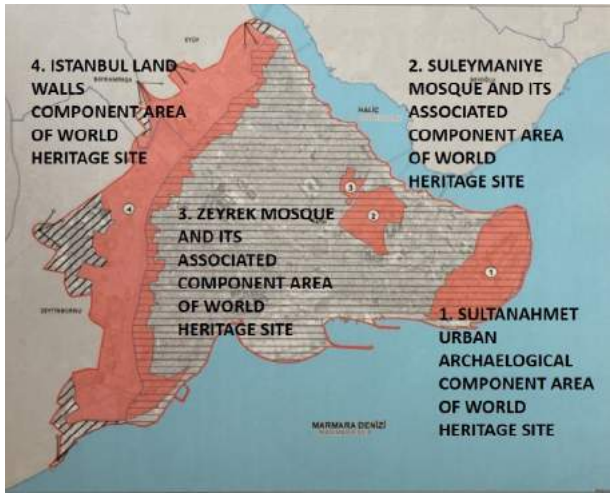

Figure 4. Istanbul historical peninsula management plan boundary (historical areas of İstanbul site directorate, 2018).

on 2.11.1990, which includes the districts of Istanbul-Eminönü-Fatih, were still pending, decision no. 6848 of Istanbul Cultural and Natural Heritage Conservation Board No. 1 dated 12. 7.1995, "The Historical Peninsula (Suriçi Region) was declared an Urban and Historical Site, Urban and Archaeological Site and First-Degree Archaeological Site within Sur-u Sultani" as indicated on the attached 1/10.000 scale map. (see Figure 1)

4. **Renewal area (2005):** While the planning efforts in the Historical Peninsula continued, a new concept related to conservation areas, renewal areas entered the planning agenda: Law No. 5366, adopted on 16.06.2005 on "Renewal, Protection and Use of Worn Historical and Cultural Immovable Assets".[2]

The declaration of renovation areas by the Cabinet in areas declared as conservation areas under the Law on the Protection of Cultural and Natural Assets raises concerns about the conservation of these heritage sites. In an area such as the Historical Peninsula, which needs to be protected holistically, renewal areas have been declared, and the authority has been left to the "Renewal Boards." The decision-making process of the Renewal Boards, which were established when the Conservation Plan was being prepared, but lawsuits were initiated for its annulment, and the compatibility and relationship between the projects produced for the conservation plan/renewal area were discussed for a long time. The concept of "renewal" in the field of conservation has been at the centre of the debate. The projects prepared in these areas and the procedures related to their implementation have been the subject of discussions on different axes, such as protecting historical urban fabric, the social problems they will create, and the participation process.

While preparing the plan for the Historical Peninsula (currently called Fatih District), the preliminary projects approved within the scope of Law No. 5366 by the Istanbul Renewal Areas Regional Board of Cultural Properties Conservation were examined and transferred into plans. It was accepted as the basic norm that the foreseen functions in the Master Plans for Conservation Purposes and the integrity of the plan are preserved in the renewal areas, and various functions such as residential-commercial-tourism-accommodation and medical-education-social, cultural areas, municipality service areas, management area, parks, and playgrounds could also be included provided that these are not against the conservation criteria. (Historic Peninsula Management Plan, 2018, p 73). The results of the Hatice Sultan-Neslişah Neighbourhoods Renewal Project, the first implementation of the renewal areas, also added fuel to the ongoing discussions. Another implementation is the Atik Mustafa Paşa Neighbourhood Renewal Project (Figure 5).

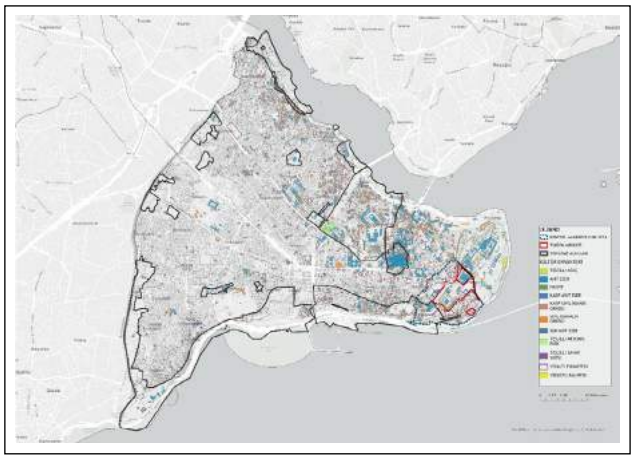

Figure 5. Historical peninsula renewal areas (historical areas of İstanbul site directorate, 2018).

ASSESSING THE EFFECTS OF STATUS CONFLICTS

The Historical Peninsula has been planned with the concepts of tourism, conservation, and renewal, which sometimes compete and often conflict with each other. In almost all studies, problems that underscore common points have been defined at the spatial, institutional, and legal levels regarding these aspects. In line with the decision of the Center of Tourism; the parcels (parcels no. 1-2 in the Sultanahmet District of Fatih District, section 67, block 58), which were registered as "cultural assets" by the Supreme Council of Immovable Artefacts and Monuments in 1981, are located within the boundaries of the first palace complex of Byzantion, where significant historic buildings such as the Blue Mosque, Hagia Sophia Topkapı Palace and Sultanahmet Prison were built. Sultanahmet Prison was closed in 1969, after the opening of Bayrampaşa Prison. It is known that important names such as Necip Fazıl, Nâzım Hikmet, Can Yücel, Aziz Nesin, Orhan Kemal, Kemal Tahir, Vedat Türkali wrote their works here during the period of its activity. Sultanahmet Prison was turned into a prison again at the request of the Martial Law Command in 1980 due to the tightness in the prisons in Istanbul. It functioned as a military prison until 1986, when martial law was lifted in Istanbul. The ownership of the building was then transferred to the Ministry of Tourism, which allocated the building to the investor company Sultanahmet Turizm AŞ in 1992 for 49 years. Sultanahmet Prison was reopened as a hotel in 1996 (Büyükdoğan, Çavuş, 2016). The decision of the Supreme Council of Immovable Artefacts and Monuments was that the interior of the building could be modified according to the needs of the building provided as long as the façade is preserved (decision dated 11.06.1967 and numbered 3514) and that turning it into an accommodation facility posing no harm (decision dated 10.11.1981 and numbered 13012). In 2000, the Ministry of Culture and Tourism requested that the area be given

the function of "Archaeological Park, Tourism and Culture Area," and the plans prepared for this purpose were sent to the Istanbul Metropolitan Municipality for public scrutiny.

As a result of the lawsuit filed due to the ongoing construction of the archaeological remains that were uncovered during the excavations financed by the investor company, the project was cancelled by the court decision, and the construction of the additional hotel building was stopped. However, the excavations in the area that were planned to become an archaeological park after the suspension of the additional construction could not be completed due to the lack of funds. Although board decisions have taken measures to protect the archaeological artefacts, the area remains unprotected against all natural conditions. In the 2005 plan, the former Sultanahmet Prison was designated as a "tourism facility area", and the Cankurtaran area was designated as a "housing-accommodation" area. Then in the 2012 plan, the area was designated as a tourism centre; however, no planning decisions were made for it (Yıldırım Burma, 2017). Law No. 4957, enacted on 24.07.2003, attempted to change the "tourism centre" concept that was popular throughout the 1980s. With this amendment, in addition to tourism centres, the concepts of "culture and tourism conservation and development region" and "culture and tourism conservation and development sub-region" were introduced. Within the enactment of this law, no tourism zones were declared in conservation areas in Istanbul (Dinçer et al., 2011).

In conclusion, although the Conservation Board approved the function change and modernising the interiors of the Sultanahmet Prison, it is a controversial decision, and the risk of damaging the heritage value is evident.

Although the prison is divided into two distinct sections, a connecting glass bridge was created during the restoration process to allow access back to the accommodation facility. The function necessitated interior modifications, which were made. Archaeological artefacts were discovered during the construction of the new structure as the building began to lose its original character. It was anticipated that the two structures that would be added to the hotel would be built on the remnants of the "Great Palace," which dates back to the Byzantine era. The renovation, which generated a lot of controversy while it was being built, took three years to complete and was then made available for hotel use.

The destruction of the archaeological site during the construction of the additional building is also a wrong decision according to national and international regulations and practices. These wrong decisions have caused irreversible damage to the building and the archaeological site (See https://tr.foursquare.com/v/four-seasons-hotel-istanbul-at-sultanahmet/4be2bf92ee0062b5c659b3c8/photos).

Following the declaration of the site as a World Heritage Area, conservation zones were identified in the planning preparation carried out in the area, but due to the plans' annulment, essential conservation steps could not be taken. The "Convention for the Protection of the World Cultural and Natural Heritage" emerged in 1972 as a document in which the "management of heritage sites" came to the fore for the first time. As areas, "area management" has been important in terms of the formation process.

The concept of management planning started to develop as a strategic spatial planning approach applied in cultural heritage places in the 1980s as a result of the paradigm shifts in the axis of neoliberalism, environmentalism and postmodernism. It was legalised in the international protection legislation in the early 2000s, and accordingly in Türkiye in 2005, upon the amendment made in the Law on the Protection of Cultural and Natural Assets No 2863. With the Annex-2a article added to Law No. 2863 on the Protection of Cultural and Natural Heritage in 2005 with Law No. 5226 and the definitions added to Article 3, the concepts of "management area" and "management plan" were included in the national legislation for the first time. Following this decision, it has become obligatory to prepare management plans for "World Heritage Sites" and all conservation areas in Turkey. In 2005, the "Regulation on the Procedures and Principles regarding the Establishment and Duties of the Site Management and Monuments Board and the Determination of Management Areas" entered into force. With the decision of the Istanbul Metropolitan Municipality Council dated September 15, 2006, and numbered 1675, the Istanbul Cultural and Natural Sites Management Directorate was established and became the responsible institution for the management of conservation areas in Istanbul. The "Site Management Plan" prepared by this institution was finalised in October 2011. The vision of the approved 2011 Istanbul Historical Peninsula Management Plan is defined as "For the Historical Peninsula which protects its rich historical background, preserve its liveliness, produces and passing on its socio-economic spatial and cultural identity to the future; a site management plan that protects the outstanding universal value of the Historical Peninsula and is executed by all related institutions and establishments in coordination and transparency by also the participation of users and inhabitants." The main principles and policies of the Management Plan include the concepts of cultural heritage, conservation, and utilisation, planning, and participation.

In time, there have been changes in the boundaries of the Istanbul Historical Peninsula Management Plan. First, the boundaries of the Management Plan Area increased from 2110 hectares to 2168 hectares with the addition of the Yenikapı fill area constructed between 2013 and 2014. 1615 hectares of the Management Plan Area consist of the Historical Peninsula, and 553 hectares are located west of the Land Walls. During the revision process, the boundaries

of the World Heritage Site of the Historic Areas of Istanbul, approved by UNESCO in 1985, were also partially expanded, and the Management Plan boundary was changed. In 2018, the Management Plan was revised and finalised. The vision set out in the 2011 Istanbul Historical Peninsula Management Plan, which is based on some core values, was not changed during the revision process. This vision is defined as "For a Historic Peninsula which protects its rich historical background, preserves its liveliness, produces and passing on its socio-economic spatial and cultural identity to the future; a site management plan that protects the outstanding universal value of the Historical Peninsula and is executed by all related institutions and establishments in coordination and transparency by also the participation of users and inhabitants" (Historic Peninsula Management Plan, 2018,256).

When the first Management Plan for the area was approved in October 2011, the Historical Peninsula's Conservation Master Plans were in the making, which later became one of the reasons to update the Management Plan in 2018. The integration problem of the Management Plan into the Master Plan for Conservation Purposes (approved in 2011) and the Implementation Plan (approved in 2012) was discussed during the planning process in 2018, and the revisions were made in line with these discussions. The action areas were identified in the Management Plan accordingly. However, despite all good intentions, the effectiveness of the Site Management Directorate in terms of conservation has been a matter of debate since its establishment. The main reasons for this situation are as follows: the ill-defined roles of the Conservation Plan and the Management Plan in the planning process, the lack of clarity of the project packages and their execution methods, as well as their financing (there is no budget for the Site Management Directorate). Although the Site Management Directorate is given a managerial role, the coordination between the Municipality, the Regional Conservation Board, and the Site Management Directorate was not well defined.

After the announcement of a site as an Urban Archaeological And Historical Conservation Area, according to the law, Conservation Plans should be prepared, and principles for comprehensive conservation should be determined. However, although the entire district was declared a conservation area in 1995, the 2005 plan, which was the first plan and had a comprehensive approach, was cancelled due to litigation processes. Throughout this process, transition period construction rules were applied. Two plans are in force today: the 1/5000 Conservation Master Plan approved in 2011 and the 1/1000 Conservation Master Plan approved in 2012. The decisions introduced in the plan specific to the study area are regarding the 1st and 2nd-degree conservation zones. While these decisions require the preparation of urban design projects that should be designed in a way to make the urban fabric visible in a three-dimensional way, the Fatih Urban Design Guide made for the area is far from being a document that will guide the designer and determine the principles of the execution since it was based on the road map, that is only two dimensional. As a result, it was identified as an issue that the design projects to be developed included different details.

In the Cankurtaran–Sultanahmet Urban Area, the plan notes state that "In order to build a basement floor, if no archaeological remains are found as a result of a survey conducted by a university with archaeogeophysical methods (georadar, geomagnetic and geoelectric), the application shall be made according to the decision of the relevant conservation board. The altitude of new buildings should be a maximum of 9.50 and only those practices that respect the traditional architectural character of the area and that would not give any damage to the fabric integrity of the area will be allowed". The fact that the basement floor, which was not allowed in the 2005 plan, is allowed in the 2012 plan and that the compliance report is required from the planner may create conflicting situations. All the research required in such areas with special status should be already completed and recorded in the inventories by the local administration.

Similarly, in the Gedikpaşa-Nişanca-Küçükmustafapaşa-Zeyrek-Balat-Ayvansaray-Yalı-Samatya-Yedikule Area, the planner is responsible to provide the necessary reports. However, the maximum height was set as 12.50 m. The 2005 plan note states, "Basement floors cannot be built within the boundaries of the First-Degree Archaeological Site and Urban + Archaeological Site and on the building blocks adjacent to this area. More than one basement floor cannot be built within the boundaries of the Historic and Urban Conservation Area. In case more than one basement floor is exposed due to elevation difference in the First- and Second-Degree Conservation Areas within the boundaries of the Historic and Urban Conservation Area, Istanbul No.1 Cultural And Natural Heritage Protection Board decision will be applied" has been removed.

The Renewal Area is located in the south of the Sultanahmet Urban and Archaeological Conservation Area and consists of a part of the Little Hagia Sophia Neighbourhood and the entire Nişanca and Sultanahmet Regions Urban Renewal Area. It was announced on 20.07.2007 in the Official Gazette No. 26588 (see Figure 6). However, there is no approved project yet.

The law appears as an example of neoliberal policies that dominate cities, especially with globalisation that results in the commercialisation of conservation areas. Historic environments are particular areas that contribute to urban life, as long as they are sustainable and harmonious with the development and transformation of the urban environment. Interventions in these areas may result in irreversible losses that cannot be replaced. For this reason, every intervention

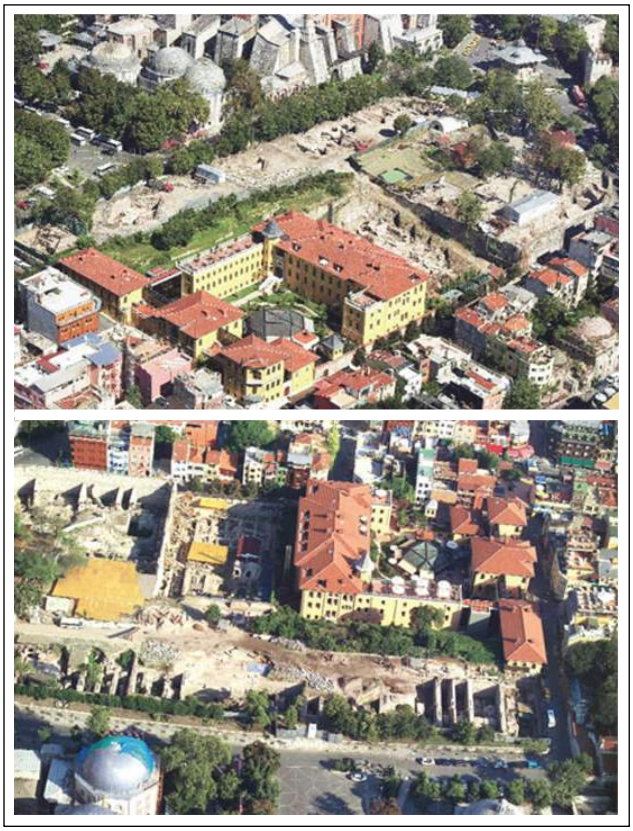

Figure 6. Relationship between archaeological site and accommodation facility. (The Archaeological Settlements of Turkey, 2007).

made in conservation areas should be handled multi-dimensionally. It has been a source of discussion that the comprehensive approach to conservation planning is being replaced with a fragmented and project-based approach in the renewal areas. As mentioned above, the purpose of the law is as follows: "The reconstruction and restoration of areas that have been worn out and are about to lose their characteristics, which are registered and declared as protected areas by the conservation boards of cultural and natural assets, and the protection areas belonging to these areas, in accordance with the development of the region". It is inevitable that the urban fabric will deteriorate over time. It should be essential to ensure that registered buildings are used with as little intervention as possible through maintenance and simple repair. However, if restoration or under some circumstances, reconstruction is needed, the materials used should be in accordance with the original building. According to the article above, the rebuilding of the registered parcels should be planned as "reconstruction" and not be interpreted as "demolition and construction in a way that is not in accordance with the original."

- "Create zones of housing, business, culture, tourism and social facilities in such areas". The execution area of the law is the conservation area. Therefore, the conservation plan is the legal document that directs the implementation and decides on the density and functions. In the study area, there is the Nişanca Renewal Area, which was announced in the absence of a conservation plan. When projects are being developed for the area, they should be based on a conservation plan. The aim of regeneration projects should not be to generate land rent but to eliminate the situations causing urban deterioration.
- "Take measures against risks of natural disasters, renovate, conserve and actively use historical and cultural immovable assets". (Art. 1). As a result, Law No. 5366 on the "Conservation by Renovation and Use by Revitalisation of the Deteriorated Historical and Cultural Immovable Property," which has been an object of debate since it was first proposed, including the proposed name of the law, should be seen as a facilitator when conservation plans are being executed.

The conservation plan defines how interventions such as sanitisation, revitalisation, and reconstruction would be implemented in conservation areas. Renewal areas should also be designed as sub-regions whose renewal principles will be determined in conservation plans, and the contradicting situation between conservation and renewal should be eliminated.

CONCLUSION

The policies implemented to reduce or eliminate irreversible and irreplaceable loss in cultural heritage areas must be structured differently regarding the system, functions, and how the policies are formulated. In other words, success in conserving cultural heritage is synonymous with the harmony facilitated between concepts such as collective consciousness, resource generation, and public interest in policy-making. The examples given above were intended to illustrate the perspective of and policies in the area of conservation.

Today, where neoliberal policies regard the city as a commercial commodity, it is crucial not only to plan the Historical Peninsula within itself but also to consider it as a whole with historically prominent areas such as Bosphorus, Beyoğlu, Eyüp, Golden Horn, and Üsküdar, to create a comprehensive approach and preventing further construction in these areas.

When the study area is evaluated in terms of effective management elements determined in the World Heritage Convention;

- Perception of cultural heritage in the same way by all stakeholders: There is a diversity of laws as well as stakeholder diversity in the area examined in the Historic Peninsula. For this reason, it is important and

necessary to eliminate the contradictions in the laws and direct them toward the same goal.

- Planning – implementation – monitoring – evaluation – running the feedback loop: In an area such as the Historical Peninsula, which is a centre of attraction for cultural tourism, conservation should be a priority, and the act of limiting, supervising, and controlling tourism activities should be incentivised. The promotion of cultural assets is an essential source of tourism income. However, it should not be at the expense of the historical artefacts and also not be damaging "the spirit of the place."

The activities that support accommodation and tourism, particularly eating and drinking, have expanded when seen from a spatial perspective; prioritising the tourism function in the planning studies after it was originally designated a tourism hub. Following the establishment of the tourism centre, the area underwent rapid change, with the residential character being replaced by tourist attractions, boutique hotels, hostels, and regular commercial uses, all of which benefited from tourism incentives, the effects of the zoning plans' assigned roles, and investor pressure.

The housing, housing-trade, trade, and tourism sectors contribute to the study area's diversity of land uses. In addition to residential uses, there are hotel uses, food-and-beverage businesses, souvenir shops, travel agents, and other daily-use commercial enterprises that support the tourism function. Yet, compared to the region's business uses for tourism, the commercial uses that support the use of housing continue to be quite little. The residential user finds it challenging to stay in the region because of this condition. All of these issues result in the area's registered structures being neglected and abandoned (Figure 7).

In railway transportation, the Cankurtaran Train Station of the suburban line serving between Sirkeci-Halkalı, which is adjacent to Cankurtaran Square, and the permanent closure of the area in 2013 due to the Marmaray Project made the accessibility of the area difficult for the residential user.

The tourism accommodation function for Historical

Figure 7. Tourism and tourism-related functions in the study area.

Peninsula should be suspended, and the registered buildings that have been allocated and transformed for tourism should be inspected. Additionally, sanctions should be imposed as a disincentive for those who have modified the original structure of the registered building's original form. Then a monitoring mechanism should be developed to control and supervise future function changes. The problem of the gradual destruction of the residential fabric and the loss of inhabitants should also be addressed.

- Allocating the necessary resources: While the region where the study area is located was a sub-region where the housing function continued in the past, it has lost its use of housing today. It is evident that the housing stock it owns is being slowly destroyed, and the issue of user loss needs to be addressed (Figure 8).

One of the primary purposes of the renewal is to improve the building stock in the designated area. The registered building stock, concentrated predominantly in Nişanca Renewal Area, should be renewed with a focus on health and safety. Decisions should be made after detailed examinations of parcels but without missing the whole. The building stock in the area is rapidly deteriorating, resulting in the loss of inhabitants and eventually its urban vitality. A solution could be to allocate finances for a certain period for restoration only for the restoration of the Historical Peninsula.

- Ensuring the participation of actors and stakeholders: The plan should first be implemented with the understanding that it is essential for success. Protected areas are particular geographic areas where interdisciplinary and multi-actor conservation activities should be set up and maintained in terms of the law, administration, and finances. A kind of coordination platform that will permit communication between the institutions in charge of the cultural heritage places, the locals who live there, and the temporary beneficiaries of the region must be established due to the study area's unique position.

Assigning different statuses to a conservation area and turning it into a "zone of conflict for authorities and institutions" has been detrimental to conservation efforts. There is no need for more institutions or policies to protect our cultural assets. Instead, a system should be implemented that is sustainable and modern, redefines the duties and the jurisdiction of the existing authorities, allocates financial resources correctly, and ensures coordination.

It is vital to use the principles of international agreements as the basis of Turkey's conservation policy-making process. Adapting and revising existing international policies according to our local needs should not be disregarded. Last but not least, it is crucial that national conservation policies and plans and the institutions responsible for executing them work together to ensure harmony and stability.

[1]*Sultanahmet Square became a center where the heart of the city beat until the end of the 12th century when the chariot races held in and around the Hippodrome during the Byzantine period gained significant importance. It became a square*

Figure 8. Deteriorations in the housing stock in the study area.

not only for races but also for the coronation ceremonies of emperors, grand celebrations, and victory parades. After the Ottoman conquest of the city in 1453, the Hippodrome and its surroundings became known as Atmeydanı, and during this period, as in the past, it was the scene of royal weddings, grand ceremonies, and at the same time, riots and brutal events. Sultanahmet Square is the largest square in the district and was the scene of the famous Sultanahmet rallies in 1919-1920. The neighborhood's residential areas are located on the slope towards Cankurtaran, south of Kabasakal Street, and below Sultanahmet Square and the Ibrahim Pasha Palace, which is today the Museum of Turkish and Islamic Arts, extending towards Kadırga. There are two-story wooden residential buildings (Arlı, 1994).

[2]*Article 1 of the Law No. 5366 on the Renovating, Conserving and Actively Using Dilapidated Historical and Cultural Immovable Assets adopted on 16.6.2005 defines the purpose and scope as follows: "The purpose of this Law is to ensure that metropolitan municipalities, district and first-tier municipalities within boundaries of metropolitan municipalities, provincial municipalities and district municipalities, and municipalities with populations above 50,000, and special provincial administrations for the areas outside the purview of such municipalities, reconstruct and restore, in a manner consistent with area development, the areas registered and announced as protected areas by the cultural and natural heritage conservation boards and protection zones of such areas which have been dilapidated and are about to lose their characteristics, create zones of housing, business, culture, tourism and social facilities in such areas, take measures against risks of natural disasters, renovate, conserve and actively use historical and cultural immovable assets. This Law covers the procedures and principles relating to the designation of renovation areas which shall be formed according to the purposes specified above, the determination of technical infrastructure and structural standards, the design, implementation, organization, management, supervision, participation, and utilization of the projects." (Çolak, 2015).*

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Makale [Article in Turkish]

Bir yer iki hikâye: Beyoğlu'nda "otantik" olanın yeniden üretimi üzerine

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One place two stories: The reproduction of the "authentic" in Beyoğlu

EXTENDED ABSTRACT

Authenticity, real or not, existing or not, constitutes an important element of strength for the urban environment. The perceived authentic identity of the place is transformed into economies of experience associated with consumer culture. Sometimes this can be in the form of transforming and protecting a historical building or neighborhood, sometimes supporting the development of cafes and shops, branding cultural identity, and sometimes presenting the place with new media channels. This problem plane, which constitutes the beginning of the study, aims to reveal the impact assessment process of an environment that is stuck between the existing place authenticity and the elements that are newly attributed to the place and that shape the authenticity in perceptions.

Authenticity was first revealed in heritage conservation studies and was included in social science studies over time. Today, the concept is introduced into a new production and consumption process within the scope of urban area activities. While the authentic is sometimes defined as the memory that needs to be preserved with deeply emotional expressions, it is sometimes associated with a vulnerable imposition for consumption. In this cycle, the existing authenticity of the place cannot be revealed, and a new perceptual authenticity production is started. This study dealt with the spatial memory of Beyoğlu and aimed to reveal the perceived and existing level of authenticity.

The method step of the study was carried out in two stages as collecting data related to the problem and analyzing the data. Data were collected by snowball sampling method and document analysis technique. In the analysis step of the data, deductive content analysis was taken as reference. Category matrices were extracted, contexts and codes were revealed. The category matrix step, through Bennett's (2018) titles of screen, literary text, culture-art and project productions; context step, through Somers' (1994) public, ontological and meta narrative titles; the code step was created by the author through the concepts explained in theory and revealing the problem of the study. Codes; Goffman's (1959) onstage/backstage self discourse, MacCannell's (1976) false pattern discourse, Trancik's (1986) lost space discourse, Auge's (1995) non-places discourse, Boym's (2001)) nostalgia discourse has been deepened by making use of Zukin's (2010) narratives such as cultural identity branding discourse.

While the process carried out through document analysis and snowball sampling enables accurate determination of what, why, why, how and where to search and a reliable evaluation,

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categorizing the sources and coding their contents will reveal the changes and duality seen in the "existing and perceived authenticity" perspective.
While losing the monumentality of Beyoğlu's memory spaces that go beyond being a residence, the opera and dances introduced by the west, its stories, patisseries and people, an image object is produced over the nonexistent. The universal elite growth rhetoric, based on the economic power of the capital and the state, and the cultural power of the media and consumer tastes, has also surrounded Beyoğlu. This situation is expressed by Guy Debord as contemporary capitalist modes of production produce a huge spectacle for societies.
It has been an important finding for Beyoğlu that the perceptual authenticity discourses, which symbolize the return to the past, also construct a new place memory culture and are shaped around the consumption potential. In summary, this study is important for an exploration to be made in a cultural space saturated with the spirit of self and place, to see where the cognitive dimension takes the subject in narratives and to embody what the space has lost in the social dimension with visual images. It can be said that the right solution can be found if the root experiences about Beyoğlu can be revealed.
Encountering the types of signs and narratives that will reveal these two meanings in Beyoğlu is also an expression of the fact that the work is in the right qualitative production process. Based on the analyzes of the discourses and visual data collected throughout the study, the question of whether it is possible to prevent the falseness produced by this shift and updated experience environment of Beyoğlu becomes very important. The study raises awareness by raising this question and provides this through a method trial.

ÖZ

İlk kez miras koruma çalışmalarında ortaya atılan otantiklik kavramı zaman içinde toplum bilim çalışmalarına dâhil olmuştur. Bugün ise kavram, kentsel alan faaliyetleri kapsamında yeni bir üretim ve tüketim sürecine sokulmaktadır. Otantik olan, bazen derin duygu yüklü ifadelerle korunması gereken bellek olarak tanımlanırken bazen de tüketim manzarası için savunmasız bir deneyim dayatmasıyla ilişkilendirilmektedir. Bu çift yönlü döngü içinde yerin sahip olduğu var olan otantiklik ortaya çıkarılamamakta, yeni bir algısal otantiklik üretimi başlatılmaktadır. Bahsedilen otantiklik ikiliğini temele oturtan bu çalışma, Beyoğlu'nun mekânsal hafızasını ele almış, algılanan ve var olan otantiklik düzeyini ortaya koymayı amaçlamıştır. Tarihsel analiz yoluyla sürdürülen bu çalışma, kaybedilme endişesi duyulan izlerin belirginleştirilmesi noktasına da katkı sunmayı hedeflemiştir. Çalışmanın yöntem adımı, probleme ilişkin verilerin toplanması ve verilerin çözümlenmesi şeklinde iki aşamalı olarak yürütülmüştür. Veri toplama basamağında, kartopu örneklem yöntemiyle genişletilen doküman inceleme tekniği kullanılmıştır. Verilerin çözümlenme basamağında ise tümdengelim içerik analizi referans alınmıştır. Bu noktada, kategori matrisleri çıkarılmış, bağlamlar ve kodlar ortaya koyulmuştur. Kategori matris düzlemi, Bennett'in (2018) ekran, yazınsal metin, kültür sanat ve proje üretimleri başlıkları aracılığıyla; bağlam düzlemi, Somers'in (1994) kamusal, ontolojik ve meta anlatı başlıkları aracılığıyla; kod düzlemi ise teoride anlatımı yapılan ve çalışmanın problemini ortaya koyan kavramlar aracılığıyla yazar tarafından oluşturulmuştur. Sonuç olarak, Beyoğlu için geçmişe doğru dönüşü sembolize eden algısal otantiklik söylemlerinin aynı zamanda yeni bir yer belleği kültürü kurguladığı ve tüketim potansiyeli çevresinde şekillendiği önemli bir bulgu olmuştur. Bu durum hafıza ve kaybedilme endişesi duyulan gerçeklik arayışında hassas bir öykünmenin olduğunu ortaya koymaktadır.

Atıf için yazım şekli: Yalçın B. One place two stories: The reproduction of the "authentic" in Beyoğlu. Megaron 2023;18(2):231–245. [Article in Turkish]

GİRİŞ

Nostaljinin Geleceği (Boym, 2001) kitabında geçen nostalji kavramıyla birlikte geçmişe ait olanın bir tarihsellik kurgusuyla sunumunun üzerinde durulmakta, kavram yaşanmamış olana karşı duyulan özlem olarak tanımlanmaktadır (Değirmenci, 2011). Bugünün gündelik hayat kurgusuna bakıldığında ise küresel bir muğlaklıkla karşı karşıya kalındığı, bu muğlaklık içinde metaya dönüşen nostaljik ifadelerin ortaya çıktığı gözlenmektedir. Öyle ki; yaşanmamış olan anılar, yanılsamalar birer gerçeklik olarak sunulabilmekte, nostalji kavramı ise otantiklik[1] söylemine dönüştürülmektedir. 1976 yılında MacCannell, kavramı modern dünyanın sahtelik ve derin olmayan örüntülerine dikkati çekerek kullanmıştır (Sağıroğlu, 2019). Diğer taraftan, Goffman (1959), gündelik hayat deneyimlerinde bireylerin sahne önü ve sahne arkası benlikler yarattığından, bunu yaparken de gündeliği manipüle ettiğinden bahsetmektedir. Bu deneyim parçalanması, uzamlar ve gerçeklikler arasında bir çekişme başlatmaktadır (Urry, 1990; Massey, 1993; Bennett, 2013).

Otantiklik gerçek ya da değil, var ya da yok kentsel ortam için önemli bir güç unsuru oluşturmaktadır. Yerin algılanan otantik[2] kimliği tüketici kültürüyle ilişkili olan deneyim ekonomilerine dönüştürülmektedir (Ram, Björk ve Weidenfeld, 2016). Bu bazen tarihi bir binanın ya da mahallenin dönüştürülerek korunması, bazen kafe ve mağazaların gelişimini destekleyerek kültürel kimlik markalaşması, bazen de yerin yeni medya kanallarıyla parlatılmış sunumu şeklinde olabilmektedir (Zukin, 2009). Çalışmanın başlangıcını oluşturan bu problem düzlemi, var olan yer otantikliği ile yere yeni atfedilen ve algılardaki otantikliği şekillendiren unsurlar arasına sıkışan bir ortamın etki değerlendirme sü-

recini ortaya koyabilmeyi amaçlamaktadır. Eskiyi ararken yeninin kabul görüp görmediğini okuyabilmek amacıyla atılan temel, Beyoğlu'nun izlerinde aranmaktadır. Görüntülerden, alanda farklı zaman dilimlerinde farklı amaçlarda bulunmuş olan kullanıcı anlatılarından, metinler arasına sıkıştırılmış görsel ve yazınsal verilerden faydalanılmaktadır.

Son dönem araştırmalarına bakıldığında farklı disiplinlerden beslenen yöntem yaklaşımlarının geliştirildiği görülmektedir. Bu gerçeklik doğrultusunda hazırlanmış olan bu çalışma, otantiklik kavramını başlangıç olarak kabul ederek, yöntem adımında otantiklik çerçevesini tek boyutluluk ekseninden katmanlı bir dizine dönüştürmüştür. Bu noktada, çalışmanın probleminden yola çıkılarak ortaya koyulan yöntem adımlarında ve bulguların değerlendirilmesinde bazı kavramsal anlatımlardan faydalanılmıştır. Auge'nin (1995) *"yok yerler"* anlatısında geçen, dönüşüm ortamı ve ruh kaybı, aynı zamanda Trancik'in (1986) *"kayıp alan"* kavramıyla da üst üste binmekte, çalışmaların bulgularını desteklemektedir. Auge'nin tanımlamış olduğu yok yer kavramı; havalimanı, otoyol, transit kullanım alanları, zincir kafe ve oteller gibi yalnızlık duygusu oluşturan, kimliksiz yerler olarak tanımlanmaktadır. Bu durum, yalnızca binalar üzerinden sınıflanmamakta, günümüz toplumunda aidiyet hissi sunmayan, yatırım ve tanıtım amacının dışında anlam içermeyen üretimler olarak da bahsedilmektedir (Brogden, 2019). Trancik ise, özel sektörün egemenliğinin kamu çıkarlarının üzerinde tutulması sonucunda yaşanan şehir içi arazi kullanımın değişimlerinden bahsetmekte, bu durumun kayıp alanlar ürettiğini belirtmektedir. Çalışma bulgularıyla da desteklenen bu kavramsal anlatı ortamı, okuyucuya bir hatırlatma telaşıyla sunulmaya çalışılmakta, bu durum algılanan otantikliğin önüne geçecek bir var olanı sunma çabasına dönüşmektedir.

TEORİK ÇERÇEVE: OTANTİKLİK ÜZERİNE

Otantik tanımlarına; insanlar, mekânlar ve anlamlar arasındaki dinamik bir ilişki olarak ve bu ilişkinin mekânın üretimini etkilediğini düşünerek başlamak mümkündür (Ouf, 2001). Bilimsel konuşmalarda bulunan farklı otantiklik biçimleri arasında, üç tipolojinin çağdaş kentsel deneyimler için çok önemli olduğuna inanılmaktadır. Ahlaki otantiklik, kişinin kendine sadık olmasının koşuludur (Heidegger, 1996). Maddi otantiklik, bir eserin doğruluğunu ifade etmekte ve koruma teorilerinin merkezinde yer almaktadır (Jokilehto, 1995). Sembolik otantiklik, tüketicilerin görüntü ve mekân deneyimleriyle aradıkları şey olarak görülmektedir (Knudsen ve Waade, 2010; Piazzoni, 2018).

Otantiklik tartışmalarının son dönemlerinde ise; özcü, yapısalcı, uzlaşmacı ve varoluşçu olarak öne çıkan dört yaklaşım dikkati çeker. Özcü yaklaşımda, eskiye ait olan savunulmaktadır. Kültürel süreklilik ve etnik topluluklar tarafından yerel olarak tanımlanan otantiklik vurgusu burada önemlidir. Yapısalcı yaklaşım, otantikliğin var olan piyasa güçleri ve çevreleri tarafından etkilendiği düşüncesine dayanmaktadır. Uzlaşmacı yaklaşımda ise, tüketiciler ve üreticiler arasında birlikte inşa edilen bir süreç olarak değerlendirilmektedir. Varoluşçu duruş, tecrübeyi ve heyecanı optimize etmeyi savunmaktadır (Chhabra, 2019; Ersavaş Kavanoz ve Budak, 2020).

Otantiklik, özellikle son 30 yılda, tüketicileri motive eden ve deneyim ekonomisinde sermayenin çekiciliğini destekleyen güçlü bir markalaşma aracı olarak ortaya çıkmaktadır. Belirsiz aidiyet algısı, kimliklerin değiştiği bir çağda gerçeği hissetme arzusu şaşırtıcı değildir (Banet Weiser, 2012; Gilmore ve Pine, 2007). Aynı derecede şaşırtıcı olmayan bir başka durum, bireylerin otantik arayışının mekân üretimini ve tüketimini yönlendirmesidir (Zukin, 2010). Öte yandan, otantiklik iddiaları, uzun süreli ikamet ve kullanım ile geliştirilen bir kentli hakkı talebini de artırabilmektedir (Zukin, 2010). Otantikliğin bahsedilen bu çok yönlü yapısı derin tarihselliği bulunan kentsel mekânda kendini en net haliyle göstermekte, kent bilimcileri bu yaklaşımın giderek daha fazla farkına varmaktadır. Özetle, tüm değerleri ve belirsizlikleriyle birlikte otantik olanın, mutenalaştırma, koruma ve mekân yapımı gibi kentsel fenomenlerin temelinde yattığı tespit edilebilmektedir. Ancak bu bağlantıyı görmek yeterli değildir. Sosyal ve politik sonuçlarını aydınlatmak istiyorsak, bir kentte otantikliğin işlediği mekanizmaları belirlenen bir uygulama sahası içinde anlamak gereklidir.

ARAŞTIRMA YAKLAŞIMI

Beyoğlu'nda Bir Tur

İstanbul'da yaşayan ve yolu düşen herkesin Beyoğlu'nda bir hatırası bulunmaktadır. Bölge, tarih boyunca kentin en önemli çekim merkezi olmuş, zaman içinde zengin bir sosyal ve kültürel hayat gelişmeye başlamıştır. 1970'li yıllara kadar Beyoğlu, insanların temiz giyinerek, kravat takıp gittikleri bir yer olma özelliğini korumuştur. Beyoğlu'na çıkıldığında sinemaya, tiyatroya, operaya, baloya, gazinoya, kabareye gidildiğine, lokantaya, kahveye, pastaneye ve sergilere uğranılmadan dönülmediğine yönelik anlatılar farklı kaynaklarda sürekli dile getirilmiştir (Akın, 2020; Akıncı, 2018; Günal ve Çelikkan, 2019).

Ancak, 1950-1980 yılları arasında Beyoğlu hem mekânsal hem de sosyal anlamda köhneleşmenin etkisi altına girmiştir. Bu dönemde bölgenin elit grubu Beyoğlu'nu boşaltmış, gelir seviyesi düşük gruplar alana yerleşmeye başlamıştır. Aynı zamanda 1955 yılında Beyoğlu'nda gerçekleşen toplumsal anlatılarda 6-7 Eylül olarak bilinen olay sırasında etraf yakılıp yıkılmış, bölgenin boşaltılma hızı artmış, eski kültür, sanat ve eğlence mekânı olma özelliğini yitirmeye başlamıştır (Soysal, 1984). Kozmopolit bir bölge olarak bilinen Beyoğlu azınlıklara uygulanan vergilerden ve göç olgusundan etkilenmiş, ilk kullanıcılar zaman içinde alanı terk etmiştir (Dökmeci ve Çıracı, 1990).

Bugün ise kentsel dönüşüm faaliyetlerinin yoğun olarak gerçekleştirilmesi, büyük sermayeli emlak projeleri, özellikle Arap turistlerin yoğun olarak tercih ettiği bölge olması gibi sebeplerle Beyoğlu'nda değişim süreci farklı bir boyutta devam etmektedir (Yalçın, 2018; İslam, 2020). Aynı zamanda, eski Beyoğlu anlatıları aracılığı ile otantiklik gücünü kullanmayı da devam ettirmektedir (Şekil 1).

Yöntem: Gösterge ve Anlatılar Üzerinden Beyoğlu'nda Otantiklik İzleri

Beyoğlu'nun özellikle 19. yüzyıl mekânsal hafızasını ele alarak başlatılan söz konusu bu çalışma, Beyoğlu'nun katmanlı tarihselliği ile deneyimsel dayatmalar ile oluşan otantikliğin ikiliği kurgusuna odaklanmaktadır.

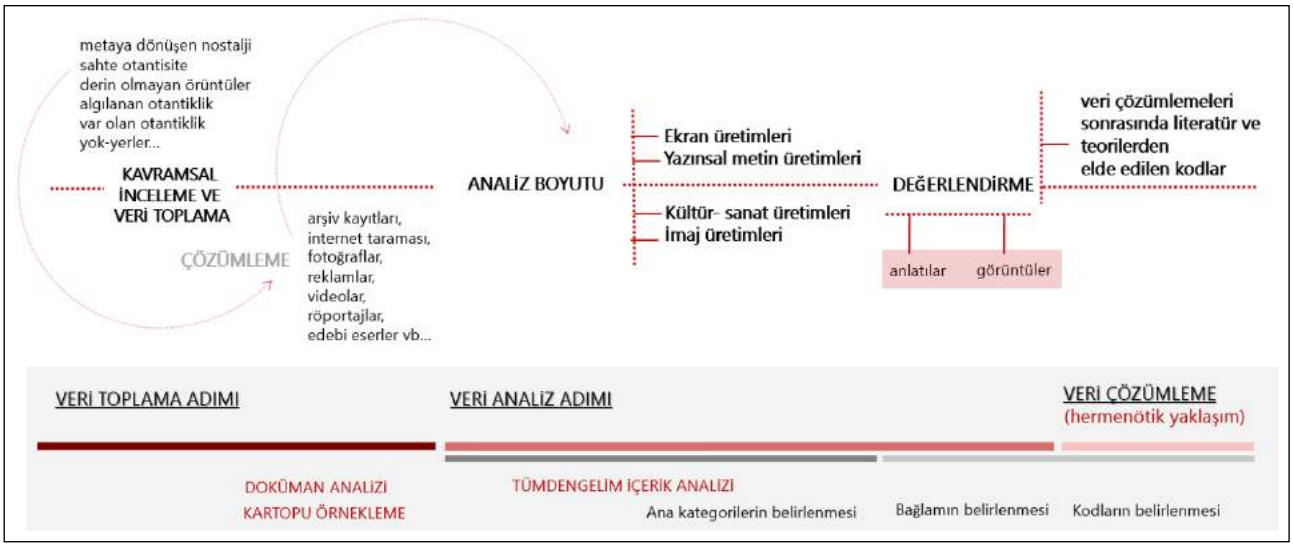
Çalışma içinde incelenmiş olan örnek kümeleri *"kartopu örnekleme yönteminden"* faydalanılarak oluşturulmuş, elde edilen tüm veriler *"doküman incelemesi tekniği"* ile sistematik ve kronolojik bir okumayla sunulmuştur. Kartopu örnekleme, örnek kümelerinin aşamalı olarak çekilmesiyle ortaya çıkmakta, nicel olarak küçük bir değerlendirme grubuyla başlatılıp, çoğalan bir veri yığınını temsil etmektedir (Aziz, 2011). Doküman incelemesi kapsamında, yazılı kaynaklar olarak kitaplar, dergiler, anılar, makaleler, romanlar, öyküler, şiirler, gazete haberleri vb. kullanılırken, görsel kaynaklar olarak resimler, filmler, anıtlar, mimari yapılar, reklam afişleri vb. olabilmektedir (Sönmez ve Alacapınar, 2013). Bu kapsamda Beyoğlu'na dair; arşiv kayıtları, internet tarama bulguları, konuya ilişkin görseller, reklamlar, gazete haberleri, videolar, röportajlar, internet kaynakları, Instagram ve Twitter gibi sosyal medya platformlarından elde edilen kişilere özgü görsel paylaşımlar, mekân yorumları, roman, öykü, şiir kitabı gibi edebi metinler kartopu tekniğiyle taranmıştır. Özellikle sosyal medya uygulamaları üzerinden yapılan doküman incelemesi, çalışmanın sürdürüldüğü dönem olan 2022 yılı ocak ayı içinde yapılmış olup, temelde Beyoğlu bölgesine ilişkin uzman kimliği bulunan kişilerin hesaplarından hareketle genişletilmiştir. Aynı zamanda incelenen hesap paylaşımlarına yapılan yorumlar dikkate alınmıştır. Söz konusu hesapların açık erişimli oluşu, görseller üzerinden ilerletilecek kartopu örneklem genişletmesine de olanak tanımıştır. Beyoğlu'na ilişkin yapılan doküman incelemelerinde verilerin sınırsızlığı dikkati çekmektedir. Bu nedenle, elde edilen kaynaklar ilk aşamada rastlantısal, ancak tüm evreni temsil edebilme gücü bulunduran, devam eden aşamalarda ise sistematik kartopu ağını temsil edecek şekilde problem bağlamında sınırlandırılmıştır. Doküman analizi çalışmalarında, konuya ilişkin karşılaşılan her türlü dokümanına değil, belirlenen probleme yönelik gerekli belgelerin taranmasına vurgu yapıldığı görülmektedir. Aynı şekilde bu yaklaşımın araştırmanın gücünü artırdığına yönelik çıkarımlar bulunmaktadır (Sönmez ve Alacapınar, 2013; Güçlü, 2019; Aziz, 2011). Bu bağlamda, çalışma kapsamında taranan belgelerin analiz tekniğini destekler nitelikte olmasına dikkat edilmiştir. Kaynaklardan elde edilen katmanlı yapının çözümlenmesi adımında ise, *"tümdengelim içerik analizi"* kullanılmıştır. Tümdengelim içerik analizi, genelden özele doğru hareket eden, incelenmekte olan konuyla ilgili teori, kuram, kavram, model, kategori ve hipotezleri test eden bir yöntemdir. Matrisler genellikle; teoriler, modeller, zihin haritaları ve literatür incelemelerine dayanmaktadır (Güçlü, 2019). Burada ilk yapılması gereken, çalışma düzleminin oturtulduğu kavramlara ve çalışmanın amacına uygun olarak yapılandırılmış bir kategori matrisi hazırlamak, kategori matrisine göre bağlamları ve kodları ortaya koymaktır (Mayring, 2014; Krippendorff, 2018).

Gündelik hayatın uzam ve mekânlarının artık homojen olmadığı, aksine çekişmeli bir alanı temsil ettiği iddiaları

Şekil 1. Beyoğlu'nda tarihsel süreç ve yaşanan otantiklik değişimi.

20. yüzyılın sonlarında başlamış, 21. yüzyılda ise tamamen görünür olmuştur. Uzam ve mekân temsillerinin söz konusu dönüşümlerinin altında ise yeni toplumsal kimlik biçimleri üreten farklı etkenler yatmakta, bunlardan bir tanesi medya ve kültür endüstrileri olarak tanımlanmaktadır (Havik, 2003). Böyle bir ortamda, mevcutta var olanı korumak, tarihsel bileşenleri güçlü kılmak, projeler aracılığıyla gerçekleştirilen kültürel ve mekânsal melezleşmenin önüne geçmek oldukça zorlaşmıştır (Bennett, 2013). Çalışmanın kategori matris düzlemi, Andy Bennett'in (2013)*"Kültür ve Gündelik Hayat"* kitabında bahsetmiş olduğu söz konusu bu söylemlerden hareketle oluşturulmuştur. Bahsedilen medya ve kültür endüstrileri çalışma içinde; ekran üretimleri, yazınsal metin üretimleri, kültür sanat üretimleri ve imaj üretimleri başlıkları şeklinde verilmiştir. Söz konusu bu başlıklar, Beyoğlu'nda görülen küresel dayatmaların ortaya koyduğu düzlemi sistemli olarak aktarma ve çalışmanın bulgularını ortaya koyma noktasında fayda sağlamıştır. Kategorilerin belirlenmesinin ardından, metinler arasında aranan referans bağlam birimleri, Margaret R. Somers'in (1994) kurguladığı üçlü anlatı diyalektiği çerçevesinde irdelemiştir. Somers'in (1994) anlatı diyalektiği; yerin varoluşsal temellerine dayanan ontolojik anlatıyı; kullanıcı deneyimleriyle şekillenen, mikro ya da makro hikâyelere bağlı olan kamusal anlatıyı; ilerleme, çöküş, sanayileşme, aydınlanma gibi bireysel analitik çerçeveden uzaklaştıracak teorilere bağlanabilecek bütüncül bir katmanı içeren meta anlatıyı içerir. Anlatı bilimini tek bir bireyden, kültürel normlara, kültürel normlardan küresel oluşumlara kadar taşıyan bir yaklaşımı temsil etmesi nedeniyle Somers'in anlatı çözümlemesi çalışma süresinde Beyoğlu'nda yapılacak tur için büyük katkı sunmuştur. Görüntüler arasında aranan bağlamlar ise, Peirce (1982) yardımıyla derinleştirilmiştir. Peirce'e göre, ortak bellek şemaları üçgen bir ilişkinin sonucudur ve önceden tanımlanabilir. Göstergelerin üçgen ilişki katmanları, bir temsilci (gösterge, işaret ya da araç), bir temsil edilen (nesne) ve bir yorumlayıcıdan (zihinsel görüntü üreten) oluşur. Bu üç katman görüntüleri okuma sürecinde etkin hale gelir. Zihinsel imgeler, sözlü işaretler ve geçmiş bilgi birikimleri ise bağlamın sonucunu oluşturur. Böylece, yorumlayıcılar, şematize edilmiş bilgiyi inceleyen ve böylece bunun onlar için sahip olduğu ek anlamı arayan kâşifler olarak görünür (Barthes, 2018; Keunen, 2020).

Kategorilendirilen ve bağlamları ortaya koyulan ham verilerin anlamlı bütün haline dönüştürülme adımı ise kodlamadır. Bu adımda, tümdengelim içerik analizinin kavramsal anlatısından faydalanılmıştır. Kodlar; kelime, kelime grubu, cümle ya da paragraf gibi anlamlı bütünleri oluşturabilir. En yaygın kod türü ise kelime ve tema üretimleridir (Güçlü, 2019). Yapılacak olan kodlamalar, çalışma içinde incelenen verilerin doğrudan içinden çekilebileceği gibi verilerden elde edilen çıkarımlar doğrultusunda literatürden ve teorilerden de elde edilebilmektedir (Güçlü, 2019). Bu bağlamda şematize edilen kodlar, tüm anlatı ve görüntüler üzerinden yapılan teorik değerlendirmelere bağlı bir biçimde ön anlama ve yorumlama kuramı olarak bilinen hermenötik (Habermas, 2002) bir yaklaşımla yazar tarafından oluşturulmuştur (Şekil 2). Yazarın, hermenötik yorumlama yapabilmesi için, yorumlanacak şey öncelikle anlaşılmış olmalıdır. Bu nedenle, öncelikli olarak araştırmanın temel aldığı kuramsal okumalarla ortaya koyulan kavramlar üzerinden başlangıç kodları çıkarılmış, tarihsel bir sunuşla kategori matrisleri ve bağlamlara göre şematize edilmiştir (Zhang ve Wildemuth, 2009). Kodlar; Goffman'ın (1959) sahne önü/sahne arkası benlik söylemi, MacCannell'ın (1976) sahte öröntü söylemi, Trancik'in (1986) kayıp alan söylemi, Auge'nin (1995) yok yerler söylemi, Boym'un (2001) nostalji söylemi, Zukin'in (2010) kültürel kimlik markalaşması söylemi gibi anlatılarından faydalanılarak derinleştirilmiştir.



Şekil 2. Çalışmanın yöntemi.

Özetle, doküman analizi ve kartopu örneklem belirleme aracılığıyla yürütülen süreç, neyi, neden, niçin, nasıl ve nerede aranacağının doğru tespitini ve güvenilir bir değerlendirmeyi mümkün kılarken, kaynakların kategorilendirilerek içeriklerinin kodlanması *"var olan ve algılanan otantiklik"* bakışında görülen değişimleri ve ikiliği ortaya koymaktadır. Ayrıca, Beyoğlu'nda bu iki anlamı ortaya çıkaracak gösterge türü ve anlatılarına rastlıyor olmak çalışmanın doğru bir niteliksel üretim sürecinde olduğunun da ifadesidir.

BULGULAR

Ekran Üretimleri

Bir görsel iletişim aracı olarak televizyon ile kentler uzun zamandır karmaşık bir ilişki içindedir ve bu durum 21. yüzyıl dünyasında iyice görünür hale gelmiştir. Bennett'in (2013) televizyonu popüler medya kanalları arasında sayması, bugünün bilgi toplumlarının gündelik hayat inşasında en önemli iletişim aracı olduğunun bir göstergesi niteliğindedir. Buna bağlı olarak, Shields (1992), televizyon dizilerinin kentsel mekânsal karmaşıklığını, çeşitliliğini ve sosyal dinamizmini kullanarak görselleşen bir ortam haline geldiğini belirtmektedir. Eski dönem dizi ve filmlerin içeriklerinde bile, kentsel alanda günlük faaliyetleri tasvir etme eğiliminde olan, bir fabrikadan çıkan işçilerin ve bir istasyona giren trenlerin sahnelerini yakalama isteği olduğu görülür. Bu temsiller aracılığıyla dizi ve filmler, bir kentin fiziksel olduğu kadar sosyal manzarasını da haritalandırabilir (Giddings, 2020). Geç modern kültür ortamı, bu şifreyi iyi çözmüş ve görsel kanallarla doygunlaşan yer ve kültür üretimi içine girmiştir. Film ve dizi ortamı, gerçek olan bu kentsel görüntüleri, insanları ve bazen yerleri yeniden üreterek, yakalanmış bir gerçeklik ve otantiklik hissine büründürebilmektedir (Croy, 2010). Bu ortam; tarihin derin anlatısından faydalanmanın ardından artık var olanı unutturarak yeni bir kültürel hafızayı, algısal otantikliği pazarlamaktadır.

Esser (2020), son yıllarda yapılan nörogörüntüleme çalışmalarıyla elde edilen bilişsel beyin taramalarının, ekranın sunduğu deneyim ortamıyla gerçek dünya deneyimlerinin aynı beyin hareketleri tarafından işleniyor olduğunu belirtmiştir. Konuyu, gerçek yer temsilleri bağlamında ele aldığımızda ise kendine özgü bir iç yapıya sahip otantik yerin izleyici için benzersiz bir görsellik kurgulayacağı, aynı anda yeni bir anlam atfedileceği ile ilişkilendirebilir. Yerin algısında yaşanan bu oynamayla yeni bir popüler ürüne dönüşmesini film etkili turizm olarak tanımlayanların yanı sıra film ve televizyon konumlarının Baudrillard'ın hiper gerçeklik teorisinin örnekleri olduğunu söyleyenler de çoğunluktadır. Çünkü hiper gerçeklik, dünya gerçekliği ile birbirine karıştırılan bir simulakrayı temsil etmektedir (Macionis, 2004).

Bu konunun anlatısını Beyoğlu'nun sunduğu dizi seti ortamı üzerinden okumak mümkündür. Skyscanner verilerine göre, uçuş aramaları ile turistik alanlarda gösterimde olan diziler arasında kuvvetli bir ilişki bulunur (Deloitte, 2014). Bazıları için Beyoğlu'nda bulunmanın ana motivasyon kaynaklarından biri dizilerde üretilen gerçeklikten kaynaklanmaktadır. Bu durum, adını birçok kişinin ilk kez 2018 yılında *Şahsiyet* dizisinin çekildiği apartman olarak duyuran Temel Apartmanı üzerinden açıklanabilir. Birçok medya kanalında dizilere ev sahipliği yapan tarihi apartman[3] olarak tanınıyor olması gerçeğin önüne geçecek niteliktedir. Oysa Temel Apartmanı, Beyoğlu'nun Babylon gibi önemli bir kültür mekânına açılan Jurnal Sokak'ta yer alan, Art Neuveau kapısıyla dikkati çeken, II. Abdülhamit'in Avrupa'dan gelecek müzisyenler ve sanatçılar için yaptırdığı 107 yıllık bir apartmandır. Bu apartman, Süper Baba dizisine göre Elif'in yaşadığı bina; Şahsiyet dizisine göre Mebrure Apartmanı; 2020 yılı yapımı bir diziye göre de Masumlar Apartmanı olmuştur. Var olan otantikliğinin bilinirlik düzeyine ilişkin yapılan incelemelerde doğrudan Temel Apartmanı olarak yapılan paylaşımlarla karşılaşmak oldukça güçtür. "Temel Apartmanı" anahtar kelimesiyle ulaşılan, açık erişimli Twitter ve Instagram görselleri ve yorumlarından elde edilen sayılı veri, yapının var olan otantiklik algısına vurgu yapmıştır. Söz konusu bu paylaşımlarda;*"1977'den beri boş. Diziler için kiralanıp duruyor."; "Bundan çeyrek yüzyıl önce banka hacze çıkarmıştı üç kuruşa, ne acı, böyle bir apartman ve terk edilmişlik."; "Dizi için binaya özgün olmayan alçılar yapılıp, resimler çizilmiş. Eğer altta özgün kalem işi varsa onu yok etmiş oldunuz. Bu resimler tuvallere yapılarak, tarih atılabilirdi, yapıcı hasar vermezdiniz."; "Çocukluğum Şehzadebaşı, gelin geldiğim yer Sofyalı Sokak, Temel Apartmanı, Karadenizli görmüş geçirmiş bir ailenindi."* şeklinde yakınma ve anıların dile getirilmesi söz konusudur.[4] Algılanan otantiklik üzerinden yapılan paylaşımlara bakıldığında ise, yoğun bir veriyle karşılaşılmakta, Temel Apartmanı bilgisinin geçmediği görülmektedir. *"Şahsiyet dizisinin çekildiği apartmana gittik."* manşetli başlıkları *"Evet bugün günlerden Masumlar Apartmanı."; "Agah Beyoğlu burada yaşadı demek."; "Şahsiyet'i hatırla."* gibi cümleler takip etmektedir.[5] Aynı zamanda, yapının Jurnal Sokak giriş cephesinde gördüğümüz Art Neuveau yeşil kapının var olan otantikliği Şahsiyet dizisinde korunmuşken, Masumlar Apartmanı'nda kırmızıya boyanmış ve dizinin gerçekliğine uygun olarak temiz görüntüsüyle ziyaretçiler için imaja dönüştürülmüş bir temsilin simgesi olmuş, algılanan bir otantiklik kurgulamıştır.

Ekran üretimleri ile Beyoğlu'nun gündeme gelmesi yalnızca 21. yüzyılın ürünü değildir. Beyoğlu semtinin sokakları, kent hayatı, arka sokakları, bazen tekinsizliği, bazen tarihi dokunun güzelliği, sahip olduğu derin anlatıya sahip mekânlarıyla 1980'ler dizi ve film kuşağının sahnesi olma özelliği taşımıştır (Dorsay, 2014; Akmeşe ve Akmeşe, 2020). 1986 yılında yönetmenliğini Şerif Gören'in Beyoğlu'nun

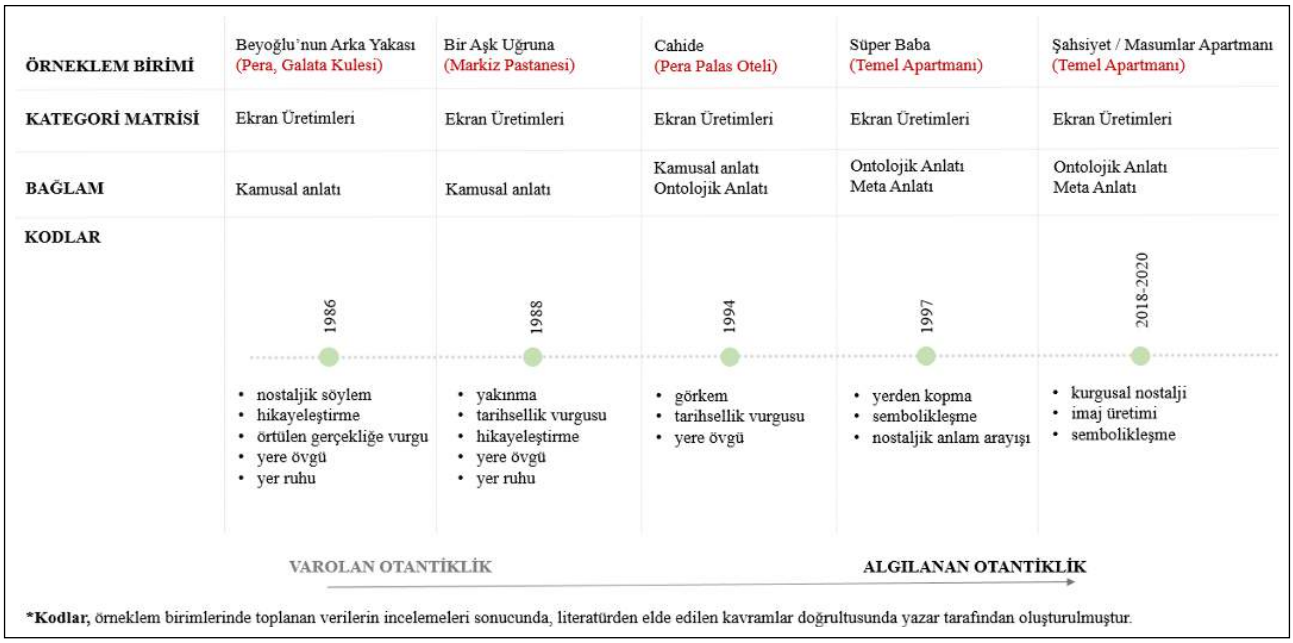
Arka Yakası filmi, Beyoğlu'nun sahip olduğu tüm gerçekliği sunma çabasıyla ekranlarda yer bulmuştur. Filmin dönemin Beyoğlu izlerini tüm açıklığıyla anlatma gayesini içerdiği daha ilk sahnede sunulmuş, *"Aklınıza böyle bir film yapmak nereden geldi?"* sorusuna verilen; *"Metin yazarı arkadaşımla uzun zamandır konuşuyorduk, neden bizde Beyoğlu filmi yapmayalım dedik. Kültür ve tarihine ağırlık veren nostaljik bir yarı belgeselde karar kıldık, Pera."* cevabıyla doğrulanmıştır. Filmin farklı sahnelerinde, Beyoğlu'nun Galata gibi bir kent simgesinin önünde; *"Röportaj yapmaya gidiyorum. Hem de kiminle Beyoğlu ile. Köprüde düşündüm. Atar tutarım, verir veriştiririm. Ahlaksızlığından, kumarından tutunda meşhur bir sokağına. Beyoğlu'nu öveceğim, kötü sokaklarını, meyhanesini, her şeyini öveceğim."* şeklinde bir anlatı mevcuttur. Dizi boyunca sunulan Beyoğlu simgesinde elde edilen kodların dönemin ruhuna övgü, nostaljik ifadelere yer verme, üstü örtüleni ortaya çıkarma, yerle kurulan bağ gibi kodların varlığı göze çarpmaktadır.

1988 ve 1994 yıllarına ait temin edilen gazete sayfalarında Beyoğlu'nun kimlik mekânlarının dizi veya filmler için kullanıldığı bilgisi yeniden karşımıza çıkmaktadır. *"Bir Aşk Uğruna dizisinin çekimlerinin bir bölümü önceki gün Beyoğlu, İstiklal Caddesi'ndeki Markiz Pastanesi'nde yapıldı. Uzun süredir kapalı olan Markiz'in dizi için açılması çevredekilerin büyük ilgisini çekti. Türkan Şoray: Bu pastane aşklarıyla ünlü bir yer. Küskünler burada buluşur, barışır. Yazık ki kapalı, diye yakındı."* şeklinde sunulan haberin başlığı Markiz'e olan övgüyle eşleştirilmiştir. *"Cahide, Pera Palas'taydı."* başlıklı bir diğer haber de benzer içerikleri barındırmıştır.[6]

Burada dikkati çeken, alt metinde Beyoğlu'nun gerçekliğinin kullanılması, bölgenin ya da bölge özelinde yapıların yeni bir pazar programına sokulması, dizilerin çekildiği yer ile ekrana yansıtılan yer arasında algısal bir otantik bağ kurulumu ve dolayısıyla oraya gitmenin ana motivasyonunun bu bağ olduğu vurgusudur. Bu durum, tarihsel süreç içinde ekran üretimleri aracılığıyla yerlere ilişkin nostaljik söylemlerin azalarak kamusal anlatıdan meta anlatıya dönüşümünü ve yerden kopma eğilimini artırmaktadır (Şekil 3). Özetle, 20. yüzyılın son dönemlerinden itibaren özellikle diziler, kitlesel nüfusa erişim için baskın bir medya haline gelmiş, ister kurgusal ister kurgusal olmayan yollarla olsun algılanan otantikliği etkileme noktasında önemli bir rol oynayarak duygusal bağ görüntülerini muğlaklaştırmıştır. Sinemanın, bir kenti herkesçe bilinen anahtar noktaları aracılığıyla temsil eden ve izleyiciye görmeyi beklediği idealize kent imgesini sunup kenti içselleştirmesini sağlayan yapısı, sinematografik bir otantiklik yaratmış, var olan gerçekliği ise silmiştir (Beeton, 2006; Liz, 2014).

Yazınsal metin üretimleri

Yazınsal kurgu, mimari ve kentsel mekânları olay örgüsü ile sözlü olarak temsil edebilirken, kentsel ortam da araştırma sahasında bir araç olarak yazınsal metinlerden faydalanabilmektedir. Pamuk'un İstanbul betimlemeleri, Dicken'in Londra sahneleri, Proust'un Paris'i, Gogol'un St. Petersburg'u düşünüldüğünde, pek çok ünlü roman ve hikâyenin çeşitli kentsel ortamlar da sahnelendiği görülmektedir (Ultav, Çağlar ve Drinkwater, 2016). Edebi yazınlarda çok kez kendisine yer bulmuş olan Beyoğlu; zevk, tanıklık, özlem ya da yaşantıya ait bir istek uyandırmasıyla bilinmektedir. Bu edebiyat haritasını yerler üzerinden okuyabilmek ise dönemsel olarak değişkenlik göstermek-



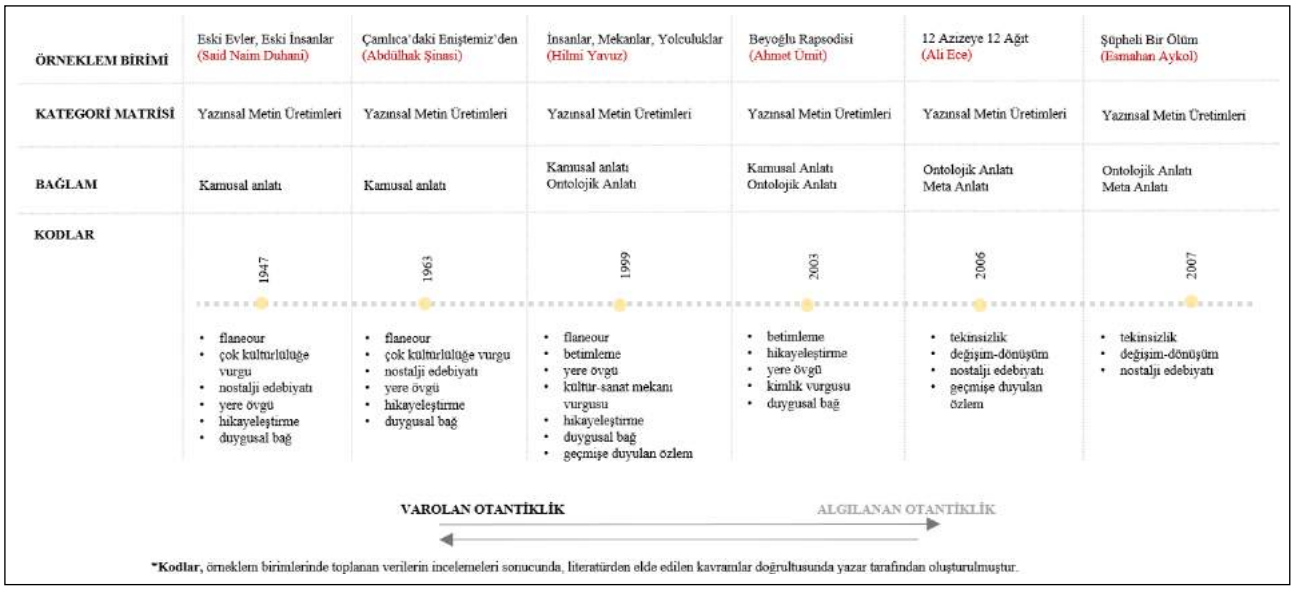
Şekil 3. Veri çözümlemeleri ile elde edilen kategori matrisi, bağlam ve ekran üretim kodları.

tedir. Çoğunun değindiği Beyoğlu yaşantısı, insan izleri ben hangi Beyoğlu'nu biliyorum sorusunu düşündürmektedir. Hızlan (2008), edebi metinlerle Beyoğlu turu yaparken, bazen Haldun Taner'le Markiz'de buluştuğunu, bazen Melih Cevdet Anday ile İstanbul Kulübü'ndeki Pazartesi buluşmalarına gittiğini, Yusuf Atılgan'ın aylak adamını yeniden okuduğunu söyler.

Metinler yere bağlanma olgularıyla oluşan bir kesit üzerine yerleşirken, büyük oranda etkili olan duygu özlem olmaktadır. Geçmişten seçilen bir kare, o dönemin tüm ihtiyacını karşılayan bir anlatıyla sunulabilmektedir. Beyoğlu bu anlamda farklı zaman dilimleri içinde farklı anlamlarla edebi metinlere konu olmuştur. Çok kültürlü imparatorluk izlerinin vurgulandığı dönem metinlerinde Beyoğlu'nun yürüyerek deneyimlenen ortamından sıkça bahsedilmiş, ikili ilişkiler birer sahne canlandırması şeklinde sunulmaya çalışılmıştır. 1982 yılında Said Naim Duhani tarafından yazılmış olan Eski Evler, Eski İnsanlar, 19. Yüzyıl Sonunda Beyoğlu'nun Sosyal Topoğrafyası kitabında karşımıza çıkan Beyoğlu; *"İstiklal Caddesi ile Müeyyed Sokağı'nın kesiştiği noktada apartman olarak kurulmuş olan Narmanlı Han, Rus devletinin mülkiyetindeydi, konsolosluk bu binadaydı. Bir zamanlar sokağın büyük bir yüzeyini kaplıyordu, şimdiki çizgisine 1914'te getirilmiş. Yine o yıllara Narmanlı'ya pek uzak olmayan bir yerde Fransız kasap Prieur'un dükkânı, karşısında İngiliz Hayden'in kumaş mağazasını görürdünüz, giriş katında kurşun askerler satılırdı, kutusu 7,5 kuruş."* ifadeleriyle anlatılmıştır. Burada resmedilen geri gelmeyecek zaman ontolojik anlatılarda şekillenen kamusallıktan ibarettir. Duhani tarafından seçilen bir sahnenin; dedikoduları, kişileri, eşyası, sokağı paylaşanları, dostlukları ile birlikte betimlenmesi kayıplardan çok, o anın durdurulmuş bir görüntüsüdür. 1960'lı yıllarda kaleme alınan Abdülhak Şinasi'nin Çamlıca'daki Eniştemiz'den[7] kitabında da benzer yaklaşımlar dikkati çeker. Bölgedeki çok uluslu yapının varlığı İstiklal Caddesi'nde gezinirken sık sık bizleri karşılar, yer bağlılığını kurgulayan mekânlar tanımlanır. Kitabın, *"O zamanlar Tünel'den Halep Çarşısı'na kadar canlı ve eğlenceliydi. Barlar ve sinemalar yok, lokantalar ve çalgılı gazinolar vardı. O zamanlarda babalarımızın neslinden olanlar, böyle tanınmış gazinolarda, sevdikleri Avrupa'yı biraz bulmuş olurlardı. Babamın oyun arkadaşı Mösyö Timöni, gözünde tek gözlüğü Tokatlıyan'a gelirdi."* bölümünde yere yapılan övgüyle birlikte Beyoğlu'nun eğlence ve sosyalleşme odaklı yapısını da önemsemiştir. Yirminci yüzyıl hikâyeleştirmelerinde ise bizi karşılayan yoğun duygunun geçmişe özlem olduğu görülmektedir (Ciritci, 2019). 1999 yılında yayımlanan *"İnsanlar, Mekanlar, Yolculuklar"*[8] kitabında Hilmi Yavuz'un 1950'li yıllarda deneyimlediği Beyoğlu'na nostaljik bir bakışla yaklaştığı, ritüellerini inatla hatırlama çabası içinde olduğu görülür. Kimlik mekânları olarak Markiz'in, Tokatlıyan'ın, Lebon'un sembolik anlatılarını kullanmasının yanı sıra yaşadığı yere bağlılığını görme, tatma ve dokunma duyularını kullanarak kaleme dökmüştür. Kitapta yer verdiği *"1954'lerde yeniyetme bir edebiyatçı olarak Lebon'a da giderdik, sonrasında Markiz'e de. Demir Özlü'nün yazdığı gibi çekingen ve kaçamaklı gidiyorduk Lebon'a... O hep gidebilme düşleri kurduğumuz Paris ve Viyana'daki zarif kaldırım üstü kahvelerinden birinde oturmak gibiydi" ve "Markiz'e gittiğimizde Dört Mevsim vitray panolarını seyrederdik – ki sadece üç tanedirler, Duhani'ye göre, kış panosu imalat ya da taşıma sırasında kazaya uğramış olmalıdır.- Gözlerimizi saygın edebiyatçılardan kaçırmanın yollarından biriydi."* ifadeleri bu duygusal bağı ve ontolojik anlatıyı ortaya koymaktadır.

Beyoğlu'na dair 2000'li yıllarda üretilen yazınsal metinler incelendiğinde kayıp mekânlar ve izlerin takibinin yoğunlaştığı, yere bağlanma güdüsünün yok olanın içinde var olana ulaşma ihtiyacı olarak sunulduğu dikkati çekmeye başlar. Ahmet Ümit, Beyoğlu Rapsodisi'nde[9] *"Katya'yla Beyoğlu'nda Rebul Eczanesi'nin[10] önünde karşılaşıncaya kadar ne bizim iki kafadarla ne de onların projeleriyle uğraşabildim. Fakat dünya küçüktü, Beyoğlu daha da küçüktü. Gündüzleri esnafın işiyle gücüyle uğraştığı bu cadde, gece yarısı olup saat biri devirdi mi farklı bir kimliğe bürünür. Çok kollu, çok dallı büyük bir ırmağa benzer."* demiştir. Burada ilk kez 1895 yılında Grand Pharmacie Parisienne adıyla, İstiklal Caddesi üzerinde döneminin aidiyetlik kurgusunu sağlayan Rebul Eczanesi'nin sahip olduğu anlama tutunma düşüncesi mevcuttur. Metinler arası yolculukta bugün yerinde olmayanın varlığına hüzün ve yerin anlamıyla atıf yapılıyor olması da bu düşünceyi desteklemektedir. Yer ruhu ve bağlanmayı inşa eden temel şeyin hafıza olduğu düşünüldüğünde (Nora, 2006), son dönem metinleri bunun en belirgin örneklerini sunmaktadır. 12 Azizeye 12 Ağıt, Şüpheli Bir Ölüm kitapları Beyoğlu'nun artık yerinde bulunamayan mekânlarına, sahip olduğu anlamın yok oluşuna özellikle değinmektedir. Söz konusu kitaplarda geçen; "*Birkaç gündür işler kesat. Balıklama Beyoğlu gecelerine dalıyorum. Bazen gençlerin favori mekânlarına gidiyorum. Gereğinden fazla melankolik ve bunalımlar. Üstelik hiçbiri dans etmiyor.*" ve "*İstanbul tehlikeli bir şehir. Hele son zamanlarda İstiklal Caddesi ve civarı. Bankaya gitmek için evden çıkarken, bir arkamdan su dökmediği kalıyor Fofo'nun.*" satırları Beyoğlu ve deneyim değişimini sunarken, yere bağlanma ile algılanan özgünlük arasında pozitif bir korelasyon kurar, ancak var olan üzerinden geçmişe olan saygısını elden bırakmamaya da özen gösterir niteliktedir.

Katmanlı bir kentsel mekân olarak Beyoğlu'nun edebi metin çözümlemesine bakıldığında, benlik ve yer arasındaki duygusal bağın psikolojik alt metinlerle sıklıkla sunulduğu, tarihsel dönemler içinde bunun hâkimiyetinin korunmaya çalışıldığı açıktır (Şekil 4). Oysa 1940'lı yıllarda yapılan anlatılardan elde edilen kodlarda şu anın içinden kayıp giden zamana bakmak, ona anlamlar yüklemek ya da "ah Beyoğlu" deme ihtiyacı hiçbir zaman olmamıştır.



Şekil 4. Veri çözümlemeleri ile elde edilen kategori matrisi, bağlam ve yazınsal metin üretim kodları.

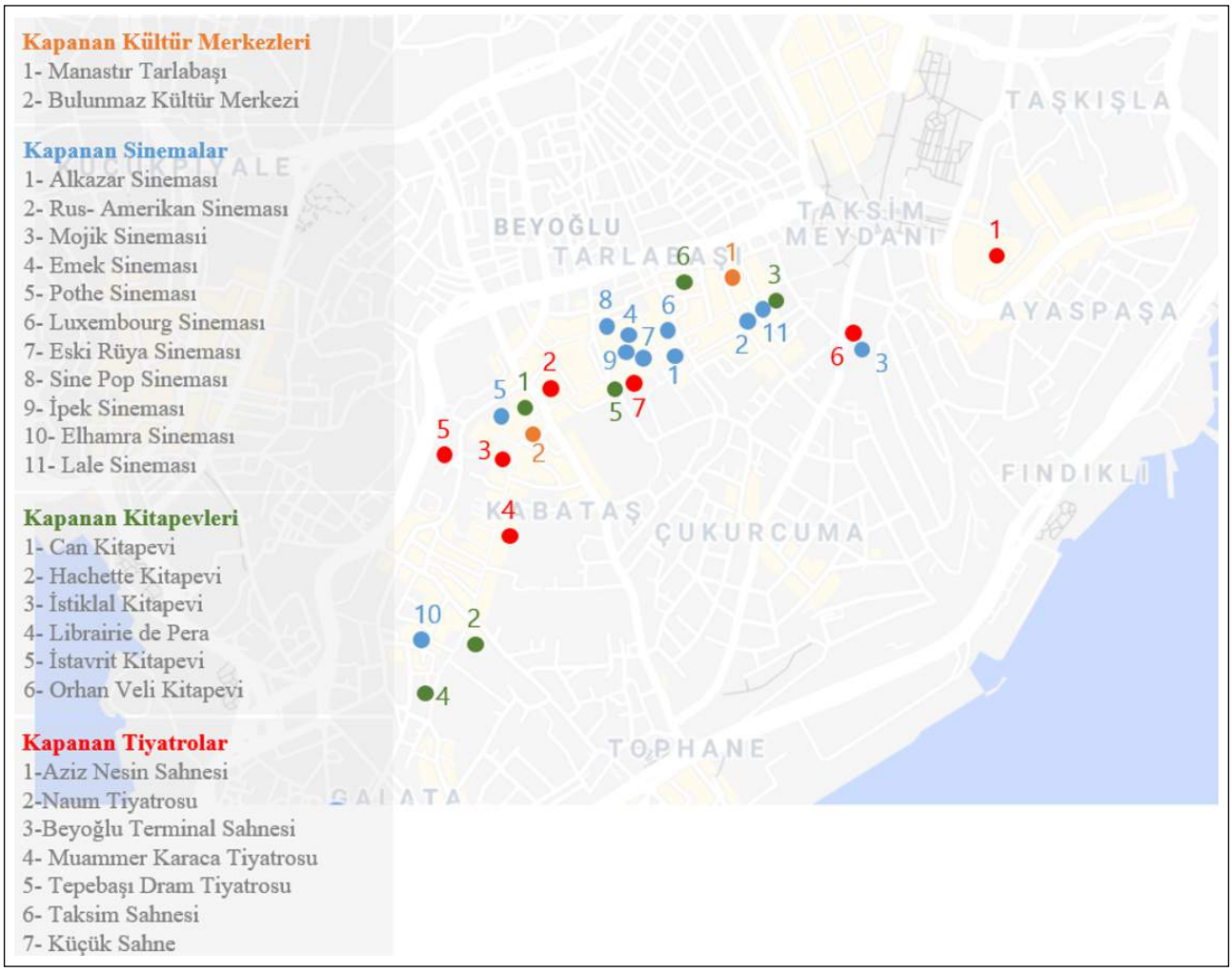
Kültür sanat üretimleri

Beyoğlu'nun sahip olduğu sinema, tiyatro, kitabevi, galeri, kültür merkezleriyle 1920'li yıllardan itibaren giymiş olduğu kültür sanat şapkası, İstanbul anlatılarının en önemli simgesi olmuş, İstanbul'un sanat imajı her ortamda Beyoğlu ile resmedilmiştir (Şekil 5). Özellikle hem eğlencenin hem de sanatın sarayın dışına çıkması, özel bir anlam taşıyan "cadde" kültürünün gelişmesine olanak tanıması noktasında da önemli kılınmıştır (Adanalı, 2020). Kemal Tahir, Esir Şehrin İnsanları kitabında; *"Gazetelerdeki eğlence ilanlarına göz gezdirdim. Beyoğlu Tepebaşı Tiyatrosu'nda sinema… Önümüzdeki cuma günü Karmen Operası. Beyoğlu, Doğruyol'da Gülistan Birahanesi. Şehzadebaşı Millet Tiyatrosu'nda Kin ve Aşk, müthiş dram bir perde. Kadın Galip, Erkek Yenik, kahkahalı komedi bir perde. İstanbul'un en süslü sineması Alemdar, Kemal Bey Sineması, diye devam eder Beyoğlu'nun 1950'li yıllarına ait kültür sanat perdesi."* diyecek, dönemin Beyoğlu kültürünü açıkça ortaya koyacaktır (Tahir, 1956).

İlk sinema gösterimi, 1896 yılında Avrupa Pasajı'nın içinde bulunan Sponeck Birahanesi'nde gerçekleştirilmiş, zamanla Cinema Pathe (Tepebaşı,1908), Eclair (1909), Cine Central (1910), Oriental (1911), Magique (1914), Palace (1914), Elektra (1920), Elhamra (1922), Opera (1924) gibi sinemalar açılmış, Cadde-i Kebir bir sinemacılar caddesi olarak tanınmaya başlanmıştır (Baysan Serim, 2009). Sinema mekânlarında yaşanan en büyük hamlelerden biri de dönemin buz pateni salonunun 1924 yılında Melek Sineması'na –*zaman içinde Emek sineması olarak değişecektir*- dönüşümüdür. 1973 yılında çıkan bir yangın sonrası Emek Sineması'nın bulunduğu Cercle d'Orient binasının da hasar görmesi ve zaman içinde yapının bakımsız kalmasıyla birlikte 2013 yılında yapı da bir dönüşüme gidilmiştir. Cercle d'Orient, 2006 yılında, 5366 sayılı yasaya göre Beyoğlu Belediyesi tarafından yenileme alanı ilan edilmiş, Grand Pera adıyla bir alışveriş merkezine dönüşen binanın üst katında yeniden Emek Sineması açılmıştır.

Pastane mekânı tanımı, başka bir ölçekte ya da inceleme alanında derin bir anlamı ve heyecanı bulunmazken, özellikle Beyoğlu için özel bir anlama sahiptir. Bu mekânları özel kılan yeme içme geleneğinin ötesinde bir mekânsal karakter ve deneyim ortamı üretmeleridir. Atilla İlhan'ı görmek için 1950'li yıllarda Baylan Pastanesi'ne gidenlerin sayısı az olmamıştır (Uz, 2009). Markiz Pastanesi'nin hikâyesi de bölge için önemli mekân olduğunu gösteren derinliktedir.

Bugün, bu deneyim ortamının yitimi, dönüşümün anti anlatılarında oldukça fazla duyulur haldedir. Çünkü modernleşme ortamı Beyoğlu için var olan tiyatro, sinema, galeri, pastane, şık mağaza vitrini, lokanta otantikliğini; aksi yönünde gelişen, onu yok ederek yalnızca adını dönem dönem zikretmekten öteye gidemeyen bir tüketim biçimlenmesine dönüştürmüştür. Yeni Beyoğlu profili, bu anıyı heyecanla tüketirken, eski Beyoğlu görünmez olmaya başlamıştır. Öyle ki, 1962 yılında ilk mağazasını Beyoğlu'nda açan Vakko, tarihçesini anlatırken; *"İlk Vakko mağazası İstanbul'un kalbi Beyoğlu'nda açıldı."* ifadesini kullanmış, Beyoğlu Geliştirme ve Güzelleştirme Derneği'ne üye olan Vitali Hakko, 1997 yılında çıkarmış olduğu kitabında Beyoğlu mağazasının açılışına yönelik; *"İşlerimiz iyi gidiyor. Daha iyi gitmesi için neler gerekiyor diye düşünmeye başladım. 'Daha büyük bir mağaza. Gerçek bir mağaza. Ve tabii. Beyoğlu'nda bir mağaza."* demiştir (Uras, 2006). Mağaza caddeden çekildiğini açıklarken ise; *"Beyoğlu'ndan çekiliyoruz"* ifadesi kullanmıştır. Beyoğlu nüfusunun başkalaştığı yer için önemli olan bir izin kalkmasıyla görünür olmuş ancak yere özgü anlamı silinemeyen Vakko mağazası ve belleklerdeki yeri, *"Vakko'nun önünde buluşuyoruz."* kamusal anlatısı kullanılmaya devam etmiştir.



Şekil 5. Beyoğlu'nda kapanan kültür sanat merkezleri (Kaynak: Kuyumcuyan, 2020).

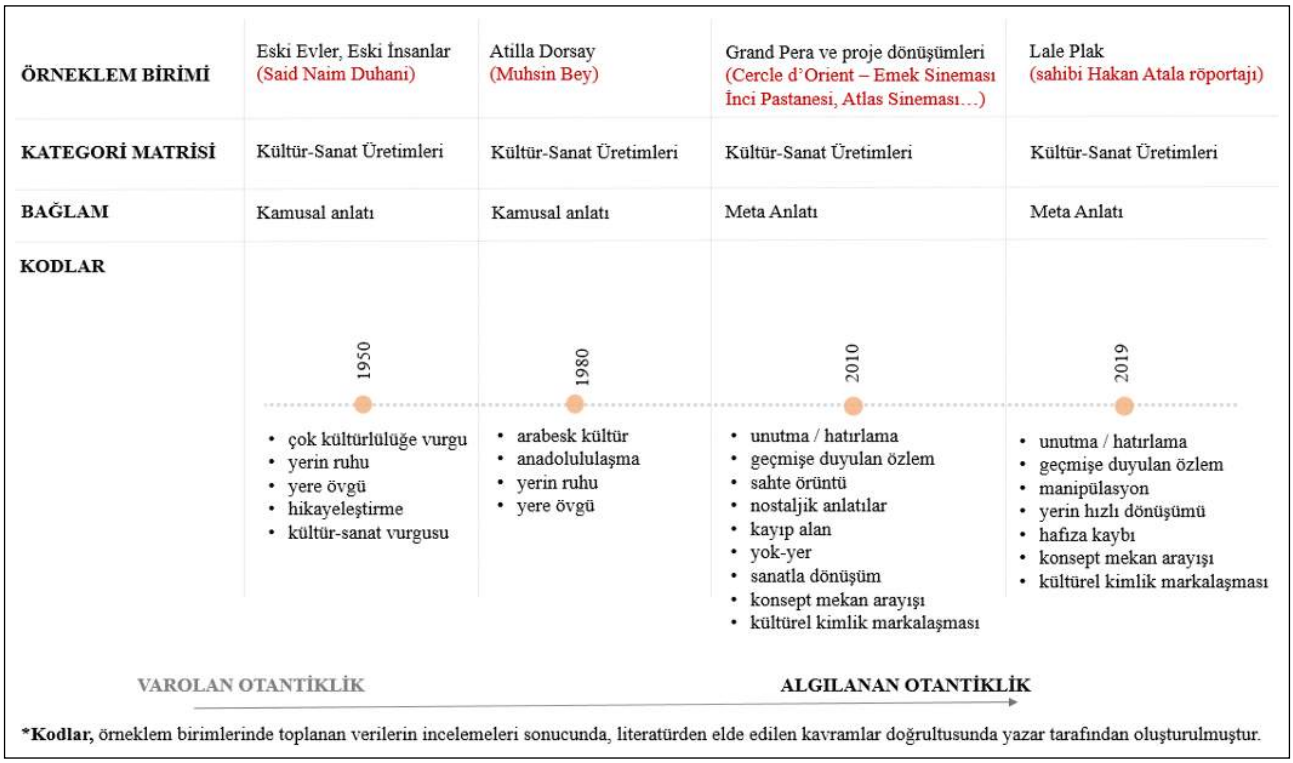
Bir diğer gündelik hayatta güçlü bir etkiye sahip sanatsal üretim müziktir. Müziğin var oluşunu ve hayata dâhiliyetini anlamanın en önemli yolu ise toplumsal düzlemin doğru analizinden geçmektedir. Uygun sahnenin sağlandığı ortamda müzik toplum ve alt kültürün temelleriyle şekillenmekte, bu da onun kültürel yönünü anlama ihtiyacını doğurmaktadır (Bennett, 2013). Beyoğlu müzik sahnesi ele alındığında ortak kültür ve özdeşleşme ortamıyla karşılaşılmaktadır. Duhani'nin anlatımlarında 1960'lı yıllarda Beyoğlu'nda üretilen müzik Avrupalı kimliğiyle örtüşmekteydi. Bunu dile getirirken *"Pera Palas Oteli görkemli siluetiyle yükselir. Avrupa'dan ve Avrupa dışından pek çok önemli ad konuk olmuştur. 1900 döneminin önemli baloları onun geniş salonlarında verilir. Birbirine kenetlenmiş çiftler Nava Orkestrasının melodileri eşliğinde dans ederlerdi."* sözlerini kullanması, dönemin kuvvetli bir müzikle kurulan temsilin var olduğunu göstermektedir.

Beyoğlu'nun görünür değişimi müzik kültürü üzerinde de hissedilmesi özellikle son kendini göstermeye hızla devam etmiş, sembol mekânlardan Lale Plak; *"13 Mayıs 1954 günü başlayan serüvenimiz, 31 Aralık 2019 günü sona eriyor. Elimizde olmayan nedenlerle mağazamızı kapatıyoruz."* diyerek kapısını kapatmıştır. Lale Plak sahibi Hakan Atala bir röportajında; *"Artık buralar Arap işgalinde. Eskiden batılı müşteri gelirdi. Onlar gidince boşalan yerler her zaman birileriyle doldurulur, şansımıza Araplar geldi. Eskiden dükkâna yüzlerce insan gelirdi; hepsini tanırdım. Şimdi tanıdığım iki elin parmakları kadar."* sözlerini kullanarak aslında yalnızca Lale Plak kaybının mekânsal boyutun ötesindeki sosyolojik olgusuna dokunmuştur (Şekil 6).

İmaj Üretimleri

On dokuzuncu yüzyıldaki Sanayi Devrimi ve aydınlanma düşüncesiyle güç kazanan modernite, yaşam biçimlerini ve düşünce dünyasını büyük bir dönüşüme uğratmış, en büyük etkisi imaj üretimleri olmuştur (Connerton, 2012). Bu yaklaşıma göre, her şeyin kontrol altına alınabildiği bir gelecek yaratmak için önce geçmişten kopmak gereklidir.

Beyoğlu'nda yaşanan modernite etkisi ve imaj üretimlerinin başlangıcına yönelik, Melih Cevdet Anday'ın söylemle-



Şekil 6. Veri çözümlemeleri ile elde edilen kategori matrisi, bağlam ve kültür sanat üretim kodları.

rinden faydalanılabilir. Yazarın, Yiten Söz (1992) kitabında Beyoğlu Güzelleştirme ve Koruma Derneği'nin yaptığı bir toplantıya çağırıldığını belirterek; *"Beyoğlu'nun denetimsizlik, sorumsuzluk, çıkarcılık yüzünden nasıl çirkin duruma geldiğini elbette o toplantıda öğrenmedim. Her dükkâncının, kapı üstüne demir bir çubuk saplayarak ikinci üçüncü katta ise balkonunu, çatısını kullanarak, kendi adını gösteren tabelaları, gözümüze sokması, güzel demir kapıların, taş kabartmaların bu türden reklam levhaları ve bezlerle örtülmesi, eski yapıların ön yüzlerinin üzüntü veren görünüşü… Bu yüzden Beyoğlu Güzelleştirme ve Koruma Derneği Kurulmuş. Şimdi ne mi olacak? Bugünküne pek benzemeyen yeni bir Beyoğlu ortaya çıkacak. Eski Beyoğlu projelerle mi kurulmuştu? Yaşam, eskiden beri bildiğini yapar. Gerçekten de ne güzeldi o Beyoğlu."* cümlelerini kurmuştur. 1980'li yıllarda Beyoğlu'nun içine girdiği yaratıcı yıkım çağının derinleştiğini gördüğümüz bu metin daha derin bir imaj ve projeler mekânına geçişin ilk adımları olmuştur. Ancak, süreç küçük dokunuşlardan büyük projelere dönüştükçe, devlet desteğiyle eskiyi yenileme, canlandırma, ayağa kaldırma adını aldıkça büyük bir tüketici yıkım ortamı tam anlamıyla hızlanmıştır. Elde kalan ise tarihselliği görselleştirmeye çalışan imaj ve sahne detaylarından ibarettir (Bibina, 2017).

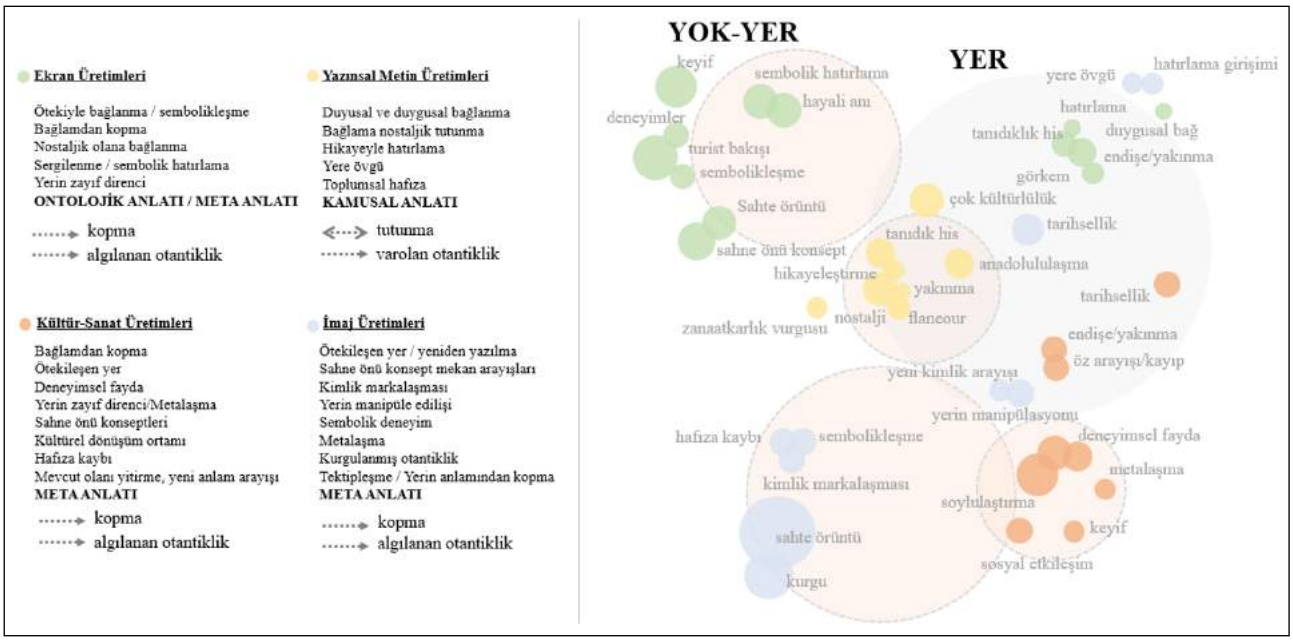
Narmanlı Han'ın yaşadığı süreç de bahsi geçen anlatılarla örtüşmektedir. Melih Cevdet Narmanlı'yı tanımladığı satırlarında, "*Ve iç içe girmiş Sofyalı, Müeyyet, Curnal sokakları. Gökyüzünde gözü Kasap Pireur'un ve yalnızca üç düğmesini iliklemiş yeleğinin. Kâğıt beyazlığında Narmanlı Han, demir pencereli ve bir Çariçe güzelliğinde iç avlulu, bir gazete, bir kuş ve bir tarih çıkması: Aliye Berger ve iki güzel adam, Ahmet Hamdi, Bedri Rahmi ve Lebon, güzel sakallı Namık Kemal, Şinasi, Halit Ziya, Tevfik Fikret.*" ifadelerine yer verirken; dönemin devlet yöneticileri, "*Beyoğlu tarihini kimileri ah eski zamanlar diye okur, kimileri nasıl da değişmiş, şenlenmiş der, kimileriyse bozulduğunu söyleyerek dünden bugünü yorumlar. Biz buranın değişimini çağdaş şehircilik kurallarıyla düzenleyerek, yaşatmaya çalışıyoruz.*" şeklinde bir tanımlama yapmıştır. Özgün alanda toplumsal özneyi aramak yerine mekânsal bir siyasetin hareket ettiği bu kuluçka mekânı üretmek Beyoğlu'nun yeni kaderi olarak karşımıza çıkmaktadır. Var olan yerden yok olan yere doğru ilerletilen bu hamleler ilişkisel ve bağlamsal olanı koparatarak tekil temsillere dönüştürmektedir. Aynı şekilde fotoğraf çekimleriyle deneyim sağlayanların bir dönem Narmanlı'da yaşayan önemli isimlerin duvar resimlerinin önünde poz verdiği ancak Aliye Berger, Bedri Rahmi tanımlarını es geçtikleri dikkati çeker. Bu yaklaşım yapılan eleştiriler ise yakınma şeklinde karşımıza çıkmakta, "*Restorasyon sonrası devasa bir yaş pastaya dönmüş han… Her yere Ahmet Hamdi, Bedri Rahmi, Aliye Berger gibi bir dönem orada yaşayan insanların grafitisini yapınca onları anmış olmuyorsunuz.*" diyerek nesnel ilişkilerin yüzeyselliği ortaya koyulmuştur.[11] Yeni zevk ve talepler, eski zamanların zevklerinin yerini birçok kez almakta, politikacıların retoriğinden gelen büyüme imajlarını güçlendirmekte ve güçlü mekânsal izleri dönüştürme tehdidi sunmaktadır (Huyssen, 2003).

SONUÇ YERİNE

Bazı kavramlar, doğruluklarına bakılmaksızın, özellikle popüler medyadakiler gibi saygı duyulan kaynaklar tarafından yeterli bir düzenlilikle tekrarlanırsa, genel kamuoyu tarafından doğru olarak kabul edilebilmektedir. Otantiklik kavramı da genellikle bu fenomenin bir tanığı şeklinde gelişmiştir. İkilemler doğrultusunda şekillenen otantikliğin anlamına ilişkin sorunlar bugünün toplumlarında oldukça yaygın haldedir. Otantiklik yansımaları da turizm, iktidar, marka, reklam ve kültür gibi deneyim ortamlarında yineleyerek kendini gösterir. Olaylar, yerler ve şeyler yeniden ve yeniden bir otantiklik sürecine dâhil edilerek üretilir, böylece hatırlama yetisi unutmanın ardından gelen yeni bir inşayı başlatmış olur. Buradan hareketle, Beyoğlu geçmişi, tüketim ortamına zemin hazırlar nitelikte kullanılmakta, otantiklik kurgusu bazen yeni bir konseptin içine yedirilirken, bazen de nostaljik bir anlatımla pazarlanabilmektedir. Tanyeli'ne göre, yıkmak ile yapmanın içsel bir bağlantısı vardır. Her yeni, eski ile koşullandırılmıştır. Ne var ki yine de yeni kendisini var eden eskiyi giderek tasfiye etmektedir (Wildner, 2009; Tanyeli, 2017). Bu tüketim ortamı ve onun zamansal kurguları otantiklikle kurgulanan unutma eylemini sağlamlaştırmaktadır. Beyoğlu'nun bir konut olmaktan öteye giden bellek mekânlarının anıtsallığını, Batı'nın tanıştırdığı opera ve danslarını, hikâyelerini, pastanelerini, insanlarını kaybederken olmayanın üzerinden birer imaj nesnesi üretilmektedir (Şekil 7). Bu durum Guy Debord'un Gösteri Toplumu kitabında, çağdaş kapitalist üretim biçimleri toplumlara dev bir seyirlik manzara üretir, şeklinde ifade edilmektedir (Debord, 1996).

Benlik ve yer ruhuyla doyurulmuş bir kültürel alanda yapılacak bir keşif bilişsel boyutun anlatılarda konuyu nereye götürdüğünü görmek ve görsel imgelerle mekânın sosyal boyutta kaybettiklerini somutlaştırmak için önemli bir adım olarak görülmelidir. Bu izlenceden hareketle Beyoğlu'nda görülen mekanik yeniden üretim süreçlerinin ortaya koyduğu durumun yeni bir algısal otantiklik kurguladığı açıktır. Beyoğlu'na yıllar içinde yüklenen özlemler, hikâyeler, sohbetler, buluşmalar, ayrılıklar, sinema, müzik, tiyatro faaliyetleri sürekli değişen yeni bir heyecanın ürünüdür. İnsanlar her fırsatta onu yeniden ve yeniden üretmektedir. Bu yorgunluk halinin önüne geçemeyen Beyoğlu için Fatih Özgüven (2009); *"Ben çocukken gözdeydi, sonra bir sokak kadını muamelesi gördü, şimdilerde yeniden el üstünde tutulan bir hanımefendi sanatçı gibi. Gene yavaş yavaş boyaları dökülmeye başladı, başlıyor. Eskiden beri hep böyle olmuş anladığım kadarıyla. Ne kadar yaldızı dökülmüş, dökülecek olsa da o pırıltının içinden geçip gidecek olmak, itiraf edelim ki bana, hepimize iyi gelir."* ifadelerini kullanmıştır.

Çalışma boyunca toplanan söylemler ve görsel verilerin analizlerinden hareketle, Beyoğlu'nun yaşadığı bu kayma ve güncellenen deneyim ortamının ürettiği sahteliğin önüne geçmek mümkün mü sorusu oldukça önemli hale gelmektedir. Yerin ruh kaybının yaşandığı bir bölgede, kentsel alanların kullanıcıların kontrolünde ve gözetiminde nasıl yer aldığını keşfetmek önemlidir. Konuya birkaç örnek üzerinden bakarak, farklı noktadan çözüme gitmek bir yol olarak denenebilecektir. Liverpool ve Bilbao, son dönemde, terk edilmiş marinaların, eskimiş rıhtım ve depoların çağdaş sanat müzelerine dönüştürülmesiyle gündeme gelmektedir. Farklı bir örnek olarak Londra, Paris ve New York'ta



Şekil 7. Bulguların değerlendirilmesi ve kategori, bağlam ve kodlardan elde edilen Beyoğlu'nda yer ve yok yer kavramsallaştırma sonuçları.

sanatçılar ve soylular, eski göçmen mahallelerine gelerek, proleter barları överek, bu bölgeleri yeni kafeler ve butiklerle doldurmuş, onları zincir mağazalar izlemiştir. Sermayenin ve devletin ekonomik, medyanın ve tüketici zevklerinin kültürel gücüne dayanan evrensel elit büyüme retoriği örnek bölgelerde olduğu gibi Beyoğlu'nu da çevrelemiştir. Bu bakış açısıyla, bahsedilen yerlere ilişkin kök deneyimler ortaya koyulabilirse doğru çözümün bulunabileceğinden bahsedilebilir (Baudrillard ve Adanır, 1998). Beyoğlu için özellikle; yeme, içme, eğlence, kültür sanat, turizm gibi var olan gerçekliklerini mevcut dokusuyla bütünleştirecek keşifleri ortaya koymak önemli görülmelidir. Çünkü, bölgenin bahsedilen gücü, büyüme imajlarının ürettiği temiz ve modern otantikliğin önüne geçebilecek derinliktedir.

[1]Kavramın sözlük tanımlaması; "orijinal, gerçeğe dayanan, gerçek olan, özgün" şeklinde yapılırken, Venedik Tüzüğü (1964) kavramı eski eserlerin ortak bir miras olarak, orijinal zenginlikleriyle beraber taşınması şeklinde tanımlamıştır. Aynı kavram 1977 yılı itibariyle UNESCO'nun belirleyeceği Dünya Miras Alanı seçim ölçütü olarak tanımlanmıştır.

[2]Çalışma boyunca kavram var olan ve algılanan otantiklik şeklinde tanımlanacaktır.

[3]Gazeteci Nilay Örnek tarafından hazırlanan "Her Umut Ortak Arar" isimli internet sayfasında 20 Eylül 2020 tarihli blog yazısı, Temel Apartmanı'nda çekilmiş diziler, yapının tarihsel önemi ve sembolik anlamı üzerine hazırlanmıştır. Yazının başlığı ise, Temel (Masumlar) Apartmanı olarak atılmıştır. Benzer şekilde Yenişafak Gazetesi internet kanalında 25 Kasım 2020 tarihli gündem başlığında Temel Apartmanı haberi ile karşılaşılmış, haber başlık seçimi "dizilerin meşhur apartmanı" şeklinde olmuştur.

[4]Metinde sunulan alıntılar 10.01.2022-20.01.2022 tarihleri arasında İnstagram uygulaması üzerinden yapılan Temel Apartmanı araması sonucunda; yoğun Beyoğlu paylaşımları nedeniyle çalışma kapsamında incelenmek üzere seçilen gazeteci Nilay Örnek tarafından yönetilen @herumutortakarar, Sora Sora Beyoğlu kitabının yazarı ve gezgin kimliği ile Zuhal Floria tarafından yönetilen @banabiyersoyle, mimar Seda Özen Bilgili tarafından yönetilen @seda_ozenn Instagram ve @seda_ozen Twitter hesaplarında yapılan paylaşımlarla başlatılmış, söz konusu hesaplar tarafından paylaşılan görsellere ilişkin yapılan kullanıcı yorumlarıyla çoğaltılmıştır. Hesaplar açık erişimli olup, veriler kartopu örneklem belirleme aracılığıyla genişletilmiştir.

[5]Metinde sunulan alıntılar, 08.01.2022-18.01.2022 tarihleri arasında İnstagram uygulaması üzerinden yapılan "#Şahsiyet" ve "#Masumlar Apartmanı" araması sonucunda yapılara ilişkin ulaşılan görsel paylaşımlar ve yorumlar aracılığıyla elde edilmiştir. Hesaplar açık erişimli olup, veriler kartopu örneklem belirleme aracılığıyla genişletilmiştir.

[6]Gazete sayfaları, 1988 ve 1994 tarihli Taha Toros'un kendi arşivi olan "Kişisel Arşivlerde İstanbul Belleği" başlıklı internet paylaşımından elde edilmiştir.

[7]Abdülhak Şinasi Hisar, 1944 yılında kaleme aldığı "Çamlıca'daki Eniştemiz" kitabında özlem duyduğu dünyayı anlatırken, dönemin Beyoğlu gecelerine odaklanmıştır.

[8]İnsanlar, Mekânlar, Yolculuklar kitabı 1999 yılında Boyut Yayınları tarafından çıkartılmış, Pastane Günleri başlıklı bölümünde özellikle Beyoğlu'nda Markiz, Baylan, Tokatlıyan, Lebon çok kez tekrarlanmış, "Chez Lebon, tout est bon! (Lebon'da herşey iyidir)" sözünü hatırlatmıştır.

[9]2003 yılında Doğan Kitap tarafından yayımlanan, 50'li yaşlarda çok eskiden beri arkadaşlık eden üç kişinin hikâyesini anlatır Beyoğlu Rapsodisi. Sık sık Beyoğlu sokaklarında gezdiren kitap, "Grand Rue De, Pera, Cadde-i Kebir ya da Beyoğlu… Nasıl adlandırılırsa adlandırılsın her an değişen yeryüzünün en büyük tiyatro sahnesi gibidir." der.

[10]Rebul Eczanesi 2014 yılında vitrinine astığı; "1895 yılında hayatına Grand Pharmacie Parisienne olarak başladığında; sinema daha bulunmamıştı, Marconi daha telsizi bulmamıştı, konrat röntgen keşfedilmemişti, Wright Kardeşler henüz ilk yaptıkları uçakla uçmamışlardı, Titanik batmamıştı. Rebul olarak devam eden bu koca çınarı yakında inşaatı başlayacak olan AVM/Otel projesi için taşımak durumunda kalmaktayız." yazısıyla kapılarını kapatmıştır.

[11]Alıntı, yazar tarafından doküman analizi kapsamında gerçekleştirilen internet taraması sırasında, yorum tabanlı bir uygulama platformu kullanıcısının 09.10.2020 tarihli söylemlerinden elde edilmiştir. Yazar, söz konusu açık erişimli paylaşıma 15.01.2022 tarihinde ulaşmıştır. Yapılan alıntının tamamına, https://eksisozluk.com/narmanli-han--147939?p=9 linki üzerinden ulaşılabilmektedir.

ETİK: Bu makalenin yayınlanmasıyla ilgili herhangi bir etik sorun bulunmamaktadır.

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Article

Risk factors affecting blockchain-based smart contract use in architecture, engineering, and construction industry

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ABSTRACT

Management of traditional construction contracts that is frequently preferred in the architecture, engineering, and construction (AEC) industries are affected by many factors due to the complexity and large number of contract documents. With the introduction of Web 3.0 technology, blockchain is considered as a suitable solution for solving many problems arising from traditional contracts and can be considered as an alternative method to traditional contracts in the AEC industry. Using cryptocurrencies, switching to blockchain-based contracts, and using smart contracts will be advantageous for AEC industry in many ways. However, in addition to these advantages, the existence of risk factors cannot be denied. With this background, this study aims to identify risk factors affecting blockchain-based smart contract use in AEC industry through a comprehensive literature review and to prioritize the identified risk factors using Analytic Hierarchy Process, respectively. The prominent risks were found to include implementation risks, followed by legal risks and contractual risks. The contributions of the study to the academic literature are the identification of the risks that may occur during the integration of blockchain-based contracts into the AEC industry and the diagnosis of any problems that may occur during the integration process. Professionals in the field of construction management can also benefit greatly from the findings of this study by analyzing those risks throughout their projects.

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INTRODUCTION

The construction industry involves very long-term work in all stages. In contract processes, the acceptance and signature processes of the parties and transferring money to the accounts take days (Di Giuda et al., 2020). Moreover, every person and institution that acts as an intermediary receives a commission and it is seen that the loss of time and money is over-much (Kim et al., 2020). The traditional contract system is affected by a lack of communication between stakeholders and defective planning and scheduling, major accidents (Chaveesuk et al., 2020). Some of the risks of the traditional contract

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system have been solved by converting this system through blockchain-based smart contracts. For this reason, smart contract applications are considered a very facilitating application for the AEC industry (Chaveesuk et al., 2020; Lamb, 2018).

A smart contract is a self-managed program used to implement automated transactions agreed by the parties (Governatori et al., 2018). It seems possible to replace this whole system with a block network by eliminating the agreements and uncertainties made with each of the stakeholders of the construction projects separately. However, new risk factors have emerged through the integration of blockchain technology in AEC industry. Considered that a construction contract management that can solve the challenges inherent in the construction industry is required (Luo et al., 2019), it is crucial to identify risk factors affecting blockchain-based smart contract use in AEC industry. Thus, the use of blockchain-based smart contracts can be learned, widespread, and used effectively in the AEC industry. The identified risks are important in terms of determining the topics to be focused on in the future studies. In addition, stakeholders know the risks they may encounter in advance and make risk management accordingly. Determining these risks will contribute to the determination of the strategy that will minimize the problems that may occur during the integration of blockchain technology into the AEC industry. For the smart contracts based on the blockchain to be understood by the project stakeholders, the risks they undertake must be identified and measured, the control points must be determined, and the risks must be prioritized.

It is a known fact that technological adaptation process of the AEC industry falls behind in comparison with other industries due to the reasons such as high complexity and structural fragmentation of the sector, the limited degree of repeatability of construction projects, weak collaboration, and insufficient investment in innovation (Sigalov et al., 2021). Although the necessity of the AEC industry to adapt to technological advancements is frequently emphasized in the literature, there are not many studies that explain the reasons behind this slow adaptation process in terms of smart contracts. On the other hand, the number of studies focusing on smart contracts is relatively few in numbers compared to the numbers of studies in other areas of construction management. In addition, these studies mostly focus on either explaining the benefits of adapting these applications for the industry or the usage of smart contracts in supply chain management, information management, and integrated asset delivery domains (Scott et al., 2020; Güven and Aladağ, 2022). This study provides literature-based information to aid in mitigating risks that arise from using smart contracts in the AEC industry. Thereby, it will be possible to contribute to the prevention of delays experienced by the AEC industry in the adaptation process to technological developments due to identified risk factors related to smart contract use in AEC industry. Thereby the usability, acceptance, and readiness of the AEC industry for smart contract use will arise. By identifying the risks, risk weights, and impacts associated with the use of smart contracts in the AEC industry, it also supports the necessary technological adaptation required by the AEC industry. This innovative approach serves as a guiding resource for industry stakeholders.

BLOCKCHAIN-BASED SMART CONTRACTS IN AEC INDUSTRY

The Fourth Industrial Revolution has quickly been changing the modern climate. The construction industry is also an example of different intermingling exercises that have occurred by coordinating arising innovations such as robots, building data displaying, expanded reality, augmented reality, web of things, and blockchain innovation. (Kim et al., 2020). The construction industry has adopted certain patterns regarding the production process for various internal and external impossibilities and practical reasons. In addition, when the developing and changing conditions are considered, restructuring is inevitable (Arslan, 2018).

The construction industry has been using formal contracts for many years to define and enforce the obligations and rights of the contracting parties (Cook and Hancher, 1990). Blockchain technology has great potential to manage contracts because it is strong against external attacks and its past transactions are almost impossible to change and the entire system works without the need for a central authority (Watanabe et al., 2016). The effective intermingling of blockchain innovation with the construction industry could lead to inventive changes by expanding the productivity of agreements and exchanges and making new plans of action (Kim et al., 2020).

For the project stakeholders to cope with the competitive environment in the construction industry, tenders must be completed successfully and result in certain profit margins for the parties. In this context, one of the priority issues affecting the performance of the projects is contract management (Odeh and Battaineh, 2002). Moreover, loss of time is a very big problem for the construction sector that requires high investment. For this reason, applications that benefit time management should be developed. Although several industries are now surveying and testing blockchain applications in their actions, its consideration in the construction industry is still inadequate and at a conceptual level (Mason, 2017).

The present studies related to smart contracts can be grouped under the headings of incorporating blockchain

technology into smart contracts and integrating smart contracts into the AEC industry. Chatterjee et al. (2018)'s research is a quantitative analysis of smart contracts, and they discussed the topics describing the weaknesses of smart contracts. Although this article does not fully show the weaknesses in the AEC industry, it is important in terms of explaining the features that smart contracts have themselves. Dakhli et al. (2019) and Luo et al. (2019) figure out the potential of blockchain in the construction industry and they also mentioned the limitations of the implementation. Kim et al. (2020) also mentioned the implementation risks. Lauslahti et al. (2017)'s research focuses on implementational, technical, and legal risks. Watanabe et al. (2016), Magazzeni et al. (2017), Staples et al. (2017), Lamb (2018), Mohanta (2018), Wang et al. (2019), Yıldız (2019), and Gedik (2020)'s study helps to understand the legal aspects of smart. Likewise, Governatori et al. (2018) discussed the lifecycle of blockchain-based contracts and explained some of the problems that may occur in the process. Kemmoe et al. (2020)'s research is also about the smart contract but in a technical way. Zheng et al. (2017) and Di Giuda et al. (2020) handle the digital transformation of the construction industry. While describing the integration between BIM and blockchain, they made inferences about the integrations that can be made with the blockchain. Gurgun and Koc's (2020) study emphasize the risk challenges of smart contract implementation on construction projects, but this research focused on administrative risks. Wang et al. (2019)'s study has general information about blockchain technology in the AEC industry. Although Khatoon (2020) has discussed the use of blockchain-based smart contracts for the health-care sector, implications for the construction sector have been reached by considering the profits and losses of the current implementation. The examples of studies generally focus on the potentials, benefits, and gains of this integration, it is seen that the process needs literature support in terms of risk management.

RISK FACTORS ON BLOCKCHAIN-BASED SMART CONTRACT USE IN THE AEC INDUSTRY

In line with the aim of identifying risk factors affecting blockchain-based smart contract use in AEC industry, a comprehensive literature review was conducted. As a result, a total number of 30 risk factors were identified and classified under six groups. Table 1 shows the identified risk factors. Detailed information about the main and sub-risk factors is given in the next section.

Contractual Risks

Contract risks are listed as one of the three main criteria of directorial risks challenging the adoption of smart contracts in the AEC industry (Gurgun and Koç, 2021).

- Non-changeable contract clauses (Irreversibility): Due to its irreversibility, it should be added to the contract definition by considering all scenarios that may require changes in the contract in cases where the contracts do not meet the demands (Gedik, 2020). While technically some updates can be made, all history is recorded in the blockchain system (Wang et al., 2019; Chatterjee et al., 2018). If the contract is not carefully formulated, it is almost impossible to solve the problems that will arise (Yıldız, 2019).
- Language Paradigm: A smart contract program with no natural language equivalent can be generated. However, this can affect conflict resolution and contract formation due to the type of programming language, leaving the contracting parties alien to their own will (Governatori et al., 2018; Magazzeni et al., 2017). In addition, the translation of the smart contract, which is a "program code," into local languages carries a risk (Gedik, 2020).
- Archiving of the Contract: In addition, the irreversibility feature of smart contracts can also bring the risk that parties will not have the opportunity to negotiate the terms of the contract (Watanebe et al., 2015).
- Interpretation of the Contract: The "if/then logic" eliminates gray areas in contracts while reducing contractual conflicts. However, new conflicts may arise when the programmer misunderstands the customers' requests, and a brand-new markup language must be created to prevent this (Lamb, 2018; Magazzeni et al., 2017).
- Termination: Since smart contracts are not suitable for changes, parties that are not satisfied with the terms cannot withdraw from the contract and termination cannot be made (Yıldız, 2019; Governatori et al., 2018). In addition, to ensure security in the network in a detected vulnerability, the contract must self-destruct (Wang et al., 2019).
- Dispute Resolution: There are risk factors such as the lack of a resolution mechanism and the ineffectiveness of lawyers in the resolution of disputes (Gurgun and Koç, 2021). On the other hand, considering the bindingness of contracts, consent-based solutions can be tried in the blockchain (Governatori et al., 2018).

Financial Risks

Financial risks that may be encountered in the implementation of smart contracts are considered under five sub-risk factors such as initial cost, transactional costs, energy consumption, taxes, and attitudes toward payment of stakeholders.

- Initial Costs: The initial cost is an obstacle to the use of smart contracts and cannot be considered a cheap contract (Kandiye, 2020; Savelyev, 2017). In addition, translating the contract language to code is costly (Lamb, 2018).

Table 1. Risk Factors Affecting Blockchain-based Smart Contract Use in AEC Industry

Risk Factors	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**	**15**	**16**	**17**	**18**	**19**	**20**	**21**	**22**	**Freq.**
Contractual Risks																							
CR-1																							
Non-Changeable Contrac Clauses (Irreversibility)	X	X	X			X												X			X		6
CR-2																							
Language Paradigm				X		X								X									3
CR-3																							
Archiving of the Contract						X	X											X	X			X	5
CR-4																							
Interpretation of the Contract	X													X	X						X		4
CR-5																							
Termination						X															X		2
CR-6																							
Dispute Resolution				X		X															X		3
Financial Risks																							
FR-1																							
Initial Costs				X			X				X				X			X					5
FR-2																							
Transactional Costs				X							X					X		X					4
FR-3																							
Energy Consumption							X	X								X		X		X			5
FR-4																							
Taxes			X																		X		2
FR-5																							
Attitudes Toward Payment of Stakeholders					X	X	X				X												4

Risk Factors	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**	**15**	**16**	**17**	**18**	**19**	**20**	**21**	**22**	**Freq.**
Implementation Risks																							
IR-1																							
Fluxional Nature of Construction	X	X			X	X	X	X	X	X		X	X	X	X	X	X		X					15
IR-2																							
Inconvenience to Complex and Huge Projects						X							X								X		3
IR-3																							
Pitfalls of Interoperability	X	X			X	X	X	X	X	X		X	X	X	X	X	X		X	X	X			17
IR-4																							
Unfamiliarity of Smart Contract Use	X	X				X	X	X	X	X	X	X	X	X	X	X	X		X		X			16
IR-5																							
Later Changes to the Project						X															X		2
IR-6																							
Audit Deficiencies				X	X	X															X		4
IR-7																							

Table 1. CONT.

Risk Factors	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	Freq.
Rigidity of the Smart Contract	X					X					X					X					X	X	6
Security Risks																							
SR-1																							
Dishonest Interactions	X				X			X									X			X	X	X	7
SR-2																							
Privacy Leakage	X		X	X			X	X	X							X		X		X		X	10
SR-3																							
Hacks and Theft of Cryptographic Keys	X		X				X	X			X							X				X	7

Risk Factors	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	Freq.
Technical Risks																							
TR-1																							
Coding Errors	X					X	X	X			X	X		X		X	X	X			X		13
TR-2																							
Transaction Speed	X			X												X		X					5
TR-3																							
Storage		X		X			X	X								X		X					6
TR-4																							
Scalability	X	X		X		X	X											X					6
TR-5																							
Complex Structure	X	X	X	X		X	X	X				X				X		X	X	X			12
TR-6																							
Lawyer/ Programmer Requirement			X			X	X				X												4
Legal Risks																							
LR-1																							
Legal Status of Smart Contracts	X	X	X	X		X	X	X			X	X				X	X	X			X	X	14
LR-2																							
Determination of the Legal System to be Applied			X			X					X	X				X	X	X					7
LR- 3																							
Shortcomings of Current Legal Arrangements			X	X		X					X					X	X	X			X	X	9

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1. Chatterjee et al. (2018), 2. Dakhli et al. (2019), 3. Gedik (2020), 4. Governatori et al. (2018), 5. Di Giuda et al. (2020), 6. Gurgun and Koç (2021), 7. Kandiye (2020), 8. Kemmoe et al. (2020), 9. Khatoon (2020), 10. Kim et al. (2020), 11. Lamb (2018), 12. Lauslahti et al (2017), 13. Luo et al. (2019), 14. Magazzeni et al (2017), 15. Mohanta (2018), 16. Staples et al (2017), 17. O'Hara (2017), 18. Wang et al. (2019), 19. Watanebe et al (2015), 20. Watanabe et al. (2016), 21. Yıldız (2019), 22. Zheng et al. (2017).

Exist
Not Exist

- Transactional Costs: Blockchain transactions are not free because computing power consumes energy (Governatori et al., 2018). It is more costly to add records to the blockchain compared to traditional contracts (Staples et al., 2017).
- Energy Consumption: The blockchain system works based on computing power. For this reason, it is widely criticized in terms of energy expenditure (Lamb, 2018; Watanebe et al. 2016). One of the examples of blockchain applications, the Bitcoin network consumes enough

energy to power more than 1.3 million households according to Microsoft (Dakhli et al., 2019). The worldwide pool of computers performing cryptographic operations generates significant electricity usage, many of which do not directly produce a successful solution (Staples et al., 2017).

- Taxes: The development of smart contracts based on blockchain technology and its widespread use of it in the financial sector will bring along taxation problems in all legal transactions, such as the determination of the taxpayer, the type of income obtained, and the determination of the tax base (Gedik, 2020). With the standardization studies of blockchain and smart contracts, protocols should accelerate (Yıldız, 2019).
- Attitudes Toward Payment of Stakeholders: The relationship between the parties is characterized by the presence of asymmetric information, so conflicts that occur create distrust. The atmosphere of distrust also prevents the execution of the contract (Di Giuda et al. 2020). Although the payments made through contracts are advantageous for contractors and subcontractors, it may be a disadvantage in the process of completing the missing work for employers (Kandiye, 2020).

Implementation Risks

Aside from the deadlocks of blockchain-based smart contracts, there are also more sectoral risk elements to be brought by their use in the AEC industry. The complex processes of construction work create unpredictability. In this case, the execution phase of integration into the AEC industry also constitutes risk factors.

- Fluxional Nature of Construction: The impossibility of predicting certain construction process variations makes it difficult to execute smart contracts efficiently (Di Giuda et al., 2020). In addition to the opportunities they bring, smart contracts can also cause some damage with faulty applications, and DAO (decentralized autonomous organization) is one the example of this damage (Lauslahti et al., 2017).
- Inconvenience to Complex and Huge Projects: Gurgun and Koc (2021) emphasize the importance of the nature of construction projects and define them as unique and complex (Gurgun and Koc, 2021).
- Pitfalls of Interoperability: Blockchain research in the AEC industry is still inadequate and conceptual (Di Giuda et al., 2020). This integration has the potential to solve these critical problems in data security, storage, and transactions, especially blockchain technology (Khatoon, 2020).
- Unfamiliarity of Smart Contract Use: It is important to have basic policies and standards that protect stakeholders' rights and ensure legitimate transparency before full implementation (Lamb, 2018). Traditional technology may be considered a better option until the technology matures (Lam et al., 2007). Lack of awareness and understanding about blockchain hinders the spread of this technology and this technology dating back to 2008 is not mature enough yet (Dakhli et al., 2019; Staples et al., 2017).
- Later Changes to the Project: This factor involves requests for changes in the contract, scope changes, etc. It may be necessary to amend the contract clauses.
- Audit Deficiencies: Audits are important as distributed ledger systems will open new opportunities for automatic payments, which raise important legal issues (Governatori et al. 2018). Inadequacies in overseeing the fulfillment of contractual responsibilities pose a new risk. In a smart contract, it is difficult to determine in real life whether the code-providing performance is appropriate or whether the contract conditions are met.
- Rigidity of the Smart Contract: Due to the rigidity of the smart contract, there is a decrease in trust, communication, and interaction between the parties. Chatterjee et al. (2018) mentioned the sharp limits and immutability of the contract (Chatterjee et al, 2018).

Security Risks

Security risks are listed as one of vital risks challenging the adoption of smart contracts (Chatterjee et al., 2018; Wang et al., 2019).

- Dishonest Interactions: The security of smart contracts is in the hands of developers who cannot devote enough time and focus enough to provide this security (Kemmoe et al., 2020). Since the contract consists of code, anything hackers do is allowed within the contract (O'Hara, 2017). Malicious behavior is difficult to control because there is no effective regulatory mechanism (Wang et al., 2019).
- Data Privacy Breach: The transparency feature of blockchain technology is one of the reasons why it is rejected by many potential buyers. Institutions such as governments should protect access to sensitive data for various reasons. Establishing privacy on a blockchain is difficult due to its transparency feature, as any user can make a complete copy of all transaction history (Staples et al., 2017; Khatoon, 2019). Besides, not only transactions but also contract-related information is public, which leads to security vulnerability (Wang et al., 2019).
- Hacks and Theft of Cryptographic Keys: It has been stated that although users only transact with their own private key, there may be a privacy leak in the blockchain (Zheng et al. 2017). The private system keys of the network participants somehow fall into the hands

of the attackers, giving them the chance to reverse the transaction history or the luxury of access to the entire database (Dakhli et al., 2019). Wang et al. focused on the hacking problem in smart contracts (Wang et al., 2019).

Technical Risks

Blockchain-based smart contracts have some technical risks just because they are included in the blockchain system due to being very new and having unexplored areas (Wang et al., 2019).

- Coding Errors: Problems may occur due to coding errors in the smart contract, so the code that creates the smart contract must be flawless and error-free (O'Hara, 2017; Gedik, 2020; Chatterjee et al, 2018). The contract needs to be updated to tolerate the detected errors (Wang et al., 2019). If there is an error in the code, the contracting parties will not know about the error, but the execution of this error will now be intended by the smart contract owners without their prior knowledge (Magazzeni et al., 2017). One party will be compelled or misled to assume an unfair obligation (Lamb, 2018; O'Hara, 2017; Governatori et al., 2018).
- Transaction Speed: In today's technology, blockchain structures have high latency when transactions are validated and added to block logic (Gedik, 2020). Due to the limited block size, the speed of writing transactions also slows down (Dakhli et al., 2019). In addition, when an existing contract needs to be updated, the data in the previous contract is not transferred directly. This data must be re-entered manually, and it causes slowness and clumsiness (Wang et al., 2019).
- Storage: Another problem with blockchains is that they are not suitable for storing big data, that is, large volumes of data or high-speed data (Staples et al., 2017). The system needs data storage and bandwidth because the limited block size available slows down the writing of transactions (Dakhli et al., 2019). Due to the consensus mechanism, the transactions made at each node are stored and this storage causes the amount of data in the network to be too large (Kandiye, 2020).
- Scalability: Blockchain cannot be configured. In other words, it is also very difficult to correct errors or make other adjustments (Kandiye, 2020). Scalability is a big problem and uncertainty. Chains accumulate over time to create a larger block, and larger blocks mean larger storage space and slower propagation across the network. This carries the risk of gradual centralization. Bitcoin block size is limited to 1 MB and a block is mined every ten minutes, the time loss that this will bring leads to centralization in the long run (Zheng et al., 2017).
- Complex Structure: It is known that the high block creation speed compromises the security of Bitcoin (Zheng et al. 2017). The complex structure of blockchain technology is an issue that has been extensively studied in the literature.
- Lawyer/Programmer Requirement: Knowledge of blockchain technology should be available not only to the expert who wrote the contract but also to legal teams, IT, and management teams of companies (Lamb, 2018). In this case, tax experts will need to work with code experts to incorporate tax rules into blockchain applications (Gedik, 2020). The lack of experts who know blockchain technology and contract law and the need for these experts will be an obstacle for blockchain applications to become widespread in the future (Kandiye, 2020). There is a need for legal and administrative personnel in favor of coding the parameters of a contract by a programmer.

Legal Risks

While there might be strong market opportunities to embrace a new internet era, the law does not move into new ages with the same speed (Goanta, 2020). Regulatory bodies have not caught blockchain innovation yet, and this negatively affects the adoption of blockchain by businesses in industries (Kandiye, 2020).

- Legal Status of Smart Contracts: The legal status of these contracts is currently under debate (Staples et al., 2017, Lauslahti et al. 2017). It is expected that it will take decades for blockchain technology to have a legal standard and to determine the necessary policies in this regard (Dakhli et al., 2019). In addition, the lack of a regulation mechanism against bad behavior caused by legal deficiencies makes it difficult to control (Wang et al. 2019).
- Determination of the Legal System to be applied: It is still unclear how courts will respond to contract terms written in the form of a code as legal issues arise (Lauslahti et al., 2017). It is impossible to find a clear answer that applies to smart contracts in legal matters, and therefore, situations should be analyzed on a case-by-case basis (Lauslahti et al. 2017). One wonders how the world's financial system will cope with a company that is not registered in any state and has no employees (O'Hara, 2017). Yıldız (2019) mentioned the dangers of using smart contracts synonymously with contracts in the legal sense due to their nature (Yıldız, 2019).
- Shortcomings of Current Legal Arrangements: Due to the lack of an effective regulatory mechanism in smart contracts, malicious behavior is difficult to control (Wang et al., 2019). There is a need for a formal framework to control smart contract errors from a security point of view, as errors in smart contracts have direct economic consequences and there is no compensation for these errors (Chatterjee et al., 2018; Lamb, 2018). Rules and regulations cannot be enforced

at the same time as technological advances. It is expected that it will take decades for blockchain technology to have a legal standard and to determine the necessary policies in this regard (Dakhli et al., 2019). Since the law is open to violation due to the lack of existing legal regulations and allows many vital freedoms, especially civil disobedience, it is necessary to make changes in tax laws in parallel with technological developments (O'Hara, 2017; Gedik, 2020).

RESEARCH METHODOLOGY

There are several methods available for risk identification such one-to-one interviews, brainstorming, the nominal group, and Delphi techniques. (Chapman, 2001). To avoid the unclarity of given answers in face-to-face (or online) interviews (Voldnes et al., 2014), a qualitative and explorative approach (comprehensive literature review) was used in line with the purpose of determining potential risk factors since the subject discussed is new, the examples that have been applied are not widespread and it promises a popular research area. After then, with the aim of prioritization of the identified risk factors, study adopts Analytic Hierarchy Process (AHP) which is a commonly used Multi-Criteria Decision-Making (MCDM) method that aims to determine the best alternative by considering more than one criterion in the selection process. The stages of research methodology used in this study are as in Figure 1.

In the first phase of this study, a preliminary literature review was conducted to identify research problems, objectives, and research methods that would effectively address the research questions. During this stage, it was discovered that although the need for the AEC industry to adopt smart contracts is frequently emphasized in the literature, there are few studies that focus on revealing potential risk factors that may hinder smart contract

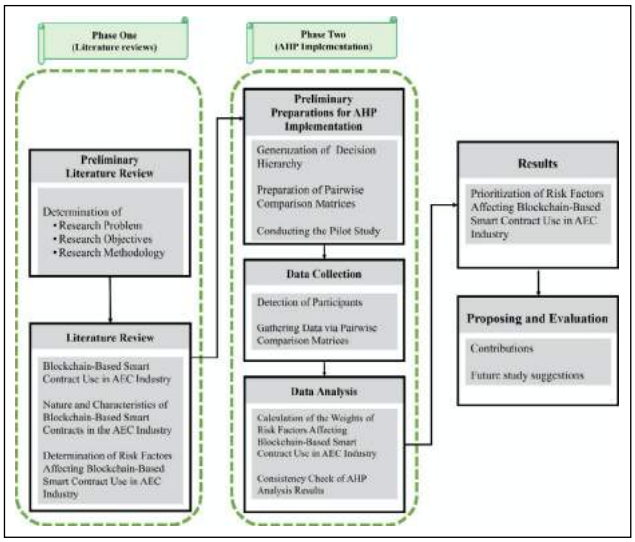

Figure 1. Research methodology stages.

adaptation in the AEC industry (Güven and Aladağ, 2022). Based on these findings, the aim of this study is to identify risk factors that impact the use of blockchain-based smart contracts in the AEC industry through a comprehensive literature review, and to prioritize these risk factors using the AHP. Afterward, a comprehensive literature review was conduction related to (1) Blockchain-based smart contract use in AEC industry, (2) nature and characteristics of blockchain-based smart contracts in the AEC industry, and (3) determination of risk factors affecting blockchain-based smart contract use in AEC industry. The previous sections present the outcomes of literature review phase. From the preliminary literature review, AHP was also determined as an adequate method in line with the aim of identifying the significance level of identified risks factors among other MCDM methods because multilateral data collection is more practical compared to other methods (Aggarwal and Singh, 2013). In addition, AHP method was selected due to (1) its ability in analyzing complex situations and making sound decisions, (2) being flexible and can be used as a stand-alone tool to resolve construction decision-making problems, (3) advantage of using a small sample size, (4) high level of consistency, and (5) simplicity (Darko et al., 2019). There are many studies using AHP method in construction management domain and one of the most common studies among these studies is related to risk management (Bigdeli et al., 2021; Kucuker and Cedano Giraldo, 2022; Cimino et al., 2023; Mandal et al., 2023).

AHP implementation starts with constructing the problem structure and pair-wise matrices of the components (Saaty, 1990). Data are relatively compared by experts in terms of certain criteria. In this way, the scale of the weights of the data is determined. AHP builds on six basic stages: (1) the composition of a decision-making problem (aim); (2) defining criteria and sub-criteria; (3) generating pairwise comparison matrices; (4) assessment of the relative value or priority of each decision criterion; (5) calculation of the weights of the criteria and priorities; and (6) analyzing the consistency (Saaty, 1990). It is possible to prioritize the available data by structuring the identified problem and thus determining priorities in line with various criteria. In this step, complex problems can be solved by comparing criteria and other possibilities and determining sub-criteria. Thus, in the second phase of the research, first, decision hierarchy (Figure 2) and pair-wise comparison matrices were generated as the Stages 1, 2, and 3 of AHP implementation.

Second, a pilot questionnaire study was carried out with the feedback of nine experts, who declared that they have advanced level knowledge of contract management and whose active years in the sector ranged from 13 to 17. The main motivations for conducting a pilot study were first to validate the determined risk factors affecting blockchain-based smart contract use in AEC industry and second to

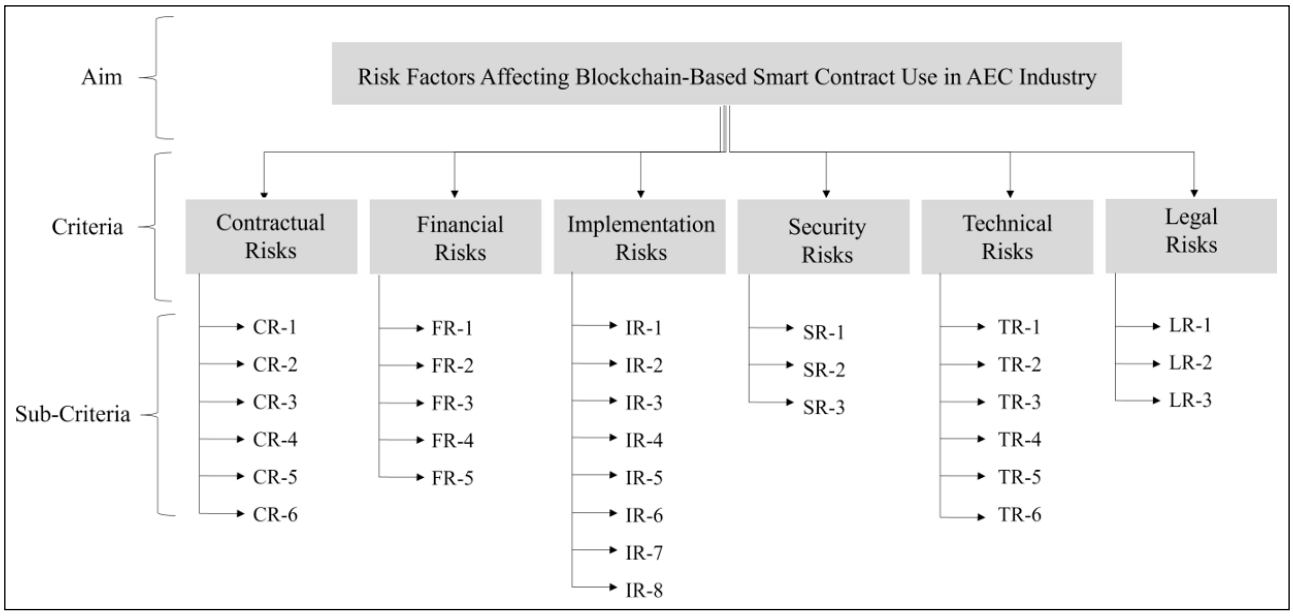

Figure 2. Decision hierarchy.

guarantee the relevance and clarity of questions related to pairwise comparison matrices. For the pilot study, first, a survey was prepared, and afterward the prepared survey file was sent to experts (pilot study participants) to request feedback within the received feedbacks. After updating the current survey based on experts' feedbacks, the pilot study was finalized (i.e.: some main titles were named with more inclusive names). The process of identifying experts was as follows: Emails were sent to the management of leading construction firms with the idea that the sought-after experts should have knowledge and expertise in contract management and technological developments. At the same time, a list of experienced experts in the construction industry was compiled through user profiles on the LinkedIn website. This list was expanded by adding experts whose names appeared in past academic studies, resulting in a contact list of more than 150 experts. As a result of the scientific research call sent to experts, some experts indicated that they could not spare the time to participate in such a study, while another group of experts refused to participate due to their lack of sufficient knowledge about smart contracts, despite their experience in the field. Some experts withdrew from the study, stating that they did not have the qualifications to provide opinions on this topic due to insufficient fieldwork on smart contracts. Hereby, the pilot study was conducted with the feedback of nine experts that voluntarily participated in the study among a compiled list of experts with a number of 150. Following the completion of the pilot study, the data collection phase was started to perform the remaining stages of AHP (stages 4, 5, and 6). The second phase of the research continues with the data collection and analysis.

DATA COLLECTION

In the data collection stage, the risk factors were compared by experts to determine the relative importance of the risks. Participants were asked to evaluate which of the two risk factors carries the greater risk for the integration of blockchain-based smart contract use in AEC Industry using Saaty's pair-wise comparison 1–9 scale (Table 2). Intermediate values of 2, 4, 6, and 8 are used in the expression of uncertainty between two options. When the decision maker is in doubt or unsure about prioritizing the data when comparing two data, she/he chooses an intermediate value. In this stage, the judgments of experts were obtained in n × n comparison matrices.

In this research, to determine the relative importance of risk factors, they were compared in pairs by both online questionnaire and questionnaires presented through face-

Table 2. Saaty's pairwise comparison scale (Saaty, 1990)

Judgments	Value
Equally important	1
Intermediate value	2
Moderately important	3
Intermediate value	4
Strongly important	5
Intermediate value	6
Very strongly important	7
Intermediate value	8
Extremely important	9

to-face interviews. Respondents were asked to prioritize the risk factors on the main criteria and sub-criteria among themselves. Within the scope of this study, data were collected through interviews that were held with five experts from the same group of pilot survey participants (The pilot survey was conducted with nine experts, while four experts could not continue with the study due to personal reasons).

AHP is based on a principle to make decisions; experience and knowledge of people are at least as valuable as the data they use (Vargas, 1990). Therefore, the small number of participants does not create an obstacle to draw meaningful conclusions from the gathered data. The small number of participants in the survey, that is, the number of samples, may negatively affect the interpretation and conclusion of the data analysis, but it is possible to obtain robust and statistically significant results since the selected samples are made up of experts using AHP (Dias and Ioannou, 1996). It should be noted that there are studies in the literature indicating that a minimum of four people is sufficient to obtain valid and reliable results in AHP analysis. In Çenet's study, a statistic related to studies including AHP in the construction management domain is available, and it is seen that generally a total number of 4–9 samples are frequently used in those studies (Çenet, 2021). The main reason for using a small number of participants in AHP is derived from the high level of experience and/or knowledge expected of the participants, which ensures valid results despite working with smaller groups in AHP method applications (Deng, 1990). Since the data in the AHP are based on expert judgments, it can be claimed that even one expert's opinion is a general representation (Golden et al. 1989). In other words, AHP is based on a principle to make decisions; experience and knowledge of people are at least as valuable as the data they use (Vargas, 1990). According to Lam and Zhao, AHP does not require the use of large samples since it is a method that focuses on a specific subject and feeds on subjective information (Lam and Zhao, 1998). The small number of participants in the survey, that is, the number of samples, may negatively affect the interpretation and conclusion of the data analysis, but it is possible to obtain robust and statistically significant results since the selected samples are made up of experts using AHP (Dias and Ioannou, 1996). However, it is still imperative for researchers to consider the AHP sample size selection with special care, as the potential impact of an optimally selected sample size on decision outcomes cannot be ignored (Darko et al., 2019). Exactly how much the identified risks will affect the AEC industry and their degree of effectiveness will be determined based on the subjective judgments of the participants, rather than a mathematical measurement. In this case, as stated in Lam and Zhao's study, since it is not easy to find and verify objective effectiveness criteria after finding them (Lam and Zhao, 2006), attention was paid to the advanced level of expertise of the selected participants. The participants' experience level in AEC industry and their knowledge level in contract management were categorized as beginner (1–5 years of experience), proficient (5–10 years of experience), and advanced (10+ years of experience), depending on their duration of experience in the sector. The competency levels of survey participants are found in Table 3.

When Table 3 is examined, the participants are eligible for ensuring the expected high experience, knowledge, and competency to make interpretations about the smart contract use in construction industry. In addition, experts in a certain region/country might have a narrower perspective on the subject due to the insufficient use and/or awareness of the smart contract concept in their respective construction industry. Therefore, in the selection of participants for AHP analysis, having experience in international projects along with experience in the construction sector and contract management was one of selection criteria. Thus, these five experts were competent to shed light on data related to the industry, as they have international project experience, not just knowledge of the use of smart contracts in a single country/region.

Table 3. Competence levels of survey participants

ID	Proficiency	Experience in AEC sector	Region	Experience in contract management
R1	Civil Engineer	Advanced level	Middle East and Asia	Advanced level
R2	Civil Engineer	Advanced level	South America, Middle East, and Asia	Advanced level
R3	Contract Manager	Advanced level	Africa, South America, Australia, Middle East, and Asia	Advanced level
R4	Construction Control Manager	Advanced level	Australia, Middle East, and Asia	Advanced level
R5	Company Owner/ Civil Engineer	Advanced level	Middle East and Asia	Advanced level

DATA ANALYSIS

After data collection, calculation of the weights of risk factors and consistency check of AHP analysis results should be performed.

The risk factors were compared among themselves to determine the relative importance of the risks obtained from the literature data. First, the identified parent risks were evaluated among themselves, and then the subcategories of these risks were evaluated among themselves. The questionnaire asked from the participants is to evaluate how important the two risk factors are over each other, through the comparison format as shown in Table 2.

With the knowledge that AHP does not require perfect consistency (Garbuzova-Schlifter and Madlener, 2016), the consistency of the obtained comparison matrices was tested. To evaluate the data of all participants together, the geometric averages of the data were taken. Conducting the contrast matrices pairwise, the consistency is found by the usage of eigenvalue, λ max, to determine the consistency index (CI). The steps required by AHP were executed with Microsoft Excel®. According to the calculations, to improve the consistency of the results containing unacceptable inconsistency, various corrections were proposed, and the survey data were updated by communicating with the survey owners. Since the subjective judgments of the decision makers are involved in the AHP method, the consistency of these judgments cannot be automatically guaranteed. For this reason, it is necessary to verify the consistency of the data (Darko et al., 2019). Consistency ratio is a checking method that should be <0.1. The CI of the participants was found as valid by taking values below 0.1. For this reason, it has been proven that the data collected is consistent. At this stage, the method of reaching the group judgment suggested by Saaty (1988) was used by including only the expert judges who were found to be consistent. Therefore, the geometric mean method was applied to obtain the consensus of the experts. Here, again, the GCR should <0.1 to prove the consideration of group judgment. Table 4 presents the importance level of main and sub-risk factors according to the AHP analysis.

According to the AHP analysis results, the most important risk factor group was found as implementation risks whereas financial risks were found as the least important risk group with an effect on blockchain-based smart contract use in AEC industry.

DISCUSSION OF FINDINGS

In this study, a total of 30 risk factors under six main risk factor groups regarding the use of smart contracts in the AEC industry were determined and AHP methodology was applied for prioritizing the identified risk factors to find their importance level in AEC industry. According to the AHP analysis results, the most important risk factor group was found as implementation risks whereas financial risks were found as the least important risk group with an effect on blockchain-based smart contract use in AEC industry.

Although information technology has advanced, various administrative risks have caused construction projects to be slow to adapt to these innovations. The application and adoption of smart contracts in AEC industry are challenging due to uncertainties, change orders, and conflicts. In the study by Gurgun and Koç, stakeholders were shown to be skeptical about the implementation of smart contracts in the AEC industry in the perspective of mentioned uncertainties and conflicts during their administration (Gurgun and Koç, 2021). Therefore, implementation risks are considered as a result that is expected to have the highest degree among prioritized risks.

Within the implementation risk factor group, "Rigidity of smart contract (IR-7)" was found as the risk factor that has the highest weight in its cluster. The rigidity of smart contracts and their refusal to accept changes or revisions are very challenging for the AEC industry, as it involves processes of constant renewal, revision, and redesign (Chatterjee et al., 2018; Kandiye, 2020; Kemmoe et al., 2020). Changes in the contractually agreed scope might require the addition or removal of certain work steps, resulting in an update of the BoQ or the billing plan (Sigalov et al., 2021). For the subsequent modification of billing arrangements, BIM and common data environment (CDE) integration is highly recommended by the authors. This integration will also provide flexibility through the versioning of the smart contract stored in a CDE and, thereby, of its internal files that are affected by the changes (Sigalov et al., 2021). On the other hand, studies suggest that changes and revision requests frequently occurring in construction projects lead to disputes between parties (Mason, 2017; Governatori et al., 2018). For this reason, it is obvious that the need for a continuous change and revision process due to the rigidity of the smart contract will create extra pressure on the parties in terms of time and cost effects. Thus, there is a need for smart contracts to show the necessary flexibility based on these revisions. However, since smart contracts do not accept a change retrospectively (irreversibility), this situation is considered as a crucial risk factor. As mitigation risk response, it is possible to carefully formulate the contract and add all possible situations that may require a change to the contract definition (Yıldız, 2019; Gedik, 2020). On the other hand, the immutable nature of smart contracts may compromise some of the rights of the contracting parties. This is because it is very difficult, sometimes even impossible, to make any changes to the smart contract that has been implemented. Although it is possible to make minor changes by adding data to the system later, this change does not mean that the relevant

Table 4. Importance level of main and sub-risk factors

Risk factors (Criteria)	Weight	Rank	Sub-Risks (Sub-criteria)	Weight	Rank	λ_{max}
Implementation risks	0.206	1	IR-7	0.211	1	0.206
			IR-6	0.158	2	
			IR-4	0.144	3	
			IR-3	0.116	4	
			IR-2	0.105	5	
			IR-5	0.103	6	
			IR-1	0.079	7	
Legal risks	0.153	2	LR-3	0.334	1	3.021
			LR-2	0.286	2	
			LR-1	0.277	3	
Contractual risks	0.144	3	CR-1	0,192	1	6.386
			CR-4	0.190	2	
			CR-5	0.171	3	
			CR-6	0.145	4	
			CR-2	0.134	5	
			CR-3	0.091	6	
Technical risks	0.112	4	TR-1	0.287	1	6.156
			TR-5	0.210	2	
			TR-6	0.145	3	
			TR-4	0.120	4	
			TR-2	0.087	5	
			TR-3	0.069	6	
Security risks	0.111	5	SR-3	0.353	1	3.011
			SR-2	0.312	2	
			SR-1	0.298	3	
Financial risks	0.080	6	FR-5	0.252	1	5.325
			FR-4	0.207	2	
			FR-3	0.232	3	
			FR-2	0.128	4	
			FR-1	0.104	5	

transactions are completely changed (Çubukçu, 2021).

According to the AHP results, "Audit Deficiencies (IR-6)" was found as the second important implementation risk that influences smart contract use in the AEC industry. Audits are important as inadequacies in overseeing the fulfillment of contractual responsibilities might pose a new risk in terms of determining whether the code-providing performance is appropriate or whether the contract conditions are met. It does not seem possible for the code that enables the execution of smart contracts to determine whether the performance is appropriate or whether the contract conditions are met. In this case, there is a need for experts called "oracle" to intervene in the smart contract process (Çubukçu, 2021). The concept of Oracle is defined as a system that determines whether the contractual obligations are duly fulfilled and meets the external needs that occur outside the blockchain. As an example, one of the application areas of blockchain-based smart contracts in the construction industry is progress payments. Automating these payment processes has been deemed meaningful by experts (Governatori et al., 2018). However, these payments should also include the verification of whether the performance subject to payment meets the required level as stipulated in the contract. As this verification

presents a challenging factor in the implementation of smart contracts, the importance for its integration into the smart contract use should be attributed.

Taken into account that smart contracts are established and enabled on the internet, it is difficult to draw the legal limits of these contracts (Çubukçu, 2021). Thus, questions regarding (1) What should be considered for smart contracts to be valid contracts under the law of contracts? and (2) How legal principles can be applied to smart contracts? should be clarified. The results of the AHP analysis also reveal the importance of "Shortcomings of current legal arrangements," "Determination of the legal system to be applied," and "Legal status of smart contracts" and since these legal sub-risk factors have a high significancy level among other sub-risk factors in general. The integration of smart contracts into legally binding construction contracts presents a challenge due to the lack of legal precedents and regulations so far. Thereby, semi-automation is strongly recommended as a suitable compromise for offering a legally compliant and feasible solution for legal compliance (Sigalov et al., 2021).

Technical issues are the source of important risks that may be encountered in smart contracts. Smart contracts, which consist of a computer program, can bring some problems with them due to their technical characteristics. The AHP analysis result also highlights this issue since coding errors were determined as an important technical risk with a weight of 0.287 within its cluster. For example, it is not possible to completely prevent the possibility of typing errors in computer codes and probability of being hacked due to these code errors (Çubukçu, 2021). Thus, it may be considered that it is a more acceptable approach to compromise the immutability feature of smart contracts in certain situations to prevent events that may cause greater damage. Another risk mitigation measure can be the artificial intelligence (AI) integrations for complete human error-free smart contracts (Gupta et al., 2020).

According to the AHP analysis results, financial risks were found to as the least important risk group with a weight of 0.080. The rankings of sub-financial risks were determined as attitudes toward the payment of stakeholders, taxes, energy consumption, transactional costs, and initial costs, respectively. The use of smart contracts in the construction industry, much such as the use of BIM and laser scanning technologies requires a technological adaptation. For that kind of technological adaptation often requires high-cost items for making these systems viable (Savelyev, 2017; Lamb, 2018; Kandiye, 2020). In this context, it is an unexpected result that such high-cost items are not considered as a major obstacle by experts. The reason behind this finding might arise from the judgment of experts specific to large-scale companies. Notwithstanding for many SMEs cost issues would be among the important barriers to invest in new IT infrastructures or new software that is required for the use of smart contracts (Sigalov et al., 2021).

Stakeholder attitudes toward payment were identified as the riskiest financial factor. It is inevitable that this technology, which has not yet proven its legal status and has not been clearly accepted by the countries, carries risks in terms of taxation (Gedik, 2020). Based on the two prominent criteria, it can be stated that these results stem from the experts' handling of risk choices within the scope of the projects they are involved in. It has also been stated through the literature in the previous chapters that the implementation processes are the most challenging phase of the construction projects. In addition, it can be stated that the difficulties caused by the nature of smart contracts are considered a risky option based on the contract experiences of the experts.

According to the AHP results, it was found that "Contractual risks" have moderate importance in affecting smart contract use in AEC industry. When the sub-risk factors defined under this category are examined (non-changeable contract clauses, language paradigm of the contract, contract interpretation, termination, and dispute resolution), these risk factors can be considered as one of the most important obstacles regarding smart contract use in AEC industry (Çubukçu, 2021). For instance, Yıldız considers the misformulation of smart contracts to be a major problem, stating that solving the resulting issues is nearly impossible (Yıldız, 2019). Similarly, Governatori et al. argue that if smart contracts are unable to provide desired changes, the parties may not be able to withdraw from the contract or terminate it, which is seen as a major barrier/obstacle to the use of smart contracts (Governatori et al., 2018). Despite the findings of studies emphasizing the contractual risks as the crucial barriers/obstacles associated with smart contract adaptation, it is surprising that expert responses prioritize contractual risks at a moderate level. This may be since the focused more on problems related to the adaptation of smart contracts rather than contractual issues. However, another possible reason for why these risks were not perceived as strong threats by the interviewed experts could be the lack of adequate IT knowledge regarding the coding and technical specifications that smart contracts require.

Finally, open-ended questions asked to the experts also open new doors to examine the subject of our article. All the experts involved in our study stated that smart contracts have enormous potential as technological innovation. They stated that smart contracts and the integration of the AEC industry can be used in processes such as material procurement, material selection, supply chain, and contract management. While one expert emphasized the possibility that the use of smart contracts outside the supply chain would not be efficient enough, another expert stated that smart contract integration would only be fully efficient for information technology. It was stated that with

a new system created by smart contracts, integrations such as BIM, and AI, great innovations can be brought to the construction industry. In addition, it was emphasized that the information infrastructures established in this way are a factor that protects the rights of stakeholders, facilitates the resolution of disputes, and prevents the realization of illegal practices. On the other hand, when we look at the time that experts predict for smart contracts to be integrated into the AEC industry, it is seen that experts state that this integration may take 10–20 years. The reason for this situation was expressed as the conservative structure of the AEC industry.

CONCLUSION

As digitalization becomes more widespread, the AEC industry will have to evolve with changes in contract culture. Since existing contracts do not seem suitable for digitalization, a change to be experienced in the light of technological developments is inevitable. Thus, with the developed uses of blockchain innovation, emerging smart contracts in the AEC industry have turned into a hot examination point both scholarly and practically.

With the implementation of smart contracts based on blockchain in construction projects, the dilemmas of traditional contracts can be solved, and institutions and authorized persons can be held accountable on a public basis. This technology will be active in many sectors soon and will become widespread in the construction sector as well. However, currently, the use of blockchain-based smart contract applications in the AEC industry is still in the development stage. Hence, this study is designed to identify the risk factors that affect blockchain-based smart contract use in AEC industry through a comprehensive literature review and to prioritize the identified risk factors using AHP, respectively. The five prominent risks were found as "Shortcomings of current legal arrangements," "Determination of the legal system to be applied," "Legal status of smart contracts," "Coding Errors," and "Rigidity of smart contract." It is seen that out of five, top three is related to legal issues. Moreover, the future of smart contracts is fraught with legal risks correspondingly. Semi-automation can be a suitable compromise for offering a legally compliant and feasible solution for legal compliance. In addition, concepts like.

Oracle, which is a third-party service, should be adopted for indicating whether the code-providing performance is appropriate or whether the contract conditions are met. On the other hand, smart contracts should be supported with BIM implementation to provide flexibility through the versioning of the smart contract and, thereby, of its internal files that are affected by the changes. AI integrations are highly supported to provide coding errors in terms of provide human error-free smart contracts.

Identification of these factors is crucial to get efficiency from smart contracts and to achieve an effective project management performance since project risk management has a direct effect on project management performance. These findings from this study suggest the role of smart contracts' risk factors in promoting blockchain technology adaptation decisions in the AEC industry. Besides, this study is important to recognize the adoption of smart contracts and has provided useful insight to prioritize the risk factors. The study is also at a point that makes a difference in terms of the approach to increasing industry awareness.

The future practice of the AEC industry could benefit from the findings of this study. Especially the top management of AEC firms could recognize their vital role in the implementation of smart contracts in the industry. They can enhance their competence in smart contract technology by giving a primary focus on the identified risk factors. The sectoral and academic contributions of this study can also be summarized as follows:

- As a sectoral contribution of this study, the determination of risks related to smart contract use in the AEC industry, the determination of risk weights, revealing of the risk effects are important basis for the effective risk management for industry practitioners. Additionally, the literature knowledge and expert opinions presented in this study will support sector professionals in understanding the risks related to smart contract adaptation at an early stage and help the AEC industry become more technology driven. This pioneering approach supporting the use of smart contracts in the construction industry will also be a guide for industry stakeholders.
- The academic contribution of the study on the other hand is based on its ability to address the gaps identified in the preliminary literature review. Existing studies have focused on the challenges, validity threats, and outcomes associated with the integration of smart contracts into the AEC industry (Güven and Aladağ, 2022). However, there has been no publication specifically dedicated to the risk management domain related to this integration, and no literature has prioritized these risks with a holistic approach or interpreted these risks based on expert opinions. In addition, identifying prioritized risks is crucial in terms of being of great benefit for the researchers who want to develop smart contract adaptation models for the construction industry since the integration of risk mitigation measures to eliminate prominent risk factors might be essential for this kind of Technology Adaptation Models.

The limitation of the study is that the use of smart contracts in the AEC industry is still very new, as well as the problem of access to experts in the AEC sector who have a good grasp of the subject of smart contracts. In the future

studies, depending on the increase in smart contract use in the AEC industry, data can be collected from a growing number of experts, and it can be examined whether there is a differentiation in the importance level of identified risk factors. In other words, in the future studies, more general and valid results can be obtained with studies with more participation.

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Article

Comparison of variations in EPC/turnkey oil and gas projects depending on tender methods

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ABSTRACT

Variations are inevitable in construction projects. Therefore, owners try to predict potential variations in the project preparation phase and try to adopt the most appropriate project strategies and contract provisions that can help to mitigate variation-related risks. In general, turnkey lump sum contracts are preferred when undertaking large or medium-sized oil and gas projects. These contracts cover the Engineering, Procurement, and Construction (EPC) phases of the project. Once the conceptualisation is completed and the basic engineering design package has been prepared, owners may prefer to award the EPC/Turnkey contract directly (i), or have a front-end engineering design (FEED) study done first, and award the EPC/Turnkey contract afterward (ii), or set up a convertible contract and convert it to EPC/Turnkey after an open book cost estimate (OBCE) process (iii). In this study, after a general overview of the variation concept, the common tendering methods used in EPC/Turnkey oil and gas projects are reviewed. In order to analyse the effects of the tender methods on potential variations, four EPC Lump Sum Turnkey (LSTK) projects which were awarded using different tendering methods, namely single-stage tender (direct EPC) and two-stage tender (OBCE+EPC), are compared. Finally, the frequency and content of the variations are studied according to their tendering methods. The primary findings reveal that the variation ratio experienced in the two-stage tender case is comparatively less than the variation ratio in single-stage tender cases.

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INTRODUCTION

Since variations may have a direct impact on the cost and completion dates of construction projects, many studies have been conducted on their causes and effects. Researchers have focused on the subject using different approaches to tackle the problem. Some of them preferred to study variations regardless of the project type. For example, Alnuaimi et al. (2010) and Al Maamari and Khan (2021) analysed variations in construction projects of Oman. An and Ma (2019) concentrated their research on Chinese construction projects. Memon and Rahman (2014) highlighted the major causes and effects of variation in construction projects in Malaysia. Bhadmus et al. (2015)

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studied the causes of variations in the construction industry of Nigeria. Keane et al. (2010) reviewed several articles in the literature and grouped the causes of variations based on the contracting parties.

On the other side, some researchers preferred to focus on the type of the project when they investigated the causes of variations. For example, Babalola and Idehen (2011), Muhammad et al. (2015), and Perera et al. (2020) studied the subject in residential projects, Kassim and Loong (2002) on sewerage projects, Priyantha et al. (2011) in road projects, and Halwatura and Ranasinghe (2013) in infrastructure projects.

Surprisingly, it is difficult to find similar research studies conducted in industrial projects even though industrial construction is subject to significant variation risk. For example, large and medium-sized oil and gas projects involve high risks and are prone to frequent and substantial variations. In addition to being large, oil and gas projects are highly complex, have a multi-disciplinary structure, and are generally managed in a fast-track manner by overlapping engineering, procurement and construction in order to shorten otherwise long project durations (Komurlu and Er, 2018). These features expose oil and gas projects to high risks relative to the frequency and substance of the variations. Al Hammadi's (2009) work specifically focuses on oil and gas projects constructed in the UAE.

This paper is expected to contribute to the subject by comparing the variations in EPC/Turnkey oil and gas projects with a specific perspective that takes into account their tendering methods. Thus, the findings of this study are expected to add value to the variations literature by complementing the limited amount of research in oil and gas projects.

A research methodology that involves case studies is used in the study. Four completed large-scale oil and gas projects with similar characteristics apart from their tendering methods were considered in the study. All projects were commissioned by the Turkish Petroleum Refineries Corporation (TÜPRAŞ) which is the largest refinery company in Turkey and the 7th largest in Europe. They are typical refinery projects that include process and utility units and off-site connections to existing refinery facilities. Detailed information about these projects is presented in the Case Study section of the paper. The research team had access to variation order records that included enough information relevant to the study. The causes of variations were identified and classified by the researchers. In order to ensure the reliability of the data, the findings were also reviewed by an expert.

In the following sections, after a general discussion of variations in construction projects, the common tendering methods followed in EPC/Turnkey oil and gas projects are reviewed. In order to analyse the effects of tendering methods on variation orders, four EPC Lump Sum Turnkey (LSTK) projects were compared. One of these projects was awarded using a single-stage tendering (direct EPC) and three of them used a two-stage tendering (OBCE+EPC). Finally, the contents of the variation orders in projects awarded by direct EPC and OBCE+EPC were compared.

OVERVIEW OF VARIATIONS IN CONSTRUCTION PROJECTS

In general terms, variation refers to changes in the scope or work schedule of a project after the contract provisions between the owner and the contractor have become effective. These changes are not surprising due to the unpredictable nature of construction projects. If the preparation phase of a project is conducted in a well-planned and comprehensive manner, it will be less likely to encounter unforeseen situations during the implementation period. Nevertheless, it is not possible to totally eliminate such occurrences. Since construction projects are long-term activities involving numerous actors, they are open to several uncontrollable impacts such as changes in needs, financial fluctuations, extreme climate conditions, etc. throughout their lifetime. Although there are several ways of classifying variations in projects, one of the most preferred classifications focuses on the initiator of the variation, i.e., variations initiated by the owner, a consultant, the contractor, or other none of these parties. Table 1 shows Keane et al.'s (2010) classification of variations.

A "variation order" is the documented form of a variation. The term "change order" is frequently, while the term "adjustment order" is rarely used for the same purpose. Variation order/change order is defined by AACE (2017) as a document requesting and/or authorising a scope and/or baseline change in the project, which should be approved by both the owner and the contractor. For the project team, this document refers to a change in the project that is approved by senior management. For the contractor, it is an agreement between the owner and the contractor that compensates for a change in the scope or other terms of the contract (AACE, 2017).

Deviations in the delivery time of the project, especially the delayed deliveries cause damages to the construction owner and may threaten the feasibility of the endeavour. The contractor, however, faces additional direct and indirect costs (Figure 1, Syal and Bora, 2016). Direct costs are addressed in variation order documents, which involve a detailed description and documentation of the variation. Indirect costs, which are generally overhead expenses, may be distributed between line items in a multitude of approaches, which makes it difficult to assign indirect costs

Table 1. Classification of variations (Keane et al. 2010).

Owner-initiated Variations	Consultant-initiated Variations	Contractor-initiated Variations	Other Variations
Change of plans or scope (CII, 1990a)	Change in design (Fisk, 1997; Arain et al., 2004)	Lack of involvement in design (Arain et al., 2004)	Weather conditions (Fisk, 1997; O'Brien, 1998)
Insufficient planning at the project definition stage, or lack of involvement of the owner in the design phase (Arain et al., 2004)	Errors and omissions (Arain et al., 2004)	Unavailability of equipment (O'Brien, 1998)	Safety considerations (Clough and Sears, 1994)
Owners' financial problems (Clough and Sears, 1994; O'Brien, 1998)	Conflicts in contract documents (CII, 1986)	Skills shortage (Arain et al., 2004)	Change in economic conditions (Fisk, 1997)
Inadequate project objectives (Ibbs and Allen, 1995)	Technology change (CII, 1994)	Financial problems (Thomas and Napolitan, 1995)	Sociocultural factors (O'Brien, 1998)
Substitution of materials/procedures (Chappell and Willis, 1996)	Value engineering (Dell'Isola, 1982)	Desired profitability (O'Brien, 1998)	Unforeseen problems (Clough and Sears, 1994; O'Brien, 1998)
Impediment of prompt decision-making process (Sanvido et al., 1992; Gray and Hughes, 2001)	Poor coordination (Arain et al., 2004)	Differing site conditions; poor workmanship (Fisk, 1997; O'Brien, 1998)	
Obstinate nature of owner (Wang, 2000; Arain et al., 2004)	Design complexity (Fisk, 1997; Arain et al., 2004)	Fast-track construction (Fisk, 1997)	
Change in specifications by owner (O'Brien, 1998)	Poor working drawing details (Geok, 2002; Arain et al., 2004)	Poor procurement process (Fisk, 1997)	
	Poor knowledge of available materials (Geok, 2002)	Lack of communication (Arain et al., 2004)	
	Lack of required data (Arain, 2002)	Lack of experience	
	Ambiguous design details) (O'Brien, 1998	Long-lead procurement (Fisk, 1997)	
	Poor design (CII, 1990b; Fisk, 1997)	Complex design and technology (Arain, 2002)	
	Change in specifications (O'Brien, 1998)	Lack of strategic planning (Clough and Sears, 1994)	

to a particular line item affected by a variation order. In order to prevent conflicts between parties, the true cause of any delay needs to be well known (Komurlu, 2018). With the loss of efficiency added to this, cost is the most important factor in disputes caused by variation orders. Thus, variations greatly affect a contractor's profitability (Goldsmith, 2016).

In general terms, a variation alters the agreed terms or scope of the contract. However, a claim normally involves a change in the way that the contracted work is delivered (Sergeant, 2015). For example, a change in the design parameters by the owner in a later stage of a project may end up with reengineering or construction changes. Thus, such variations should be managed by means of a variation order. However, additional costs incurred by the contractor due to the late owner approval of the design will be subject to a claim. Some other differences between variation order and claim could be listed below:

- Variations are normally initiated by the owner, whereas claims are mostly initiated by the contractor.
- Claims should be preceded by a written notice in order to allow the other party to take action to mitigate the effects of the situation (Sergeant, 2015).
- Variation and claim provisions are usually defined under different clauses in a contract since they have different workflows and approval processes.
- Scope variations are usually performed after mutual agreement, while contractors cannot stop the work because of a claim (Komurlu and Arditi, 2017).
- Contracts often include additional sections that set unit rates to be used for variation orders. However, claims are normally compensated by reference to costs that should be proven to the owner with proper documentation (Sergeant, 2015).
- Claims can arise when there is a conflict between the owner and the contractor about the need for a variation (Komurlu and Arditi, 2017).

In some instances, acceleration of the work may be required to overcome the delays which are not caused by the contractor's fault (Komurlu and Arditi, 2017). In such a case, the extra cost associated with the acceleration is requested by the contractor. However, the need for a variation order or the cost of the proposed variation order can cause disputes between the owner and the contractor (Wallwork, 2003). If these disputes are not resolved to the mutual satisfaction of the parties, their effects could cause new disputes (Figure 2, Iyer et al., 2007).

Since claims and the resulting disputes have substantial economic, relational and operational consequences, they have to be managed properly throughout the project. Claim management aims to establish the necessary structures, first to prevent counter claims, and then pursue potential entitlements in an efficient manner. The main processes of claim management involve prevention, mitigation, pursuance, and resolution (Mirza, 2005).

Following the occurrence of a variation, for the proper management of the process, the contract should be evaluated for related clauses, the variation should be identified, a timely notification should be submitted, a request regarding the variation should be prepared, and the variation request should be resolved (Molly, 2007). Variation order management consists of tracking, monitoring and analysis of the variation (Stone et al., 2011). In order to minimise the negative effects of the variation order, these orders should be processed in a timely manner. A method for determining the cost and the stipulation of a fixed fee increases the likelihood of mutual agreement. In addition to the cost, the time implications of the variation should be agreed upon by the owner and the contractor to avoid potential claims and disputes (Kettlewell, 2003). Any claim that is not resolved amicably may lead to disputes that have to be tried in courts of law, a process that involves significant attorney fees and major aggravation for the parties involved in the contract. This situation can be avoided if precautions are taken to avoid variations and variation order management is well defined in the contract documents (Komurlu and Arditi, 2016).

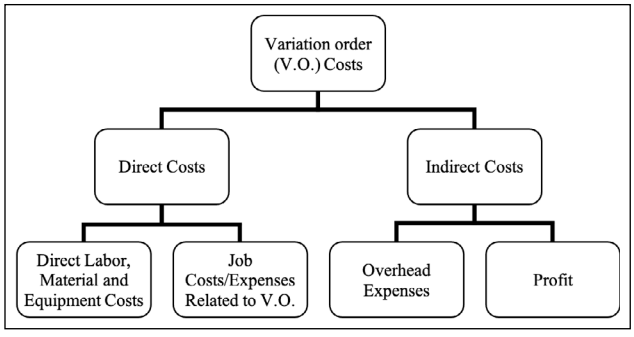

Figure 1. Variation order costs (Syal and Bora, 2016).

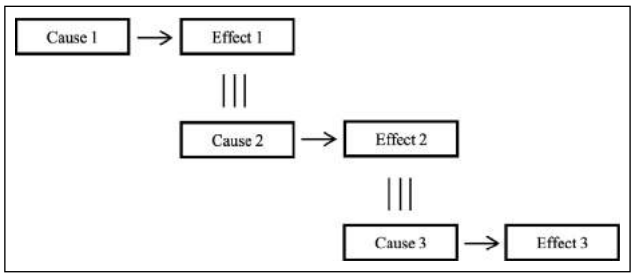

Figure 2. Cause and effect relationship of disputes (Iyer et al., 2007).

EFFECTS OF TENDERING DURATION ON VARIATIONS

According to Jawad et al. (2009), cost overruns caused by variation orders account for 5–10% of the original contract value, whereas delays represent less than 10% of the original contract duration in large building projects. In a similar study, Hanif et al. (2016) reported a 31% cost overrun and 20% delay in mega hydropower projects. It is not surprising that the impact of variations in building projects is less than the impact of variations in infrastructure projects because building projects are generally awarded after a detailed design is completed, which provides a much clearer scope at the tendering stage. However, big-scale energy or oil and gas projects are generally executed with EPC contracts which means they are more open to variation risks since the scope is not as well defined in EPC tendering.

Despite the negative impact mentioned above, considering the characteristics of medium or large-scale oil and gas projects, EPC/Turnkey contracting appears to be the most advantageous contracting strategy for owners (Komurlu and Er, 2018) because EPC/Turnkey contracting provides the most reliable budget to owners. In this method, engineering, procurement and construction activities are managed by the same contractor. Additionally, engineering continues during both the procurement and construction phases, improving the budget continuously. Thus, phases can be overlapped in the work schedule and projects can be completed in the shortest time. Owners can also manage the projects with a smaller organisation due to less interference because in multi-contractor cases all interconnections between contractors should be managed by the owner. McNair (2016) pointed out the advantages of EPC LSTK contracts as follows;

- Single point of responsibility
- Fixed contract price
- Fixed completion date
- Strong accountability of contractors due to performance guarantees, liabilities, defect liability period, etc.
- Use of internationally well-known contracts containing regulations against sophisticated problems such as variations, intellectual property, suspension, termination, performance specifications, etc.

On the other hand, this strategy has a number of disadvantages, the most important of which are maximum contingency in the contract price and less involvement of the owner in the detailed design. It may also require more time for tendering, especially considering the preparation of the tender package, disclosure of the questions prior to technical tender and final negotiations before contracting. Finally, the project scope should reach an adequate level of maturity before the tendering phase to mitigate variation risk during the EPC phase. Despite all these disadvantages, considering the benefits of the aforementioned advantages, owners commonly prefer EPC LSTK contracts in the oil and gas sector (Al-Hammadi, 2009).

EPC/TURNKEY TENDERING METHODS

As shown in Figure 3, an EPC/Turnkey contract can be awarded using different tendering methods. Owners may prefer to award the EPC/Turnkey contract directly (i), have a front-end engineering design (FEED) study done first and award the EPC/Turnkey contract afterward (ii), or set up a convertible contract and convert it to EPC/Turnkey after an open book cost estimate process (iii). The last two methods have been developed to minimise the disadvantages of EPC/Turnkey contracting over the

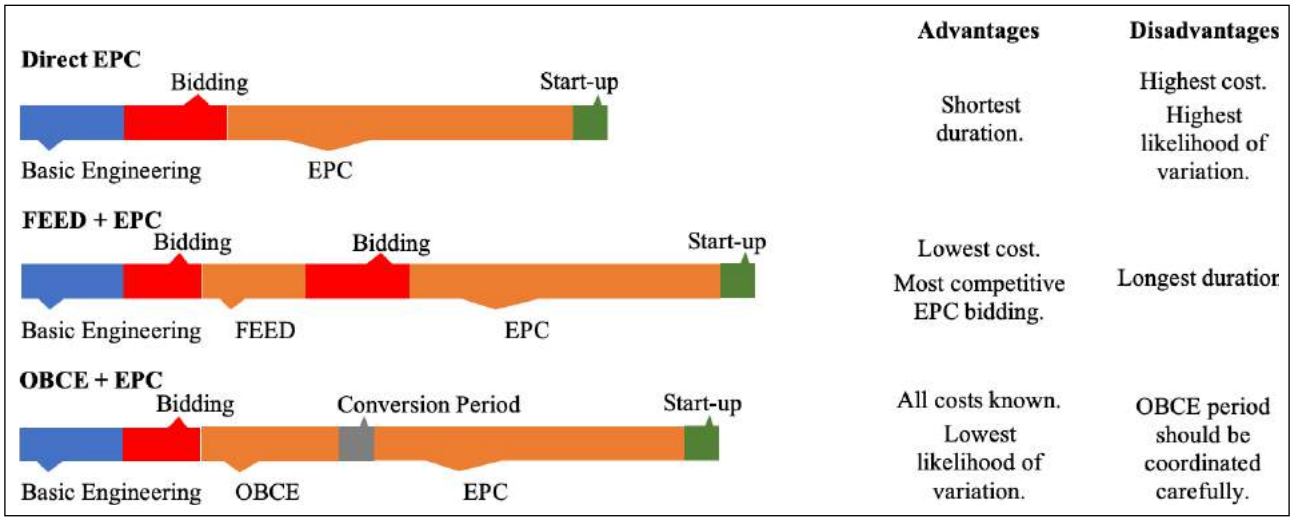

Figure 3. Comparison of EPC/Turnkey tendering methods.

course of time.

In the case of direct EPC/Turnkey contracting, the owner defines the scope of the project and hires a contractor to execute all engineering, procurement and construction activities accordingly. The role of the owner is mainly limited to project controls and contract administration. The contractor bears the risks and responsibilities of the project. Therefore, the lump sum contract price includes maximum contingency. If the scope of the project is not clearly defined in the tendering documents, possible design changes may result in significant variation orders. However, the total project duration will be the minimum because EPC allows for phased construction.

To minimise the drawbacks mentioned above, owners may prefer to have a front-end engineering design (FEED) contract first and award the EPC/Turnkey contract afterward. The aim of the FEED contract is to improve the scope of the project by enhancing the basic engineering documents and to produce more detailed technical documents to facilitate the implementation of the project (Moazzami et al., 2015). This way, design development is expected to reach a reasonable level of maturity before an EPC/Turnkey contract is awarded. In such cases, the cost of the project can be estimated precisely because cost deviation is inversely proportional to the level of information. At this stage, material requisitions of long lead items become ready for purchase orders and drawings and lists are more detailed. Thus, major equipment prices and quantities can be estimated most accurately. However, the FEED+EPC method of tendering requires two tendering periods, one for the FEED contract, and another for the EPC contract. If the EPC contractor selected in the second tendering is different than the FEED contractor picked in the first tendering, a discontinuity will be created in the process. In this case, some owners may request the EPC contractor to endorse the existing FEED documents.

In convertible contracts, different contract price arrangements such as reimbursable costs, unit rates, and lump sum are used at different stages of the project to distribute cost and performance risks between the contracting parties (Moazzami et al., 2015). Therefore, the disadvantage of discontinuity observed in the FEED+EPC Turnkey method can be eliminated in a convertible contract. In this process, the owner and the contractor agree on a two-stage contract. In the first stage, a detailed design is developed up to a certain level where a reasonable cost estimate can be estimated. The calculation of the cost estimate should be transparent and traceable for the owner. So, both the contractor and the owner participate in developing the cost estimate with full access to all cost information. This process is called the open book cost estimate (OBCE) and can be an effective way to estimate an accurate and reliable EPC lump sum price (Patty and Denton, 2010). During the OBCE stage, the contractor can receive payment in a price adjustment structure. Later on, the contract is converted into an EPC lump sum contract following the conversion method previously defined in the tendering process. This way, all project costs, the contingency, and the contractor's profit are all known by the owner. Moreover, the contractor can proceed to the second stage immediately after the conversion with no interruptions.

CASE STUDY

Four large-scale oil and gas projects constructed in TÜPRAŞ are used as case studies to observe the effect of EPC/Turnkey tendering methods on the variations experienced during the projects. Some of the characteristics of these projects are as follows:

1. The owner was the same on all four projects.
2. The same contract was signed with only minor differences in the EPC phase of the projects.
3. The project management practices of the owner's project management teams assigned to the four projects were similar to each other.
4. Contractors were equally qualified to do the work and some of them were involved in more than one of the four projects.
5. The contractors were organised in similar consortium structures in the projects whereby the consortium leaders were foreign companies that handled engineering, procurement and project management whereas responsibility for the construction rested with the Turkish consortium members.
6. The contract value of each of the four projects was $100 million or more.
7. The refinery units built in the projects were equally complex.
8. All projects were conducted in Turkiye.
9. Three of those projects were awarded directly as EPC LSTK after basic engineering in a single-stage tender. In the remaining one two-stage tendering was preferred. An open book cost estimate (OBCE) process was performed over basic engineering and the project was converted to EPC LSTK afterward.

Considering the above-mentioned points, it is clear that most of the characteristics of the projects are the same except for the tendering methods used, hence assuring a sample of projects that provides meaningful data for the purpose of comparing the effects of tendering methods in the study.

In this study, the project variations recorded by the

owner were examined. It was observed that there were no deficiencies in the records and that the records were kept regularly. In the first step, the effect of the EPC/Turnkey tendering method on the variation ratio (measured by dividing the cost of variations in a project by the contract price) were studied. Afterward, the variations were classified according to their causes presented in Table 1 to compare the effects of the EPC/Turnkey contract methods on the causes of variations. It is found that only six of those causes were encountered in the studied projects. The findings are as follows:

a. The variation ratio (i.e., the cost of the variations divided by the contract price)

The variation rate of each project was found to be less than 10%. This result agrees with the findings of a similar study conducted by Al Hammadi (2009) that involved oil and gas projects in the UAE.

Figure 4 shows the variation ratios in each case project. In the Direct EPC projects (i.e., Projects 1, 2, and 3) the variation ratios range from 1.6% to 6.1%, while in the OBCE+EPC project (i.e., Project 4) it is 1.2%. Furthermore, Direct EPC projects with a higher contract value have a higher variation ratio. However, in the OBCE+EPC project, although the contract price is very high compared to the others, the variation ratio is much lower than in the other projects. Overall, it can be concluded that Direct EPC projects require a rigorously defined scope, which in turn reduces the risk of costly variations, but it is more difficult to have fewer variations with a smaller cost as the size of the contract, and by implication, the scope of the project grows. On the other hand, even in mega projects such as the OBCE+EPC project (i.e., Project 4), the engineering study carried out during the OBCE period ensures that the scope is much clearer and consequently the cost of variations is much lower than in the Direct EPC projects (i.e., Projects 1, 2, and 3).

b. Effects of the tender methods on the causes of variations

In Table 2, the variations in the case projects are compared based on their causes. The projects are grouped according to the tender methods and the percentages of the causes

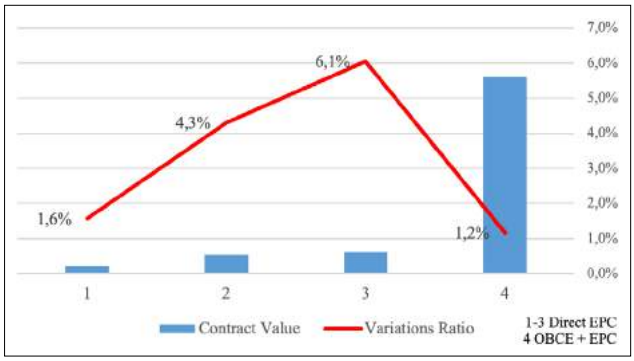

Figure 4. Variation ratios in the case projects.

of variations in each group are calculated by considering the number of variations and the cost of variations in each group.

"Change of plans or scope" is found as the most significant reason, independent from the tender method, very much supported by the literature about causes of variations in construction projects (CII, 1990a; Arain and Pheng, 2005; Al Hammadi, 2009; Sunday, 2010; Mohammad et al., 2010; Hanif et al., 2016). "Change of plan or scope" occurs usually because of insufficient planning at the project definition stage or due to the lack of involvement of the owner in the design phase (Arain et al., 2004). Convertible contracts like OBCE+EPC offer the opportunity to minimise these risks. As described earlier, in OBCE+EPC projects, a detailed design is developed in the first stage before converting a contract to an EPC lump sum; so the scope is quite well-thought-out and quite well-defined in the first stage for use in the second stage. In contrast, Direct EPC projects are exposed to all variation risks due to the immature scope at the time of production. When the occurrence of "change of plans or scope" in the case projects are compared based on the tendering methods, the percentages of occurrence of "change of plans or scope" out of the total number of variations are 50% and 53% in Direct EPC projects and in OBCE+EPC projects, respectively. On the other hand, the percentages of the cost of "change of plans or scope" out of the total contract price are 83% and 33% in Direct EPC projects and in OBCE+EPC projects, respectively. Although the percentages based on the number of variations are similar, the percentages based on the cost of variations indicate that the cost of "change of plan or scope" is much higher in Direct EPC projects.

Concerning "change in design", the percentages based on the number of variations are 36% in the Direct EPC projects versus 15% in the OBCE+EPC project. Changes in design are experienced frequently in projects where the construction started before the design is completed (Fisk, 1997). Projects are affected in various ways and levels depending on the timing of the design change (Memon et al., 2014). Since detailed engineering is carried out at least one year before conversion in OBCE+EPC projects, fewer variations are expected in the EPC period. A similar trend is observed in the percentages based on the cost of variations, with 10% and 13% in Direct EPC projects and in OBCE+EPC projects, respectively. It has to be noted however that late design changes may affect the percentages based on the cost of variations negatively.

Although, variations due to "unforeseen problems" constitute approximately 10% of all variations in both Direct EPC and OBCE+EPC projects, the cost of variations compared to the contract price is much higher in the OBCE+EPC project (14%) than in Direct EPC projects (1%). The surprising finding is that the number and cost of

Table 2. Comparison of the causes of variations

Causes of variations	Direct EPC		OBCE+EPC	
	% of number of variations	% of cost of variations	% of number of variations	% of cost of variations
Change in design	36	10	15	13
Change in specifications by the owner	2	6	7	21
Change of plans or scope	50	83	53	33
Conflicts in contract documents	0	0	14	9
Substitution of materials	0	0	3	9
Unforeseen problems	12	1	9	14
TOTAL	100	100	100	100

the variations caused by "change in specifications by owner" are considerably higher in the OBCE+EPC project (7% and 21%, respectively) than in the OBCE+EPC projects (2% and 6%, respectively). Soil and subsoil tests and studies made after the OBCE period may be a reason for this finding.

Variations caused by "conflicts in contract documents" and "substitution of materials" are recorded only in the OBCE+EPC project. This result is questionable since the engineering maturity observed in the OBCE+EPC project was quite high compared to the engineering process in the Direct EPC projects. When the events that caused "conflicts in contract documents" and "substitution of materials" are examined in detail, it is seen that these causes were triggered by unrelated project management decisions.

DISCUSSION

The primary finding of this study is that the variation ratio in the two-stage OBCE+EPC project is less than the variation ratio in the single-stage Direct EPC projects. This is an expected outcome because extensive engineering studies are conducted and procurement packages are evaluated in detail in the first stage of OBCE+EPC projects. This situation provides the advantages stated below:

1. The scope of the project becomes much clearer.
2. The amount of construction and the type and amount of materials to be used in the project are calculated much more accurately.
3. The datasheets for the components to be used in the mechanical/electrical systems are prepared and vendor proposals are obtained.
4. The owner and the contractor are able to prepare precise cost estimates.

As a result, project managers are in a better position to prevent potential problems by performing extensive engineering and preparation work way before the EPC stage. This finding is also supported by the findings related to the causes of variations identified in the four case projects. The data collected from the four case projects showed that for variations caused by "scope and plan changes", the percentage of the number of variations out of all the variations that occurred in the OBCE+EPC case project is significantly less than in Direct EPC projects. Similarly, the percentage of the cost of the variations compared to the cost of all the variations that occurred in the OBCE+EPC case project is also significantly less than in Direct EPC projects.

Variations caused by "change in design" were expected to show similar behaviour. However, although there are fewer variations caused by "change in design", the cost of the variations is negatively affected by late design changes in OBCE+EPC projects.

It is understood from the literature review that the two causes cited above are quite common in most construction projects as evidenced by the many studies conducted in many countries including Oman, China, Nigeria, and Sri Lanka.

- Alnuaimi et al. (2010) stated that the first cause for the variations in construction projects undertaken in Oman is "owner's additional work". Al Maamari and Khan (2021) conducted a similar study in Oman and found "change of scope", "errors and omissions in design" and "insufficient logistics" as the primary causes of variations.
- According to An and Ma (2019) "incompleteness of design" and "continuous demand for project by client" are the first and second causes of variations in Chinese construction projects.
- The main findings of Babalola and Idehen (2011) who investigated the causes of variations in building construction projects in Nigeria are "change in plan or scope by owner" and "change in specification by owner". Muhammed et al. (2015) conducted a similar study in Nigeria and found "change of the original plan", "conflicting contract documents", "substation of materials" and "change in design" as the main causes of variations.

- Perera et al. (2020) examined building projects in Sri Lanka and found that the main causes of variations were "change of plans or scope", "inadequate working drawing details" and "design discrepancies". Priyantha et al. (2011) found "requirement increases of client" and "design changes of consultants" as the most often causes of variations in highway construction in Sri Lanka.

The surprising finding of the study was that the number of variations caused by "change in specification by owner" was significantly higher in OBCE+EPC projects. Soil tests and related changes made after the OBCE period seem to be the main reason for this finding. Variations that were caused by "changes in specifications by the owner", "conflicts in contract documents" and "substitution of materials" are mostly observed in the OBCE+EPC project.

CONCLUSION

In this study, variations in EPC/Turnkey oil and gas projects are analysed relative to their tendering methods. Four EPC LSTK projects which were awarded using the Direct EPC and the OBCE+EPC tendering methods are compared using four case projects. The variation ratio is 1.2% in the OBCE+EPC project, while this ratio ranges from 1.6% to 6.1% in the three Direct EPC projects. The variation rate is less than 10% in each case project, very much in sync with the findings of a similar research study conducted by Al Hammadi (2009) relative to oil and gas projects in the UAE.

Variations are classified according to their causes to analyse the effect of the tender methods on them. According to the data collected from the four case projects, "change of plan and scope" was found to be the most dominant cause for variations. The cost of the variations caused by "change of plan and scope" ranged between 33% in OBCE+EPC projects to 83% in Direct EPC projects. This finding highlights the importance of an accurate and reliable definition of the scope and a high level of engineering maturity prior to undertaking Direct EPC/Turnkey tendering, as evidenced by the lower cost of variations in OBCE+EPC projects where the scope is developed in the detailed engineering is thoroughly done in the OBCE stage, way before the EPC stage. It also supports the assertion of Dumont et al. (1997) about the negative effects of inadequate scope definition on project cost overruns. This finding also strengthens the idea of implementing a FEED study before the EPC phase.

"Change in design", "change in specifications by the owner", "conflicts in contract documents", substitution of materials", and "unforeseen problems" are other causes of variations which were found in the four case projects. These issues are also listed as major causes of variations by other researchers such as Mohammad et al. (2010) and Hanif et al. (2016) but in different types of projects other than oil and gas.

Unfortunately, there are only a few quantitative research studies that focus specifically on the causes of variations in oil and gas projects, even though billion dollars are invested in this industry. This situation makes it impossible to compare studies that investigated similar parameters for the same type of project. Therefore, additional studies have to be conducted to increase the reliability of the conclusions. Nevertheless, according to the results, the two-stage tendering method is recommended for large and medium-sized oil and gas projects.

This paper is expected to contribute to a better understanding of variations when owners are discussing investment strategies and provide benchmark data to other researchers for use in similar studies. The effect of the FEED+EPC tendering method on variations can be examined in future studies.

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