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Effects of COVID-19 pandemic on spatial preferences and usage habits of users in shopping malls and its relation with circulation layout

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ABSTRACT
The COVID-19 pandemic, with its global impact on every scale of life, has caused a change in all the habits of people regarding daily life, and this change has also been directly reflected in the human-space interaction. The bidirectional relationship between human and space has evolved by being influenced by each other during the pandemic process. Within the scope of this study, which aims to determine the predicted change in the spatial preferences and usage habits of the users in the shopping malls due to the COVID-19 pandemic, which causes changes in the space and the usage habits of the users from micro scale to macro scale, analyzes were made with the research methodology consisting of three stages (i. space syntax, ii. survey, iii. comparison) and the results were evaluated. According to the results obtained from the case study, it was determined that the COVID-19 pandemic deeply changed people’s spatial perception, preferences and usage habits in shopping malls and circulation layout also plays a role on it. To summarize, while personal preferences were at the forefront in places to be preferred for shopping before the pandemic, the characteristics of the place gained importance after the pandemic.

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1. Introduction
Coronavirus disease (COVID-19) originated in Wuhan, China in the month of December 2019 [1] is assumed as one of the most aggressive pandemics causing severe danger to humanity in the twenty-first century due to its progression, infection, spread and mortality rate in the World [2]. It led to global measures taken by all countries worldwide to confront this pandemic – from social distancing to home isolation measures to a complete curfew in some countries [3]. It is possible to say; COVID-19 has affected human lives to a great extent. Work, economy, education, daily life and almost everything has come to stand still and people for a while only focused on what is essential to live. The reasons for its spread and thinking about its threat, practically all the nations have proclaimed either partial or complete lockdowns all through the influenced districts and regions [1]. During the ongoing process; because of the risks associated with the COVID-19 virus spread, social distancing and impermanent lockdowns have significantly affected public life [4] in sociable spaces [5,6], healthier places [7,8] and changed every day social life experiences in public spaces [9,10,11]. These changes have included the need to rearrange the physical and nonphysical urban environment spatial urban forms [12,13,14,15].

Among these physical urban environments shopping malls is an important part of peoples’ daily life. Shopping is a social act that emerged through people entering into mutually beneficial relationships with each other to meet their various needs [16]. In accordance with the changing conditions over time, the dimensions of the concept of shopping have also changed with the change of needs. Recently, shopping has turned from being an activity carried out to meet natural needs, as it was in the past, to a determinant of social status, an indispensable tool for psychological satisfaction, and most importantly, a consumption activity that enables the evaluation of spare time. With the change in the consumption habits of people from the past, shopping places have also changed in the historical process [17]. Trade buildings have changed according to the socio-cultural structure of the place and period in order to meet the needs. Considering the transformation of shopping spaces in the historical process, agoras, which are the first formations, are followed by bazaars, shops, inns, grand bazaars, multi-storey stores, hypermarkets-supermarkets and...
shopping malls [18]. Shopping malls, which are the last point of
shopping spaces that have appeared in different forms throughout
history; have become places where social, cultural and entertain-
ment activities can be provided, rather than just shopping places.
International Council of Shopping Centers (ICSC) defined today's
shopping centers as closed or open independent bazaars consisting
of a single building or a group of buildings, which include food-
beverage and entertainment units, as well as stores that sell prod-
ucts in various categories [19]. Victor Gruen, who is accepted as the
inventor of the shopping malls that emerged in the USA in the
1950s [20], stated that in addition to the physical requirements,
social requirements in the shopping mall will be met in a safe, pro-
tected, air-conditioned, completely pedestrianized urban environ-
ment isolated from vehicle traffic, and even he claimed that in
the future, the shopping malls would replace the traditional city
center [21].

Purposes of shopping in today's shopping malls are; (i) meeting
the wishes and needs of the users according to different age, gen-
der or status, (ii) the opportunity to find and evaluate a needed
product in a wide range, (iii) easing the life in today's social life
by means of the accessibility and the comfortable circulation areas
it provides, (iv) shopping in a safe environment and (v) saving
time. In this sense, shopping malls are the areas that meet the food
and beverage needs of people with cafe-restaurants, social and
entertainment needs with educational-instructional cultural activi-
ties, personal and general needs with clothing-shoe stores and
units such as market-pharmacy-hairdresser-tailor. In other words,
shopping malls are consumption places in complex multifunc-
tional buildings group that respond to many functions at the same
time [22].

The prominent feature of the shopping mall design is to bring
together people living in different parts of the city, regardless of
differences such as age, gender, income status, personal interests
[23]. In this framework, flexibility and diversity in spatial arrange-
ments emerge as an element that should be emphasized [24]. As a
result, we can say that the spatial designs of shopping malls should
be applications where architecturally ostentatious materials and
complex design elements are combined with comfortable interiors,
including the designs of various stores and shops, aiming to bring
together users from different groups in a safe atmosphere as much
as possible [23]. These places, which have become symbols of
today's cities with these features, appear as important places of
'pleasure' with their designer touches [25]. However, it is the pri-
cency for such structures to be functional in order to
achieve their commercial purpose, and circulation is one of the
most important design criteria. For example, in these areas where
human circulation is intense; providing easy access to users with
horizontal-vertical circulation elements such as escalators, eleva-
tors, circulation areas with adequate dimensions is a functional
solution. Corridors should have transition areas and corner turns
in accordance with accessibility standards, and gallery spaces
should be of dimensions that allow stores to be easily perceived
between floors. The plan type in shopping malls is shaped accord-
ing to the location of the stores, eating and drinking areas, social
areas, circulation elements and galleries it contains [26].

Within the scope of this study, the effect of the COVID-19 pan-
demic, which has affected the whole world since March 2020 and
brought about change in every aspect of life, on the spatial prefer-
ences and usage habits of shopping mall users, through shopping,
which is an important part of daily life, has been tried to be deter-
mmed. It is important to investigate the predicted change in peo-
ple's approaches to shopping malls that they use with certain
habits and movement patterns, and in their spatial perceptions,
in terms of providing data for future designs.

2. Material and methods

Kule Site, Kent Plaza and Novada Shopping Malls (SM) in Konya/
Turkey, were discussed in the case study, and their multi-storey
structure and different plan schemes were taken into consideration
in the selection of the buildings (Fig. 1). The scope of the study was
limited to circulation areas, and areas such as markets, shops, cin-
emas etc. were excluded. This research utilizes a mix of qualitative
and quantitative methods such as others [27,15] where the combi-
nation of survey and other scientific research methods give specific
results to be compared. The methodology designed in the research
was composed of three stages: (i) the space syntax analysis, (ii) the
user survey, and (iii) the comparison stage where the data from the
two analyses are compared. First of all, with the space syntax anal-
ysis, the space syntax parameter values of the circulation areas of
shopping malls in different floor plans were determined. In the sec-
ond stage, the questionnaire, which was prepared to determine the
impact of the COVID-19 pandemic on the shopping habits and spa-
tial preferences of the users, was applied to the shopping center
users. Finally, the relationship between the changing spatial pref-
ences of the users and the syntactic values of the space has been
revealed by comparative analysis, and the changes in the user
habits have been interpreted via the space.

2.1. Space syntax analysis

Space syntax is one of the most influential scientific movements
in the fields of architecture and urban design, as a set of techniques
used to study the spatial fabric of buildings and cities, and as a
chain of theories that unite space and society [28]. It is a set of
techniques, supported by theory, developed to describe the spatial
configuration features of the built environment, and it is an
approach that aims to understand the processes that shape spatial
organization and the underlying social contexts. Thanks to the
method, it is possible to determine the movement patterns in
the space in advance, to determine which spaces are integrated with
the system and more used spaces, which spaces are segregated
and less used spaces. Space syntax is a space reading method first
developed by the research group led by Bill Hillier and Julienne
Hanson at Bartlett School University College London. The theory
of the analysis, which is also explained in the book “Social Logic
of Space” published in 1984, is based on the idea that the social
structure that creates the space can be deduced from the physical
construction of the space and that arranging spaces is actually
about regulating relations between people [29]. According to Hil-
lier, the concept of spatial or stereotomic configuration is the key
concept in his book “Social Logic of Space”, which explores both
the role of space in the construction of social structure and the spa-
tial functioning used by societies to reproduce their social struc-
tures. Space configuration is the result of behavioral principles
and functional organizations in line with the spatial hierarchy.
He explains this relationship in his book “Space is the Machine” as
follows: the building is shaped in two directions at the most
basic level. These configurations are directed from physical form
to spatial form and from physical function to socio-cultural func-
tion. The connection between these two is provided by organiza-
tions in which socio-cultural functions are shaped and spaces are
transformed into fabrics [30]. According to Peponis, space syntax
is used to describe, express and measure spatial relationships
and is a unique method for evidence-based analysis as it provides
a systematic framework for comparing environments and their
performance [31]. Seamon also, stated that the space syntax
method includes the nature of daily spatial movement, and
explained that how this movement occurs, the ways in which peo-
ple move, whether they are aware of their surroundings, their stance with other people, the ways in which they meet or not are the themes of space syntax. In summary, space syntax is defined as a certain movement pattern and encounter created by a certain spatial organization [32].

Space syntax is built on two formal ideas which try to reflect both the objectivity of space and our intuitive engagement with it. The first is that we should think of space not as the background to human activity, as we think of it as the background to objects, but as an intrinsic aspect of everything human beings do in the sense that moving through space, interacting with other people in space, or even just seeing ambient space from a point in it, all have a natural and necessary spatial geometry: movement is essentially linear, interaction requires a convex space in which all points can see all others, and from any point in space we see a variably shaped, often spiky, visual field we can call an isovist [33].

The purpose of space syntax is to develop strategies to define configurations of lived spaces, in which the underlying sociologic can be articulated [34]. Space syntax is based on three propositions: (i) people use spaces both consciously and reflexively, (ii) the way spaces are connected to each other affects how people use those buildings (iii) the movement patterns between spaces affect the behavior of people using the space [35]. In this sense, the determining element in the space syntax method is the “movement” factor. The primary goal of the analysis is to understand the potential of physical space to bring people together in relation to movement [36]. The changes in the patterns of action taking place in the space depending on the spatial setup are investigated and interpreted by comparing the space syntax parameter values [37]. The space syntax parameters obtained by entering the plan diagrams of the space into the Syntax 2D software can be listed as values of integration, mean depth, isovist area, isovist perimeter, circularity, connectivity and so on. Each parameter is important to interpret the different features of the space. Within the scope of this study, integration, mean depth and connectivity values will be discussed and their effects on users’ spatial preferences will be investigated.

2.2. Survey

The questionnaire was designed to investigate the anticipated changes in spatial preferences and usage habits of users in shopping centers during the normalization process that started after a long-term quarantine applied during the COVID-19 pandemic. The survey language was Turkish; the content comprised two topics for investigation. First, the respondents were asked to answer general questions about the gender, age, education and working status of the users. Second, they were asked about their approaches before and after the pandemic on the frequency and purpose of using shopping malls, the time they spent in shopping malls, their usage habits and why they preferred which shopping mall are included. The survey was conducted in-person on 100 users selected upon the shopping mall users who used all three shopping malls in case study time to time. For all statistical analyzes, IBM SPSS program was used. In the conclusion of the study, the alpha (Cronbach) reliability analysis method was used to test the reliability of the questionnaire questions designed to collect data. In reliability analysis, the reliability coefficient takes values between 0 and 1, and as this value approaches 1, the reliability
increases [38,39]. When the reliability analysis was performed for the five-point Likert-type ordered scale, it was found that the test was reliable with a value of alpha 0.840.

3. Results

3.1. Space syntax parameters of circulation areas in shopping malls

The plan diagrams of the 3 shopping malls covered in the study were drawn in the Syntax 2D software and analyzed on the basis of circulation areas, and the integration graphs (Fig. 2) and parameter values (Table 1) were tabulated. In the graphical representations seen in Fig. 3, according to the color scale that continues from blue to red, the red areas in the plan represent the areas with the highest integration value, and the blue areas represent the areas with the lowest integration value in the space. Areas with high integration value (expressed in red) represent areas that are easily accessible, where movement is concentrated and allow for social interaction, while areas with low integration value (expressed in blue) describe deep regions that are difficult to access and where movement is low. Each determined value and the comparison of these values are important for the study as it allows evaluations to be made about the different qualities of the spaces.

In Table 1, it is seen that the connectivity, mean depth and integration values to be evaluated within the scope of the study from the space syntax parameters obtained as a result of the analyzes in the Syntax 2D program are digitized. When the data in the table is analyzed both in terms of floor plans and on average values; it is seen that there is an inverse proportion between integration value and mean depth value as the mean depth value increases at the points where the integration value decreases. In this sense, the decrease in the integration value, which expresses accessibility, and the increase in the depth value, which expresses the hard-to-reach spaces, also proves the accuracy of the analysis. Even though they differ on the basis of floors, when the average values are compared, the shopping center with the highest connectivity value, the lowest depth value, and the highest integration value was determined as Kule Site SM, and it was seen that the most negative numerical values belonged to Novada SM.

When the graphical expressions of the plan diagrams and the numerical parameter values are evaluated together;

- Although the integration value is not high enough to be expressed graphically in red on the plan scheme except for the nodal points where the circulation areas intersect in Kule Site SM, when the plans are evaluated in general terms, the wide and uninterrupted circulation areas and the wide gallery space that increases the visual perception between the floors are effective in the average integration value across the plans.
- Although the areas with high integration value, which are graphically expressed in red, are determined in the section close to the main entrance on the ground floor plan and at the nodal points where the circulation intersects in the other floor plans, when all circulation areas are evaluated together, the average integration value is low and the depth value is high due to narrowing circulation areas after an spacious and two-storey high entrance area and field of vision due to the cyclical structure of circulation, and gallery spaces that are not large enough to contribute to the visual connection between floors.
- Although the integration value is found to be high in Novada SM, which has wide and visually uninterrupted circulation areas, in the whole the ground floor, especially in the parts near the entrance to the north, this value decreases dramatically due to the gallery spaces that narrow the circulation areas on the upper floors and negatively affects the average value.
- Although the connectivity value, which expresses the connectivity of the circulation areas with other spaces in the shopping areas, differs on the basis of floors, when the average values are
considered, the highest value is seen in Kule Site SM and the lowest value in Novada SM. Whether the connectivity value has an effect on the spatial preferences of the users will be revealed as a result of the comparison with the results of the survey study.

3.2. Survey results

In the survey application, attention was paid to the fact that the users used all three shopping malls periodically, and that they varied in terms of gender, age, education and working status. When the questionnaires applied to 100 users are evaluated, 60% of the participants are women, 40% are men, 7.1% are 45–64 years old, 48.9% are 35–44 years old, 22.4% are 25–34 years old, 8.2% are in the 15–24 age group, the remaining 13.4% are in different age groups, 78% are working, 14% are students, the remaining users are retired or they were found not to be working.

When the answers given to the questions about determining the anticipated changes in the usage habits of shopping mall users before and after the pandemic are evaluated (Table 2), it was determined that the majority of users visited the shopping mall at least once or more a week before the pandemic, and they preferred to go every few months after the pandemic (Table 2.i). According to the answers given to the question about the time spent in shopping malls; It was determined that users spent more than 90 min in shopping malls before the pandemic, but after the pandemic, this time was reduced to mainly 30–60 min and also 15–30 and 0–15 min (Table 2.iii). When the question about the change in usage habits in shopping centers is evaluated; Before the pandemic, users preferred shopping malls at similar rates (a) because they could find everything they were looking for in the same environment and because a variety of products is offered, (b) because they spent more time with their friends and family in the shopping center and because they had a good time here, even if they didn’t always buy anything, (d) they do not usually make a shopping list, even if they do, they look at the products that are not on their needs list when they go to the shopping mall, and they shop at different stores where those products are available and (e) they prefer to spend time and look at the shop windows rather than buying anything in the mall. It was also determined that before pandemic a small percentage (12%) (c) set a list of needs before going to the shopping mall and only buy the products they need and leave there, but after the pandemic it is seen that, this rate increased dramatically to 71%, users almost abandoned their other habits and 66% of users still preferred shopping centers in terms of product variety (Table 2.iv).

When the questions prepared to determine the changes in the spatial preferences of shopping center users before and after the pandemic are evaluated (Table 3); While before the pandemic, Kule Site and Kent Plaza shopping malls were preferred by almost equal percentages, it was determined that Kule Site SM was preferred more after the pandemic, and Novada SM was the least preferred shopping center before and after the pandemic (Table 3.i). When the answers given to the options prepared on spatial differences in order to examine these preferences profoundly; (a) the number and frequency of vertical circulation elements (stairs, elevators, etc.), (b) the quality of the connection between the market and the car park, (c) quick access to a desired store, (d) the feeling of spaciousness with appropriate floor heights, are examined;

| Table 1 | Space syntax parameter values of shopping malls. |
| Floor Plans | Connectivity | Mean Depth | Integration |
|----------------|---------------|-------------|-------------|
| Kule Site SM ground floor | 854 | 220 | 7.16 |
| Kule Site SM first floor | 876 | 228 | 6.55 |
| Kule Site SM second floor | 1026 | 268 | 5.45 |
| Average value | 918.67 | 238.67 | 6.38 |
| Kent Plaza SM ground floor | 1033 | 183 | 5.98 |
| Kent Plaza SM first floor | 521 | 345 | 3.64 |
| Kent Plaza SM second floor | 478 | 340 | 3.80 |
| Average value | 677.33 | 289.33 | 4.47 |
| Novada SM ground floor | 791 | 197 | 5.43 |
| Novada SM first floor | 317 | 479 | 1.16 |
| Novada SM second floor | 421 | 334 | 3.43 |
| Average value | 509.67 | 336.67 | 3.34 |

Table 2
Change in user habits before and after the pandemic.
The COVID-19 pandemic has affected the whole world since March 2020, and these effects have been the subject of research in many disciplines. The effects of the COVID-19 pandemic process, which has completed 18 months and still continues, changed the usage habits and spatial preferences of shopping mall users. After the pandemic, the frequency of users' visits to shopping malls and the time they spent in shopping malls have changed, shopping malls have been visited less frequently and used for a shorter period of time. Although the usage purposes of shopping centers varied before the pandemic, they were preferred only for grocery and individual store shopping after the pandemic. It is stated that the variety of easily accessible products in shopping centers is the primary criterion in the preference of shopping malls before and after the pandemic, but it has also been determined as a result of the research that after the pandemic users do not prefer shopping malls to spend their spare time, participate in socio-cultural activities or have fun, and they go shopping by preparing a need list and they do not spend extra time to examine unnecessary products.

According to the former researches [38,11,7,40,6] about the effects of COVID-19 on urban and architectural space, it is possible to say that there is dramatic change and spatial adaptation seen in peoples' behaviors. In line with previous studies [41,9,42], the results from this study also demonstrated that custom, habits and rituals characterize integration into the pattern of daily life practices. When the rituals change under different circumstances, the space should adopt the new situation. The imposed need for this adaptation, redesign and the new design of spaces – home environments, work spaces, urban areas, public spaces etc.- questions many architectural and urban assumptions and presents new challenges and new solutions. As different from the other studies, this research investigates the contribution of the social meaning of the space on changing human behaviors under the effect of COVID-19 via space syntax analysis.

The results of the space syntax analysis showed that; the connectivity value of the space has an impact on spatial preferences after the pandemic. As a result of the survey evaluation, Kule Site SM with the highest connectivity value was determined as the most preferred shopping center with its spatial characteristics, and Novada SM with the lowest connectivity value was determined as the least preferred shopping center.

The effect of mean depth value, which expresses the accessibility of the spaces, on the circulation areas was also supported by survey evaluations, and it was determined that Kent Plaza and Novada SM, which have floor plans with high mean depth value and predominantly blue color scale in graphical expression, were less preferred after the pandemic. It is also supported by the survey results that corridors with high integration value, easily accessible, facilitating movement, wide and uninterrupted field of vision, and wide gallery spaces that provide visual perception between floors have a direct impact on the spatial preferences of users after the pandemic. It has been determined that the most preferred criteria of Kule Site SM after the pandemic is based on circulation areas where the average integration value is determined the highest compared to other shopping malls discussed in the case study.

When the space syntax parameters are evaluated on the basis of floors, it is possible to say that the average values, not the values obtained in different floors, are reflected in the spatial preferences. Considering the ground floor plans, Novada SM, which has an integration value close to the ground floor values of Kent Plaza SM, although it has circulation areas with a wide and uninterrupted view on the ground floor, when evaluated together with the other floor plans, it has been determined as the least preferred shopping mall with the lowest integration and connectivity values on average.

According to the overall results obtained in the case study; It is possible to say that the pandemic process has led to changes in the usage habits and spatial preferences of shopping mall users. After the pandemic, the frequency of users' visits to shopping malls and the time they spent in shopping malls have changed, shopping malls have been visited less frequently and used for a shorter period of time. Although the usage purposes of shopping centers varied before the pandemic, they were preferred only for grocery and individual store shopping after the pandemic. It is stated that the variety of easily accessible products in shopping centers is the primary criterion in the preference of shopping malls before and after the pandemic, but it has also been determined as a result of the research that after the pandemic users do not prefer shopping malls to spend their spare time, participate in socio-cultural activities or have fun, and they go shopping by preparing a need list and they do not spend extra time to examine unnecessary products.

5. Conclusion

The COVID-19 pandemic has affected the whole world since March 2020, and these effects have been the subject of research in many disciplines. The effects of the COVID-19 pandemic process, which has completed 18 months and still continues, changed the

### Table 3

| Change in users' spatial preferences before and after the pandemic. |
| --- |
| ![](image.png) |
| **i.** Shopping mall preference |
| ![](image.png) |
| **ii.** Spatial preferences in Kule Site SM |
| ![](image.png) |
| **iii.** Spatial preferences in Kent Plaza SM |
| ![](image.png) |
| **iv.** Spatial preferences in Novada SM |

- The fact that the Kule Site SM is more preferred after the pandemic is based on the fact that it creates a feeling of spaciousness with its appropriate floor heights, the stores on different floors are easily perceptible through wide gallery spaces, and the circulation areas are wide (Table 3.ii).
- The features that make Kent Plaza SM to be preferred after the pandemic are that it can be directly connected to the market and the parking lot on the same floor, and that it can be accessed quickly to a desired store because of its circular layout (Table 3.iii).
- It has been determined that the spatial characteristics of Novada SM are generally evaluated rather negatively both for the pre-pandemic and post-pandemic period compared to the other shopping malls covered in the study (Table 3.iv).

4. Discussion

According to the former researches [38,11,7,40,6] about the effects of COVID-19 on urban and architectural space, it is possible to say that there is dramatic change and spatial adaptation seen in peoples' behaviors. In line with previous studies [41,9,42], the results from this study also demonstrated that custom, habits and rituals characterize integration into the pattern of daily life practices. When the rituals change under different circumstances, the space should adopt the new situation. The imposed need for this adaptation, redesign and the new design of spaces – home environments, work spaces, urban areas, public spaces etc.- questions many architectural and urban assumptions and presents new challenges and new solutions. As different from the other studies, this research investigates the contribution of the social meaning of the space on changing human behaviors under the effect of COVID-19 via space syntax analysis.

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deep-rooted systems, habits and life order that people thought would never change, brought about change also in the architectural field as well as in every aspect of social life.

It is obvious that the COVID-19 pandemic has created differences in people’s perception of space and therefore in their expectations about space. These differences are reflected in the basic accommodation scale, working scale and all spaces used in daily life. Shopping malls are also considered as an important part of daily life within the scope of this study and determinations have been made on the changing spatial perceptions and preferences of their users. The pandemic process has changed people’s spatial perceptions. While personal preferences were at the forefront in places to be preferred for shopping action before the pandemic, spatial characteristics gained importance after the pandemic. In the shopping malls where people used to spend their spare time, have fun, look in the shop windows and interact with other people before the pandemic, they now prefer to prepare shopping lists and get their work done in the shortest possible time and for this, they went to shopping malls with large circulation areas that could keep interaction with other people to a minimum. Spatial use in shopping malls, which are planned to meet the design criteria with wide, uninterrupted, long circulation areas and gallery spaces, has changed to reach the desired store as soon as possible after the pandemic.

There is similar spatial changes depending on peoples’ changing behaviors and spatial preferences from macro to micro scale after COVID-19 pandemic so, for future studies it is possible to study every aspect of the adaptation processes of these behavioral and spatial changes in educational, social, residential, commercial, working spaces and so on. Will this and similar changes in the built environment affect the design criteria in the long run, and how we will continue to live in buildings in the future with our changing spatial preferences in every scale are just some of the future research topics.

Declaration of Competing Interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

References

[1] Mohammad Ayoub Khan et al. Performance evaluation of regression models for COVID-19: A statistical and predictive perspective. Ain Shams Eng J, 2022;13(2):101574. doi: https://doi.org/10.1016/j.asej.2021.08.016.
[2] Selim Tarek, Eltarabily Mohamed Galal. I mpact of COVID-19 lockdown on small-scale farming in Northeastern Nile Delta of Egypt and learned lessons for water conservation potentials. Ain Shams Eng J 2022;13(4):. doi: https://doi.org/10.1016/j.asej.2021.11.016.
[3] Mohamad AH et al. Impacts of e-commerce on planning and designing commercial activities centers: A developed approach. Ain Shams Eng J, 2022; 13(4): 101634. https://doi.org/10.1016/j.asej.2021.11.003.
[4] Abusaada H, Elshater A. Effect of people on placemaking and affective atmospheres in city streets. Ain Shams Eng J 2021;12(2):2331–43. doi: https://doi.org/10.1016/j.asej.2020.02.002.
[5] Küçükomürçü B. A research on feedback about traditional Turkish Ottoman bazaars and today’s shopping centers, master thesis. İstanbul: Mimar Sinan University of Fine, Arts, Institute of Natural Sciences; 2005.
[6] Nezari E. Ekmeği I. Tahtlağın Gümüşüne Aşlıveren Merkezlerin Deng -erdeninilmiş, İstanbul Ticaret Universitesi Sosyal Bilimler Dergisi 2019;17 (33):389–406.
[7] Abusaada H et al. Articulating assemblage theory for salient urban atmospheres in children’s environments. Ain Shams Eng J 2021;12(2):2331–43. https://doi.org/10.1016/j.asej.2020.02.002.
[8] Zengel R. Tarih içinde Degis. Çil E. Bir kent okuma aracı olarak mekan dizim analizinin kuramsal ve queksel view on the changing spatial perceptions and preferences. URBAN DESIGN International 2021;26:139–73. doi: https://doi.org/10.1057/d1229-021-00153-6.
[9] Abusaada H, Elshater A. COVID-19 Challenge, Information Technologies, and Smart Cities: Considerations for Well-Being. Int J Community Well-Being 2020;3:417–24. https://doi.org/10.1080/20532650.2020.1795197.
[10] Sun C, Zai Z. The efficacy of social distance and ventilation effectiveness in preventing COVID-19 transmission. Sustainable Cities and Society 2020;62:. doi: https://doi.org/10.1016/j.scs.2020.102390.
[11] Friendly A. Insurgent planning in pandemic times: the case of rio de janeiro. Int J Urban Reg Res 2020;46(1):115–25. doi: https://doi.org/10.1016/j.ijurreg.2020.01.009.
[12] Erkip F. The shopping mall as an emergent public space in Turkey. Urban Design International 2020;25(6):669–74. doi: https://doi.org/10.1080/13574809.2020.1745175.2020.1842484.
[13] Lev A. Community Resilience and Placemaking through Translocal Networking. J Public Space 2019;4(2):165–78. , https://doi.org/10.32891/jps.v4i2.1208.
[14] Hillier B, Hanson J. Space, place, and atmosphere: Peripheral perception in existential experience. In: Architectural atmospheres: On the experience and politics of architecture. 2014; Basel, Birkhäuser, p. 230-245. https://doi.org/10.1515/9783038211785.18.
[15] Elshater A et al. What makes livable cities of today alike? Revisiting the criterion of singularity through two case studies. Cities 2019;92:273–91. doi: https://doi.org/10.1016/j.cities.2019.04.008.
[16] Zengel R. Tarih içinde Degis. Çil E. Bir kent okuma aracı olarak mekan dizim analizinin kuramsal ve queksel view on the changing spatial perceptions and preferences. URBAN DESIGN International 2021;26:139–73. doi: https://doi.org/10.1057/d1229-021-00153-6.
[17] Friendly A. Insurgent planning in pandemic times: the case of rio de janeiro. Int J Urban Reg Res 2020;46(1):115–25. doi: https://doi.org/10.1016/j.ijurreg.2020.01.009.
[18] Friendly A. Insurgent planning in pandemic times: the case of rio de janeiro. Int J Urban Reg Res 2020;46(1):115–25. doi: https://doi.org/10.1016/j.ijurreg.2020.01.009.
[19] Friendly A. Insurgent planning in pandemic times: the case of rio de janeiro. Int J Urban Reg Res 2020;46(1):115–25. doi: https://doi.org/10.1016/j.ijurreg.2020.01.009.
[20] Beyond DM, O’Mara WP. Shopping Center Development Handbook, Urban Land Institute, Washington D.C.; 1999.
[21] Gruen V. Shopping Towns USA. New York: Van Nostrand Reinhold; 1960.
[22] Gez Ş. A study for the urbanization criteria which effects the development of shopping centers in Turkey, master thesis, Istanbul Technical University, Institute of Natural Sciences, Istanbul; 2008.
[23] Terece T. The investigation of physical comfort criteria in accordance with the universal design principles at shopping malls: a broad programmed shopping mall experience, master's thesis, Fatih Sultan Mehmet University Institute of Graduate Education, Department of Architecture; 2019.
[24] White R, Sutton A. Social planning for mall redevelopment: An Australian case-study. Local Environment 2001;6(1):65–80.
[25] Etkin F. The shopping mall as an emergent public space in Turkey. Environment and Planning A 2003;35:1073–93.
[26] Koşş J. The magic of the mall: An analysis of form, function, and meaning in the contemporary retail built environment. Ann Assoc American Geographers 1993;83(1):18–47.
[27] Coleman P. Shopping Environments: Evolution, Planning And Design. Architectural Press; 2006.
[28] Megahed G et al. Competencies urban planning students need to succeed in contemporary retail built environment. Ain Shams Eng J 2021;12(3):3389–403. doi: https://doi.org/10.1016/j.asej.2021.04.019.
[29] Megahed G et al. Competencies urban planning students need to succeed in contemporary retail built environment. Ain Shams Eng J 2021;12(3):3389–403. doi: https://doi.org/10.1016/j.asej.2021.04.019.
[38] Aydin D, Sayar G. Questioning the use of the balcony in apartments during the COVID-19 pandemic process. Archnet-IJAR 2021;15(1):51–63. doi: https://doi.org/10.1108/ARCH-09-2020-0202.

[39] Ural A, Kılıç, I. Bilimsel Araştırma Süreci ve SPSS ile Veri Analizi, Detay Yayıncılık, Ankara; 2005.

[40] Abusaada H, Elshater A. COVID-19 and “the trinity of boredom” in public spaces: urban form, social distancing and digital transformation. Archnet-IJAR 2022;16(1):172–83. doi: https://doi.org/10.1108/ARCH-05-2021-0133.

[41] Maturana B et al. Architecture, urbanism and health in a post-pandemic virtual world. Archnet-IJAR 2021;15(1):1–9. doi: https://doi.org/10.1108/ARCH-02-2021-0024.

[42] Alraouf AA. The new normal or the forgotten normal: contesting COVID-19 impact on contemporary architecture and urbanism. Archnet-IJAR 2021;15(1):167–88. doi: https://doi.org/10.1108/ARCH-10-2020-0249.