

A BIBLIOMETRIC MAPPING ANALYSIS FOR THE CHANGE ON SPATIAL DESIGN IN COVID-19 PROCESS

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ABSTRACT

In 2020, the COVID-19 pandemic had a global impact, necessitating changes to daily life, since activities such as work, education, shopping, and socializing were curtailed due to the pandemic, and people had to perform most of these activities in their houses. However, the existing residential houses were insufficient to perform these activities. As a result, concepts affecting private life became prominent, leading to limitations on vital needs. Therefore, the restrictions imposed by the governments had negative social and psychological consequences for individuals. The limitations of action areas within houses lead to changes in spatial design. Consequently, studies on the requirements of the human environment have been initiated, with concepts such as flexibility, natural spaces, and privacy gaining importance in the design and use of housing. This process has led to a redefinition of the concept of space, necessitating the adaptation of spatial design to the new normal. The present study examines the impact of the COVID-19 pandemic on spatial design through a comprehensive review of relevant literature. Thus, a theoretical framework was proposed by revealing the distribution of the existing studies through a bibliometric analysis. Two bibliometric analyses were performed by considering the titles, abstracts, keywords of the studies, and findings, and conclusions of the studies, respectively. Based on the identified prominent keywords at the end of bibliometric analyses, the problem and result concepts were revealed. The most commonly used words are "user," "order," "function," "housing," "pandemic," "time," "change," "process," "impact," "quality," "environment," "space," "life," "need," "health," "quarantine," and "architecture."

Keywords: Covid-19 Pandemic, Housing, Spatial Design, User, Change.

1. INTRODUCTION

The COVID-19 pandemic has had a global impact (WHO 2020), affecting physical, social, and psychological well-being. It has also become a topic of discussion in architectural and urban discourse, particularly with regard to quarantine and infectious diseases (Valizadeh and Iranmanesh, 2022). The pandemic has led to differences in spatial experiences for housing users, with isolation having an impact on privacy. It has been observed that the quality of the environment is directly related to residents' health (Pancani et al., 2020).

Quarantine measures have forced people to change their daily lives, resulting in changes to the usage of various spaces (Özker and Tuğlu, 2021). The pandemic has led to an increased need for spatial requirements, particularly with regard to integrating living, working, and leisure activities into a single space (Valizadeh and Iranmanesh, 2022). These changes have transformed users' spatial experiences and require new configurations. The transformation of spatial design has become apparent as per the needs, demands, and desires of users. The COVID-19 pandemic has not only influenced the inclination to cope better with staying at home but also emotional and psychological well-being, as well as physical health (Asim et al., 2021). This process has impacted the lifestyle of users, leading to a diversification of new configurations and requirements. Salama (2020) has indicated that the effects of COVID-19 on living spaces may persist for a prolonged period, affecting various areas, including public spaces, housing, working environments, and urban areas (Salama, 2020).

In this context, different studies on spatial design during and after the COVID-19 pandemic process have been carried out in many fields. These studies emphasize the importance of users and their needs. They propose some concepts which can be used for spatial design. For instance, the need for concepts such as flexibility, natural spaces, and privacy in residential use has increased, and spatial design has started to align with these concepts. Despite the rapidly growing literature on this subject, it is still necessary to investigate smaller-scale habitats and to carry out further studies (Valizadeh and Iranmanesh, 2022).

Examining these studies can be beneficial for identifying the problems by revealing the most studied keywords in the relevant literature. Thus, the reflections of the Covid-19 pandemic on spatial design can be exposed. Therefore, this study aims to determine the most used words containing solution suggestions in the studies on the detection and solution of problems in spatial design during and after the Covid-19 pandemic process. As such, this study proposes a comprehensive framework that delves into the literature relevant to the COVID-19 pandemic and spatial design. Specifically, the study utilizes quantitative research and bibliometric analysis methods. The bibliometric analysis can reveal the subject distribution of the studies. Thus, the problem and result concepts can be determined according to the prominent keywords in the studies on the Covid-19 pandemic and spatial design.

In this study, the first section is dedicated to the literature on the change of spatial design in COVID-19. Then, the research methodology followed to conduct this study is explained. The findings of the performed analyses are presented in the third section of this study. Finally, these findings are discussed elaborately to reveal the most important concepts considered in the literature.

2. LITERATURE REVIEW ON THE CHANGE OF SPATIAL DESIGN IN COVID-19

The everyday routine has been greatly affected by the COVID-19 pandemic, resulting in major changes to the spatial design of homes. Traditional designs, which were once sufficient in meeting basic accommodation needs, are now inadequate to compensate the new conditions emerged due to strict restrictions and lockdowns. As a result, numerous studies are being conducted to identify the new user needs that must be addressed in designing homes that can be better equipped to handle the challenges of the pandemic. The following is a summary of some of these studies.

Alawad (2021) conducted a review of literature on housing design during the pandemic. The objective was to gain insights into how individuals have adjusted to and engaged with their living spaces during the Covid-19 crisis. The study revealed that housing users have made changes, transformations, and adaptations to their living spaces to align with the new functional requirements during the pandemic.

Ayala et al. (2022) carried out a research study on the significance of housing and housing deprivation during the COVID-19 lockdown and discussed the importance of housing in meeting human needs through government measures. The study underscores the unequal distribution of social welfare losses during the lockdown-quarantine process among European countries. It stresses the importance of government interventions that encourage the availability of fair and equitable housing.

Çağlar (2020) investigated the impact of the post-pandemic normalization process on buildings and highlighted the significance of indoor air quality for individuals spending extended periods at home during the pandemic.

Çebi (2020) conducted a study on the boundaries of "normal" and "new normal" life that have been frequently emphasized during the COVID-19 process. The study revealed that behaviors considered "normal" in the pre-pandemic period were seen as abnormal during the pandemic or "new normal" life.

Diker and Demirkan (2022) conducted research to investigate the psychological effects of COVID-19 quarantines on individuals' well-being while indoors. The study found that factors such as access to nature, privacy, and regulation of crowding positively impacted individuals' well-being during quarantine and played a crucial role in improving their psychological well-being.

Ehsani Oskouei et al. (2021) aimed to determine how individuals adapt to the new lifestyle in residential environments under quarantine conditions caused by the global pandemic. The study found that the quarantine adaptation process was affected by the physical conditions of dwellings and living spaces that allow residents to interact.

El-Din and Mostafa (2022) discussed the impact of the Covid-19 pandemic on daily life and the need for sustainable and functional interior design in homes. In the study, novel and impactful design suggestions were proposed to cater to the evolving requirements of building occupants amidst the pandemic. In the aforementioned study, novel and impactful design suggestions were proposed to cater to the evolving requirements of building occupants amidst the pandemic.

Elrahman (2020) conducted a case study on the impact of Covid-19 on the city of Cairo, specifically focusing on three upper-middle-class neighborhoods. The study aimed to observe how existing home, work, and leisure activities have adapted to residential environments. The study concluded that post-pandemic Cairo has seen the emergence of different considerations and new norms in housing typologies.

Güney and Tulum (2021) sought to examine the concept of the ideal house before and during the pandemic, tracing its evolution from the 19th century to the present day. The study partially confirmed the notion that the ideal house has been perceived as a detached house in a garden and highlighted that the pandemic has impacted the perception of the ideal house.

Güvnlü and Yılmaz (2021) explored the changes in space utilization and design proposals developed in response to the pandemic. The study highlighted the importance of spatial variation in public areas and reached the conclusion that the shift in how public spaces are used will endure even after the pandemic is over.

Hwang and Kim (2022) conducted a study to identify the issues with modular building design and construction post-pandemic and proposed solutions to enhance the quality of life in housing design and address the pandemic's impact. The study suggests that housing designs must adapt to new functions such as quarantine, teleworking, and e-learning in Palestine.

Itma and Monna (2022) revealed that while modern open plans are more suited for entertainment and social functions, traditional closed plans are better equipped to accommodate new functions such as working from home and studying.

Maharani et al. (2022) conducted a literature review to identify the ideal spatial design for residences that can promote physical and mental health and create a more comfortable living environment, particularly during the pandemic period when individuals have spent more time at home. Design criteria that can be employed in forthcoming design strategies were revealed by the study.

Molaei et al. (2021) aimed to evaluate the function and impact of balconies during the pandemic period when individuals were required to stay at home. The study found that the majority of residents living in apartments experienced increased satisfaction levels with the use of balconies during the pandemic.

Navas-Martin et al. (2022) examined the living conditions and indoor environmental quality of Spanish residences during the Covid-19 pandemic. The study identified several factors such as house area, storage space, outdoor space, thermo-acoustic insulation, window quality, natural lighting, and others that were deemed necessary but challenging to change.

Parsa and Demir (2022) investigated the requirements for dwelling spaces during the pandemic period when individuals were required to spend more time at home due to imposed restrictions. The study found that the demand for requirements in all types of residences has increased.

Peters and Halleran (2020)'s study aimed to identify solutions that promote health in housing design after the pandemic. The study's findings emphasized the importance of designing plans that can accommodate various uses and cater to the needs of different users.

Pinheiro's (2020) study investigated the potential for the COVID-19 pandemic to change residential areas and benefit from special solutions for sustainable buildings or urban areas. The study highlights the importance of identifying strategies to mitigate the spread of COVID-19, enhance resilience, enhance air quality, and reduce energy consumption and material usage.

Saragih (2022) sought to gain insight into the conduct of family members and the spatial arrangement of their residences in connection with the likelihood of COVID-19 family clusters, examine the occurrence of family clusters, and authenticate preceding research on this subject matter. The study concluded that sustainable housing designs that prioritize improved air circulation and natural lighting, as well as access to isolated rooms and private sunbathing areas, can help minimize the risk of COVID-19 transmission.

Shamaileh (2021) aimed to determine the changes in the interior spaces of houses in Jordan during the COVID-19 pandemic. The study led to the proposal of a conceptual model that presents present and future responses that can be implemented to address the repercussions of the pandemic with regards to spatial design.

Sipahi and Yamaçlı (2021) investigated human health and COVID-19 effects in residential buildings. As a result of the study, it revealed the importance of daylight illumination, which is an important component of indoor environmental quality, as a potential solution for future housing understanding.

Spennemann (2021) conducted a study on the impact of the COVID-19 pandemic on user requirements and new housing construction. The study emphasized the emergence of new requirements due to COVID-19 on existing housing and the need for customized spaces.

In Spennemann's (2022) conceptual discussion, strategies for appropriate building designs were explored to mitigate the effects of current and future pandemics on human beings. The role of architects in new building design was also questioned in light of the current pandemic. The study revealed the necessity for design strategies in building design to meet emerging requirements.

Taşçı's (2020) study aimed to examine user comfort in response to changing perceptions due to the pandemic. The findings emphasized the necessity to construct residential structures that cater to people's outdoor engagement requirements and to modify the layout of indoor arrangements.

Turna and Usta's (2021) study investigated the changes houses have undergone during the COVID-19 pandemic and explored potential applications for working spaces in houses with a usage area of 45 to 100 m² by discussing through examples selected from the literature.

Valizadeh and Iranmanesh (2022) conducted a case study with a group of architecture students to investigate the impact of changes in the built environment on residential areas during the Covid-19 pandemic, as well as the transformation of spatial organization. The research discovered that the demarcation line between public and private actions within residential spaces became indistinct, and balconies and similar openings became the focal points of residential spaces.

Xu and Juan (2021) aimed to develop new design strategies by determining the preferences of users in multi-story residential buildings in China in response to the Covid-19 pandemic and subsequent changes in people's housing needs. The research yielded the discovery of 26 design tactics for Chinese multi-unit residential structures and their corresponding prerequisites.

Yüksel (2022) conducted a reassessment of the evolving interiors of housing and the correlation between the environment and housing in the new normal process. The study placed a significant emphasis on green areas and the landscaping of buildings.

Zaher (2020) examined design solutions for common and public spaces through the eyes of interior designers in accordance with the instructions of the World Health Organisation. The assessment also assessed the state's strategy for creativity and growth in fourth-generation cities, with a primary emphasis on developing design solutions to brace for the second wave of the pandemic.

Zarrabi et al. (2021) conducted an assessment of the health indicators within apartment-style dwellings following the Covid-19 outbreak. The study emphasized relevant variables that impact mental health, such as natural light, landscape, acoustics, and open or semi-open spaces. The authors concluded that planners, builders, and architects should design residences with attention to mental health parameters.

Zoğal and Emekli (2020) aimed to comprehend the changes that emerged during the COVID-19 pandemic process in Turkey and to establish a foundation for further studies by assessing the current and potential effects of the phenomenon. The evaluation and interpretation of statements made by local administrators on the subject were undertaken. The task of evaluating and interpreting statements made by local administrators on the subject has been undertaken.

As per the relevant literature studies, numerous research studies have been conducted to identify and address spatial design problems during and after the COVID-19 pandemic. These studies are categorized based on their respective fields. Although the studies on spatial design commenced from different starting points, they all share a common concern and focus on specific concepts. Most of these studies are literature reviews about change in residential spaces, whereas some publications aim to highlight the issues of the urban environment. The COVID-19 pandemic, which has become a global issue, is considered a universal factor in the sustainability of human life. Despite the structural and cultural variances among countries, the research findings concentrate on the pandemic's challenges and offer recommendations and solutions to tackle them.

3. BIBLIOMETRIC MAPPING ANALYSIS

To determine the essential concepts related to the COVID-19 pandemic and spatial design requirements, a thorough analysis of relevant literature was conducted. Firstly, a search was made through the Google Scholar database. Google Scholar is a comprehensive database that facilitates the scanning of scientific literature, allowing for the querying of numerous disciplines and sources from a single location (URL1). The reason for selecting the Scholar database is its ease of access to relevant literature and other databases, as compared to search engines. A search comprising the keywords "Covid-19, pandemic, housing, housing design" was undertaken via the Google Scholar database. The title, abstract, and keywords of the studies extracted were examined, and 62 publications (1 conference paper, 1 book chapter, 60 articles) were determined appropriate for the content of the study.

Two bibliometric analyses were conducted using VOSviewer in this study. The first analysis was based on the titles, abstracts, and keywords of the studies, while the second analysis was based on the findings and conclusions of the studies. During these analyses, the "binary counting" option was used as the counting method and the number of repetitions of a word was chosen as 10. This enabled the identification of keywords that repeat at least 10 times in the file. For both analyses, the first 40 words repeated at least 10 times in the text were selected, and the network map and density map between these words were obtained based on these 40 words. Also, these 40 words were clustered by the program based on their relationships with each other. Figure 1 and Figure 2 respectively show the density map and network visualization of the first bibliometric analysis. While the density map shows the clusters of these concepts, network visualization shows the relationships between these concepts.

Concepts obtained according to the density map as a result of bibliometric data analysis are shown as follows.

Group 1 (green): Covid, pandemic, time, home, housing, quarantine, environment, impact, architecture, quality, mental health.

Group 2 (red): Person, importance, individual, life, process, order, content, World Health Organisation, health, pandemic process, world, China, problem, Turkey, effect, pandemic.

Group 3 (blue): User, function, place, house, space, resident, term, quarantine.

Group 4 (yellow): Data, participant (Figure 1 and 2).

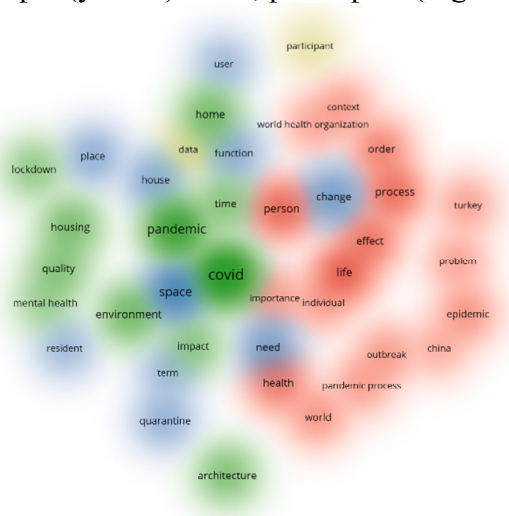


Figure 1. Concept groups obtained according to the density map obtained from the first bibliometric analysis

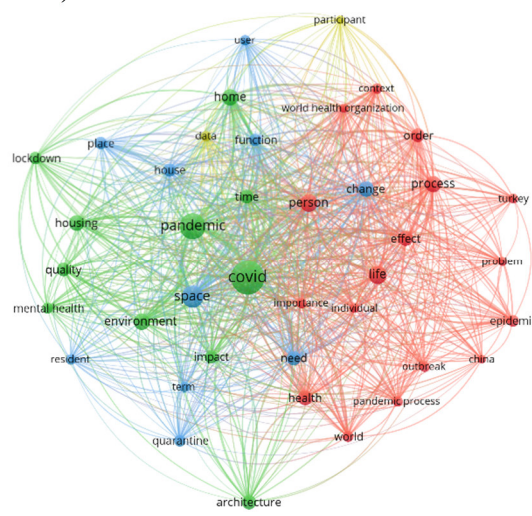


Figure 2. Relationship of concepts according to network visualization map obtained from the first bibliometric analysis

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These groups show that “Covid, pandemic, environment, house, life, person, process, space, change” are the most frequently studied words.

The results of the second bibliometric analysis are shown in Figure 3 and Figure 4 respectively.

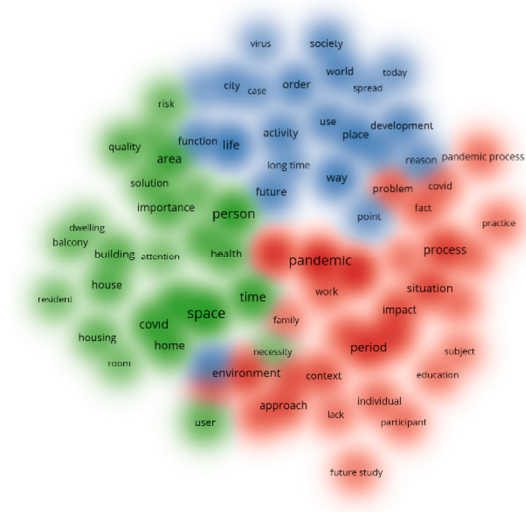


Figure 3. Concept groups obtained according to the density map obtained from the second bibliometric analysis

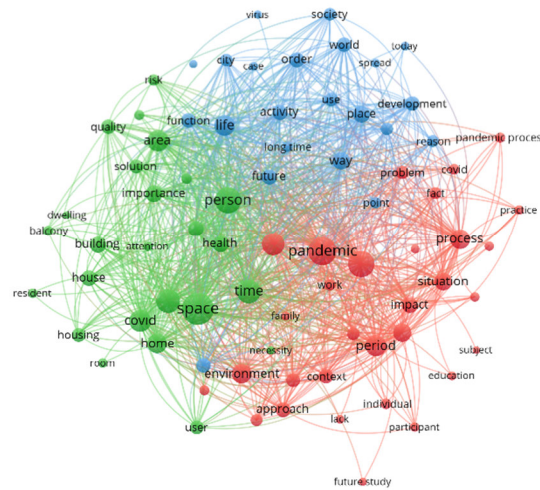


Figure 4. Relationship of concepts according to network visualization map obtained from the second bibliometric analysis

As a result of the second bibliometric data analysis, the extracted concepts are shown as follows.

Group 1 (green): Risk, quality, area, solution, importance, person, health, dwelling balcony, building, attention, house, resident, housing, covid, space, time, user, home, room.

Group 2 (red): Pandemic process, covid, problem, fact, practice, process, situation, pandemic, impact, work, family, period, subject, context, individual, participant, lack, future study, approach, environment, education.

Group 3 (blue): Virus, society, world, today, city, case, order, spread, use, function, life, activity, place, development, reason, point, future, long time, way (Figure 3, 4).

Based on the density map shown in Figure 3, it is evident that the most frequently researched topics include pandemic, area, person, health, space, time, home, environment, period, importance, and future.

Regarding the COVID-19 pandemic and spatial design, the studies considered in this study emphasize the importance of meeting the housing user's needs, spatial design and performance, the necessity for a new design, housing quality, access to work and education, welfare level, ventilation systems, antibacterial materials, smart equipment, social and physical isolation, the importance of privacy, space psychology, private outdoor spaces, green and healthy spaces, psychological requirements, indoor environmental quality (including lighting, sound insulation, visual and thermal comfort, and air quality), living conditions that support the well-being of housing users, spatial diversity, interaction areas, connection with nature, user health, and sustainable architecture. In future pandemics, it is crucial to consider these criteria in spatial design to reduce the negative impact of the pandemic on the housing concept and mitigate its effects on the user.

Finally, numerous studies have been conducted in various fields related to the COVID-19 pandemic.

As a result, studies focusing on COVID-19 and spatial design have also increased, along with publications pertaining to the COVID-19 pandemic process, post-process, and studies on the new normal order. While the majority of these studies are centered on propositions that emphasize the needs of the housing user, they are not appropriate to the construction and design sector. Therefore, it is imperative to conduct studies that determine the needs of the housing user. However, these studies are lacking and thus, there is a need to conduct research that observes the housing user one-on-one to determine targeted requirements. The findings of these studies must be shared with the housing sector to benefit the housing user during new pandemics.

4. CONCLUSION

The COVID-19 pandemic has left a significant impact on the world, causing widespread concern and uncertainty among human beings. It's crucial that we learn from this experience to prevent future pandemics from having negative impacts on human health. By examining the pivotal factors that facilitated the transmission of the virus and the consequential impact it had on societies across the globe, we can determine optimal methodologies for construction and other industries, thus enabling us to create safer and more resilient environments for all individuals.

It's also important to examine how these lessons can be applied to the construction sector and related fields to prepare for future health crises. Since, the impact of the COVID-19 pandemic on spatial design has attracted many scholars, the examination of these studies can provide insights about the existing problems in spatial design. Therefore, it's crucial to consider the findings of studies in this area when investigating the pandemic and planning for a post-Covid world to ensure that our spaces are conducive to healthy living.

Despite methodological differences in the existing studies, they all unanimously state the user's comfort and well-being as the ultimate goal, with housing users being the primary focus. This underscores the importance of sustainable investments in spatial design that prioritize human health and well-being. Future recommendations for spatial design improvements must prioritize the needs of users to enhance their health and quality of life in pandemic times. Thus, we can allocate adequate resources to address the most important needs proactively. This approach can ensure that we are better equipped for future health crises and that we are taking every measure possible to safeguard the health and well-being of individuals and communities worldwide.

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