Perception Of Architectural Output: The Presence Of Architecture In The Presence Of A Pandemic

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Abstract: The importance of the fourth dimension in architecture is based on its use to determine the effectiveness and structure of four-dimensional space through perception; how people live in architecture and move within spaces is affected by the ways their senses become accustomed to what they see and perceive. New intellectual responses are generated by both new formations and circumstances, generating the research problem focused on the role of architecture with respect to recognising the current pandemic and its effects on architectural production. The research goal was thus to achieve a new perception of architecture by adding the fourth dimension of time as one of the component dimensions within the system of change that architecture must develop in response to the pandemic; this can be achieved by creating broader horizons within classic theories in an attempt to formalise architectural products that adopt the fourth dimension to address issues arising from the pandemic. The research method included inductive, analytical, and interpretive approaches, examining various theories and concepts to arrive at a set of values, and the results were a set of mental concepts that describe an architectural perception of the pandemic, based on interaction, which provide a knowledge base for developing awareness of the pandemic through architecture.

Key words: physical presence, perception, epidemic, architectural presence, cognitive dimension.

Research importance and objectives: This research aimed at determining levels of influence resulting from real-time variables (the Covid-19 epidemic) on the perception of architectural output based on studying the presence of architecture, the existence of the pandemic, and the ways the pandemic may be perceived within the architecture of this crisis. This goal was approached via a specific set of questions:

- What are humans’ relationships with the fourth dimension, and how has the pandemic affected the resulting perception of architecture?
- How has the realisation of these effects affected the architecture of the pandemic to produce a product for the audience?

Research methodology (research method): A rational approach depends on induction and deduction to reah a goal. This research thus...
instigated a mixed approach over several levels, as shown in Figure 1:

- The first level: the cognitive framework (the definition of the concept of perception)
- The second level: the theoretical framework (united architecture, fourth dimensional architecture, pandemic architecture)
- The third level: the practical framework (Iraqi architecture)
- The fourth level: findings, conclusions and recommendations

**Expected results of the research:**

- Perception is the fourth dimension of architecture; this has a particular importance in the architecture of a pandemic
- A knowledge base for architects dealing with emergency events such as the Covid-19 pandemic

**The temporal and spatial dimensions of the research:**

- The temporal dimension: the present, 2020, and the uncertain future
- The spatial dimension: the architecture of the future as the architecture of the pandemic

**Aims:**

- Opening up the horizons of research in terms of realising a new architecture that meets the needs of immediate variables (Covid-19)
- The presence of the fourth-dimension in architecture in dealing with events such as the pandemic
- A study of the relationship between humanity and architecture, and an examination of the impact of contingent events on that relationship

1. **Introduction**

   Everything that exists has form, and every form requires substance to support it; matter is the means of experiencing a thing, while form is the means of perceiving a thing; if there are things in the universe that have no form, humans can neither know or perceive them. Human beings seek out information and organise it; their resulting perception is thus a complex process consisting of several stages interspersed with various physiological, psychological and behavioral variables; it is thus the outcome of the interaction of these variables that forms perception [1].

2. **Conceptual framework**

   The conceptual framework can be summarized as:

   **2.1. Perception concept:**

   Various concepts of perception, types of perception, theories of perception, and, in particular, the perception of architectural output require clarification for this work.

   **2.1.1. Perception**

   Perception (from the Latin perceptio, meaning gathering or receiving) refers to the organisation, identification, and interpretation of sensory information in order to represent and understand the presented information or environment.[2]

   The term perception in psychology refers to the mental processes by which knowledge of the sensible external world is accomplished based on the sensations received and their interpretation, with the latter
process completing them and giving them meaning. This kind of response is triggered not by the various sensory forms but by what they symbolise, and this response thus elicits certain types of behaviours [3]. Feelings are also translated into perceptions through knowledge and experience. For example, “your vision of green is just a feeling, but your understanding of its significance is awareness, and you here have resorted to your previous knowledge and experience to realize its meaning” [4].

2.1.2 Types of Perception:

Architectural studies, according Rapoport [5], have identified three basic “stages” or processes that encompass the act of receiving and visualising the external environment, all of which can thus be seen as successive phases of a single process, as shown in Figure 2:

- Sensory Perception: Direct and involuntary sensory input
- Cognitive Perception: Determining the features of and information about the perceived element
- Evaluation

2.1.3 Theories of Perception:

Many theories have been developed to explain the concept of perception; BAGO collected these into seven categories, as shown in Figure 3 [6].

- Structural theory and empiricism
- Behavioural theory
- Castilian theory
- Formative theory
- Environmental theory
- Transactional theory
- Cognitive theory

2.1.4 Perception:

Architectural shapes in particular are perceived mainly through the following theories:

- Theory of information analysis
- Theory of perception of shape based on memory
- Theory of integration of features [7]

2.1.5 Perception of architectural products:

The perception of the recipient is affected by the way attention is focused on the architectural product and how the latter evokes feelings through stimuli; this is in turn affected by the characteristics of perceptive architecture, which are divided into three types: formal characteristics; spatial space characteristics; and sensory-emotional properties [8], as shown in Figure 4.
2.2. Theoretical framework: (united architecture, fourth dimensional architecture, pandemic architecture)

2.2.1 United Architecture:

United architecture is architecture that exists inside human thought before occurring in reality, being an idea that then develops existence based on the process of interfering with the surrounding variables. Such embodiment creates a product that attracts acceptance, as the initial process occurs within the thought of the architect; thus, such architecture is represented by the efforts of humans as shown in Figure 5.

General objective: Creating architecture, whether human architecture, place architecture, or land architecture

Special objective: To show the relationship between buildings and what may be achieved by acknowledging the presence of place and the presence of human beings imultaneously to form the product of architecture.

“Human architecture: place architecture; land architecture”

2.2.1.1 Human architecture: From the beginning, humas have sought was to fill their needs throughout the course of life; although Muslims believe that God has created the fulfillment of the requirements of such needs, the availability of blessings in their natural form does not mean that the need is automatically met: there is a need to prepare these blessings, and thus human beings adapt and use multiple resources to fulfill those needs. Shelter is a need and necessity, and all the materials to fill that need are available; humans should thus fulfill that need from those materials available in nature. However, the question remains of whether, in forming a shelter, only utilitarian function will be considered, or whether the psychological effects of a building are considered, meeting a range of needs; thus, belief in purpose plays a role in the formation of the building[9].

2.2.1.2 Architecture of place: Piaget indicated that place is the product of the interaction between a human being and the environment as the subject of that interaction. Place is frequently represented in architectural expression, with images closely related to the intention of the architect, who may try in turn to associate these with various concepts such as identity, localism, belonging, and memory association; these images, if presented by architecture, are thus linked in one way or another to society[10]. Issa (2008) discussed this as a set of stimuli, part of an integrated system generating a product that is closely related to natural considerations (climate, nature and geography) and the cultural and moral considerations of a place[11].

2.2.1.3 The architecture of the land “Istikhlafl”: The Istikhlafl refers to land as assigned by God. The architecture of the Istikhlafl thus considers succession, which has two requirements: 1. It is a concern of human beings and not other creatures; and 2. it reflects participation with others in the worship of God Almighty. The state of succession is reflected in persistence in fulfilling human needs, and constancy does not necessarily promote either understanding or estrangement. Modernity could not exist without classicism; it succeeded the classic, and did not come out of nowhere. Nothingness is a concept associated only with the Creator, while every movement vanishes, another comes into being[12].

2.2.2 Fourth dimension architecture:

The fourth dimension may be thought of as the transitional dimension between a thing having a mental existence and it developing a physical presence. This full presence comes about
only through the fourth dimension, and thus the fourth dimension may be seen as a transitional area or integration between the senses and the mind, represented by conscious or unconscious striving for the aesthetics of mobility that occur in architecture. The possibility of a virtual architectural space in a four-dimensional environment leads to the idea of the concept of a smooth, non-linear four-dimensional space[13].

- **The first dimension**: A line extending as far as the eye can see, with this linear dimension only and no width
- **The second dimension**: A square drawn on the ground with both length and width
- **The third dimension**: A cube, with length, width, and height, creating a stereoscopic image
- **The fourth dimension**: The concept of the fourth dimension is rather philosophical, despite its logical nature; no scientific attribution or algebraic mathematical equations support the concept of the fourth dimension, though a group of hypotheses call the fourth dimension of "time, movement, spirit, perception, meaning, place, illusion, visual deception, and the virtual environment" (Figure 6).

### 2.2.2.1 The fourth dimension in architecture:

Architecture achieves greater intellectual and physical perception through acknowledging the presence of the fourth dimension as a perceptual dimension

- Everything that exists has a shape, and every shape has a substance that supports it; matter is the means to feel a thing, and form is the means to perceive a thing; if there are things in the universe that have no form, humans cannot know of or perceive them [1] (Figure 7).

#### 2.2.2.2 The perceptual dimension as expressed in presence:

"Things" have both a perceptual physical existence in the external world and a conceptual mental presence in the mind. This mental presence is based on direct perception and the knowledge of actual physical presence somewhere. The relationship of perception as a fourth dimension to the mind, however, states that the mind's perception of things is not merely based on knowledge, but on creation within the categories of the mind as per Kant. Thought is thus the mind's way of perceiving things and objects in the external world[14].

### 2.2.3 Pandemic architecture:

- What is the role of architecture in addressing a global crisis?
- Are there rules for architectural action in light of a pandemic?
- What are the basic values in architecture affected by raised the pandemic?
- To what extent will there be a potential change in architecture after such a crisis?
- How can the pandemic event be physically translated into architecture?
- Can multiple event values be employed in an architectural act?

2.2.3.1. Pandemic: This is a state of spread of a specific disease, in which the number of cases of infection is greater than would generally be expected in a specific community, geographical area, season, or period of time[15].

2.2.3.2. Pandemic architecture: when architecture interacts with events through space or ideas, it reveals a change that occurs in the environment. In the world today, there are many events which architectural acts could clarify philosophical positions towards. The role of architecture in fighting the current crisis has been addressed previously [16], based on architectural approaches to confronting the pandemic and how the pandemic has affected architectural products.

2.2.3.3. Architecture in the fight against COVID-19:
• **Architectural Treatments and COVID-19:** As the global health crisis continues, architects and designers are putting their expertise, technical capabilities, and research skills to work to mitigate the effects and spread of the virus. Metropolis magazine has compiled a list of several companies and various initiatives trying to help with the situation. Approaches include 3D printing of personal protective equipment for medical workers, designing modular intensive care units, and identifying ways to convert buildings into hospitals; in this way, the creative community is making contributions to efforts to tackle the pandemic. (17) (Figure 8).

• The high number of cases means that many hospitals are now forced to operate at maximum occupancy. Some architecture practices have thus began researching the potential for easy conversion of different building types into hospitals, while others have designed new, easily deployable, emergency care units. Carlo Ratti Associati and Italo Rota have developed open-source designs for an additional component intensive care tablets, called CURA, while in a similar vein, JUPE, a crisis-and-disaster housing start-up, has developed a mobile recovery unit [18].

• **Social Distancing: Coexistence Communities Designed to Deal with COVID-19:** many people have lived, or are currently living, in communal co-housing, a loosely defined but increasingly popular form of coexistence that takes many forms in society. As the COVID-19 pandemic continues, and enforced social mandates and stay-at-home orders increase isolation, co-tenants have been compelled to navigate their community designs in order to discover new ways of living with others, while mitigating health risks (Figure 9). However, those engaged in co-living communities may be better positioned to deal with the pandemic while balancing a sense of normality than those in traditional residential property[19].

• **Life after the virus: How will the epidemic affect homes?** Life after Covid-19 will not be the same as it was before; this is the beginning of the end, the start of a new beginning. Values have changed, influencing lives and habits, and homes will also change under this influence. The most important changes might be as in the list below: [20].

  1- **Homes, not apartments:** High-rise buildings are designed to house the largest possible number of people in one place, and health and hygiene are rarely considered. In times of pandemic, it is necessary to reduce external contact, and this affects everything used in multi-storey buildings, from lifts and lift buttons to communal spaces.

  2- **Bunkers over open plan:** Those who are constantly training to survive an upcoming apocalypse have tended towards creating dungeons, and it may be realistic to expect this trend to become more widespread.

  3- **Self-sufficient energy and water:** Buildings of the future should be more independent in terms of water supply and heating. Geothermal wells are gaining in popularity, as in addition to water, they provide partial heating for houses.

  4- **Filtration and Neutralization:** Water and air filtration systems have sometimes been seen as non-essential additions, easily abandoned in favour of designer fittings. After the pandemic, this trend is likely to change, however, as people worry about what might happen if the virus gets into their water supply.
5- **Home as the new office**: During quarantine, many people have been forced to work from home, and more attention will be paid to arranging home workplaces in the future (Figure 10).

### 2.3. Hypothesis:

i. This research assumes that perceptions in the architecture of the pandemic can be organised into forms and patterns to establish a new architecture, and can be perceived and dealt with according to the relationship between humans and architecture as developed through experience.

ii. The architecture of the pandemic has been developed globally through many activities and conferences discussing the pandemic event and its impact on architecture. The variables applied in architectural products as a result of the pandemic can be represented in several points, including [21] (Figure 11):

- 1- Transition from big city offices
- 2- Decrease in dependence on cars
- 3- New shapes in public space
- 4- New restaurant designs
- 5- An increase in standard construction
- 6- Greater attention to lightweight architecture
- 7- Flexible architecture
- 8- Homes, not apartments

iii. The pandemic has highlighted many cracks in urban infrastructure, particularly where people spend on average 90 present of their time indoors despite the fact that nearly one in five Europeans live in overcrowded dwellings. "The pandemic reinforces what we already always thought architecture should be about - providing inspirational space that is safe, but also crucially, healthy for those that use it "[22].

iv. It is difficult for architects and planners to compromise, particularly based on the need to have ever-more compact and densely built urban environments; suggestions for green and eco-friendly cities conflict with the need to have large open spaces that allow for social distancing
and for the occupants to spread out, to reduce proximity. Architects, as problem solvers, will have to arrive at informed compromises that equitably serve diverse requirements while providing safe and healthy environments for all. [23]. People must no longer act selfishly and think only of personal needs; consideration of others, and their needs, must be included in the overall equation, and this will require lifestyle changes. Airborne diseases have no physical boundaries, and all classes of a population are equally affected, no matter where the original infection is generated. To quote Dumas, therefore, the new motto must thus be “All for one – one for all”. Living through the days of isolation and lockdown, many individuals have come to various realisations, many of them positive:

- Life need not be as busy; it is possible to slow down
- Working from home is very feasible in this age of connectivity; further, when traffic is minimised, nature has a chance to recover
- Families are strong sources of happiness and support
- Air quality and environmental conditions are strongly linked to lifestyle
- Human values must change to improve the environment

v. The architectural firm BDP used BIM modelling to repurpose Manchester's Central Convention Complex, a 19th century former train station, into one of the UK's temporary Nightingale COVID-19 hospitals at breath-taking speeds. Jon Super/AP. BIM models were used to design the majority of the ground-breaking emergency coronavirus treatment centres developed during the early stages of the crisis, including the yardstick project, the Huoshenshan hospital in Wuhan, which was famously built in just ten days (Figure 12) [21].

vi. The theory deriving from these hypotheses is the Castilian theory. Castilian theory states that perception and feeling are a single thing, a holistic response to the behaviours imposed by the environment; accordingly, the perception process does not create mental images of sensory data simply within the mind, being instead subject to certain laws and external and objective factors [7]. This theory assumes that the most important changes that occur in architecture in response to an emergency event such as Covid-19 can thus be perceived empirically, and it can thus be considered one of the most important theories explaining what the environment imposes on us in terms of behaviours Iraq is thus taken as a case study in this work to identify the most important responses in the architectural products resulting from the pandemic. (Figure 13).

3. Practical framework (Iraqi architecture)
The current Coronavirus pandemic is rapidly changing the way people live and work; the question then becomes whether these changes indicate long-term impacts on planning and architecture in Iraqi
“The Covid-19 pandemic is an opportunity to reform the economy, the environment and the way of life in the long term, it creates opportunities for a dynamic push in the status quo and to raise deep questions about the future and in all sectors of life”[24].

Architecture is a human cultural product that is thus related to a large extent to other fields of knowledge, including, but not limited to the health and environmental fields; architecture is affected and influenced by both internal and external circumstances and indicators around it. The architecture itself is necessarily affected by various crises, including the current crisis (Covid-19), and thus any work rules must change in order to identify the best possible options and to make decisions that lead to effective and acceptable products[25] (Figure 14).

“The city is human’s most consistent and more generally the most successful attempt to reshape the world in which he lives in greater degrees with the desires of his heart, but if the city is the world that man has created, then it is therefore the world in which he must live. Without a clear awareness of the nature of his mission, during his creation of the city he reconfigured himself”[26].

3.1. The most important aspects affected by the Covid-19 pandemic in Iraq are:

- **Social aspects**: The COVID-19 crisis has been tough on the people of Iraq in many ways, as well as its direct toll on public health. In Iraq, disease often carries a stigma that impacts whole families, not just the carrying individual. There is also a fear of being isolated in dreadful conditions at ill-equipped hospitals, which Iraqi doctors think may be preventing many patients from seeking medical attention.

- **Economic peril**: The economic crisis that had already begun to hit Iraq’s oil-dependent economy may be easiest to quantify. However, it may also be the most difficult for the Iraqi government and people to address with emergency measures. Oil prices collapsed in March under dual pressures from slowing demand due to the COVID-19’s impact on global economies and a supply glut resulting from competition for market share between Russia and Saudi Arabia, which created a supply issue unconnected to the virus.

- **Healthcare crisis**: Iraq’s health sector was among the least prepared to deal with a pandemic that is challenging even robust health care systems in the world’s most developed countries. The sector suffers from decades of under investment, war damage, poor management, corruption, and emigration of doctors. As a result, Iraq has a dire shortage of skilled health professionals, hospital beds, and reliable medication. [25]. **Health in Iraq is the area most seriously affected by the pandemic; this research is thus limited to the health sector and the effects of Covid-19 on health buildings, it identifies the most important changes that have occurred in architecture.**

3.1.1. In Mosul, in the Nineveh governorate, MSF prepared a building dedicated to isolating suspected cases in the Al Salam health complex. The local health authorities identified Al-Shifa Hospital, which is located next to Al-Salam Hospital and which was rebuilt by MSF in 2019, as the main referral hospital for Covid-19 patients in Nineveh Governorate (Figure 15). MSF worked in cooperation with the Health Directorate in Nineveh Governorate to provide Al Salam Hospital with a fully equipped emergency room to increase the capacity of the hospital and improve the accessibility of high-quality emergency care for residents of East Mosul.
Currently, the emergency room receives patients 24 hours a day, with two emergency wards containing 11 beds altogether, a trauma room, a pharmacy, and a corridor to facilitate access to the operating theater.\[27\]

3.1.2. In the governorate of Erbil, MSF worked with three hospitals affiliated with the Ministry of Health designated to deal with Covid-19, with the aim of providing technical support to these hospitals with regard to infection control, patient triage, and psychosocial support for patients and families (Figure 16).

3.1.3. Healing centers built in Iraqi governorates in response to the Covid-19 pandemic:

- An 80-bed healing centre was provided by the Hussaini Shrine to Maysan to handle the Covid-19 pandemic (Figure 17) [28]. This center will contribute effectively to removing congestion in the governorate in terms of clinical cover, with part allocated to critical cases and the other part to other patients. The engineering and technical lead at the Hussaini Shrine noted of this center, which was created in a record period of 25 days, that “the total area of the project is 1,250 square meters”, and that the centre consists of private lobbies for men, women and children, in addition to special rooms for examination. He also pointed out that "the center was designed according to modern models, taking into account the psychological side of the injured in terms of designs, colors and gardens, with the provision of negative pressure technology to purify the air inside the center, as well as a system to provide oxygen to preserve the lives and health of the injured". [29].

- In Wasit, the Shifa Center No. 5, with a capacity of 100 beds, was implemented by Iraqi engineering and technical staff in a record completion period of 30 days; "its design will take into account the psychological state of the patients" [30] (Figure 18)

- Al-Diwaniyah opened the Shifa Center to handle the Covid-19 pandemic, a project accomplished by the Hussaini Shrine. It is equipped with the latest medical equipment and implemented according to modern architectural frameworks. Therer are 100 beds, 48 of which are for intensive care, over in three halls (men, women, and children). [31] “The center includes a group of important systems, including the negative pressure system for air and cooling, an integrated oxygen system, the Internet and television system and the self-extinguishing system. It is also distinguished by the beautiful architectural touches inside the center, especially in the children's hall, as well as green gardens to reduce psychological pressure on the injured” [32] (Figure 19).

- Diyala Governorate: The Ministry of Health inaugurated the Shifa 8 Center, with a capacity of 60 respiratory care beds dedicated to treating cases of Covid-19. [33] "The center will be built on the designated land located behind Baqubah General Hospital " [34] (Figure 20)

4. Findings, conclusions and recommendations

4.1. Results:
Future architecture must be far more flexible if it is to adjust to the demands of resilience in the face of a pandemic or adaptations to shifts in lifestyles and technology.

Buildings should be more durable; the idea that building are for only 60 years and may get pulled down after 30 is not a sustainable option.

The pandemic reinforces what architecture should be about: providing inspirational space that is safe and healthy for those that use it.

The pandemic should be considered an opportunity to acknowledge the reality of human succession, realising that a crisis makes it easier to devise radical solutions. Architects must thus think about utilising this crisis and carrying out activities whose aim is to develop solutions for both the present and the future. Several points have been put forward as a starting point for creating post-pandemic architecture, both at the level of architectural production and that of urban planning.

The architecture of the pandemic has drawn attention on a global scale through the many activities and conferences that have discussed the event and its impact on architecture; the applied variables that have appeared in the architectural output as a result of the pandemic are represented in several ways, including a shift away from large city offices, a decrease in dependence on cars, new designs for public spaces, new designs for restaurants, an increase in modular construction, greater interest in lightweight architecture, and greater interest in creating flexible architecture.

4.2. Conclusions

Spaces identified with health spaces (health centres and hospitals) have been created to positively affect the psychological state of users. Such architecture is known as healing architecture and tends to have broad dimensions, interspersed with nature so that users feels comfortable and able to complete natural existence within the physical structure of the architecture.

Architecture can meet the needs and desires of multiple human beings, with components of architecture affecting various individuals within society. That presence has been translated through a group of health buildings built in several Iraqi governorates that show a real awareness of the pandemic in their architecture.

The impact of the pandemic on Iraqi architecture can be best perceived through the speed of construction seen in the work of the Al-Shifa health group; this can be considered an important achievement in Iraqi architecture, even if these buildings themselves have modest designs.

The characteristics of epidemiological architecture include flexibility, which accepts the addition of parts or units to a building for future expansion; adaptation, which allows functional adaptation; and the most important change to combat the Covid-19 pandemic, transformation, which is evident in the functional and kinetic transformations of buildings, allowing the development of interaction and response by facilitating rapid responses.

4.3. Recommendations:

The research recommends further study of the impact of the pandemic on various social aspects, but in particular the impact on Iraqi architecture and identity.

The research also recommends further study of the impact of the pandemic on urban planning and the possibility of developing new mechanisms at an urban level that take into account the appropriate distances between people and the creation of new plans that enable the reduction of gatherings in public places.

5. References:
1) Al Dhahab, Ali Imran Latif (2012). Perception in Architecture as a Philosophical View, Arab Scientific Heritage Magazine, No. 2, University of Babylon, p. 22.
2) Schacter, Daniel (2011). Psychology, Worth Publishers.
3) Holl, Steven. Pallasma, Juhani. Gorez, Perez. Question of Perception, Phenomology of Architecture, SanFrancisco.
4) Kendra Cherry (2020). The color psychology of green, verywellmind. www.werywell.com
5) Imran Samih Nazzal (2017). The difference between sensory perception and mental perception.
6) Al-Dabbagh, Shamael Muhammad Wajih(2010). Architecture of Multiple Sensory Responses, An Analytical Study in the Interior Space Remaining in Memory in Closed Marketing Centers, PhD Thesis, University of Technology, pp. 119.
7) Sarhan, Maysoon Mohi Hilal Sarhan, Perception and Interpretation of Architecture, University of Samarra, Department of Architecture Engineering, pp. 12, 2017
8) Salim, Yunus Mahmoud Muhammad, Ola Muhammad Abdel Karim, Cave System Technology as one of the most important applications of virtual reality in architecture, University of Technology, pg. 188
9) Al-Mamouri, Abdullah Saadoun (2011), The Humanist of Arab-Islamic Architecture - Architecture between the Requirements of Need and the Idealism of theorizing, University of Technology, pp. 3-4
10) Issa, Haydar Jassim (2008), The Theory of Place in Architectural Action.
11) Ali, Khalil Ibrahim. Latif, Rafid Abdul (1998), Philosophical Concepts of the Spatial Environment.
12) Al-Husseini, Ibrahim Jawad (2017), This is How I Read Architecture, University of Technology, pp. 104-105.
13) Abbawi, Rawa Fawzi Naoum (2008), The role of the fourth dimension in achieving sensory pleasure for the recipient in outdoor spaces, University of Technology.
14) Al-Yusuf, Ali Muhammad (2020), Perception of the Mind with Thought and Language, Al-Muthaqaf Newspaper, Issue 4921.
15) Epidemi, Al Jazeera Magazine (2014), https://www.aljazeera.net/encyclopedia/encyclopedia-healthmedicine
16) Al-Askari, Abdul-Hussein (2015), The Impact of the Event on the Context and Response to the Architectural Act, University of Baghdad - Center for Urban and Regional Planning for Postgraduate Studies.
17) Andreea Cutieru (2020), Architects and Designers Join the Fight Against the Pandemic, https://www.archdaily.com/937857/architects-and-designers-join-the-fight-against-the-pandemic?ad_medium=widget&ad_name=navigation-prev
18) Nathaniel Bahadursingh (2020), 8 Ways COVID-19 Will Change Architecture, https://architizer.com/blog/inspiration/industry/covid19-city-design
19) Kaley Overstreet (2020), Social Distancing in a Social House: How Co-living Communities are Designed to Handle COVID-19, https://www.archdaily.com/938191/social-distancing-in-a-social-house-how-co-living-communities-are-designed-to-handle-covid-19
20) Sergey Makhno (2020), Life after coronavirus: how will the pandemic affect our homes?, https://www.dezeen.com
21) Christele Harrouk (2020), Architecture post COVID-19: the Profession, the Firms, and the Individuals, https://www.archdaily.com/939534/architecture-post-covid-19-the-profession-the-firms-and-the-individuals
22) Thomas Wintle (2020), COVID-19 and the city: The future of pandemic-proofed buildings, https://newseu.cgtin.com/news/2020-07-12/COVID-19-and-the-city-The-future-of-pandemic-proofed-buildings-RcRHMsn72/index.html
23) Zebun Nasreen Ahmed; Architecture After The Covid-19 Pandemic Re-Imagining Our World, 2020, Bangladesh University of Engineering and Technology
24) Ali A. Alraouf, 2020, Amara, Amran, and a Post-Corona Pandemic City: Inevitable Transformations, jadaliyya.https://www.jadaliyya.com/Details/40978
25) Al-Husseini, Ibrahim Jawad Kadhim. Al-Saaidy, Haider J. E.(2020), Post-Corona Architecture Reality and challenges, University of Technology, Baghdad, Iraq.
26) Mitigating the Impact of COVID-19 in Iraq (2020). Policy Brief and Recommendations.
https://enablingpeace.org/mitigating-the-impact-of-covid-19-in-iraq/

27) https://www.msf.org/ar.

28) https://www.alsumaria.tv/news.

29) Al-Shahani, Wahhab (2020), The Holy Hussaini Shrine in the city of Amara, the center of Maysan Governorate, the Shifa Center. imamhussain, https://imamhussain.org/news/30348

30) http://www.alliraqnews.com/modules/news/article.php?storyid=95697

31) https://ninanews.com/Website/News/Details?Key=852389

32) https://www.nasnews.com/view.php?cat=38783

33) https://www.mawazin.net/Details.aspx?jmare=112417

34) http://kalemeh.net/?p=7170