Antivirus architecture: links between epidemic thought and images

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Abstract. Local architecture has succeeded in treating general issues related to human life and interests within various areas, including the social, economic, and environmental; however, it has been unable to address a global viral epidemic as a variable affecting human needs, thus necessitating diagnosis of defects and the development of alternative solutions, working with the idea of the overlap between thought and images in the systems of both the local architecture and the intelligent architecture, and the research problem thus emerged as "the necessity to develop the concept of an antivirus architecture with a local character and to examine its impact on improving reality during an epidemic crisis based on creating a locally intelligent architecture". The aim of the research was thus to develop a theoretical model represented in an antivirus architecture with a local character that defines its components and mechanisms within the apparent system and carries within itself ideas that interact with both spatial and time dimensions in light of the current epidemic crisis. The research method included applying several procedures based on developing the theoretical framework and selecting samples for practical application, allowing the presentation of the most important conclusions that clarified the possibility of extracting specific components of the apparent system of that theoretical model.

Key words: thought and image; antivirus; viral epidemic; local architecture; intelligent architecture.

1. Introduction
For each virus, whether biological or informational, there is an antivirus that can protect the space it sees to colonise; by reversing this concept, an idea for a model of anti-virus architecture that senses and interacts with possible dangers that threaten human life can thus be developed. This idea necessitates a search for complementary solutions in local architecture in response to the current epidemic crisis, with attempts to develop an architecture characterised by a type of artificial intelligence that can address possible dangers and interact with the relevant environmental variables, human behaviours, and changing needs to mitigate potential damage. Consequently, this study proposes the following hypothesis: "Local architectural thinking and the inclusion of local details can be combined with advanced technological intelligence systems and techniques to create an intelligent local architectural image that interacts with, harmonises to, and adapts with respect to human behaviours and the surrounding environment". By addressing this hypothesis to solve the research problem, the goal of the
research was thus achieved based on extracting specific mechanisms and components of a system in the theoretical model that allow the development of antivirus architecture of a local character.

2. Conceptual framework

The conceptual framework can be summarized as:

2.1. Thought and image in language and terminology

Ibn Manzur defined thought in Arabic as the actions of the mindfulness in a thing, noting that contemplation is the name of thinking; others said that a thinker, and a thinking man do a lot of thinking, while Al-Gohari also said that thinking was contemplation [1]. “Think of Allah's blessing and favours a lot, and do not think of Allah”; “Likewise, Allah clarifies to you the verses, so that you may contemplate” [2]. Jamil Saliba said: "In the sentence of saying that thought is called the action that the soul performs when it moves in the intelligibles, or it is called the intelligibles themselves..." [3]. Muhammad Reda Al-Mudhaffar defined thought as the movement of the mind between the unknown and the known [4]. He considered thought and science to be conditions for the existence of the mind.

In terms the concept of the image, Saliba indicated that the image in language is made up of form, adjective, and genre [2]. Perhaps the closest definition of an image produced by the ancients is what Abd ul-Qaher Al-Jarjani (d. 471 AH) presented when he said: "Know that our saying: the image is a representation and a measure of what we know with our minds over what we see with our eyes ...” [5]. (Al-Jarjani, 1989, p. 320). The idiomatic concept of image among modern critics is exemplified by Dr Abdul-Qader Al-Qatt’s definition: "The image is the artistic form that words and phrases take, organized by the poet in a special graphic context in order to express an aspect of the poetic experience inherent in the poem, using the energies of the language and its potential in significance, composition, rhythm, truth, metaphor, synonyms, contrast, correspondence, homogeneity and other means of artistic expression ... and expressions and phrases are the poet’s first material from which that artistic form is formulated or with which he draws his poetic images” [6].

2.2. Virus

A virus is a microorganism, not generally apparent with a normal microscope, that is fast spreading, and may act as a mediator between living and non-living tissue. They come in many types and cause many infectious diseases including as smallpox, measles, polio, HIV, and influenza [7]. An antivirus is a program that used to check computer files for malware of various kinds and to eliminate any viruses or malicious programs detected, in order to prevent them from damaging the computer or stealing personal data, by removing or repairing them. Such programs can also fight adware, spyware, and other forms of malware [8].

An epidemic crisis refers to an event in which such a disease is spread actively; the term pandemic is related to geographical spread and is used to describe a disease that affects an entire country or even the entire world [9].

2.3. Thought and image in architecture

Architecture reflects emerging thought; it represents a phenomenon that has both inherent properties and applications in practice, and which consists of a subject and an object. Architecture is not universal, and thus the relationship between the subject and the object is a relationship of thought with image, with thought being teleological and having an effective cause that produces the image with its physical cause; the image thus reflects the nature of the thought that created it, which means that the subject production of a certain image carries a belief in the usefulness of that thought that produced the image. Consequently, the outward appearance of the embodied latent system is reflected as a result of the teleological thought. The latent system and its causes are fixed and integrated according to the philosophical thinking they fulfil, yet integration in architecture lies only in the apparent system, whereby the theoretical foundations of the movement are integrated within a specific time and offset by
the teleological cause. Its concepts or applications then evolve to give various sophisticated, and advanced forms [10].

The philosophical thought that reflects the principle of existence as a latent system offers differed interpretations or concepts related to these ideas and, accordingly, the apparent system reflects a latent system of ideas and concepts and a reflective image of that thought, regardless of the nature of progress (process or becoming) of the apparent system, as shown in figure 1. By analysing a set of systems of architecture, it becomes clear that architectural systems vary according to the different origins of philosophical emergence and the generation of images that reflect different times, circumstances, changes, and transformation arising from changing human, natural, political, or economic conditions or even certain crises or negative events or similar changes in the human condition. Such changes alter the nature of subject-thinking and change its purpose, and are thus also the cause of change of concepts and their alteration in dealing with the object, which in turn changes the latter's modes. Thus the system coordinates its changes to produce images as models that represent the state of change in the system, creating an apparent system that reflects multiple images that express the latent system that in turn reflects a specific thought [11].

2.4. Literature review
To develop the research problem, an architectural literature review was undertaken to deal with the possibility of merging local architecture and intelligent architecture and exploring the gap that the current research could fill with respect to the knowledge framework.

Opaluwa, Obi, and Osasona (2012) indicated the importance of integrating local materials such as mud bricks, stone, and straw with modern technology to produce a new generation of homes that do not require mechanical conditioning during hot days and nights. Their study dealt with ways to technically improve building craft on the African continent through the use of traditional materials. It also addressed the benefits of using biodegradable, natural and local materials in housing delivery, in addition to
discussing the importance of local input for affordable housing based on an overview of tropical architecture, and its evolution into a new traditional (local) tropical architecture [12].

Abarah (2014) dealt with the effect of traditional architecture on intelligent architecture in homes and the interaction of architectural elements in traditional architecture with regard to smart creativity in line with the requirements of contemporary life. The study examined smart environmental treatments that characterised traditional architecture and how to develop and employ these in modern buildings in line with current requirements; it also dealt with the suitability of traditional architecture for the environment, the features of architectural elements in ecological architecture, and the environmental impact of traditional architecture. By examining the requirements of contemporary life in terms of intelligent architecture, the relationship between traditional architectural design and smart architectural design, and a comparison of building materials between traditional architecture and intelligent architecture, was developed [13].

Hamza, Ibraheem, and Mubarak (2017) touched on the impact of the rapid advancement of technology on the characteristics of contemporary local architecture, examining the act of technological advancement and its impact on local architecture, including investigating the products of various elements of contemporary forms and the problem of preserving local architecture. Their study aimed to examine the necessity of renewal and of rooting development in architectural expression as well as linking it with concepts of modernity. The study thus determined the importance of integrating those elements within contemporary local architecture by adopting original texts with the characteristics of local architecture and then generating new forms to carry the original meanings and values through contemporary local architecture. As well as highlighting the role of elements and techniques of advanced construction through interaction with local elements, whether as formal patterns or inspiration for specific events, in creating communication and integration between technology and a rooting strategy, the authors raised the possibility of producing an architecture that combines the modern and the traditional to reflect a deep understanding of the possibilities of an era and the nature of society that would benefit from the data of the current intellectual and cultural age without losing a community's identity [14].

Analysing previous studies and identifying the most important aspects of them clarifies that these studies have dealt with many aspects in terms of the possibility of merging local materials with modern techniques and identifying how to achieve integration between these factors in terms of design and environmental compatibility in local architecture and intelligent architecture. Emphasis has also been placed on the importance of integrating elements resulting from acts of technology within contemporary local architecture by adopting original texts that carry within them the characteristics of local architecture, previous studies have all adopted mechanisms and goals that differ from those of the current research, which aimed to create a theoretical model to deal with the intellectual side of local architecture and the physical side of intelligent architecture, focusing on the overlap of thought and image to develop multiple images of new architectural movements that differ according to their relationships with both factors. In particular, antivirus architecture of a local character was expected to one of these multiple images, and by defining the mechanisms and components of this theoretical model, the thoughts and images that interact with the spatial and time dimensions in light of the current epidemic crisis, in terms of those affected by it and responding to it to achieve a balance of values and beliefs that people carry, were determined.

Based on this, the research problem was determined as the necessity to develop the concept of an antivirus architecture with a local character and to examine its impact on improving reality during an epidemic crisis based on creating a locally intelligent architecture that interacts with human beings and the surrounding environment and senses the existence of possible dangers that threaten human life. The research approach thus included several procedures to achieve the goal of the research and address the research problem by building a theoretical framework and applying its major, and secondary values to three case studies of a nature consistent with the concepts of both local architecture and intelligent architecture in order to present, discuss, and analyse the results of such application and thus determine
appropriate conclusions and recommendations. Informatics was thus used to formulate the most important mechanisms and components of the theoretical model of local antivirus architecture.

3. Extracting the theoretical framework

Architecture includes many different movements according to the nature of place and time and the many factors, determinants, and accidents that lead to the formation of these things. Assuming that the architecture developed according to the current time and spatial dimensions is represented by both local architecture and intelligent architecture, and by adopting Aristotle's Square of Oppositions, the nature of the relationship between these two architectures is a contrary one, being affirmative or negative universally within any adaptation; however they are also both ruled by many contradictory relationships according to any number of previous architectural movements that have resulted from both local architecture and the intelligent architecture.

The most important characteristics and features of both local and intelligent architecture are thus discussed below:

3.1. Features and characteristics of local architecture

Local architecture is characterised by its rich and varied meanings, interspersed with multiple levels of techniques. It is a cultural and vital heritage rather than being frozen in time like historical heritage; local architecture is a pure real response to the building needs of local persons or communities, which meets needs because it is developed by the self-same people and societies. In addition, the construction methods utilised are tested through the principle of experimentation and continuous improvement by the community, allowing the to approach functional perfection over time, being specially designed to suit the social needs of the community. People tend to construct building to suit their desires and needs, and thus local architecture is a dynamic architecture, with continuity of change. In terms of further explanation of this architecture, some of the most common descriptions of the features of local architecture include [15].

- Built for humans and society.
- Taking advantage of traditional technology.
- Strong relationships with the local environmental context.
- Building materials taken from local sources.

These objective and physical characteristics are part of a fuller description of local architecture, alongside its embodiment of the values and traditions of the community; thus, local architecture reflects the beliefs and systems of the universe of a common group. Moreover, local architecture has the advantage of being unique in terms of its concept of balance within daily life and between the environment and technology, the indoors and outdoors, and public and private life in direct relation to local human needs, residence requirements, beliefs, and cultural values. These offer the phenomenon of a sense of place and represent the important value of studying the design of such architecture to help determine the future of the built environment. What gives such architecture its key characteristics are the wide differences in climate, economic conditions, customs, and traditions around the world, which trigger architectural differences that confirm the necessity of preserving them because they give that architecture its local identity [16].

Based on the characteristics of local architecture, it represents a local response to local need at a given stage, as well as reflecting the privacy of a community. If such architecture is analysed according to the components of the apparent system, it can be seen as an architecture of experimental thinking, being reliant on the principle of experimentation and development to find ways to serve environmental conditions and the local need for privacy over a number of repeated attempts and experiences that reflect the development of cultural identity, and thus encourage the development of certain concepts related to local forms resulting from social, environmental, cultural or ideological needs. These concepts and thoughts are used to express the privacy of the local form and the surrounding environment, creating a special identity for that society and environment, through the nature of the architectural relationships used to form spaces or forms. Where the concepts of openness to the indoors and closure to the outdoors
appear as an environmental and social necessity, such as the use of air hooks as an environmental necessity and window bays as an aesthetic and social necessity simultaneously, these concepts may reflect multiple images and details of local architecture.

3.2. General features and characteristics of intelligent architecture

Intelligent buildings are characterised by a number of features that together constitute routes to achieve the values of intelligent architecture and to develop an intelligent architectural product. These features can be identified as automation, virtualisation, and sustainability, and the most important resulting general characteristics of intelligent architecture are [17].

- The building must “know” what is happening inside and outside and have access to automation systems that allow to respond to external conditions and factors such as climate, security risks, and fire hazards.
- The building should be able to “decide” the most efficient way to supply an appropriate and comfortable environment for users by using management information to activate its automated systems to help support these decisions.
- The building must responds users' needs by using advanced communications to achieve links to the outside world using computers, optical fibre connections, microwaves, and traditional satellite connections.
- It must provide efficient services and manage various functions with little effort or delay in order to secure the comfort, luxury, and security of building users; alongside the factors noted above re: security and comfort, the building must be of a high capacity allow users to save energy and other environmental resources as well as money.
- An electronic control system should control the security and safety equipment, monitoring, and warning of earthquakes, fires, and similar issues, monitoring for any security breaches that may harm the comfort and safety of users.
- High flexibility is required to facilitate future expansion in the field of communications and information technology, allowing capacity to keep pace with any future development that may affect the technologies used.
- A range of different equipment that contributes to the smoothness and speed of the users performance of tasks, work, or activities must be available around the clock.

The characteristics and features of intelligent architecture all feature the use of advanced and intelligent technological techniques that allow uses to interact with buildings and the surrounding environment, thus providing for the largest possible amount of the needs and requirements of these users. In terms of the components of the apparent system, intelligent architecture is characterised by a physical system based on concepts derived from material technology and smart techniques; it reflects the shape of that technology, leading to the birth of new concepts based on the form and function of advanced technology as applied to responsive detail and control systems. It is essential in its operation, ensuring a comfortable indoor environment. New thoughts and concepts have led to the development of a level of the building structures that can adapt to their surrounding environment, and thus architecture has shifted from the principle of stability to the principle of movement and adaptation, supported by the emergence of new concepts relating to the membranes that surround buildings and the ways in which these can simulate and interact with different climatic conditions. This has led to the evolution of architectural movements characterised by technological and information intelligence, including digital, parametric, and biological architectures.

Referring to the idea of expected situations in architectural movements according to the of contrary, contradictory, and adaptation relationships adopted from Aristotle's Square of Oppositions, and by applying the idea of adaptation between local architecture to intelligent architecture to reach an architectural product that takes from both forms, the scheme in figure 2 is thus proposed.
Figure 2. The relationship between movements for local architecture and movements for intelligent architecture according to Aristotle's Square of Oppositions.

Based on figure 2, the following cases may occur:

- The first expected case: a local architecture may be born separately from intelligent architecture, thus suffering from alienation, disconnection, and a lack of continuity with it; the consequent absence of a common language that the new local architectural product to be read as and compared with intelligent architecture movements will create a subaltern relationship.

- The second expected case: a new architecture may be born that is subordinate to the authority and control of intelligent architecture, and thus both dependent on and a part of it. Thus, the thought generated is a consuming thought with no new factors that might present desirable intellectual propositions to enhance intelligent architecture; this produces a contradiction relationship.

- The third expected case: An intelligent architecture of a local character may be born that adapts, interacts, and harmonises with multiple movements of local architecture by using the concepts of those architectural movements as tools that enable development within the local environment. The result will be the creation of an intelligent architecture of a local character resulting from the overlap of the concepts of intelligent architecture images with local architecture images such that it adapts to the local architecture and does not solely represent intelligent architecture.

Identifying these three cases encourages adoption of the third model, based on utilising the latent and apparent systems of both architectures (local and intelligent), allowing and encouraging an overlap of thoughts and images, and defining the mechanisms that allow this to occur in the physical state. This allows for the development of a number of intelligent architectural movements of a local character, of which one is represented by the image of antivirus architecture with a local character that is the focus of this study. The indicators of the theoretical framework were thus extracted as in table 1.

4. Practical study
Three case studies consistent with the concept of local architecture and intelligent architecture were selected from among the large number of examples of similar natures. These cases were distributed
between two global and regional axes, though a local example was not included due to unavailability. The selection of the three cases was based on two important criteria:

- Diverse climates, to allow exploration of the extent to which the theoretical model can be applied in different climatic environments as well as to those close to the climatic environment in Iraq.
- Different design methods, using various technological techniques, and varying degrees of interaction and adaptation to the surrounding environment.

### 4.1 Case Studies

The case studies can be summarized as:

#### 4.1.1. Sharifi Ha house, Tehran, Iran, by Next Office (2013)

General description: This house consists of seven floors distributed such that two floors form the basement, dedicated to rest and entertainment, and a ground floor contains parking spaces and servants' rooms; the first and second floors are designated for general events, while the third and fourth floors are dedicated to private events. What distinguishes this house is that it has three rotating spaces in its façade that appear from the outside to be giant moving wooden cubes (picture 1). These moving elements give a distinct character to the project and allow multiple possibilities in terms of form, environmental and functional performance [18].

![Picture 1. Sharifi Ha house [19].](image)

Analysis of the design idea: The designer intended to integrate local traditional architectural ideas with advanced smart technologies by taking inspiration from the idea of traditional summer and winter houses in Iran and reformulating these in a contemporary style by using elements moving in a circular manner through 90° in the facade of the building in the form of large cubes of wood. These rotating cubes allow the owners of this home to adapt to fluctuating temperatures by opening rooms in the summer or turning them inwards during the winter (pictures 2, 3). As the house adapts to the functional needs of its users, its spaces can be reconfigured for different purposes.

![Picture 2. Section, Sharifi Ha house [19].](image)  
![Picture 3. Rotation method, Sharifi Ha house [19].](image)
4.1.2. Safe House, Warsaw, Poland, by Robert Konieczny (2004-2005)

General description: The house is located in a small village on the outskirts of Warsaw, and its surroundings are dominated by the familiar "Polish cubes" of the 1960s and old wooden barns. The built-up area is 567 square metres. This building is called the “safe house” because it turns from a villa by day to a castle at night, locking down to a safe central core, with a movable bridge and a shutter that falls down to cover the entire facade and huge wall panels blocking the windows (picture 4). Thick courtyard walls surround the house, and there is a drawbridge that leads to the roof of the closed building where a swimming pool is located [20].

![Picture 4. Safe house [21].](image)

Analysis of the design idea: The innovation in this idea consists of the interface of the movable walls with the urban structure of the plot. When the house is closed, such as at night, the safe zone is limited to the house's outline. The moving walls do not depend on the shape of the building, however, and the whole building is a concrete monolith, while its mobile parts are light steel trusses filled with mineral wool that help to isolate the building completely when closed. The designer also clad the whole house with cement-bonded particleboards, with Cetris and waterproof alder plywood fixed to steel construction and painted with dark wood stain to resemble the wood widely found on the surrounding houses and barns, allowing it fit into the rural landscape.

4.1.3. Shape Shifting House, by D*Haus Company

General description: UK designers David Ben Grünberg and Daniel Woolfson devised a concept for a shape-shifting house that morphs to deal with changing times of day, seasons, and weather conditions (picture 5). They developed the concept for an experimental house that can fold into different configurations to take on up to eight different shapes [22].

![Picture 5. Shape shifting house [23].](image)

Analysis of the design idea: The designers developed the shape of the house around the mathematical formula for converting an equilateral triangle into a square, dividing the building into four separate units.
Each of these units has the property of stability, and the units gather together such that the house is like a Rubik’s Cube. In winter, the house takes on the shape of a square, with small windows and a high thermal mass. As the seasons change and the climate warms, the house opens up, like a flower, to allow light and air to penetrate the inside of the building and to obtain full panoramic views of the surroundings. The house is a product of an applied mathematical realisation; from a manufacturing point of view, the design deploys only one set of materials to achieve flexible possibilities based on that design. This means that less waste is produced during the manufacturing process, which saves time and materials (picture 6).

![House transformation into various forms to adapt to the surrounding environmental conditions][23].

### 4.2. General practical framework

Based on the detailed description of the selected samples, the proposed theoretical framework was applied to verify whether the indicators selected are relevant to the practical study projects; this was done by adopting comparative descriptive analysis of the selected samples, with values of 1 and 0 used to measure the variables (1 = Achieved value, 0 = Value not achieved). This allowed the presentation, discussion, and analysis of the results, as shown in table 1. Further conclusions and recommendations were thus produced based on these results.

**Table 1.** Practical study of the selected samples based on the indicators of the theoretical framework.

| Primary Indicators | Secondary Indicators | Possible Value                                                                 | Code of possible values | Achieved Values (1-0) |
|--------------------|----------------------|--------------------------------------------------------------------------------|-------------------------|-----------------------|
| **Thought X1**     |                      |                                                                                  |                         | **Sharifi House**    |
|                    | **X1.1**             | Nature of thinking                                                              | X1.1.1                  | 1                     |
|                    |                      | An experimental way of thinking                                                 |                         | **Safe House**       |
|                    |                      |                                                                                  |                         | 0                     |
|                    |                      |                                                                                  |                         | **D*Haus**           |
|                    |                      |                                                                                  |                         | 0                     |
|                    |                      | A materialistic way of thinking                                                 | X1.1.2                  | 1                     |
|                    |                      | Principle not necessarily scientific and depends on personal opinion           |                         | 1                     |
|                    |                      |                                                                                  |                         | 1                     |
|                    |                      |                                                                                  | X1.2.1                  | 0                     |
|                    |                      | It has a scientific principle and depends on the scientific method in analysing  |                         | 0                     |
|                    |                      | and reaching results                                                            |                         | 0                     |
|                    |                      |                                                                                  |                         | 0                     |
|                    | **X1.2**             | Intellectual direction                                                          | X1.2.2                  | 1                     |
|                    |                      |                                                                                  |                         | 1                     |
|                    |                      |                                                                                  |                         | 1                     |
|                    |                      |                                                                                  | X1.3.1                  | 0                     |
|                    |                      |                                                                                  |                         | 0                     |
|                    |                      |                                                                                  |                         | 0                     |
It is based on the principle of technological intelligence and advanced techniques

| Percentage scores | The basis of generating form and function X2.1 | X1.3.2 | 1 | 1 | 1 |
|--------------------|------------------------------------------------|--------|---|---|---|
|                    | Form and function follow need in all its aspects and local environment | X2.1.1 | 1 | 1 | 1 |
|                    | Form and function follow intelligent technology and technique | X2.1.2 | 1 | 1 | 1 |
| Concept X2 | Achieve functional necessity | X2.2.1 | 1 | 1 | 1 |
| Privacy of generated identity X2.3 | Achieve a religious-ideological necessity | X2.2.2 | 1 | 0 | 0 |
| Type of generated design X2.4 | Achieve a symbolic-significance necessity | X2.2.3 | 0 | 0 | 0 |
| | Achieve an emotional aesthetic sensory necessity | X2.2.4 | 1 | 1 | 1 |
| | Local identity | X2.3.1 | 1 | 0 | 0 |
| | Virtual identity | X2.3.2 | 0 | 1 | 1 |
| | It only interacts with human needs | X2.4.1 | 0 | 0 | 0 |
| | Interact with human needs and the surrounding environment | X2.4.2 | 1 | 1 | 1 |

| Percentage scores | A form with local detail and determinism of environmental and identity | X3.1.1 | 1 | 1 | 0 |
|--------------------|---------------------------------------------------------------|--------|---|---|---|
| Material X3 | A form with a technological and complex composition | X3.1.2 | 1 | 1 | 1 |
| Imagine the outer membrane X3.2 | It simulates nature and interacts with different climatic conditions | X3.2.1 | 1 | 1 | 1 |
| Imagine the structure of the building X3.3 | It does not interact with nature and different climatic conditions | X3.2.2 | 0 | 0 | 0 |
| Imagine the implementation of technique used X3.4 | Stable structure | X3.3.1 | 1 | 1 | 0 |
| | Movable structure | X3.3.2 | 1 | 1 | 1 |
| | Technology with local techniques | X3.4.1 | 1 | 1 | 0 |
| | Technology with intelligent techniques | X3.4.2 | 1 | 1 | 1 |
| Percentage scores | Image of architecture with local character | X4.1.1 | 1 | 1 | 0 |
| Image X4 | Appearance of the image X4.1 | X4.1.2 | 1 | 0 | 1 |

**Final percentage values for each sample**

|                     | 76.92 | 65.38 | 53.84 |

4.3. Analysis of the practical study

Analysis highlighted a disparity in the values achieved in the selected samples, as shown in table 1:

4.3.1 Thought
In terms of the nature of thinking: the designer of the “Sharifi-ha House” combined the experimental method of thinking represented by traditional architecture with the materialistic thinking method represented by intelligent architecture; thus both possible values (X1.1.1 and X1.1.2) were fulfilled for this indicator. The designer of the "Safe House", however, adopted only the materialistic way of thinking represented by the concept of intelligent architecture to achieve the greatest possible safety for homeowners, achieving (X1.1.2) while omitting (X1.1.1). Similarly, the designer of "D*Haus" adopted the materialistic thinking method represented by the concept of intelligent architecture to achieve the greatest possible adaptation of the house to the surrounding environment. Thus, the possible value (X1.1.2) was fulfilled while the possible value (X1.1.1) was not.

In terms of the principle of thinking, the designer of the "Sharifi-ha House" adopted the scientific method in analyzing and arriving at the results, rather than personal opinion. Thus, the possible value (X1.2.2) of this indicator was a achieved rather than the possible value (X1.2.1). The same applies to both the "Safe House" and the "D*Haus", as the designers of these two homes relied on scientific principles based on the scientific method of analysis and access to results. Thus, the possible value (X1.2.2) was also achieved in both houses, with the possible value (X1.2.1) unrealised.

In terms of intellectual direction, the designer of the "Sharifi-ha House" adopted the principle of technological intelligence and advanced techniques so that the possible value (X1.3.2) was achieved, with possible value (X1.3.1) omitted. This also applies to both "Safe House" and "D*Haus" as these designers also adopted the principle of technological intelligence and advanced techniques. Thus, the possible value (X1.3.2) was fulfilled without possible value (X1.3.1) being met.

Thus, the primary indicators of Thought for the "Sharifi-ha House" and its secondary indicators, offered a score of 66.67%, as compared to the 50% achieved by "Safe House" and "D*Haus", as shown in table 1.

4.3.2 Concept

With regard to generating form and function, the basis of generating form and function in each of the projects followed each of the apparent needs in all aspects with regard to the surrounding local environment and the use of technology and smart techniques. Thus, both possible values (X2.1.1 and X2.1.2) were achieved for this indicator in all homes.

Regarding the functional performance of the generated form, “Sharifi-ha House” achieves purely functional and environmental necessity while acknowledging ideological necessity by offering openness to meet sensory, aesthetic, and emotional needs. Possible values (X2.2.1, X2.2.2, and X2.2.4) are fulfilled in this way, though possible value (X2.2.3) is not. The "Safe House" achieves purely functional and environmental necessity by achieving the utmost safety for the residents of the house; here, possible values (X2.2.1 and X2.2.4) are achieved while possible values (X2.2.3 and X2.2.2) are not. The "D*Haus", which also fulfils functional and environmental necessity through controlled adaptation to seasonal conditions by moving within itself, also achieves sensory, aesthetic, emotional necessity, causing possible values (X2.2.1 and X2.2.4) to be achieved while possible values (X2.2.3 and X2.2.2) are not achieved.

In terms of the privacy of the generated identity, local identity in the "Sharifi-ha House" was achieved by taking inspiration from traditional summer and winter houses and reformulating and modernising them. Thus, the possible value (X2.3.1) was achieved while possible value (X2.3.2) was not. The "Safe House" achieves harmony with the neighbouring buildings by using only wood material; thus, possible value (X2.3.2) is achieved while value (X2.3.1) is not. Similarly, "D*Haus" realizes a virtual identity that follows changing environmental conditions, causing possible value (X2.3.2) to be achieved while value (X2.3.1) is not.
In relation to the design type generated, in each project, the generated design type interacts with human needs, and the surrounding environment. Possible value (X2.4.2) is thus achieved in all homes, while possible value (X2.4.1) is not.

For the primary indicator of Concept and its secondary indicators, the values achieved were 70% for "Sharifi-ha House", and 60% for both "Safe House" and "D*Haus".

4.3.3 Material

• In terms of the image of the form, the designer of "Sharifi-ha House" depended on a combination between the forms with local details and determinism based on the environment and identity, and forms with technological and complex compositions. Thus, the possible values (X3.1.1) and (X3.1.2) were achieved. Likewise, in the "Safe House", the designer depended on a combination of materials with local details and forms with technological compositions, allowing all possible values (X3.1.1 and X3.1.2) to be achieved. In contrast, the designer of the "D*Haus" adopted only forms with technological compositions, so that possible value (X3.1.2) was realised while value (X3.1.1) was not.

• With regard to the image of the outer membrane, "Sharifi-ha House" simulates nature and interacts with different climatic conditions, causing possible value (X3.2.1) to be achieved without achieving (X3.2.2). The "Safe House" simulates nature in some parts, represented by the use of wood material, thus achieving possible value (X3.2.1) without achieving (X3.2.2). As for the "D*Haus", its outer membrane does not simulate nature in most of its parts concerning the materials used in finishing; possible value (X3.2.1) is achieved without value (X3.2.2) being achieved.

• In terms of imagining the structure of the building, the “Sharifi-ha House” combines a stable structure with the movable structure represented by the large rotating cubes, so each of the possible values is achieved (X3.3.1 and X3.3.2). This also applies to the "Safe House", which also combines stable structure and movable structure, represented by the moving external walls, thus achieving both possible values (X3.3.1 and X3.3.2). The "D*Haus" is based on moving the whole structure, however, meaning that possible value (X3.3.2) is achieved while value (X3.3.1) is not.

• Regarding imagining the implementation of the technique used, both the "Sharifi-Ha House" and "Safe House" depended on local techniques and technological intelligence so that both possible values (X3.4.1 and X3.4.2) were achieved, while the "D*Haus" adopted only technologically intelligent techniques. Thus, the possible value (X3.4.2) was achieved, but the value (X3.4.1) was not achieved.

For the primary indicator of Material and its secondary indicators, the values achieved were 87.5% for "Sharifi-ha House" and "Safe House", and 50% for "D*Haus".

4.3.4 Image

• In terms of the appearance of the image, “Sharifi-Ha House” combines an architectural image of a local character with an intelligent architectural image, so that each of the possible values is achieved (X4.1.1 and X4.1.2). For the "Safe House", it adheres to an architectural image of a local character, so that possible value (X4.1.1) is achieved without achieving value (X4.1.2). In contrast, the "D*Haus" is closer to an image of architecture with an intelligent and technological character, causing possible value (X4.1.2) to be achieved while value (X4.1.1) was not achieved.

For the primary indicator of Image and its secondary indicator, values achieved were 100% for "Sharifi-ha House", and 50% for both "Safe House" and "D*Haus".

Finally, the percentage of all indicators of the theoretical framework for "Sharifi-ha Home" was 76.92%, with 65.38% for "Safe House", and 53.84% for "D*Haus", as shown in bar-chart 1. The "Sharifi-ha House" is thus deemed to achieve the highest value in terms of combining the thoughts and image of local architecture with the thoughts and images of intelligent architecture.
5. Conclusions and Recommendations

The conclusions can be summarized as general and special conclusions:

5.1. General Conclusions

- When pandemic events or crises occur that affect society and threaten its ongoing existence, architects tend to adopt three intellectual trends: One declares the inevitability of absolute change, while another remains conservative; the third trend, as confirmed by this study, is an attempt to integrate change with previous thought.

- The necessity of interacting with the current pandemic crisis, considering it as a starting point to arrive at new architectural intellectual paradigms, has led to the development of a theoretical model in this research represented by antivirus architecture with a local character that carries "thought, concepts, materials, and images" that interact with both spatial and time dimensions in light of the current epidemic crisis; that theoretical model is affected and responds to the crisis by achieving a balance of the values, and beliefs that people hold and interacting with the new intellectual model within a framework of integration with the local community by continuously interacting with developments in the crisis at an international level in all fields.

- The architecture of the future is inevitably emerging, and the theoretical model for antivirus architecture that the study aimed to develop at just one of its levels; it also constantly redefines itself as a means of expanding its scope.

- The theoretical model of antivirus architecture is characterised by creating smart spaces that provide suitable spatial environments for humans based on interacting with them and adapting to changing needs and requirements.

- It is possible to create a theoretical model of antivirus architecture that can interact with surrounding environmental situations to procure an ability to face epidemic or climatic risks and other dangers based on control systems that sense and warn users of such dangers.

- The possibility of access to architecture images characterised by an apparent system that is closer to the form of local architecture at the level of local types and details, while simultaneously adopting technological aspects with regard to its ability to expand or shrink by moving some walls to certain spaces or even moving the spaces themselves is intriguing. This space expansion or shrinkage is reflected at the level of both indoors and outdoors, for the purposes of interaction with the conditions in the surrounding environment, based on advanced and intelligent technology compatible with that local environment.

Bar-chart 1. Ratios of indicators of the theoretical framework in selected samples.
5.2. **Special Conclusions**

- The research hypothesis is confirmed based on the possibility of integrating local details and techniques with advanced technological intelligence systems and techniques to create an intelligent local architecture that interacts with, harmonises to, and adapts to both humans and the surrounding environment.
- The current epidemic crisis has produced many new ideas, one of which is a theoretical model represented by antivirus architecture with a local character that has the requisite mechanisms and components embedded within its apparent system.
- Extracting specific mechanisms and components of the apparent system in the theoretical model of antivirus architecture through the combination of the local and advanced technological intelligence shows that the components of the apparent system are as follows:
  1. Thought: its nature depends on the merging of experimental and materialistic thinking in a manner that serves environmental conditions and privacy and that reflects the shape of the local environment and the current state of smart technology.
  2. Concept: this is based on the mechanisms of generating form, function, design patterns, and identity privacy resulting from local social, environmental, cultural, ideological, and technological needs.
  3. Material: this depends on the mechanism of expressing the local shape, the surrounding environment, and intelligent technological techniques. In terms of the image of the outer membrane, this is based on a simulation mechanism to facilitate interaction with different climatic conditions. The structure of the building depends on the mechanism of transformation from the principle of stability to the principle of movement and adaptation to the surrounding environment, while the implementation of the technique used requires a combination of local techniques and technologically intelligent techniques.
  4. Image: the appearance of the resulting image and its details depend on combining images from local architecture with the images of intelligent-technological architecture.
- The theoretical model developed produced a concept of smart walls and ceilings that can be moved from one location to another, thus transforming them from mere construction necessities or building protectors to more complex and interactive elements that work as interstitial membranes that can change their properties and shift from a stable state to a movable state in response to environmental conditions.

5.3. **Recommendations**

- This research recommends producing models for local-intelligent architecture related to cultural and social constants that have the ability to adapt to various crises, including epidemiological and environmental issues, as part of the ongoing work to achieve environmental and natural compatibility by investing in intelligent technology to find new and advanced solutions and treatments.
- It is necessary to invest in design types based on local architecture and to determine how to develop and use these in the future architecture by reformulating local thoughts with reference to modern concepts and making them compatible with modern requirements.
- The thinkers, theorists, and architects working in the field of architecture must strive harder to spread knowledge and awareness of how to deal architecturally with various social crises, including the Coronavirus crisis, in order to benefit from the creation of new intellectual paradigms, and to create a new generation of architecture that interacts with spatial and temporal dimensions effectively throughout the changes caused by various crises.
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