

## Architectural Characteristics of Expansion in Historical Mosques

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### ABSTRACT

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#### **Keywords:**

*expansion, historical mosques, expansion principles*

The identity of the first Islamic cities is clearly evident in its ancient mosques, and it is characterized by a continuous and always stable function, represented by prayer and other related activities, which necessitates its expansion due to the increase in worshippers. Through the historical and architectural description of the plans of the ancient historical mosques in which the phenomenon of expansion was applied, it becomes clear to us that the general problem of the research is the lack of clarity of the mechanisms and characteristics of expansion. The research problem is that the phenomenon of mosque expansion did not crystallize according to the architectural foundations that the designer can benefit from, represented in the formative and functional characteristics. The research aims to develop a studied strategy to reach the architectural characteristics of mosque expansion using the qualitative (historical) analysis methodology of historical mosques within the evaluation model and the accompanying addition of some complementary elements of expansion. The researcher concluded that most of the expansion works that were carried out on mosques were at the expense of the architectural characteristics that these mosques bear when trying to achieve a larger area without taking into account the principles of mosque expansion.

## 1. INTRODUCTION

The mosque constitutes the primary religious edifice of Islamic civilization, with daily congregational prayer serving as its central function, supplemented by other roles. In the planning of Islamic cities, the mosque was the initial nucleus, representing the most influential and vital element. This multi-functional institution is distinguished by its adaptability and expansion over time, owing to increasing numbers of worshippers [1] tied to the growth and population increase of Islamic cities.

Observing this phenomenon in the mosques of Mosul city, interviews were conducted with employees of the Engineering Division of the Sunni Endowment Office in Baghdad [2] and the Engineering Division of the Endowments Directorate in Nineveh [3]. It was determined that there exist engineering standards for designing mosques in Iraq [1]. These standards are upheld through technical committees affiliated with the Diwan and involve on-site inspections. However, it became apparent that the issue of "mosque expansion" lacked sufficient clarity in terms of area, location, construction materials, and general external appearance.

Regarding historically inclusive mosques, studies have indicated reasons for the emergence of this architectural phenomenon in general, and within the realm of Islamic architecture, particularly in mosque architecture, to accommodate the needs of an increasing number of worshippers. However, these studies have not sufficiently detailed the subsequent development of this phenomenon in a manner that allows Muslim architects to solidify this concept according to architectural principles for practical application. This study refers to the types, dates, and directions of previous expansions.

The research problem lies in the lack of a clear definition of the phenomenon of expansion in mosques according to architectural principles that designers can use, particularly in terms of formative and functional characteristics. It's necessary to derive architectural principles for expansion. Researchers can adopt one of three methods: First, the lack of clear local laws and regulations regarding mosque expansions in some countries. Second, redefining the design principles of mosques and applying them to mosque buildings where expansion is part of the plan. Third, studying famous historical mosques to derive design principles for expansion. This third method is the path that this research will take to address some aspects of the research problem.

This is accomplished by scrutinizing the design standards for mosques in various Islamic countries [1-3], revealing that while some of these standards relate to the core of the mosque, the expansion guidelines remain unclear. Solutions to this issue have been identified through historical evidence and the ways architectural designers have addressed this phenomenon, which this research aims to explore further to resolve the issue.

Numerous studies have highlighted the clear manifestation of this phenomenon in the Prophet's Mosque in Medina [4, 5], the Mansour Mosque in Iraq-Baghdad [6], the Prophet Jarjis Mosque in Iraq-Mosul [7, 8], the Mosque of Amr ibn al-Aas in Egypt-Cairo [9, 10], the Al-Azhar Mosque in Egypt-Cairo [11, 12], the Kairouan Mosque in Tunis-Kairouan [13, 14], the Al-Qarawiyyin Mosque in Morocco-Fez [3], the Mosque of Cordoba in Spain-Cordoba [15-17], the Mosque of Isfahan in Iran-Isfahan [18], and the Mosque of The Power of Islam in India-Delhi [19]. The phenomenon has been depicted through architectural plans and historical descriptions of these mosques, acknowledging their expansion stages, time frames,

and key added elements.

Definition of the phenomenon: This phenomenon in architecture, in general, came with multiple synonyms and was described in Arabic terms as (Addition) [20, 21] - (Increase) [20-22] - (Expansion) [23, 24] - (Flexibility [25] - (Dynamism) [22] - (Adaptation) [26] As for foreign terms, they are described as ((Addition) [11, 20, 26, 27], and (Expansion) [18], (Flexibility) [25], (Dynamism) [22], (Adaptation) [26], (Combined Works) [26], and expansion is defined as:

- 1) It is a design strategy for adding a new entity to another that already exists in certain formats within the framework of a specific orientation towards the issue of form and meaning [20];
- 2) It is a several floors, a room, a wing, or any other expansion related to the original building, or any new construction that aims to increase the height or area of the original building, or is added to it, whether it is a hallway or an attached garage [28];
- 3) It is a process of creation and a link between the old and the new, as the new buildings reinterpret the old buildings all the time by replacing them sometimes or re-working them at other times by adding, deleting, or elements of expression [16].

By looking at the terms, it was found that the concept of addition is a comprehensive concept according to Study [20], while the concept of (Expansion) is a type of addition, as it will be presented later in the statement of the types of additions [23]. However, these synonyms lead to the same purpose, which is the increase in the area of the building due to the increase in the number of its users [20]. In the field of historical mosques and by looking at the previous studies represented in Table 1, the terms (expansion-increase-addition) were used to describe the expansion of the mosque, and it was found that the term expansion is the most frequently used in studies that dealt with this phenomenon. Also, some sources mentioned terms synonymous with the expansion process in the same description of the phenomenon.

**Table 1.** Types of expansions in architecture and in the field of mosque architecture (the researcher)

Horizontal Additions	It is widely used, and the important factor in it is the adequacy of the site to accommodate the new expansion, and it may be in the form of wings or new parts of the buildings [10, 27, 29]
Linked Additions	Linking the new additions to the building by means of a link, which allows the old and new building to continue the physical interdependence [27]
Modular Expansion	It is the use of repeatable, self-contained modules when further expansion is needed, and is in the form of clusters [27]
Natural Growth	It is usually found in educational and institutional structures and expands over the years to include spatial requirements. The building must be made to look like a single pattern [27]
Vertical Addition	It depends on the existing structure's ability to withstand additional loads and is affected by height and zoning laws on expanding vertically [10, 27]
Internal Expansions	Create an additional space by inserting an additional floor in the current size of the building in the form of partial floors to expand the area of the building [27]
Addition As Enclosure	The new extension is made to completely encircle the existing building, so that the identity and image of the original building is lost within the new building [27]
Addition Plus	It is the addition of architectural elements that increase the ability of the building to accommodate the increasing numbers of its users. like a roof, porch, etc. [27]

A procedural definition of expansion in architecture can be given as a design mechanism used to expand a specific space to perform the same function according to the determinants, capabilities and architectural concepts. It is inherent in the addition of some elements and takes into account the formative and functional aspect and integration with the original to produce a unit in the overall final composition. Principles of Expansion: After reviewing the definition of the phenomenon and the research problem, the need arises to clarify the principles of this phenomenon in architecture in general.

Studies have differed in dividing these principles into: respecting the architectural identity of the building according to the type, plan and facades of the building, as well as the urban plan of the region [16]. As for the other division of the principles, it includes taking into account aesthetic considerations (environmental aspects - scale - contrast - shape - addition as a background - materials - links) and site considerations (border - direction) as well as structural considerations (building structure) and internal considerations (floor levels - entrances - respect for interior design Interior lighting [23]. As for the other division of the principles of historical buildings, it included respect for origin and dependency, compatibility of materials used, privacy of the site and surroundings, flexibility, simplicity, and visual integration [25]. However, the division of the principles of expansion in architecture, which the researcher adopted, (Figure 1) is:

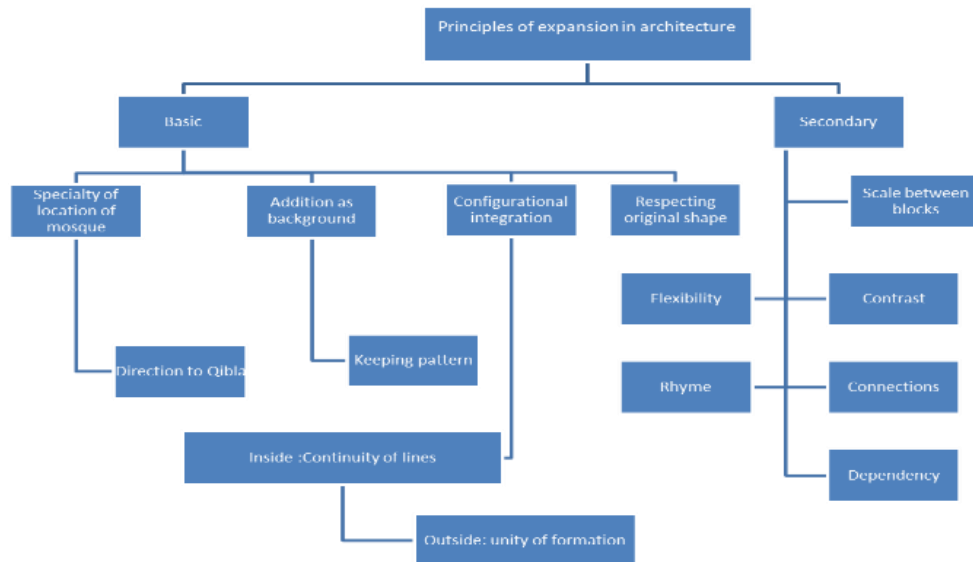
**Key principles:**

- 1) Addition as Backdrop: When a new addition becomes a background, the focus is on the original building, where the current building must take the attention that will be directed to it. Sometimes a new addition can be designed as a background for one special feature of the original building when the entire building does not require attention [27];
- 2) Formative Integration: Visual integration should be achieved between the original building and the expansion and should not distort the general view of the building. One of the methods used to maintain the visual integrity of the original building is through building a low mass of light materials that connects the old and the modern part. it is necessary to take into account the achievement of visual and formative continuity between buildings of different periods and styles, and between the addition [1]. Visual integration is achieved in mosques on the inside and outside. On the inside, communication between the rows is a functional necessity to achieve the conditions that must be followed in performing the prayer represented by not cutting the rows, communication between the worshipers, seeing the imam and others [22]. As for the visual integration outside, it is at the level of the unity of formation. Islamic architecture represents the architecture of unity. and that the basis for achieving a sense of unity within space is either by unifying surface treatments or the rhythmic repetition of elements, taking into account their relationship to the human scale [20];
- 3) The specificity of the site and the surroundings: The criteria for expansion vary according to the specificity of the site, where the buildings differ in accommodating change and addition without losing the architectural value. Therefore, the heritage, planning and architectural features and characteristics of the fabric of cities should be respected in any expansion of them [13], which requires preserving the street view during the process of

expansion [14], taking into account the relationship of the expansion to the current building and site, as well as the relationship of the building to its urban surroundings [27]. Orienting towards the Qiblah is one of the most important design constants for the architecture of mosques, in accordance with the words of Allah Almighty: “We have certainly seen the turning of your face, [O Muhammad], toward the heaven, and We will surely turn you to a Qiblah with which you will be

pleased. So turn your face toward al-Masjid al-Haram. And wherever you [believers] are, turn your faces toward it [in prayer]. Indeed, those who have been given the Scripture well know that it is the truth from their Lord. And Allah is not unaware of what they do.”

- 4) Dominance and respect for the original: It is necessary first to know the original, which includes the characteristics and character of the building, and to know its location before conducting expansion works on it.



**Figure 1.** Principles of joint expansion between the field of architecture and mosque architecture (the researcher)

This is done by following one of the two methods. To expand in terms of location, shape, weight, and materials. In both cases, the old must be distinguished from the new, while preserving the importance of the relationship between them [14]. The original and what it represents of the expressive identity of the old building must be respected, and its meanings re-introduced in new contexts so as to reflect its importance and potential as contributing parts to the new expression [16, 27].

#### Subordinate principles:

- 1) The scale between the blocks: It is considered important due to its effect on people as well as on how the building is presented. Designers can use the elements of scale to create a wonderful and strong human feeling. Designers of building additions have the opportunity to either maintain the scale or create a new scale to meet a new purpose, which is one of the distinctive characteristics of mosques; the expansion was not by the magnitude of the scale, but by the extension of the spaces and the connection to the sky of the space that extends without borders, as the Muslim architect sought to show luxury while taking into account the human scale by fragmenting the elements and their multiplicity without prejudice to the unity of design [27, 30];
- 2) Subordination: To be dependent and secondary in terms of size and shape, the expansion must play a secondary role and not dominate the original building as a result of its size, materials used in its construction, or construction site [11]. Excessive expansion can be understood as exaggerated in its dominance or as being ugly [27, 30]. The dependency is on two sides:
  - a) 2-1 Form: The mass determines the shape in general

and not in detail. Often, the extension mass can be used to achieve balance with the existing building so that the overall picture is harmonious. It is necessary to match the heights from the pedestrian point of view, to make the old and the new look balanced, and to maintain the relationship between them [27].

- b) 2-2 Materials: This includes analyzing the materials to be used in the expansion and the study of color, texture, transparency, and scale, in addition to practical features such as load-bearing properties, workability, energy efficiency, and cost [27];
- 3) Flexibility: Many old buildings have the ability to receive modifications and additions dating back to the era of their establishment, and to respect and comply with what was built before them, and this may be a justification to support the continued preservation and use of such buildings [9]. Islamic mosques are characterized by their ability to develop and expand in all directions, according to the requirements of the potential increase in the number of worshippers over time [5];
- 4) Contrast: A designer can sometimes highlight an original building by means of contrast. The ornate original building will stand out if the new extension is kept simple. This type of approach is often used when an extension is added to an architecturally important building [27];
- 5) Considering Connections: A direct connection can be made, and height and mass preserved so that the overall composition reads as a single entity, or the connection can be the narrowest of connections. Furthermore, the designer can emphasize or blend the separate shapes. The links between the original building and the new extension

are important to the function and aesthetics of the project, and careful consideration must be given to the design of the connection [27];

- 6) Rhythm: The designer can benefit from this aesthetic concept in linking an expansion to the original building. If the rhythm of a specific element is copied in the expansion, continuity is created between the old and the new, even if other variables differ. The concept of rhythm design is often used in conjunction with other concepts such as scale, material, mass, and height [27].

It turns out that the expansions are related to the nature and function of the building to be expanded, but there are common principles among the multiple buildings as in following Table 2.

**Table 2.** Symbol for each mosque (the researcher)

Symbol	Name of Mosque
M1	Prophetic mosque
M2	Almansour
M3	Prophet Jarjes
M4	Amro bin Alas
M5	Alazhar
M6	Alqaerawan
M7	Alqaraween
M8	Qurtuba
M9	Asfahan
M10	Quat Aleslam

**Types of expansions in architecture:**

There is no doubt that the types of expansion in the field of architecture take multiple forms. There are two types of expansion: (horizontal and vertical), and each of them has its own characteristics and indicators, and depends mainly on focusing on the relationship between the old and the new and respecting the architectural identity of the building [31]. There is another division of the types of expansions according to the field of the emergence of the phenomenon (at the level of the inside – at the level of the outside - both at the level of the inside and the outside) and according to the overall nature of the phenomenon (adding parts to total structures - adding total structures to parts – adding total structures to total structures) and according to the nature Syntax of the phenomenon (mono-compound) [20]. There is another division of the types of expansions according to the spatial correlation, which is (Adding On), which includes suites and their buildings, and is in the form of horizontal adjoining, and (Adding Over), which includes additions in the vertical direction, which weakens the old building because of its dominance, and is in the form of vertical adjoining [26]. As for the most prominent and comprehensive of these classifications, it is the division adopted by Saleh [27] and shown in Table 1.

The wide multiplicity of types of expansions indicates the importance of this concept in architecture and its structure, and it varies according to the nature of the shape and function of the building as well as the environment and surroundings that surround the building. Some places have high privacy that the architect must take into account while expanding them. The building may contain more than one type of expansion through different time periods.

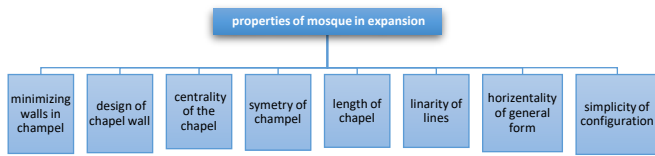
**Characteristics of mosques in the expansion works:**

By looking at the studies related to the expansion works, which are represented by studies [30, 31-34], it is clear to us that these studies did not describe the phenomenon sufficiently to help the architect to apply it properly in the expansion of

mosques, as it appears to us that there is a general specificity in the design of mosques, which must be taken into account while carrying out the expansion works for it, and it can be summarized as follows in the Figure 2:

- 1) Simplicity of composition: We simply mean composition in the architecture of mosques, the formative system that relies on the unity of the idea and the interdependence between its constructive vocabulary and its aesthetic standards and the employment of that vocabulary and standards to achieve the required structural, functional, economic and aesthetic benefit. The simplicity of the mosque reflects peace [33, 34].
- 2) The horizontality of the general configuration: Studies have shown the need to take into account the prophetic directives during the planning stage of the mosque, such as the distribution of entrances, not cutting the rows, and extending the first row. The first basic mosques were characterized by a rectangular sanctuary in which the long rib faces the direction of the Qiblah in response to the noble hadith (so that people who raise their eyes to the sky in prayer may stop, or that their eyes will be caught) (Sahih Al-Bukhari), which necessitates looking downwards or in the direction of the Qiblah [33].
- 3) Regularity of the rows: The study emphasized the need to take into account the design of the mosque in terms of the distribution of the entrances, the non-cutting of the rows, the regularity of the boundaries of the chapel, the extension of the first row, the vision of the imam, and others.
- 4) The elongation of the chapel: The first main mosques were characterized by a rectangular campus. Such shapes are considered as a response to the Sunnah of the Prophet for the virtue of the first row. The shape of the first chapel and the main one is rectangular, and the Qibla wall is longer than the two side walls, which is for the reason of increasing the wages of the first row.
- 5) Symmetry of the chapel: With regard to the mediation of the imam in prayer, it was reported that the Prophet Muhammad said: (mediate the imam and bridge the imbalance) Narrated by Abu Dawood. The evidence for this refers to the imam’s mediation for the congregation, meaning that the place of the imam is in front of the rows facing the middle of them, following the example of the Prophet and the Companions [34].
- 6) The axis of the chapel: the main entrance is always in the direction of the Qiblah and on the straightness of the main axis on the opposite side of the Qiblah, in order to maintain the ranks of the worshipers so that those who fail to attend the prayer time will not disturb them [33].
- 7) Design of the Qibla wall (linear Qibla wall): The Qibla wall must be distinguished from the rest of the walls of the mosque, as some narrations indicated that the Qibla wall in the Prophet’s Mosque before its conversion was made of palm trunks, and the rest of the walls of the mosque were made of mud bricks. It is made of planed stone without the rest of the walls of the mosque built with mud bricks [14].
- 8) Reducing the pillars in the chapel: On the authority of Anas, may God be pleased with him, he said (we used to forbid praying between the pillars and expelled them from it) (narrated by al-Hakim) and the reason for the dislike of praying between the pillars is that it is the chapel of the believing jinn [30] and the pillars also have benefits. It can be used as a rack for the Qur’an and as a

jacket to prevent passage in front of the worshippers, but the structural reason is often the reason for its presence in the chapel to carry the ceiling and domes.



**Figure 2.** Characteristics of the mosque in the expansion works (the researcher)

## 2. METHODS

The research relied on the qualitative (historical) analysis to reach the objectives of the research by reviewing and studying the historical charts and previous studies of the samples chosen by the researcher according to a mechanism that includes three aspects:

**The first aspect:** The expansion in architecture will be dealt with and explained, represented by the number of stages of expansion that each selected sample went through, the reasons for the emergence of this phenomenon, the types of this phenomenon in architecture, and its implications for mosque buildings. The aim is to reach a general and comprehensive description of the phenomenon and the number of expansion stages that the mosque went through and the relationship of the expansion to the nucleus of the mosque by knowing the types of expansion that were applied to the mosque, all aspects covered by the architectural principles of expansion will be evaluated for each expansion stage of the selected samples. The variables of the first side will be evaluated according to the principle (0-1) to ensure the existence of the variable or not, according to Table 3.

**The second aspect:** The phenomenon will be dealt within

the mosques as indicated in the first aspect above which is represented by the specificity of the mosque in terms of the relationship of the elements of the mosque to the expansion and the extent to which they are affected by the expansion works and according to the stages and for each selected sample. - Right-left) the Qiblah, as well as the percentage of the increase in the mosque, which is represented by the comparison with the nucleus of the mosque and with the previous stage for each selected sample. The locations of the expansion will be known for the selected sample and according to the stage (chapel-dish-increasing the land area), as well as knowing the compatibility of the construction side of the expansion with the nucleus of the mosque from Where the nature of the materials used and this aspect will deal with how the resulting configuration (expansion - reconstruction and expansion). Also, the elements added to the expansion, the overall composition, and the structural aspects of the expansion will be addressed. The variables of the first aspect will be evaluated according to the principle (0-1) to ensure the presence of the variable or not, according to Table 3.

**The third aspect:** Depending on what was previously clarified through the first and second aspects above and what was presented in the research previously the mosque's integration of the resulting total composition will be measured through two main variables, which are the formative features, which include (unit of formation - The dependency - the scale between the blocks - preserving the pattern - the horizontality of the general composition - reducing the chapel columns - the design of the Qibla wall) and the functional features, which include (communication between the rows - the simplicity of the composition - the symmetry of the chapel - the ability to expand - the regularity of the rows - the elongation of the chapel - the centrality of the chapel - Direction towards Qibla) and compare it with the first and second side and find out the related variables. In order to obtain high accuracy in the standardization of the variables, Table 3 will be relied upon to obtain the possible values for the standardization.

**Table 3.** The final analysis for each congregational mosque

Axis	Question	Answer	Notes	M1	M2	M3	M4	M5	M6	M7	M8	M9	M10	
Expansion in architecture	Expansion data	Expansion stages		6	3	2	5	3	4	2	3	5	2	
		Expansion type	Horizontal	●	●	●	●	●	●	●	●	●	●	○
	Vertical		○	○	○	○	○	○	○	○	○	○	○	
	Natural Growth		○	○	○	○	○	○	○	○	○	○	○	
	Internal		○	○	○	○	○	○	○	○	○	○	○	
	Expansions Addition As Enclosure		○	○	○	○	○	○	○	○	○	○	○	●
	Addition Plus		○	○	●	●	●	○	○	○	○	○	○	
	Reasons for expansion	Natural	●	○	○	○	○	○	○	○	○	○	○	
		Economical	●	●	●	●	●	●	●	●	●	●	●	●
		Functional	●	●	●	●	●	●	●	●	●	●	●	●
	Expansion direction	Qibla	○	○	○	○	○	●	●	●	○	○	○	
		Opposite to qibla	●	●	○	○	○	○	○	○	○	●	●	●
		Right of qibla	○	○	○	○	○	○	○	○	○	○	○	○
		Left of qibla	○	○	○	○	○	○	○	○	○	○	○	○
The relationship	The amount of	Space increase	Percentage with the	316%	85%	193%	1290%	24%	296%	34%	78%	235%	1144%	

of the elements of the mosque to the expansion	expansion	original	Percentage with the previous stage										
			14%	65%	29%	100%	16%	33%	25%	39%	6%	258.8%	
Mosque integration measurement	Presence of the phenomenon	The locations of the phenomenon	Prayer space	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input checked="" type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
			Court Increase of plot	<input type="radio"/>	<input type="radio"/>	<input checked="" type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
	Structural compatibility	Expansion roofing	Material compatibility	<input type="radio"/>	<input checked="" type="radio"/>	<input checked="" type="radio"/>	<input checked="" type="radio"/>	<input checked="" type="radio"/>	<input type="radio"/>	<input checked="" type="radio"/>	<input checked="" type="radio"/>	<input checked="" type="radio"/>	<input checked="" type="radio"/>
			How to configure the output	Expansion	<input type="radio"/>	<input checked="" type="radio"/>	<input checked="" type="radio"/>	<input checked="" type="radio"/>	<input checked="" type="radio"/>	<input checked="" type="radio"/>	<input checked="" type="radio"/>	<input checked="" type="radio"/>	<input checked="" type="radio"/>
	Rebuilding and expansion	<input checked="" type="radio"/>		<input type="radio"/>	<input type="radio"/>	<input checked="" type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input checked="" type="radio"/>	<input type="radio"/>	<input checked="" type="radio"/>	<input type="radio"/>	
	Product integration	Added items	Minaret	<input checked="" type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input checked="" type="radio"/>	<input checked="" type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input checked="" type="radio"/>
			Dome	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input checked="" type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input checked="" type="radio"/>
	Architectural Characteristics	Formative features	Entrance	<input checked="" type="radio"/>	<input checked="" type="radio"/>	<input checked="" type="radio"/>	<input checked="" type="radio"/>	<input checked="" type="radio"/>	<input checked="" type="radio"/>	<input checked="" type="radio"/>	<input checked="" type="radio"/>	<input checked="" type="radio"/>	<input checked="" type="radio"/>
			Mihrab	<input checked="" type="radio"/>	<input checked="" type="radio"/>	<input checked="" type="radio"/>	<input type="radio"/>	<input checked="" type="radio"/>	<input checked="" type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
			School	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input checked="" type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input checked="" type="radio"/>	<input type="radio"/>
			Gallery	<input checked="" type="radio"/>	<input checked="" type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input checked="" type="radio"/>	<input checked="" type="radio"/>	<input checked="" type="radio"/>	<input checked="" type="radio"/>	<input type="radio"/>	<input checked="" type="radio"/>
			Court	<input checked="" type="radio"/>	<input checked="" type="radio"/>	<input checked="" type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input checked="" type="radio"/>	<input checked="" type="radio"/>
			Shrine	<input checked="" type="radio"/>	<input type="radio"/>	<input checked="" type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
		Bracelet	<input checked="" type="radio"/>	<input checked="" type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input checked="" type="radio"/>	<input checked="" type="radio"/>	<input type="radio"/>	<input checked="" type="radio"/>	<input checked="" type="radio"/>	
Functional features		Configuration unit	<input checked="" type="radio"/>	<input checked="" type="radio"/>	<input type="radio"/>	<input checked="" type="radio"/>	<input type="radio"/>	<input checked="" type="radio"/>	<input checked="" type="radio"/>	<input checked="" type="radio"/>	<input type="radio"/>	<input checked="" type="radio"/>	
		Dependency Scale between blocks	<input checked="" type="radio"/>	<input checked="" type="radio"/>	<input checked="" type="radio"/>	<input checked="" type="radio"/>	<input checked="" type="radio"/>	<input checked="" type="radio"/>	<input checked="" type="radio"/>	<input checked="" type="radio"/>	<input type="radio"/>	<input checked="" type="radio"/>	
		Maintaining style	<input checked="" type="radio"/>	<input checked="" type="radio"/>	<input checked="" type="radio"/>	<input checked="" type="radio"/>	<input checked="" type="radio"/>	<input checked="" type="radio"/>	<input checked="" type="radio"/>	<input checked="" type="radio"/>	<input type="radio"/>	<input checked="" type="radio"/>	
		Horizontal configuration	<input type="radio"/>	<input type="radio"/>	<input checked="" type="radio"/>	<input checked="" type="radio"/>	<input checked="" type="radio"/>	<input checked="" type="radio"/>	<input checked="" type="radio"/>	<input checked="" type="radio"/>	<input checked="" type="radio"/>	<input checked="" type="radio"/>	
		Reducing the columns of the chapel	<input type="radio"/>	<input checked="" type="radio"/>	<input checked="" type="radio"/>	<input checked="" type="radio"/>	<input checked="" type="radio"/>	<input checked="" type="radio"/>	<input checked="" type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	
	Qibla wall design	<input checked="" type="radio"/>	<input checked="" type="radio"/>	<input checked="" type="radio"/>	<input checked="" type="radio"/>	<input checked="" type="radio"/>	<input checked="" type="radio"/>	<input checked="" type="radio"/>	<input checked="" type="radio"/>	<input checked="" type="radio"/>	<input checked="" type="radio"/>		

Chapel elongation	○	○	●	⊙	⊙	⊙	●	⊙	⊙	●
The pivot of the chapel	●	●	○	●	⊙	●	●	⊙	●	●
Direction towards Qibla	●	●	●	●	●	●	●	●	●	●

>200	150-200	100-150	50-100	0-50	2	1	0

Table 4. Symbol for each mosque (the researcher)

India	Iran	Spain	North Africa	Egypt	Iraq	Arabian Island	Date/Region
			M6	M4		M1	The beginning of migration
	M9	M8			M2		First century
			M7				II century
				M5			III century
M10					M3		IV century
							VI century

**Practical study:**

- Rules for selecting samples: The samples were selected according to the principle of the importance of these samples within the field of Islamic architecture, its antiquity, the nature of the application of the phenomenon in it, its architectural features, its historical aspects, and the impact of these mosques on the societies hosting them, and the geographical and temporal diversity was taken into account (Table 3 and Table 4).
- Schema Analysis: The charts of the selected samples were analyzed according to the stages of expansion, so each stage was separated by a specific color, as all the sample charts were redrawn from their sources with coloring by the researcher and according to the stages of expansion therein (Tables 3, 5 and 6) (Figure 3).
- Comprehensive analysis of samples: The selected samples were analyzed according to a table resulting from the data and information available on this phenomenon according to the three axes (specified in the methodology paragraph) and according to the expansion stages of each sample, where the first and second axis were analyzed according to each expansion stage the mosque went through and with an evaluation (0- 2) As for the third axis, it was evaluated (0-1-2) to achieve high accuracy in the required results (Table 3).

Table 5. Symbol and color for each expansion stage (the researcher)

Stage	Color Degree	Symbol
nucleus of mosque		S0
first		S1
second		S2
third		S3
fourth		S4
fifth		S5
sixth		S6

Table 6. Percentage of increment according to color degree

Color Degree	Percentage
	0-50
	50-100
	100-150
	150-200
	>200

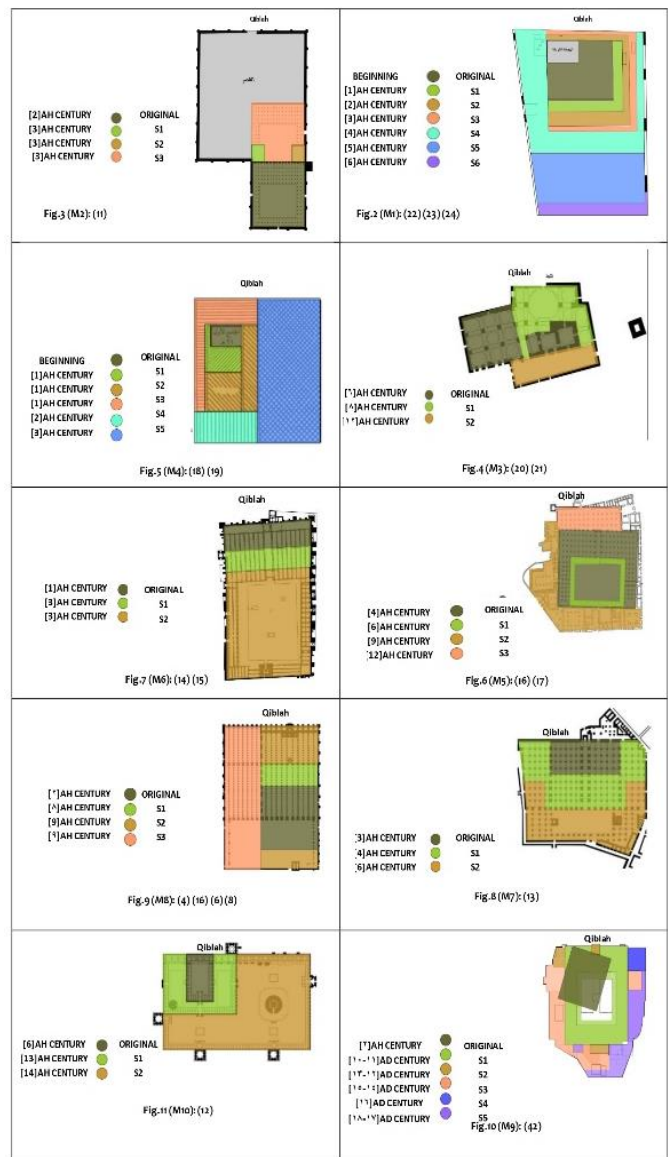


Figure 3. The selected samples were redrawn by the researcher

**3. DISCUSSION**

The results of the practical study: By analyzing the table of

the selected historical mosques (Table 3), in which the stages of the expansion of each mosque and its overall results were shown, the variables related to the expansion work were calculated according to the three axes. The results showed what follows:

### 3.1 Expansion data

Expansion stages: By observing Table 3, we can see that the various mosques have different stages of expansion.

Expansion types: It is noted from the previous tables that the horizontal expansion rate is (100%), the natural expansion rate is (0%), the internal and vertical expansion rate is (0%), Addition as Enclosure rate is (10%), and the Additions plus rate is (30%).

Reasons for expansion: From Table 3, it appears that there is a common economic and functional reason in all stages at a rate of (100%). As for the natural reason for expansion, it amounted to (10%), and these reasons are intertwined with each other.

### 3.2 Description of the elements of the mosque

- Direction of Expansion: It is noted from Table 3 that the percentage of the direction of expansion was as follows: (60%) towards the opposite direction of the Qiblah, (30%) towards the right of the Qiblah, (10%) towards the left of the Qiblah, and (30%) towards the direction of the Qiblah.

- Increasing the area: From Table 3, It is clear that 40% of the mosques an increase in the area by 100% or less, and 60% of the mosques an increase in the area by more than 100%.

- Places of occurrence of the phenomenon: Table 3 shows us that there are three places at the expense of which the expansion takes place according to the following percentages: (90%) at the expense of increasing the plot of land, (10%) at the expense of the courtyard, and (10%) at the expense of the House of Prayer. Compatibility of the structural side: It appears from Table 3 that the expansion materials may be compatible with the old materials in varying proportions, as (80%) of the total stages of the expansion of the above mosques are compatible with the old materials and (20%) are not compatible with the old materials.

- Existence of expansion works and works accompanied by demolition and expansion: it appears from Table 3 that the percentage of realization of expansion works alone is (60%), and the percentage of realization of expansion and reconstruction works is (40%).

- Added elements: Appears from Table 3, it is clear to us that the most used element in the expansion stages of the selected samples is the entrance with a rate of (100%), followed by the gallery with a rate of (70%) Then each of the dome (20%) and the courtyard (50%) and the mihrab (50%), then each of the minaret (40%) and masts (60%), then the school component (20%), and finally, the shrine component (20%).

### 3.3 Measurement of Mosque integration

- Formative features: The percentage of achieving unity in composition was (70%), while the percentage of achieving dependency on materials and shapes was (80%), and the percentage of achieving scale between blocks was (75%) and the percentage of achieving preservation of the pattern was (90%), the percentage of achieving horizontality in the general configuration was (55%), the percentage of reducing columns

for the chapel space was (45%), and the percentage of designing the Qibla wall in the selected samples was (100%).

- Functional features: The percentage of achieving communication between the rows was (85%), the percentage of achieving simplicity of composition was (90%), and the percentage of achieving symmetry of the chapel was (40%) and the percentage of achieving ability to expand (90%) and the percentage of achieving regular rows (70%) and the percentage of achieving elongation of the chapel (55%) The percentage of achieving the centrality of the chapel is (80%) and the percentage of achieving the direction towards the Qiblah (100%).

## 4. CONCLUSION

The expansion of the historical mosques was an economic and social necessity, to the increase in the number of worshipers, which calls for a challenge to Muslim architecture in how to preserve and expand the architectural features of the mosque. and one of the most important duties is to preserve the architectural characteristics of these mosques, despite the expansion works they are exposed to, which are linked to the main reasons for the phenomenon of expansion in architecture and the principles of expansion that are common to the field of architecture and mosques and the types of expansions in mosque architecture and Elements of the mosque affected by the expansion. the study also found (objective of research) that Preserving the architectural characteristics of the mosque and expanding it through the functional and formative features and applying them with their details to try the architectural designer in how and the mechanism of applying the expansion while preserving the architectural characteristics of the resulting formation.

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