

The Importance of Classifying the Traditional Mosulian Ornaments in Enhancing the Conservation Process



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ABSTRACT

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Ornaments are effective interior design elements, which enhance the identity and heritage value of heritage buildings. The Mosulian ornaments represent the mixture of the culture and architectural, which are produced by Mosulian marble 'Farish'. After the war in 2017, there was a dramatic disappearance of the original types of Mosulian ornament because of the non-oriented restoration and conservation process. UNESCO and the government sector suffered from the availability of information to find a guideline to be used in the restoration and conservation process. However, the shortage of documentations led to the disappearance of valuable ornaments, especially after investing the new technology in producing the ornaments in the conservation processes. The study aims to classify the Mosulian ornaments in terms of shape, material, and position, to construct a platform and data set of the Mosulian ornaments. The study applied a qualitative approach using observation and visual analysis methods to observe the results of the analysis with a checklist form. The results indicated that Mosulian architecture is rich in ornamental elements, floral ornaments are used in the greatest ratio than geometric, while animal shapes are rarely used. The principle of repetition in two and four steps is the main principle used in generating process. The classification of ornament can enhance the heritage value of the buildings, designers and developers can rely on this classification to design and reuse the ornament.

1. INTRODUCTION

Mosul is the second-largest city in Iraq, its history goes back thousands of years ago. It is characterized by its cultural and civilizational diversity, which is reflected in the architectural output, such as Christian, Assyrian, and Islamic architecture. These factors affected the architectural elements of buildings such as arches, arcades, and ornaments elements [1]. Old Mosul City faced various factors of distortion, such as natural, war, and management disasters, which impact the diversity of the architectural style year by year. Therefore, urgent preservation and conservation processes must be run as a response to these changes and the disappearance of the cultural heritage. The traditional architecture in Old Mosul City is a unique style that includes various interior design elements, such as ornaments. Mosulian ornaments have an aesthetic and functional role depending on the formation, position, and material type. Moreover, ornaments reflect the value of the heritage building due to the expression and formulation system that express the cultural identity and local character of the city. However, it is linked to environmental, religious, cultural, and symbolic aspects. The process of designing ornaments includes a set of basic design principles, such as symmetry, rhythm, repetition, scale, and balance. The majority of researchers and designers mentioned these principles as generating rules for each style [2, 3]. The interior space of heritage houses, administrative, mosques, churches, and bathroom buildings contained ornaments in various forms, types, and positions carried out with various materials. The

most prominent ornament material is local marble known as 'Mosulian Farish', which gave a special characteristic to the city. Therefore, it is necessary to classify these elements according to types, positions, functions, and materials, which provided a platform to reuse and redesign the Mosulian ornament in the renovation process to reduce the effects of including hybrid ornaments, as a result, will affect the heritage value negatively. The impact of technology developments and materials led to distortion in the generation of Mosulian ornaments by producing misshaped elements that affected the originality and heritage characteristics. Therefore, the research problem is "the unclear classification and documentation of Mosulian ornaments used in the interior and exterior design of the heritage buildings". The need for guidelines and classification of Mosulian ornaments was discerned after the renovation processes of the city after the mass destruction during the war in 2017. Producing new ornament elements using the technology and new materials depended on these few documentation and studies, which affected the quality. Moreover, the changing in principles, relationships, materials, and techniques of producing Mosulian ornaments generate hybrid and imperfect copies.

The main research question is "what are the original types of the Mosulian ornament depending on the formulation, material, and position systems that can be used in the interior space of the Mosulian heritage buildings?". Therefore, the research aims to find a classification guideline of the Mosulian ornaments in terms of basic principles, original materials, and where to use these ornaments in the interior space of the

heritage building to enhance the heritage value of the place". Moreover, the current research identified a data set that can be used to generate new models of architectural ornaments linked to origins. The study applied a qualitative approach using three-step observing and selected case and ornament samples, visual analysis, and observation checklist to validate the data. The current study contributed to the knowledge of ornaments in old Mosul city by classifying and presenting the types of ornament, which non of previous studies in this topic collected and presented any kind of classification of Mosulian ornaments.

2. LITERATURE REVIEW

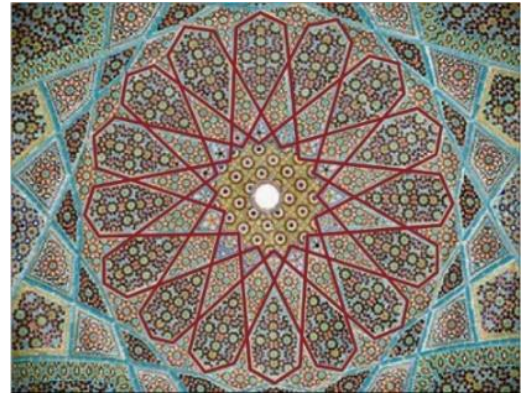
The ornaments are part of the architecture and interior design elements, which reflect the heritage and cultural identity of the place. The literature highlighted the materials of ornaments and the linking with the availability in the region. Varied materials were used to produce the ornaments, such as stone, bricks, wood, marble, and glazed bricks. The techniques and design principles have a role in generating the ornaments following the cultural and architectural style values.

The ornaments in old Mosul city are distinguished by their ancient origins and cultural heritage value. The Mosulian ornaments considered the main interior design element of traditional houses, schools, mosques, markets, Khans, and bathrooms, which decorated the architectural elements, such as Arches, Iwan, 'Mihrab', columns, entrances, windows, and walls. Most of the Mosulian ornaments are floral and geometric types, which have been developed through the ages. It is characterised by the multiplicity of the elements, compositions, materials, and methods of implementation [4]. The Mosulian ornaments were characterized by the rarely use of human and animal shapes. Moreover, epigraphic are applied in the antiques in various fonts, which reflects the aesthetic, meaningful, and functional use. The ornament types in Old Mosul city follow the architectural style, which evolved overtime. In the 'Atabek' and 'Ilkhanid' periods, geometric and abstracted ornaments were adopted, known as Arabesques. The organic and floral ornaments used during the Ottoman era developed new patterns as a mixture of three types [5]. The Mosulian ornaments were affected according to the economic situation of the houses' owners, which Alabaster or Plaster frames, wooden, iron, and stone material were used in the decoration of most interior spaces. It existed in two dimensions form, such as painting and epigraphic, or in three dimensions form, such as carved ornaments on stone, wooden, and metal [6]. However, there are various types of Mosulian ornaments highlighted by the literature, as follows:

2.1 Floral and organic ornaments

Plant, organic, botanic, or floral ornament are terms used to identify the interior design elements that include patterns designed depending on the shapes abstracted from nature, such as leaves, trees, flowers, branches, and fruits. The Umayyad Mosque in Damascus used the shape of palm trees, pears, acanthus, and grape leaves in the ornamentation elements. While, abstracted shapes that applied associated with geometric lines in their composition, which is known as Arabesque [4, 7-9]. The abstraction process of floral ornaments may use geometric shapes to define the space and produce complex designs of ornaments (Figure 1-A) [8]. The floral type is formed by the extension of elementary units by

symmetrical repetition to create harmonious and balanced interior design elements (Figure 1- B) [10]. Floral ornaments are used in furniture, walls, columns, floors, ceilings, arches, cornices, minaret, gates, 'Minbars', 'Mihrabs', and domes. The materials vary according to the place, such as stone, plaster, bricks, or glazed tiles, which applied the technique of mosaic, glazed tiles, and engraving with multi-levels [7].



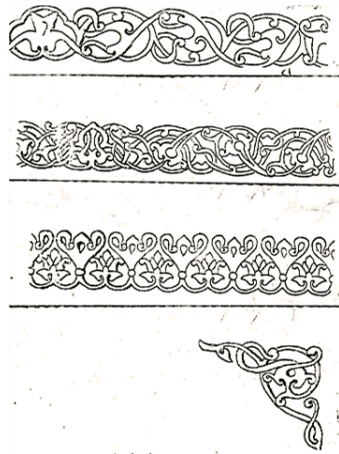
(a) Sample of Islamic patterns using the abstraction of floral and geometric type. adopted by researchers [8]



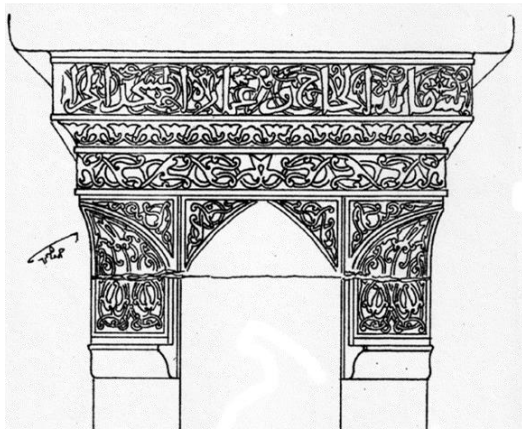
(b) Sample of organic ornaments adopted by researcher from [7, 11]

Figure 1. Samples of traditional ornament in the Islamic world

Floral Mosulian ornaments are rarely used individually, it abounds in ribbons or geometric ornaments. The Chamomile flower shape is one of the most used ornaments, which is used individually or within a group of shapes or fruits. Mosulian ornaments included various types of flowers shape, such as carnations, iris, compound flowers, and thorny leaves. It consists of harmonious ornamental compositions, and inscriptions may overlap with the epigraphic [4, 5, 12]. floral ornament with wavy and spiral branches appeared in one of the arches of the plaster facade above the main 'Mihrab' of the Al-Nuri Mosque [13]. The floral ornaments in Arab art are distinguished by the transformation into abstract shapes, which is known as Arabic securitization 'Arabesque' [4]. The column crown, Shafi'i 'Mihrab', and summer 'Mihrab' in Al-Nuri Mosque are perfect samples of this type (Figure 2 -A, B). This type used as a frame for some Iwans, entrances, windows, domes, inside Domes, outside domes, 'Mihrab', minarets, and marble areas lining the bottom of the walls. Floral ornaments appeared in metal elements, such as handrails, Lamps, Candles, Incense burners, Tableware, 'Tshet', Trays, and Vases [4, 9, 14].



(a) The ornaments of the columns and capitals of the prayer room of the Al-Nuri Mosque [13]



(b) Column's ornaments of the mosque of al-Nuri mosque [4]

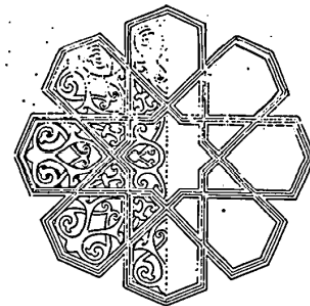
Figure 2. Using ornaments in the decoration of the architectural Elements

2.2 Geometric ornaments

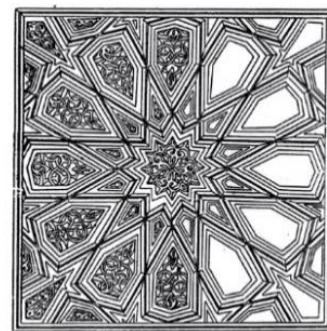
Geometric ornament is formulated by geometric shapes with specified dimensions, sizes, and design principles. The geometric ornaments can be in surface or three dimension form, which usually integrated with floral and epigraphic types [4, 9]. The elementary units of a geometric pattern are squares, polygons, triangles, circles, and lines [10]. The geometric ornaments are placed on walls, doors, floors, walls, ceilings, minarets, domes, Mihrab, Minbar, windows, handrails, and furniture. This type is generated depending on the principles of repetition, symmetry, balance, scale, rhythm, and proportion [8, 10, 15]. The ornaments can be repeated with a specific rhythm in circular forms that are not defined by visible lines to preserve the rhythmic repetition, which represents various formations within a complete image [16, 17]. The repetition principles are used in various ways, such as with transformation in shape, size, and direction [3]. The geometric ornament is mostly made of wood, stone, marble, plaster, clay, and bricks [15].

The Mosulian geometric ornaments include a type of complexity as an effect of multi-culture. it could be in individual form or framing the interior design elements [6]. This type of ornament is found in the summer Mihrab of the Al-Nuri Mosque, and the frames and niches of some Iwans, entrances, windows, domes, Mihrab, minarets, and columns adjacent to the walls, in addition to mural areas as in the halls of the Al-Nouri school. However, the metal interior design

elements included this type of ornaments, such as lamps, candles, incense burners, tableware, 'Tshet', trays, and vases [4, 9, 14, 18]. Moreover, the geometric ornaments are integrated with floral type, which reflects the richness of the Mosulian style [19]. The plaster material used in some ornaments in the Al-Nouri Mosque and the shrine of Imam Yahya Bin Al-Qasim, which designed geometrically as an individual unit with a star shape created by the intersection of geometrical lines (Figure 3- A, B).



(a) The star plate ornament on the western side of the base of the minaret of the Al-Nouri mosque [13]



(b)The star plate in the shrine of Imam Yahya bin Al-Qasim in Mosul [4]

Figure 3. Using star shape as a platform of ornament in religious buildings in the Islamic world

2.3 Figurative ornament

This type includes human and animal shapes to reflect a story or symbols related to the cultural heritage context. Figurative ornament is formed by the personification of living organisms in complete or partial form or in the abstracted form [9]. Figurative ornament type is mostly used in western architecture, while in old Mosul city slightly existed in interior designs of heritage buildings, such as Al-Nouri mosque's 'Mihrab', which integrated with geometric and floral types.

2.4 Calligraphy ornaments

This type is applied by Muslim artists using Arabic fonts, such as Kufi, Naskh, Thuluth, Diwani, Al-Raq'aa and etc., which are characterised by ease of use in ornamental formation as a result of the softness and bending of fonts lines to create a creative, aesthetic, and balanced ornament [10]. Moreover, the calligraphy type can be in form of frame, radial, reticle, annular, iconographic, and positional [20]. Mostly, it represents words from the holy Quran, which are used around entrances, windows, walls, facades, domes, minarets, pulpits, and courtyards [9, 20]. Wood, stone, marble, plaster, bricks, composite bricks, and glazed bricks are the material of this type [20].

Calligraphy ornaments are widely used in old Mosul city [6], created depending on the Holy Quran, poetry, and rulings [4], as in Shafi's Mihrab (Figure 4), and the capitals of the columns in Al-Nouri Mosque used the calligraphy ornament represented by Quranic verses written in the Thuluth script. The Assyrian script used in the Chamoun al-Safa Church, it may be inside specific spaces or in the form of straight bars [4, 13]. However, this type existed in interior and exterior walls, doors, and windows, entrance, courtyard, internal spaces, minaret and 'Minber', which mostly used stone material in framing form [4, 9, 20].



Figure 4. The ornaments of the Shafi'i mihrab in the Al-Nouri Mosque [13]

2.5 Other ornament types

'Muqarnas' are mentioned by previous studies as an ornament element, which is a three-dimensional form used in domes, arches, windows, and almost flat ornamental cornices. The materials of this type can be plaster, wood, stone, or bricks [17]. Mosulian architecture used 'Muqarnas' in domes, for example, the shrine of Imam Yahya Bin Al-Qasim [12] and the shrine of the Prophet (Yunus) [10]. There are other types of ornamental units rarely used in overlap with other types of ornaments, inspired by the elements used in daily life, such as vases, books, Kittel, etc. [6]. There are other ornaments as results of the materials, such as bricks to produce ornamental shapes through a row of bricks in different positions and levels, as is the case in the minaret of the Al-Nuri Mosque, or by engraving on the bricks [4, 12].

2.5.1 Shrufat

These elements existed in Assyrian architecture, such as temples, walls, and gates, and appeared in the interior architecture of mosques as secondary ornaments in the 'Mihrab' and 'Minbar'. Moreover, it is used to decorate the interior space of the houses, such as Iwans, courtyards, and rooms. The geometric shapes of Shrufats are semi-circular and triangular shapes. However, some of these types used plant shapes, such as leaves. The composition depends on symmetry, contrast and variety. This type was found in the mihrabs of the mosques in the Atabeg and Al-Khani era, as in Al-Nouri, Hamshid, Omar Al-Aswad, Al-Aghawat, Khuzam, Al-Nabi Gerges (Figure 5), and it is used in the heritage houses, such as Amin Bek Al-Jalili house [12].

2.5.2 Interlocking cymbals

These are ornamental elements used in the upper area of the

entrance and window, which have a structural function to increase the bonding of the cymbals to each other and increase durability [12].

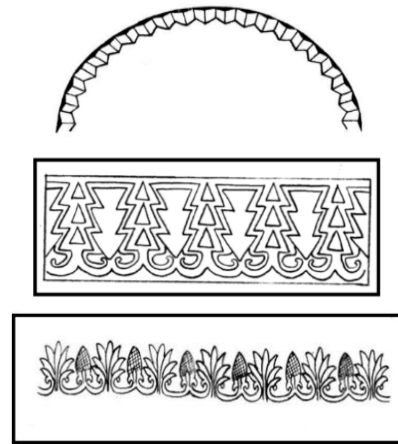


Figure 5. Various samples of Shrufat elements created by various ornament units [12]

2.5.3 Mural

The mural type mentioned in previous studies as part of the interior or exterior elements under ornament position type, which is composed of blue marble engraved with geometric, calligraphy, and floral ornaments that envelop the bottom of the internal walls as at one of the Al-Nouri School halls (Figure 6). Moreover, the mural is one of the rarest marble elements that used the method of grafting in its ornaments, this method reached the peak of its development in Mosul city [4].

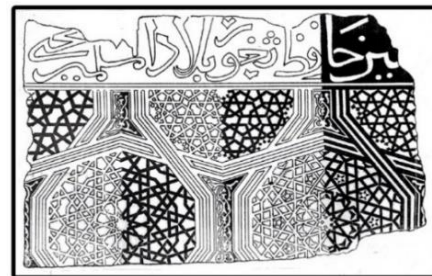


Figure 6. The ornaments of the mural areas in the Al-Nouri school [4]

2.5.4 Metal ornaments

Metalworks have appeared in Mosul city since earlier periods by the Mosulian artist who excelled in producing this type associated with gold and silver. An example of these metal antiques is a copper jug made by a Mosul engraver in Damascus, and a copper vessel covered with silver inscriptions on it images of human beings, animals, and plants [14]. Metal ornaments are used in windows, doors, handrails, and furniture in various shapes (Figure 7), including curve shapes, S-shapes, and heart shapes. These ornaments are based on the principle of repetition associated with other design principles such as hierarchy, symmetry, rhythm, reflection, and scale [3].

2.6 Types of ornament in terms of material

Various materials are applied in the construction of the ornaments. Each type of ornament has usually a specific material, such as glazed ceramic used in the production of geometric and floral ornaments [10, 13]. Moreover, carving on

stone and Mosulian marble or wood [1], which is mostly used for prominently carving to produce geometric, floral, epigraphic, 'Shrufats', and 'Muqarnas' [4, 6, 12, 13]. Carving on prominent plaster are used with painting, such as grey, red-brown, and green-yellow colour to produce geometric, floral, calligraphy, and 'Shrufats' ornaments [4, 6, 13]. Metal materials used in making handrails, windows, doors and furniture (iron, gold, silver) [3, 6, 14]. While, wooden ornaments are used in furniture, columns, ceilings, and doors to produce all kinds of ornaments. Few buildings in old Mosul city used glass as a material to create unique ornaments, such as in Al-Qamariyat [6].



Figure 7. Metal ornaments in the houses of the city of Mosul [3]

2.7 Implementation method

The method of engraving on plaster or marble is known as the 'Mosulian Farish ornaments', either in a prominent or cavernous form, which gives it a 3d shape [4, 6, 13]. Painting used as a material for colouring the ornament, especially over plaster, metal, and glass ornaments [6]. The bricks are used in various positions and in the geometrical arrangement to produce ornamental shapes, as in the minaret of the Al-Nuri Mosque. The style of standing, inclined, and horizontal paving appeared, with the difference in paving levels that may be superficial, deep or deeper, achieving shadows that form various ornaments [4]. In the ornament of serrated Shrufats with sharp angles, two methods were used, namely (bevelled slant drilling and bevelled cavernous) which made it repeated in a prominent and moderate form once, and bevelled and inverted again [12].

3. SUMMARY OF PREVIOUS STUDIES

The city of Mosul has been distinguished by its ornaments, which developed through times. Previous studies presented the types of ornaments, which included geometric, calligraphy and floral ornaments. The Chamomile flower is one of the most used shapes. The animal shapes ornaments, rarely appeared, in addition to the presence of other ornament elements such as Muqarnas, Shrufat, interlaced cymbals, mural areas, metal ornaments, and others. These ornaments varied in terms of materials and places of use. The ornament types are mostly floral and geometric ornaments. The ornaments have a role in functional and aesthetic purposes. The classification of Mosulian ornaments in terms of shape, type, shape source, materials, and place of use in the traditional buildings in old Mosul city is the results of analysis of previous studies, which will be presented associated with visual analysis and observation of case study and ornament samples (Table 5).

4. METHODOLOGY

The research adopted a special methodology to reach the objectives of the research, which is characterised by the

diversity of information sources. Therefore, the design of the research depended on the qualitative methodology. It consists of three parts to explain how to design measurement tools, collect, and analyse data. The wide lens observation technique applied to collect data by reviewing the literature related to ornaments in general and Mosulian ornaments in particular, documentation, site visits and extensive observation of the information available in the media. However, the observation sheet was designed depending on variables highlighted from previous studies. Samples of Mosulian ornaments for heritage houses that selected according to criteria of heritage value, originality, availability of documentation, and construction status. Therefore, Zyada House was selected, based on the availability of several types of ornaments extracted in the conclusion table from previous studies and provide information and data about the sample while ensuring the authenticity of the ornament. Then, the data was analysed and deconstructed to find the ornament's basic elements using AutoCAD following the steps:

First: A general analysis of the ornaments used in the house.

Second: Analyse the structure of the shape.

Third: A visual analysis of the shape.

From the previous study and the visual analysis, the important types of ornaments can enhance the heritage value of the city. The floral and geometrical types are the significant types as the previous study mentioned. Moreover, the researchers observed during the site visit that most of the ornaments that covered the important architectural elements are made from Mosulian marble using floral, geometric, and a mixture of both, which obviously have a role in forming the architectural identity of the city.

5. IMPLEMENTATION AND RESULTS

The practical study included the use of 3 types of analysis after giving the house code (P1) and ornament coded by (Sample. P1-1). The first type represented a general analysis of the ornaments used in the house of Zyada (observation sheet) in terms of type, material, and place of use. The second analysis is the structural analysis of the ornaments. This tool applied to discover the basic elements of the ornament and mechanism of generating shape, style of implementation, and method of formation in addition to the principle used in the formation of the final form of the ornaments.

5.1 Observation

The researchers observed the documentation and the building based on the observation sheet to record the type of ornaments as the first step of the classification process (Table 1). The observation methods used in three steps. The first step is a general observation of the heritage buildings in Old Mosul city in order to highlight the general type and themes of the ornaments and the function of using the ornament in each type of building. The second step is related to the case study selected from the first step, which is Zyada house. The last observation step is visual observation and analysis of the ornament samples that are included in Zyada house. Each step has an observation sheet designed based on the previous studies and site notes during the site visit (Figure 8).

5.2 Ornaments analysis

The number of steps to generate each sample of the

ornaments is different based on the complexity of the overall ornaments. However, three to five steps were included in most of the samples from Zyada house. Figure 9 shows the formal analysis process to reach the step counts in each sample.

Table 1. The observation sheet of Zyadah house including the ornaments samples

Zyada House		
Ornament Type	Geometric ornaments	✓
	Floral ornaments	✓
	Epigraphic ornaments	
	Shrfat	
	Muqarnas	✓
	Interlocking cymbals	
	Mural areas	
	Metal ornaments	✓
	Animal ornaments	
	Other ornaments resulting from the investment of building materials such as bricks	
	Jugs	
	material type	Bricks
Glazed ceramic		
Stone		✓
Marble (Mosulian farish)		✓
Plaster		
Wood		
Iron		✓
Gold		
Silver		
place of use		Column capitals
	Mihrab	
	Frame some awwain	✓
	Entrances	✓
	Windows	✓
	Domes	
	Inside the vaults and domes	
	Minaret	
	Interior walls	✓
	Marble areas in the bottom of the walls	
	In metal elements such as handrails and furniture	✓
	Columns adjacent to the walls	
	Arcade	✓
	Building walls	
	The upper threshold of the entrance and window openings	✓
	Iwan arch framing	
	Minbar	
	Yards	✓
	Closets	✓

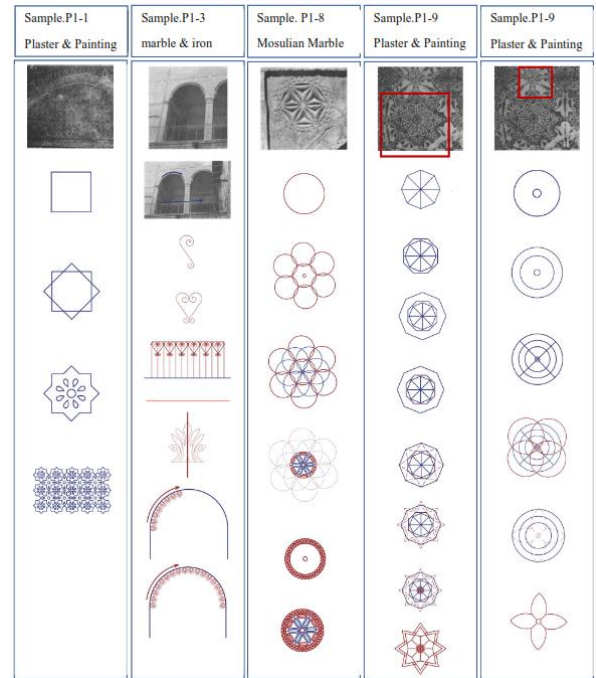


Figure 9. The steps of forming the structure of ornaments in Zyada house

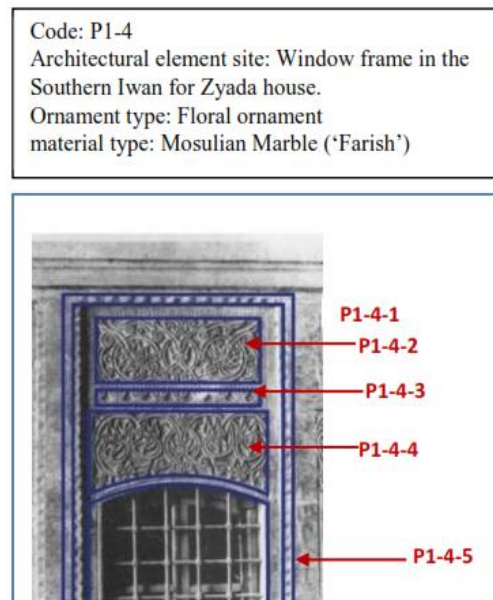


Figure 10. The information sheet of case P1-4 (sample of analysis)



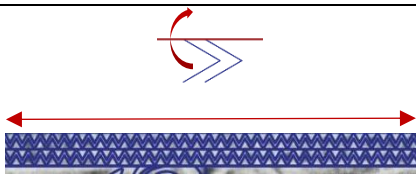
Figure 8. Samples of ornaments from Zyada house [6]

5.3 Visual analysis of the shape

This step is to find out the overall ornament form that can assist the researcher to categories the ornaments within groups. Each sample is coded by a number following the code of the sample. Figure 10 shows the sample code and details, while Tables 2, 3, and 4 show the results of sample P1-4 details of the analysis. The results showed that most of the samples were generated from simple and basic shapes with complex use of transformation process depending on repetition with various types, such as repetition with changing in direction. Moreover, the mechanism of generating Mosulian ornament follows three types. The first type is designed as individual units, which are usually used with plain walls with other types of ornament.

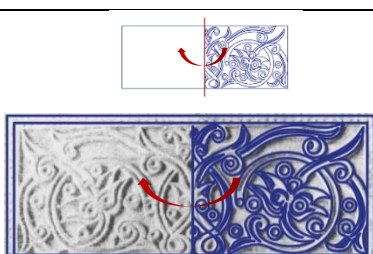
This type is usually used above the Iwan's arch or within the frame of the windows and doors (Figure 10). The second type of ornament form used as a path for framing the architectural elements, which applied the repetition principles following a path line (Table 2).

Table 2. Checklist analysis of sample P1-4-1



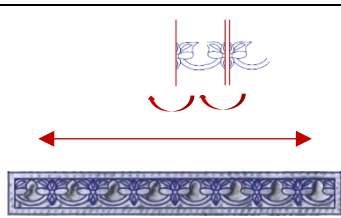
Execution type	Forming method	Principle
solid	Path	Repetition
sunken carving	Frame	Repetition with one-step reflection
prominent carving	central	Repetition with two-step reflection
drawing	Fill areal	Repetition with three-step reflection
perforated		Repetition with reflection about an overlapping axis
		Repetition with reflection about a tangent axis
		Repetition with reflection around a spaced axis
		Repetition with a change in scale
		Repeat around a point
		Repeat with copy

Table 3. Checklist analysis of sample P1-4-2



Execution type	forming method	Principle used
solid	Path	Repetition
sunken carving	Frame	Repetition with one-step reflection
prominent carving	central	Repetition with two-step reflection
drawing	Fill areal	Repetition with three-step reflection
perforated		Repetition with reflection about an overlapping axis
		Repetition with reflection about a tangent axis
		Repetition with reflection around a spaced axis
		Repetition with a change in scale
		Repeat around a point
		repeat with copy

Table 4. Checklist analysis of sample P1-4-3



Execution type	forming method	Principle used
solid	Path	Repetition
sunken carving	Frame	Repetition with one-step reflection
prominent carving	central	Repetition with two-step reflection
drawing	Fill areal	Repetition with three-step reflection
perforated		Repetition with reflection about an overlapping axis
		Repetition with reflection about a tangent axis
		Repetition with reflection around a spaced axis
		Repetition with a change in scale
		Repeat around a point
		repeat with copy

6. DISCUSSION

The results of the ornaments analysis steps, which include (observation sheet, the steps of forming the structure of ornaments, and visual analysis of ornament basic shape), showed that the Mosulian houses are rich in ornaments types, and the majority of these ornaments are floral and geometric. The floral ornaments used in the decoration of the traditional house in old Mosul city are more than geometric types. However, there are a strong integration between the floral and geometric type, which represented the uniqueness of the cultural heritage elements. The mixture of geometric, floral, and calligraphy in addition to the other types applied the principles of Islamic Architecture in terms of Unity and Diversity. The calligraphy ornaments are rarely used in the traditional houses of old Mosul city. However, calligraphy ornaments were used widely in religious buildings. The results from analysis samples showed that the Mosulian ornaments usually consist of more than one part to form an integrated ornamental formation in which several types of ornaments may overlap. Moreover, the Mosulian ornaments contained various methods of formation. Mosulian ornaments existed in the form of frames, paths, or filling of a specific area. Most of these ornaments are based on the principle of repetition, and repetition with a change in scale, rhythm with copies, repetition around a point, linear repetition, repetition with a change in direction, and these types of repetition are created based in one, two, or three stages. Most of the Mosulian ornaments are marble 'Farish', which distinguished the ornaments of Mosul from others. Moreover, wood, plaster, bricks, clay, colours, and metallic materials have been used in the production of Mosulian ornaments. The place of using

these ornaments are varied, such as frames for windows, entrances, Iwan, the capitals of columns, internal walls, and

balustrades. Additionally, in religious buildings, they are applied in Mihrab, Minbar, domes, minarets, and furniture.

Table 5. The result of the classification of Mosulian ornament

Type	Source of shape	Material	Place of use
Floral Ornaments	Chamomile flower Carnation Iris flower Compound flower The spiny leaf Rosettes and palm leaves Calyx and dagger leaves Wavy and spiral branches	Bricks Ceramic glazed Stone Mosulian marble Plaster Wood	Column capitals Mihrab Frame of Iwan Entrances windows Domes Inside vaults & domes Minaret Marble areas lining the bottom of the walls Handrails & furniture
Geometric Ornaments	Polygons stars Rectangles Lozenges Arabesque ornaments Star dish multiple vertices stars and triangles Mat ornaments Circular ornaments Quadruple stars with spherical centres & square ornaments Twisted shapes in the form of sticks with circular heads and spherical protrusions are centred	Bricks Glazed ceramic Stone Mosulian marble Plaster Wood	Mihrab Frame of Iwan Entrances Windows Domes Inside vaults and domes Minaret Columns adjacent to walls Arcade Mural areas Metallic elements
Epigraphic Ornaments	Kufic script Thuluth line Syriac script	Bricks Stone Mosulian marble Plaster Wood	Mihrab Column capitals Walls Doors and windows Yards Minaret and minbar
Shrufat	Moderate and overturned serrated Shrufats Serrated Shrufats with sharp corners Pyramidal Shrufats at Right Angles Pyramidal Shrufats with sharp angles Palm leaf Shrufats	Stone Mosulian marble Plaster Wood	Mihrab Minbar Iwan Yards Closets
Muqarnas		Stone Mosulian marble	Domes
interlocking cymbals			The upper threshold of the entrance and window openings
mural areas	Geometric ornaments Leaf ornaments Calligraphy decorations	Marble	Below the interior walls
metal	Curved ornaments Shaped ornaments heart Shaped decorations	Iron Gold Silver	Windows & doors Handrail Furniture
Animal Ornaments			
Other Ornaments result from the investment of building materials such as bricks			
Jugs			

The classification of ornament provided a significant platform for the designers and developers. The classification of ornaments can assist the designers by selecting the right elementary elements of the ornament and the mechanism of generating it to be used with the right architecture elements. However, the materials have a role in the classification process, which each type of ornaments created by specific material. The changing in material, types, and place of use could be led to generate a hybrid ornaments, which can affect the heritage value. The floral and geometrical type are the significant types as the results showed. Moreover, the researchers observed during the site visit that most of the ornaments covered the important architectural elements are made from Mosulian marble using floral, geometric, and mixture of both, which obviously have a role in forming the architectural identity of the city. Moreover, the designer and developer can rely on the

classification of Mosulian ornament to use the exiting ornament or generate new models which should matched with the classification in Table 5. The ornaments in old Mosul city used widely in the interior space more than exterior facades, which is related to the purposes of creating richness and aesthetical interior space. However, there are specific ornament types, such as calligraphy can be used in religious and public buildings more than residential buildings, which designers and developers can consider in the generating of ornaments associated with classification guidelines.

7. CONCLUSION

The study examined the Mosulian ornaments in the heritage buildings to determine the characteristics in terms of types, materials, place of use, and architectural elements to preserve

and reuse these ornaments in future work to enhance the heritage value. The study concluded by reviewing previous studies and verifying the validity of the results by conducting a practical study in which the sample was selected based on the criterion of originality and availability of ornaments. The study concluded the existence of various types of Mosulian ornaments, which are floral, geometric, calligraphy, mural, Muqarnas, Shrufat, and interlaced cymbals. However, some types appeared as a result of investing in building materials, such as bricks and other ornaments associated with daily use. Moreover, animal ornaments are rarely used in the decoration of heritage buildings. The location of ornaments followed the functional requirements and the aesthetic value, such as walls, entrance, windows, Iwan, column capitals, Mihrabs, Minaret, domes and balustrade. The types of Mosulian ornaments depend on the material, such as curved and S-shaped and spiral ornaments based on metal materials, while mural types are produced by marble material. The other ornaments used marble, stone, brick, wood, and plaster. The plant or floral ornaments are mostly used in the Mosul heritage building, the second type is geometric, and the calligraphy type follows in third place. The majority of ornaments are designed based on the principle of repetition and symmetry. Moreover, the repetition types are linear, central, and exist with changes in scale and direction. The Mosulian style is rich in ornamental elements, which vary in intensity, types, materials, position, and source. The study recommended using the classification guideline in the renovation process in old Mosul city to produce ornaments and interior design elements connected with the original style to enhance the heritage value of the renovated building and reduce the impacts of hybrid ornaments that affect the heritage quality of the interior space and the city in general. Therefore, it is a process of conserving and preserving the rest of the available ornaments in the city.

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