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## THE ORDER OF REPETITION PROCESS IN ISLAMIC ARCHITECTURE ORNAMENTS: THE CASE OF MOSULIAN TRADITIONAL HOUSES

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### ABSTRACT

The Mosulian Traditional Houses have unique characteristics, which part of Islamic Architecture. The cultural effects are represented in the patterns, materials, layouts, and order of ornaments. Furthermore, decorative ornaments, especially metal ornaments, are a significant element in the components of the houses. Metal ornaments characterised with repetition principles which affected by the technology era. The levels of repetition should be identified according to the sequence and rule to conserve the original type, which is the objective of the study. A case study is the metal ornaments in interior and exterior space in Old Mosul City, which can produce new models with common architectural characteristics. Selecting a case study depending on the value of originality. Thus, original samples were selected. The visual analysis used to identify the order of repetition to draw out the guideline of producing metal ornaments with traditional values. Visual observation of the cases and documented materials were carried out to identify this process. The result shows that the process included two levels, each level has three stages, including type, frequency, direction, path, and scale of the repetition. The shifting of the original characteristics will lead to losing the identity of the place if the new model is uncontrolled and disoriented.

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## 1. INTRODUCTION

The Mosulian Traditional Houses consists of unique heritage interior elements, especially metal Ornaments. These ornaments characterised with the repetition principle, which affected by the technology era in terms of quality and originality. These traditional houses are well-known by the unique characteristics, which represent a worthy Islamic Architecture sample, which is influenced by the Islamic principles of living and adaptation (Al-Qemaqchi & Hafsa, 2013). The architecture and interior design of the traditional houses in Old Mosul City rich in marble, wooden, and iron details (Mustafa et al., 2010). The rehabilitation and restoration processes of the traditional houses in old

Mosul city, especially after the year 2017, affects the image of the traditional identity of the interior and architectural design. The originality of the formulation process depends on the experience of the craftsman, who has the authority to formulate them. On the other hand, the designer has an impact role on conserving and sustaining these elements.

The main research question is how to conserve these metal ornaments in the traditional house in Old Mosul city. Therefore, the research questions are; "How can producing traditional metal ornament connected to the heritage identity?" and "What are the characteristics of repetition for the metal ornaments in the Traditional house in Old Mosul city?" To answer the research questions, research objectives were highlighted accordingly. The main aim is "To enhance the value of the original style of the metal ornaments in the traditional house in Old Mosul city". To achieve the main objective, sub-objectives should be reached which are; "To identify the process of creating or design new ornaments with heritage values" and "To draw out the guidelines of using the repetition in the process of producing the metal ornaments in the Traditional house in Old Mosul city". To reach the aims of the current researched, backgrounds about the case study, metal ornament, and the process of creating will be reviewed forward. The literature will be in those three main themes.

## 2. BACKGROUND OF STUDY

The Background of the current study discussed the main three Themes that related to the objects of the study. However, the first theme will be connected with the case study, which is the metal ornament in old Mosul. While the second theme focuses the metal ornament in general which can use in various functions and types. The last theme deal with the processes of creating ornaments with the formulation system.

### 2.1 OLD MOSUL CITY

Old Mosul city is one of the Islamic cities, which has a popular architectural style and rich heritage architecture, technique, and interior design (Thanoon, 2007; Mustafa et al., 2010). The research focus on the interior architecture of Mosulian Traditional Houses, and the richness of aesthetic components, which metal-work part of the interior space. After the war in 2017, many of the traditional houses in old Mosul city lost. Moreover, the remaining traditional houses, which destroyed partially or totally, the owners of these houses start to renovate and restored it as UNESCO and UNDP mentioned the official report after the liberation of Mosul (UNESCO, 2018). The renovating and restoration processes are randomly and without consultation from the local authorities. Therefore, the heritage identity of these traditional houses will be extinct and shifted. Metalwork is one of the heritage elements affected by the current situation of the old Mosul city.

### 2.2 METAL ORNAMENTS

Metal ornament is one of the many ornaments used in the Mosulian Traditional Houses that can be seen in windows, doors, handrails, façade, and furniture. The metalwork in the traditional house has a role in the functional and aesthetic side of the architectural and interior design identity. The ornaments' shapes and elements are responding to the cultural and users' needs. Various types of ornaments shape, location, and purposes of use can be included in one traditional house, which depends on the social and area of house factors (Figure 1). Metalwork in each architecture style follows the needs of function, environment, and culture of that place. The shape of ornament could be

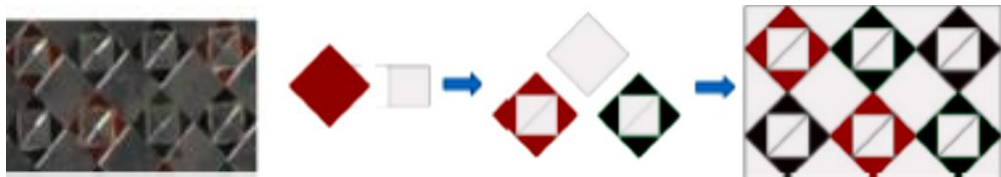
symbols or derived from symbols, which is a type of influence of the heritage culture.



**Figure 1:** Many places for metal ornament in Mosulian Traditional Houses (Adapted by Researcher)

### 2.3 FORMATIVE SYSTEM

The architectural buildings, details, and elements have a type of creating a system that used to formulate the shape. Ahmad et al. (2018) highlighted the process of design elements by using simple elements and techniques to create a geometric pattern in Islamic architecture. The architectural and decorative elements in the interior space included two levels of formulating system. The first level is the creating of the main unit, which the second level is creating by this unit by using 1 to 6 stages of generating (Ahmad et al., 2018). However, the visual analysis of the element follows the same system (Figure 2)



**Figure 2:** The levels of creating a geometric pattern using a simple unit.

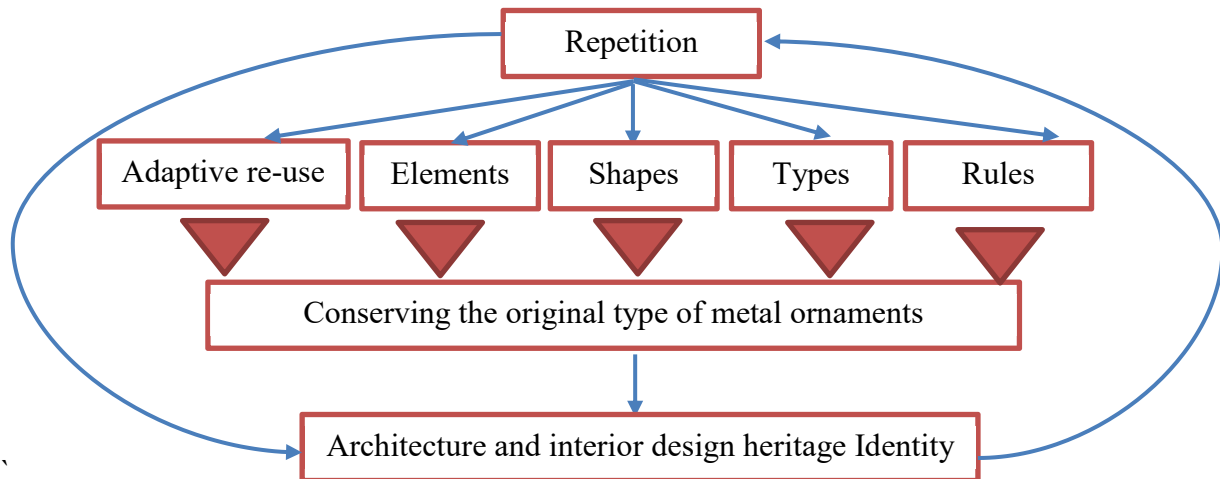
Source: (Ahmad et al., 2018, p. 129)

Ahmad et al. (2015) concluded that designing ornaments including three algorithmic stages. Each stage has a role in the design of the overall level. The researchers mentioned that the essential shape used in the first stage would be continuously appearing in the next design stage. The clearance of essential shape fades (Ahmad et al., 2015).

The design process of any form included principles of design, which played a role in creating the visual form. There are many interacted and integrated of the design principle that can use in the design process, such as, symmetry, rhythm, repetition, scale, balance, etc. The majority of researchers and designers mentioned these principles (Lidwell et al., 2003).

Repetition is an essential design principle linked to various design principles. Repetition can be used with rhythm, hierarchy, balance, reflection, symmetry, and other principles. However, repetition can be used with various types in one design according to the needs of designers and design. Scholars identified the main two types of repetition depending on the completeness of the repetition process and results. Chan (2012) identified the regular and irregular type of repetition associated with rhythm principle, which can include in the form and structure. However, Frederick (2010) mentioned that repetition can include perfect and imperfect types. The rules of repetition are one of the important aesthetic principles in the Islamic architecture, which is applied in the façade and interior elements as a frequency of one shape more than twice in the space frame (Foroozani, 1991).

In summary, the previous studies mentioned various variables of repetition, which are repetition types, location, and rules. Moreover, the importance of the elements and primary shape also mentioned, which influences culture can be highlighted. The principle of repetition will be applied in the analysis of the metal ornaments of traditional houses in old Mosul city to identify and determine the existing rules of repetition in the selected samples. Therefore, the conceptual framework of the current study reflects the ideas of previous studies in one frame as shown in Figure 3.



**Figure 3:** The framework of this study, (adapted from Ahmad et al., 2018; Chan, 2012; Lidwell et al., 2003)

### 3. RESEARCH DESIGN

The current study is a qualitative study, which deals with the quality of the original metal ornaments. The research design of the study applied the qualitative instruments in the collecting of the data. Moreover, the research included a subjective view; therefore, the data will be validated by a semi-structured interview with experts. Selecting a case study following a criterion of heritage value and completeness. The metal ornaments in the traditional houses in old Mosul city are the first stage of visual observation. The second stage is to narrow down to samples of metal ornaments in the traditional houses that included the most original and completeness. The last stage of visual observation will follow the objects in a team of stage of creating, rules, and principles. The analysis of the data in the current study consists of two techniques; the first one is visual with formal analysis. The second technique is a content analysis of the experts' interviews.

#### 3.1 METHODOLOGY STRATEGY

Two main strategies were used to collect the data in the current paper, in order to validate the data. The two methods are:

##### 3.1.1 VISUAL OBSERVATION

Visual observation is a technique in the qualitative study that included images, graphics, or drawing (Tucker et al., 2005). The type of data in the current study are images and drawing(visual), which collected from the site and documentation of traditional houses in old Mosul city. The study included two types of observation, the first type used for the sampling process, which samples of metal ornament are the target. This stage started from the large size of data by selecting traditional houses that reached the criteria of selection (heritage value and existing in the heritage zone). The next step is selecting specific houses in old Mosul city after three site visits with compering with the available documentation. The results of the observation show that (10) houses reach the criteria,



which included a metal ornament with complete details as shown in table no.5 in the practical part of the study. The second type of visual observation is used to collect data from the metal ornaments images to discover the types of repetition and formulating system. The checklist used to record the data after graphical work done for the metal ornaments. Appendix (E) shows the checklist collecting data from the graphics of the metal ornaments. The checklist included four variables of repetition (type, location, direction, variation). The checklist designed for each sample including elements and units.

### 3.1.2 INTERVIEW

The interview techniques used to collect in-depth data from experts. Four experts selected for interviews by purposeful sampling. The experts are selected from the Architectural Engineering Department at the University of Mosul, who have experiences in heritage and traditional houses in old Mosul city (Table 1).

**Table 1:** Experts information (Source: The researchers).

No.	Expert name	Experts information	Code
1	Ashraf Ibrahim Al-Hathodi	Lecture, architect, and constructor, A specialist in heritage and history of architecture in ancient Iraqi architecture.	EXAR01
2	Hassan Mahmood Al-Haj Qasim	Doctorate in history of ancient architecture	EXAR02
3	Hasan Abdulrazaq Al-Sanjari	Doctorate, assistant professor, and architect A specialist in housing and traditional houses in Mosul	EXAR03
4	Ahmad Abdulwahab Alfakhri	Master in building services, Lecture, and interest in Mosulian architecture and culture.	EXAR04

Semi-structured interviews with in-depth questions designed depending on the objectives of the study. The interview sheet included six sessions with three questions. The interview questions include the techniques of design and formulate the metal elements in the traditional houses in old Mosul City. The first theme of questions related to the importance of heritage elements in the value of heritage, which metalwork is one of these elements. The second theme of questions linked the principles of Mosulian style with principles of repetition in metal ornaments, which is the core of the formulating system of the ornaments. While the last theme related to the methods of using the metal ornaments in contemporary architecture and interior design with conserving the image originality.

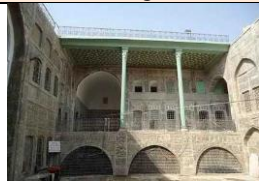









### 3.2 DATA ANALYSIS

The research applied two types of analysis techniques according to data types. The formal analysis used to analyse the visual data observed from the visiting of site and documentation resources about the metal ornaments in Old Mosul city. A qualitative study used formal analysis to withdraw the findings from the visual data (Srivastava & Thomson, 2009). Graphical instruments used for formal analysis to find out the rules, types, and relationships of the repetition that generated the metal ornaments in Old Mosul City. Photogrammetry and CAD software used in the segmentation of the metal ornament in a graphical way.

The data from interviews analysed by the content analysis techniques, which is a qualitative research technique used to summarise useful information for textual data (Bengtsson, 2016). The themes of content analysis follow the objectives of the study. However, sub-themes conducted to reach the depth information from the textual data. word-cloud and text-tree used to present the data and findings.

**Table 2:** Observation checklist of cases

(Source: The researchers, Image sources (Mahmood, 2015; Sabri, 2013; Dhannoon, 2002))

Case#	Name	Completeness	Metal ornament	Image
H1	Altaatnge		•	
H2	Hamo Al Kado	•	•	
H3	Ziadah		•	
H4	Da'ud Ishaq	•	•	
H5	Kamal Sulaiman	•	•	
H6	House 105/39		•	
H7	Noman Al-Dabbagh		•	
H8	Mustafa Hujazi	•	•	
H9	Ilya Jumaah	•	•	
H10	House 39/86	•	•	

#### 4. PRACTICAL STUDY

The first step of the practical study is to justify the valued samples in the traditional houses in old Mosul city. This step included two visual observation stages, the first one to justify the houses that included heritage value. While the second step is to justify the metalwork in these heritage houses. Table 2 highlighted the selected heritage houses that included metalwork and achieved the criterion of the study.

Various types of metal ornaments have existed in the heritage houses, where analyses graphically to find out the type of repetition. Figure no. 4 presents the sample of metal ornaments that included repetition principle. The majority of the samples are original, but few remained after the 2017 war. Therefore, some samples used from the previous documentation, literature, researches, and reports, such as (Dhannoon, 2002; Sabri, 2013; Mahmood, 2015).



**Figure 4:** some samples of metalwork in traditional houses in old Mosul city

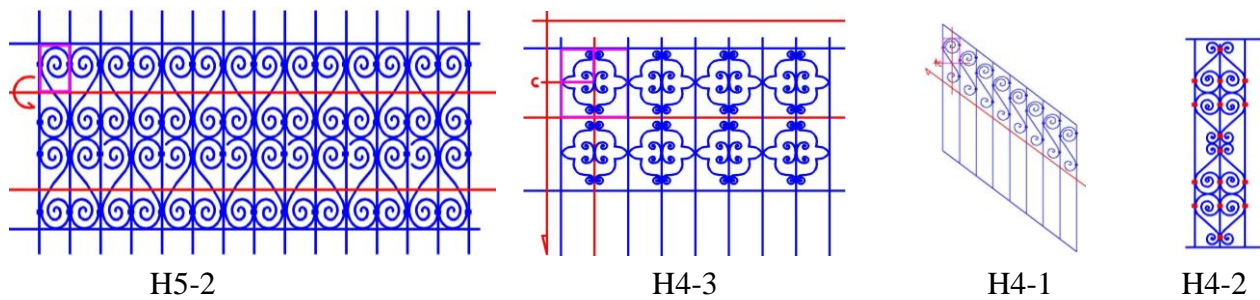
Each sample observed after formal analysis following the visual observation sheet that designed depending on the variables abstracted from previous studies. Table 3 shows the sample observation sheet used to collect data from the visual observation of the graphical analysis.

**Table 3:** Observation sheet of the sample (H4-2) for Case#H4.

Sample No.	H4-2	Images					
							Themes
			1		1		
Repetition Setting	Steps of repetition				4		
	Type	Perfect					
		Imperfect					
	Direction	Linear					
		Central					
		Matrix					
		Radiation					
	Variation	Size					
		Shape					
		Direction					
Rhythm							

The graphic analysis of the samples included analysis for the essential units and elements in the

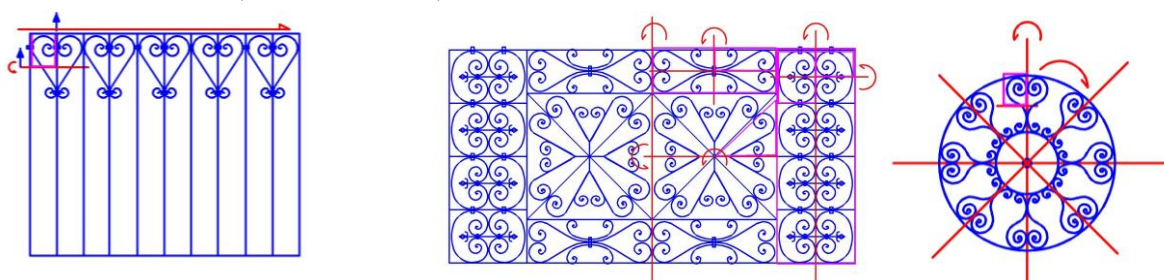
overall frame. Therefore, each case has one to three units and elements of metal ornaments that included repetition principles. The coding of the traditional houses, metalwork, units, and elements follow the case number. The traditional houses coded from (H1 to H10). The metalwork coded by numbers attached to the case number, such as, H4-1 which presents the first sample of metal ornament in the traditional house number H4. Figure no. 5 shows samples of formal visual analysis by graphical method. The figures produced using AutoCAD software, which gave accurate results of drawings.



**Figure 5:** Sample of visual analysis that used to collect data form visual sources.  
(Source: The researchers)

## 5. RESULT AND DISCUSSION

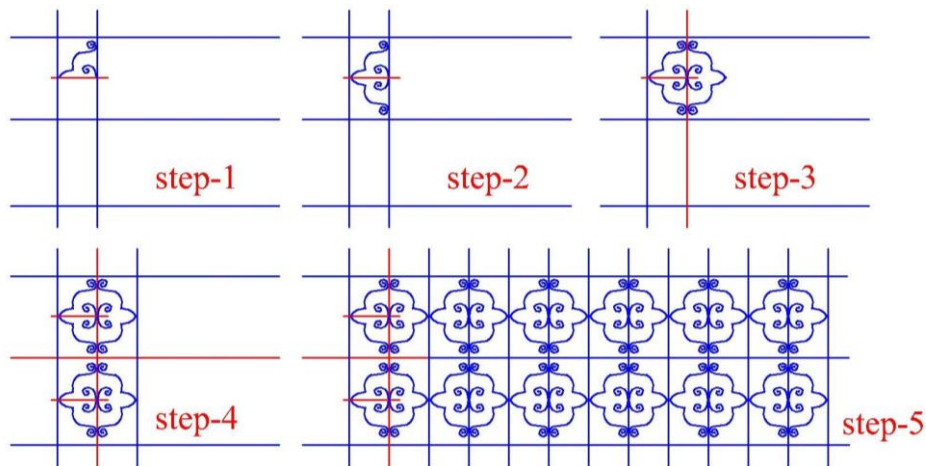
The results of the visual analysis show that metal ornaments included the repetition principle associated with hierarchy, symmetry, reflection, rhythm, and scale. The perfect repetition type included in 27% of samples from the traditional houses in old Mosul city, while the imperfect repetition included in the majority of the samples. These results show the relations of repetition principles with the Islamic architectural style, which principles reflect the variety and unity of the style (Al-Qemaqchi & Hafsa, 2013; Foroozani, 1991). The samples included more than one essential shape, unit, and element, which presented in the curve-shape, S-shape, Heart-shape, and leaner elements. The overall frame of the repetition is basic shape, such as rectangular (61%), Parallelogram (12%), circle (9%), and arc (18%). Figure 6 shows a variety of repetition and shape in the Mosulian traditional houses (Thanoon, 2007).



**Figure 6:** the variety in using repetition principles in the metal ornament of Mosulian traditional houses. (Source: the researchers)

The results highlighted the direction of repetition, in which the majority is leaner and matrix direction. Most of the samples include more than two steps in the process of generating metal ornaments. The steps of generating depending on the repetition principle also. Figure no. 7 shows a sample of these steps and how it works.





**Figure 7:** The steps of generating metal ornament in sample H4-3.(Source: The researchers)

On the other hand, the interview data showed 15 sub-theme linked to the main three groups of questions. Some of the sub-themes can be linked under one category. The variety of sub-themes and category showed the importance of heritage elements and repetition principle as one of the essential principles in the Islamic architecture, which traditional houses in Old Mosul city rich samples in Islamic architecture.

The majority of experts mention the metalwork as an important element in reflecting the identity of the place, especially in the traditional houses in old Mosul. Architect Ashraf Ibrahim mentioned that in his words

*“Windows and doors opening this is number one, secondly Metalwork which was special, and lastly columns” (Interview no. EXAR01)*

Also, Dr. Hassan Haj Qasim highlighted:

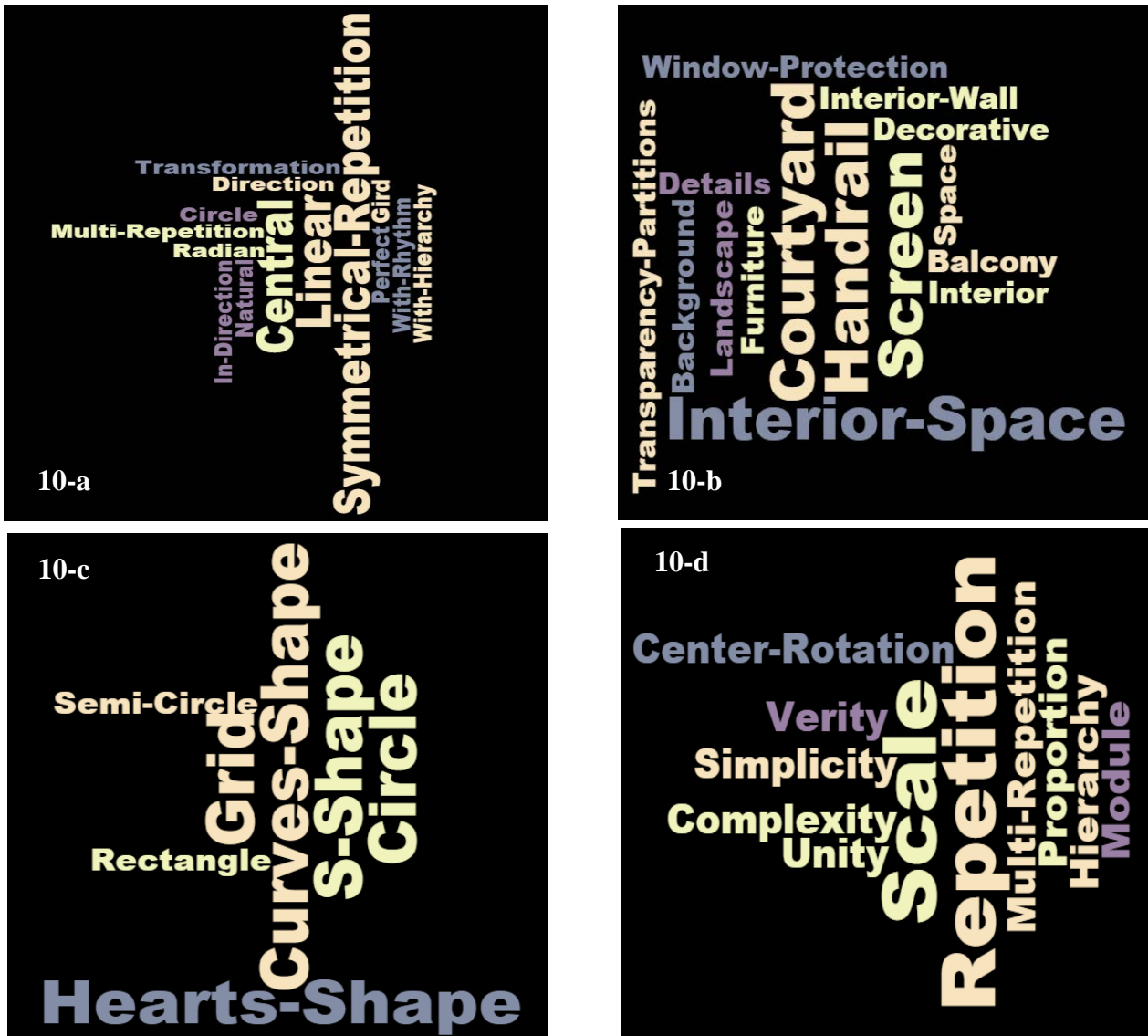
*“Each element has a role in the reflecting the heritage identity, which the plan, court shape, Ewan, and windows with the metal ornaments, which also reflect the functional and aesthetic side” (Interview no. EXAR02)*

The experts agreed that the metal ornaments in the traditional houses in old Mosul city have a role in enhancing the heritage identity, which ornaments work as function, environment, aesthetic, decorative and safety elements. Expert no. EXAR04 mentioned:

*“ The Mosulian people spent most of the time inside the house, therefore, the metal ornament is functional and decorative elements in the same time ” (Interview No. EXAR04)*

The visual observation and interview data concluded the types of metalwork in the Mosulian traditional house used in the windows, handrails of roofs, Ewan, and staircase. Moreover, it used in the furniture, between volts and arcs. The design principles in the metal ornament identified in various types, such as repetition, proportion, simplicity, scale, rhythm, hierarchy, unity and modular. The Islamic architecture used a variety of principles, but at the same time reflect unity in the overall (Thanoon, 2007; Foroozani, 1991). Dr. Hassan mentioned:





**Figure 10:** The word cloud of repetition type, location of use, type of metal ornaments, and principles associated with repetition. (Source: the researchers)

## 6. CONCLUSION

The current study conducted to determine a guideline to use the metal ornaments that reflect original identity in the contemporary and reconstruction of Mosulian houses in old Mosul city. The guideline included three main topics, the first topic is related to the element type, which screen, windows protection, handrail, and decorative elements are the main elements that can include metal ornaments and reflect the influence of the Mosulian style. The second topic is the repetition type, which imperfect repetition associated with hierarchy, rhythm, and symmetry is the main repetition type. Moreover, the repetition direction can be used in three types, linear, matrix, and central. The last topic is related to the essential shape of the metal ornaments and the steps of generating the overall frame. The essential shapes are S-shape, grid, and semi-circle, which are the minimum shapes that can reflect the originality and identity of Mosulian style as part of Islamic Architecture. Moreover, a minimum of two steps of repetition can be used to produce metal ornaments with traditional identity.

The metal ornament as interior and exterior elements have a role in conserving the architectural

identity of the traditional houses in Mosul. The research identified the type of use in the interior space, which Mosulian people usually stay inside the houses as an influence of Islamic culture. Repetition is one of the important Islamic style principles, which provide a variety and unity in the architecture and interior design. The function of the metal ornaments in the contemporary used can be in decorative, safety, and environmental function. The aesthetic of metalwork follows the including of the original rules and types of repetition principle.

## 7. AVAILABILITY OF DATA AND MATERIAL

All the used and generated data in this study are already presented in this article.

## 8. REFERENCES

- Ahmad, M., Rashid, K., & Naz, N. (2018, June). Study of the ornamentation of Bhong Mosque for the survival of decorative patterns in Islamic architecture. *Frontiers of Architectural Research*, 7(2), pp. 122-134.
- Ahmad, S., Abbas, M. Y., Mohd. Taib, M., & Masri, M. (2015). Wall Carving Decoration and Motifs Influences Spatial Social Interaction: Is it Intentional or Accidental? *Social and Behavioral Sciences*, 202, pp. 311-321.
- Al-Qemaqchi, N. T., & Hafsa, A.-O. (2013). Sustainable architecture through Islamic perspective. *International and Middle East Conference on Sustainability and Human Development* (pp. 1-8). Abu Dhabi: iMESH.
- Bengtsson, M. (2016). How to plan and perform a qualitative study using content analysis. *ELSEVIER*, 8-14.
- Chan, C.-S. (2012, June). Phenomenology of rhythm in design. *Frontiers of Architectural Research*(1), pp. 253–258.
- Dhannoon, A. A. (2002, September ). Using of Marbel in traditional house. *Turath, cultural multidisciplinary monthly journal*, 4(46), 50-52.
- Foroozani, M. (1991). Principles of aesthetics in Islamic architecture. *Periodica Polytechnica SER. ARCH.*, 35(3-4), 189-200.
- Frederick, M. (2010). *101 Things I Learned in Architecture School*. Boston: MIT Press.
- Lidwell, W., Holden, K., & Butler, J. (2003). *Universal Principles of Design*. London: Rockport Publishers.
- Mahmood, M. K. (2015). *Housing Architecture in Mosul during ottman period in 18th and 19th centuries, PhD thesis*. Mosul: University of Mosul, College of Archeology.
- Mustafa, M. M., Daizhizhong, & Hong, Y. (2010). The Characteristics of Architecture Style of the Traditional Houses in the Mosul City-Analytical Study. *American Journal of Engineering and Applied Sciences*, 3(2), 380-389.
- Sabri, S. (2013, July 28). *Highlight on the heritage house in Mosul*. Retrieved Jan 14, 2019, from Bayt Al Mosul: <http://www.baytalmosul.com/15751604157315931604157516051610-157516041601160615751606-1589157615811610-1589157615851610--1/category/939cafd913>
- Srivastava, A., & Thomson, S. B. (2009). Formal analysis A qualitative methodology for applied policy research. *JOAAG*, 4(2).



- Thanoon, A. A. (2007). Popular architecture of old city of Mosul the architecture of the traditional house. *International conference for Asian and north African studies(ICANS 38)* (pp. 1341-1356). Ankara: Middle East Technical University.
- Tucker, C., Ostwald, M. J., Chalup, S. K., & Marshall, J. (2005). A method for the visual analysis of the streetscape. *Space Syntax 5th International Symposium*, (pp. 519-529). Delft, Netherlands.
- UNESCO. (2018, 8 17). *Tentative lists: Old City of Mosul*. Retrieved from World Heritage Site: UNESCO: <https://whc.unesco.org/en/tentativelists/6355>
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