Journal of Architecture and Planning , Vol. 37 (1) , pp. 79-95, Riyadh (2025/1446H)

doi:10.33948/JAP-KSU-37-1-4

The Role of Flexibility of Technological Selection in the Formal and Symbolic Reproduction of Arches

Riyam Rajab Fenjan [1*] **Armin Sarkis Khosrof** [2]

[1, 2] Architectural Engineering Department, College of Engineering University of Basra, Basra.

riyam.rajab@uobasrah.edu.iq *armen.kosrof@uobasrah.edu.iq*

(Received 18/7/2024; accepted for publication 20/10/2024.)

Abstract: The research focuses on the significance of a technological selection strategy in generating either an updated traditional form or a new contemporary form that reflects the specific characteristics of the present. The research selects the element of the arch and the resulting morphological generations based on the designer's formal intellectual processes and technology, thereby generating diversity rather than formal copying. The research problem identified is the scarcity of studies examining the role of technological selection types in generating multiple modules of the arch element, reflecting its contemporary specificity and supporting its enduring symbolic and formal permanence. "As the research assumes, there is flexibility in structured technological selection to generate elements with symbolic, expressive, and formally defined dimensions. The methodology involved the adoption of facades for 6 diverse buildings in terms of arches and function. A questionnaire and a descriptive formal scale were conducted. The research found that structured technological selection is a balanced strategy that supports the generation of formal variations derived from the origin of the symbolic element more than the free selection that is not based on fixed foundations. The value of the research is evident in the flexibility of the formal options resulting from technology and the designer's creativity in reusing heritage elements in new and updated forms that support their symbolic values.

Keywords: Technological selection, Arches models, Structured selection, Equivalent selection, Free selection, Reproduction.

1. Introduction

The research presents technological selection as a hybrid strategy that combines the idea of a designer and the role of techniques in intellectual reproduction. The designer's choice may be after computer-generated decisions and shapes. (Saleem & Salih, 2019), And it is part of Multi-Attribute Decision Making employed to help decision-makers rate various alternatives and identify the technology with the highest rank from a finite number of alternatives (Hamzeh & Xu, 2019)

Selection is the distinction of a certain part compared to another part and its prominence over the rest of the parts (selection is the combination and distinction for the purpose of activating aspects of creativity and excellence), it thus achieves various morphological mutations, it is also based on borrowing from styles, ideas or theories and combining them with an artistic style that shows the taste and style of the designer (Elshafie & El-Sharkhawy, 2022)

Technological selection is the role of technical in determining and capturing a certain shape, and here technology enters as an influencing factor on the intellectual dimensions of the designer in determining the appropriate arch shape for a particular building, Fig 1 shows the vocabulary adopted in building the theoretical framework around the term technological selection

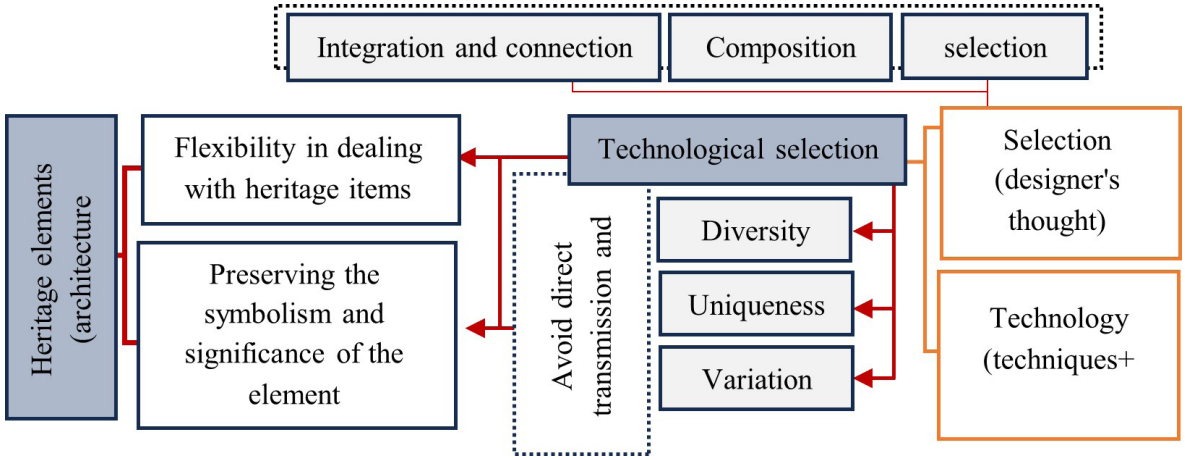


Figure (1). Definition of selection and its relationship with technology, linking it with the idea of research. Source: researchers

2. Literature Review

The selection relies on the metaphor of heritage as a source of form through the technological mechanisms that the designer may add at the design and implementation level as techniques and treatments compatible with contemporary language (Tantawy & Khamis, 2021).Technological selection through hybridization as a mechanism for generating multiple formal options depending on the designer's creativity and technological flexibility, as well as the power of simulation, whether environmental, technological, or biological, not copying, which makes the product highly flexible(Saber, 2022). Technological selection appears in the selection and display of certain formal characteristics, and thus its role in emphasizing either the material, the context, or the design process, where new materials are subjected to a design transformation process with an interactive nature that calls for a re-exploration of architectural expression (Hussein Ra & Al-Muqram, 2017)

Technological selection combines the power of technologies as a process that takes place on the element (such as transformation, fragmentation, and subtraction and in addition to making changes to the formal properties by intermeshing the form with other forms, it continues to transform until relative stability is reached. The technique as a material act to create an interaction between intellectual and formal needs to reflect the designer's intention. (Abdul-Ahadd & Mahdi, 2018). Technological selection is linked to inspiration and the selection of heritage elements and their re-creation in a new formal image that achieves rationality, adaptation, formal integration, and flexibility. Therefore, each shape is a new reading, but with an improved working mechanism compared to the basic shape (new shape + new working mechanism), as in lattices and arches. (Degwey, 2018) Technological selection is achieved through the adoption of fractional repetition as a digital process that supports the generation of multiple and diverse formal patterns according to the designer's creative skills in choosing the element and processing it formally(Aggour, 2019). The role of technology in selecting and preserving heritage elements is evident through digital documentation patterns, which maintainingallows for the possibility of elements of historical value through digital simulation (Abdelmonem, 2017). It is also linked to borrowing an element and formulating it formally by relying on generative rules and computer algorithms, and its formal processing is by repetition through two systems (evolutionary and wave ((AL-Ansari & AL-Moqaram, 2021). The selection reflects the high flexibility of technology in choosing and controlling the form at the level of its formal characteristics and qualities(Salah, 2014). It thus enters into the process of thinking with the designer to provide possible options for the form or through the invocation of Islamic forms with spiritual dimensions and continuity over time. Digital technologies have helped to generate formal possibilities through concepts of self-replication, so they are derivations of the origins of Islamic form (Alrawi, 2014)

Table (1). Points deduced from studies to determine the knowledge gap. Source: researchers

	(Tantawy & Khamis, 2021)	(Saber, 2022)	(Hussein Ra & Al-Muqram, 2017)	(Abdul-Ahadd & Mahdi, 2018)	(Degwey, 2018)	(Abdelmonem, 2017)	(Aggour, 2019)	(Salah, 2014)	(Alrawi, 2014)
The concept of selection									•
Mechanics		•		•				•	
Types	•		•						
Techniques	•	•		•		•		•	•
Designer thought	•	•			•	•	•		
Formal treatment			•		•		•		•

In Table 1, From the studies presented, the research sees that technology has a high presence in the selection of forms. Some studies have linked selection to material and technology, while others have linked it to the designer and their role in interacting with the computer to generate options from it due to its flexibility. Other studies have seen that technological selection supports aspects related to symbolism and the importance of elements that have a symbolic heritage dimension and reformulating it in new images that support the symbolic power it carries. Therefore, the research will present this level, which is the relationship between technological selection and forms with symbolic dimensions, which the studies did not explicitly and clearly present. There are several forms of them, such as (domes and arches), so the research will narrow the choice to the arch element due to the lack of studies that address the issue of technological selection and its impact on the formal transformations of the arch within the limits of its symbolic and expressive dimensions.

Research problem: The absence of a clear vision of the role of technological selection types in generating multiple models of contemporary arches that carry symbolic value and are formally creative

Research objective: The research aims to demonstrate the flexibility of the heritage element, due to its high symbolism, in generating multiple technological possibilities that can be selected to produce a renewed Islamic product.

3. The Theoretical Framework

The arch, as one of the elements with expressive symbolic dimensions, is a ritualistic object that aims to preserve cultural meanings as it connects history, language, and social dimensions into a single form (Khalfallah, 2018)Fig 2. The arch enhances the formal aesthetic and structural dimensions in all stages of architecture (historical, Islamic, and contemporary heritage). However, contemporary technological flexibility has led to the emergence of a new multifaceted image that differs from the formal transformations that appeared in its traditional form (circular, pointed, etc.). (Hanlon, 2006). Fig 2 illustrates the cases generated by the force of technological selection.

3.1 Technological selection:

Symbolic elements are characterized by relative instability. They are renewed, non-static, and capable of giving multiple possibilities. Every new idea carries the seeds of various transformations to move to a new idea that is more in line with the era under its components and mechanisms, with what the designer aims to show in terms of meanings(Al Naim, 2019) Technological selection is the process of selecting an element and reformulating it in multiple forms according to how the self (designer's thought) is linked to the adopted technological processes. This is due to technology's

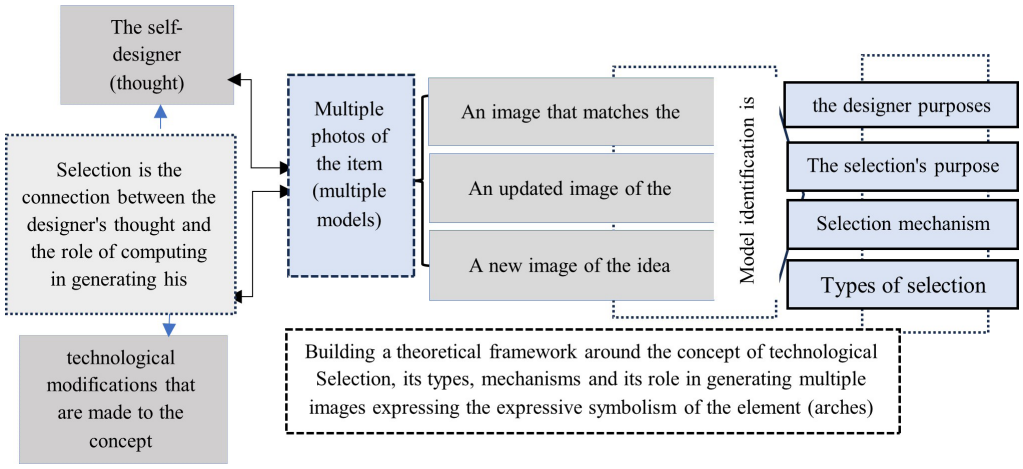


Figure (2). Illustrating the theoretical framework of technological selection. Source: researchers

high flexibility and the possibility of preserving its expressive symbolic connotations, which allows it to preserve its expressive symbolic connotations against the multiplicity of resulting possibilities.

3.2 Technological Selection Mechanisms:

Arches possess a recognizable stylistic identity characterized by symbolic and formal resistance. Mechanisms are employed to connect the designer's concept with technological capabilities, either by emulating a specific formal style, grafting traditional or contemporary details onto the arch, or manipulating formal proportions or structures. The outcome can range from fixed arches to shape-shifting arches to complete absorption into a new concept (Fanjan, 2024), Fig4 as shown morphological transformations of the Arch. They are at the level of the element or system and are as follows:

3.2.1 Selection by artistic sculpture:

Sculpture emphasizes the art of architecture in design, it is a major shift towards creativity and innovation by conducting sculptural formation by

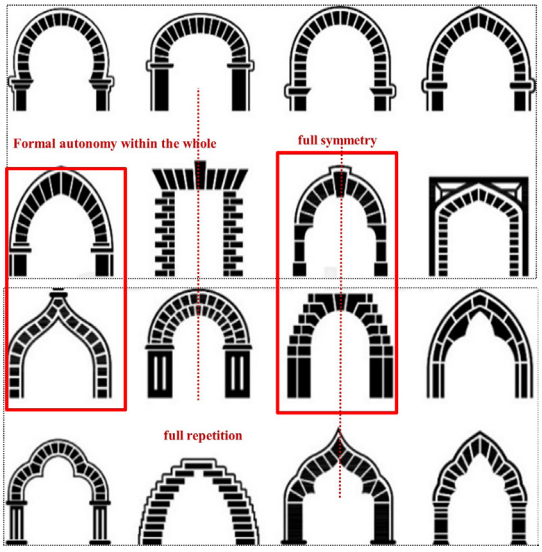


Figure (3). Shows the traditional Arches and the most important general characteristics of them, ref: https://www.shutterstock.com/search/arch-vector

Figure (4). Morphological transformations of the Arch. (McKnight, 2018)

the interaction between form and technology, and by relying on digital technologies and giant structural structures (Subbhy & Mahmud, 2010). Sculpture reflects a reductive level of form and depends on its degree and variety in maintaining the image of the original form or begins to decompose to generate a new form according to its relationship to the overall system of the building. (Fanjan & AL-Khafaji, 2022)

3.2.2 Selection by grafting:

The selection of an element that enters the building as a new force in a compatible or contradictory way to give a specific character by injecting it with materials and technological elements, depending on the designer and the resulting suggestion, which may be contemporary or Islamic heritage. The mechanism relies on the connection with the old architecture or its simulation and revival according to the designer's experience(Abudayyeh, 2021)

3.2.3 Selection by hybridization:

Selection is a process of hybridization between thought and technology or form and material. Here, multiple forms are generated according to their type. There is Random and irregular hybridization: It is characterized by spontaneity, and there is no specific criterion for selecting the material or the technology. Regular and balanced hybridization: Here, the selection is according to intentional organizational dimensions that preserve the element, technology, and material (BAZZAZ et al., 2017)

3.2.4 Selection by amplification:

The power of the amplification mechanism appears by giving a high presence, emphasizing the symbolic dimensions of the form, reflecting its great exaggeration and monumentality(Subbhy & Mahmud, 2010). It also transforms the amplified building into a sculptural form that approaches the artwork according to the relationship between form and space to highlight the aesthetic expressions of the element (Huwaida, 2021)

4. Types of Selections Technology

The types of selection can be classified based on the relationship between the designer and technological flexibility. These types are as follows:

4.1 Balanced selection:

This type of selection is based on choosing a heritage element with a building that carries all the details of heritage. In this level, preserving the symbolic dimensions of the elements is essential. The other type proposes contemporary visions and renewed solutions that reflect a high level of formal compatibility at the level of design, material, and technologies (Torabi & Brahman, 2013), fig 5. Figure 7 illustrates the formal treatments that preserve the traditional image despite variations in proportions, details, and type

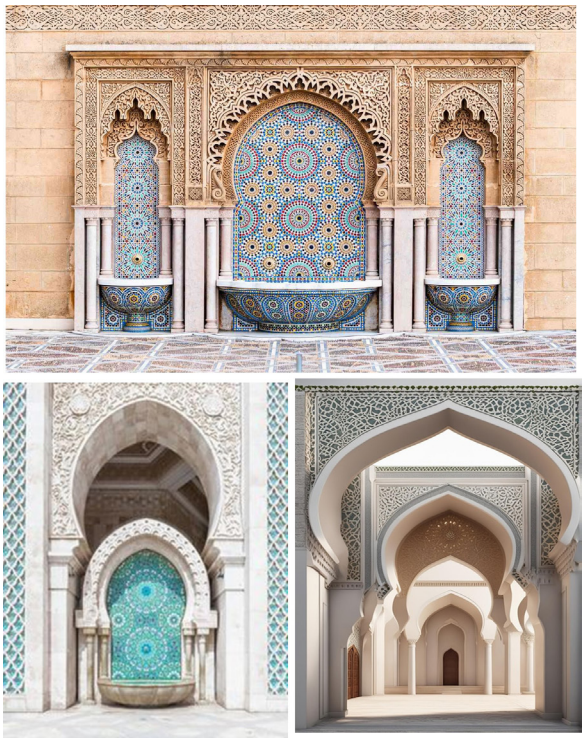


Figure (5). The formal variation of arches while preserving their conventional visual perception, https://www.freepik.com/premium-ai-image/islamic-arch-mosque-designramadan-kareem-wallpaper-ai-image_63660968.htm

4.2 Differential selection:

This selection reflects the interaction between the old, represented by heritage, and the modern, represented by technology, to reach the balanced state between (heritage-technology). The selection is carried out on a heritage element and subjected to transformation mechanisms, with the aim of moving away from the direct copy of the past by collecting heritage sources to preserve the origin

of the element as its basic lines so that it remains within the framework of its formal identity(Abdul-Ahadd & Mahdi, 2018)

4.3 Structural selection:

It moves with the existence of determinants and rules that the designer relies on by linking the element to the system. Therefore, the designer's intention in determining the suggestion that he wants to show is intentional. Therefore, the selection did not come from nowhere, but rather is linked to rules, methodology, and constants that contemporary thought refers to in order to determine its starting point in modifying the joints that are treated according to contemporary needs(Elghonaimy & Eldardiry, 2019). This selection is subject to two levels, as follows: (Fanjan & Alboadam, 2023)

- Moving the product with its different variations and multiple formal languages in terms of the techniques followed by the designer within the framework of the formal unity.
- The importance of the intellectual references achieving the belonging of the form and meaning in preserving the presence of the symbolic dimensions of the product while giving high flexibility in looking at the contextual, technological, and technical diversity and the designer's self.

4.4 Free selection:

It is a pure selection based on a high level of diversity and difference, as the designer moves away from emphasizing the symbolic dimensions, in order to achieve strangeness in producing the form in accordance with the mechanism of integration, adaptation, borrowing, and localization. The selection works to develop the origin of the heritage element in producing forms of different levels and formal complexities(Hamza et al., 2017) , fig 6.

5. Selection Technology and Designer's Intention

Technology begets new forms and structures that emerge as a novel architectural style, selected based on the expressive power of the idea. This distinguishes it from the traditional style in terms of its formal criteria and the new characteristics added to it, including flexibility and the ability to change shapes. Consequently, it is dynamic on the one hand and simple and rational on the other (Vaisi, 2012)

The selection process is directed towards linking technology as the selection is an interaction process with the computer to give design alternatives that depend on the type of mechanisms that the designer chooses, to provide the possibility of producing forms that may be beyond the limits of the designer's imagination, complex and difficult to read (Aggour, 2019).

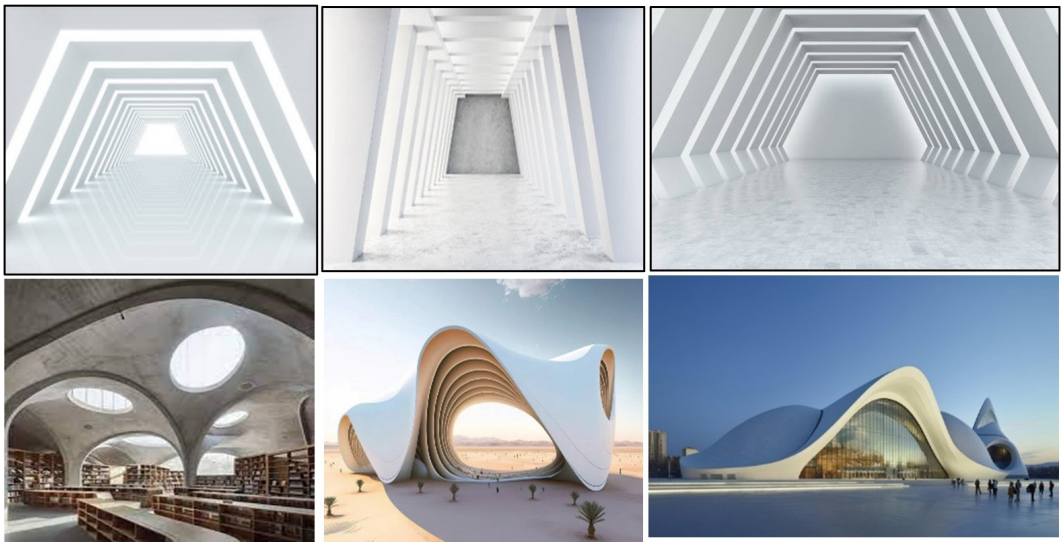


Figure (6). Arch shape transformations and dependence in interior design on the level of color, material and the resulting shapes (peshkov, 2019), https://www.freepik.com/premium-ai-image/cultural-center-marvelous-design-architecture-beautiful-generative-ai-aig32_59091337.htm

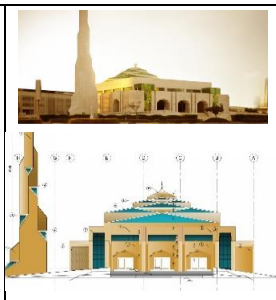
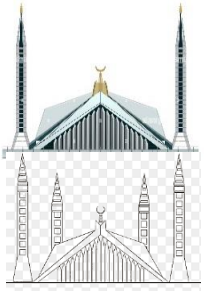
Table (2). Clarifies the variable obtained from the theoretical proposition, source: researchers

Main variable	Secondary variable				code
designer's intentionality in choosing the element of the Arch	Use of building	other use ,Religious usage			A1
	Designer's tastefulness	Formal readings of the building	Direct reading of the item		A2
			Indirect reading of the element		
		Intellectual orientations of the designer	Islamic heritage trends		A3
			Contemporary trends		
	The treatment	duplication	Direct translational complete replication		A4
			repeatability of a reflexive variable		
		Its location is within all.	Adoption of facades with a distinctive entrance		A5
			It is adopted by facades only without distinguishing the entrance		
		Source of the shape	Simulation of heritage		A6
			Not related to heritage in any aspect		
intentionality of selection	Rooting	The element in its traditional formal form	Traditional heritage image		A7
			The updated traditional image		
		Adoption of Islamic decoration	Modern Formalism decoration		A8
			Decoration through light and shadow		
	Renovation	Type of addition on the item	type of material	Traditional building materials	A9
				Contemporary building materials	
			Approved technology	Technique of integration with the building separately	A10
				Technique of blending	
		Merging the heritage element with another formal source	Heritage source		A11
			Environmental technical sources		
Selection mechanisms	single-element level (Arches)	The mechanism of artistic sculpture	Partial sculpture, full sculpture		A12
		the mechanism of subtraction	Morphological subtraction without changing the properties of the shape		A13
			Techniques of combining and morphing elements		
		grafting mechanism	The relationship of element, material and technology	Heritage revivalism	A14
				Contemporary revivalism	
			The relationship of the element to the building as a whole	Relationship compatibility	A15
				Paradoxical relationship	
			The relationship between vacuum and mass	emptying	A16
				Dictation (agglomeration)	
		Mechanism of hybridization	Balanced regular hybridization		A17
			Random hybridization		
		The mechanism of scale amplification	Amplification gives symbolic power to the element		A18
			Mass amplification contradicts		

Table (2). Clarifies the variable obtained from the theoretical proposition, source: researchers

Types of selection	Equitable selection	(Element, system) (heritage +heritage)		A19
		(Element, system) (Contemporary, Contemporary)		
	Paradoxical selection	Mixed evocative (contemporary, heritage)		A20
		Emphasis on color contrast		
	Structured selection	Balanced ratios between the element and the system		A21
		Complete symmetry of the element		A22
		Independence of the location of the element from the system		A23
		Approved regulation	Organic system,	A24
			Geometric system	
	Free selection	Adoption of flowing lines (Formal strangeness)		A25
		Solubility of the element within the whole		
Reading the status of Arches	Arch style	Elastic braces		A26
		Vanishing and continuous arcs with mass movement		
	The symbolic dimension of arch	High formal symbolism		A27
		High spiritual symbolism		

Table (3). Description of selected samples

Al Aziz Mosque (SAMPLE1), is the first mosque built in the Reem Island area of Abu Dhabi. It opened in 2019 and is characterized by its modern architectural design and advanced technology (Al Naim, 2018)		**The Faisal Mosque (SAMPLE4) is** the largest mosque in Pakistan, located in the national capital city of Islamabad. Completed in 1986, it was designed by Turkish architect Vedat Dalokay, shaped like a desert Bedouin's tent, is an iconic symbol of Islamabad (Pakistan, 2011)	
Dubai Pearl Mosque (SAMPLE2) in the UAE in 2018, designed by (Muein Fallaha) the aim of this concept was to blend local traditions and Islamic heritage and to reflect the modern vision of Dubai (Naser, 2018)		**Steyn Studio's Bosjes Chapel (SAMPLE5)** Opened 2016 in South Africa, designed by (Steyn Studio) Inside, a large and open assembly space is created within a simple rectangular plan (Steyn Studio, 2016)	
ICONIC MOSQUE FOR EMAAR (SAMPLE3), designed by Naga Architects 2018, in Dubai, UAE, to reflect the aspects of technological technical development at the level of design and material (Architects, 2018)		**Contemporary Office Space in India (SAMPLE6)** Designed as a fusion of traditional Indian architecture and contemporary office space (Sabrina Santos, 2016)	

- **Simulation**: It depends on how to transfer the properties of the original system to the newly generated system, depending on the role of the designer in the
- **Repetition**: Repetition is used through the mechanisms used in decorative processing, including repetition by reflection repetition by scale, repetition by rotation, or repetition by translation(AL-ansari & AL-Moqaram, 2021)
- **Designer's taste**: It is associated with the designer's competence in choosing the form and technology as a supporting element for the designer in structuring the idea with digital design tools that give a wide range of solutions to choose from and compare between the vision to be conveyed according to the requirements of other design requirements (Al-Eqapy et al., 2020).

6. Sample Selection Criteria

Various samples were approved (mosques, public and Islamic centers, church, library)

- Different models with varying approaches to handling arches, both structurally and functionally, were chosen to demonstrate the system's high level of flexibility.
- Models have been selected that may functionally correspond to mosques but are also completely different in form. This further proves the research hypothesis that function is no longer constrained by Arches, thus appearing diverse and completely

7. Methodology

The research methodology comprises the following steps:

stage 1: Constructing a theoretical framework around the concept of technological selection, its mechanisms, and characteristics based on previous studies.

stage 2: Determining the sample for measurement according to sample selection criteria.

stage 3: Categorizing variables into two types:

- Transforming indicators into survey questions directed to 30 experts using an electronic form (Google Forms) to assess the final state according to the attached samples. Then, converting the responses to an Excel file to calculate the percentage achieved by each variable. The higher the agreement among experts on a variable, the higher its reliability. (Appendix 1, Table 5).
- A descriptive measurement phase involving the investigation of specific variables within the sample to examine their presence or absence. Responses are then collected from the 6 samples to determine the final realization of the variable.) The higher the verification percentage (50-100%), the more stable property in the product. A percentage between)50-%10% (indicates weak verification, while 0% means the property is not verified at all .(Fig.7 shows the steps adopted

stage 4: Analyzing the results to reach conclusions

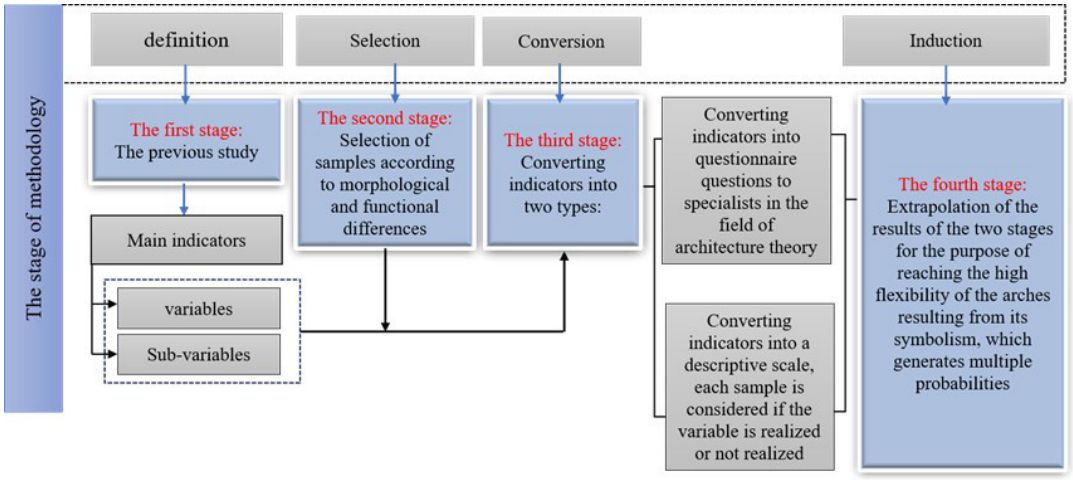


Figure (7). Shows the steps of the methodology adopted in the research: source: the researchers

8. Result

8.1 The designer's intentionality:

Variable (A1) achieved a percentage of (60%) in terms of emphasizing the importance of the religious function and its impact on the symbolism of the Arch compared to other functions; as for the designer's gastronomic dimensions, variable (A2) achieved (90%) in terms of the indirect suggestiveness of the element, while variable (A3) achieved (60%) in terms of the orientation of most designers ' ideas towards contemporary intellectual trends more than heritage, as for the adopted treatments variable (A4) achieved (60%) in terms of the partial variable, while the variable (A5) achieved in terms of the dependence of the element on the interfaces and the input together without discrimination, and the variable (A6) achieved balanced proportions in terms of the source of the form (heritage, modern) by (50%), Appendix table 5,4, fig.8.

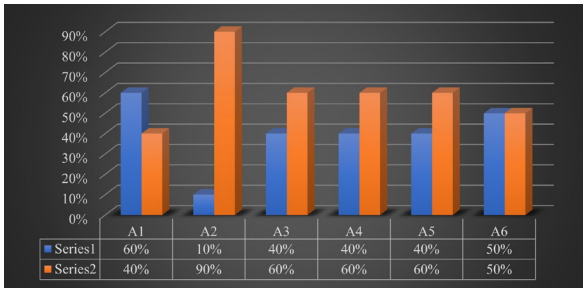


Figure (8). Shows the proportions for variables

8.2 Intentionality of selection:

The intention of the selection is shown according to two variables, the rooting variable, where variable (A7) achieved a percentage of (50%) in terms of adopting the updated traditional image, while variable(A8) achieved a rate of (80%) in terms of emphasizing the use of Islamic decoration using light and shadow, as for the renovation variable, variable (A9) achieved a percentage (88%) using contemporary building materials, and variable (A10) achieved a percentage of (60%) in terms of adopting the (A11) variable showed a (60%) rate in terms of integrating the element with Eco technical formative sources, Appendix table 5,4, fig 9

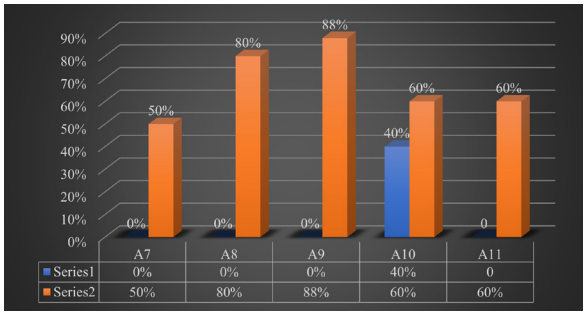


Figure (9). Shows the proportions for variables

8.3 Selection mechanics:

The selection through the mechanism of artistic sculpture (A12) showed a total percentage (65%), while the mechanism of subtraction (A13) showed a percentage (65%) using the technique of camouflage and formal integration, while the grafting mechanism (A14) showed a percentage (90%) using contemporary materials and techniques. (90%) using compatible relationships (A15) between the arch and the building, and (90%) using mass handling is greater than the vacuum handling of the element A16). The selection (A17) also relied on the mechanism of balanced formal hybridization by (83.4%), and the amplification mechanism (A18) achieved (60%) in terms of the adoption of amplification, which gives symbolic power to the element. Appendix table 5,4, fig10

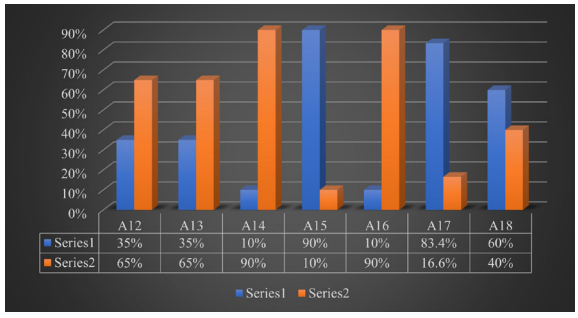


Figure (10). Shows the proportions for variables

8.4 Types of selection:

The equal selection (A19) achieved a high percentage (100%) in terms of emphasizing the contemporary suggestiveness (Contemporary-Contemporary), while the samples showed the contrasting selection (A20) with a small percentage

(20%) in terms of emphasizing the color contrast, while the samples showed the selection structured through four variables, where the variable (A21) achieved a percentage (60%) in terms of dependence on the proportionality between the element and the system, while the variable (A22) achieved a percentage (40%) the variable (A23) achieved a percentage of (90%) in terms of confirming the independence of the element from the total system, and the variable (A24) achieved a percentage of (90%) in terms of dependence on the Organic As for the free selection (A25), it achieved a percentage (90%) in terms of the adoption of exoticism and formal uniqueness. Appendix table 5,4, fig11

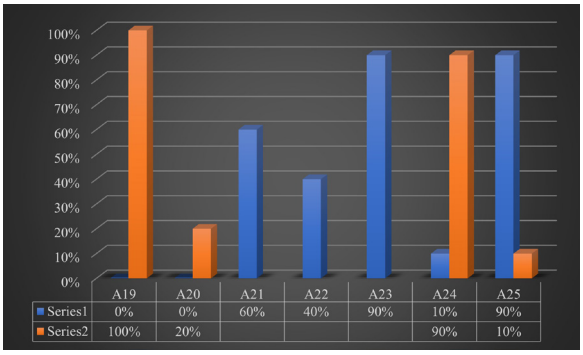


Figure (11). Shows the proportions for variables

8.5 Reading the status of Arches:

types of Arches (A26) within the samples, the results showed balanced ratios (50%) for both flexible and vanishing Arches. As for the symbolism of the arch, the samples showed a spiritual symbolism (80%) compared to the formal symbolism of the arch, as it was found that some meanings combine both symbols. Appendix Table 5,4 , Fig12

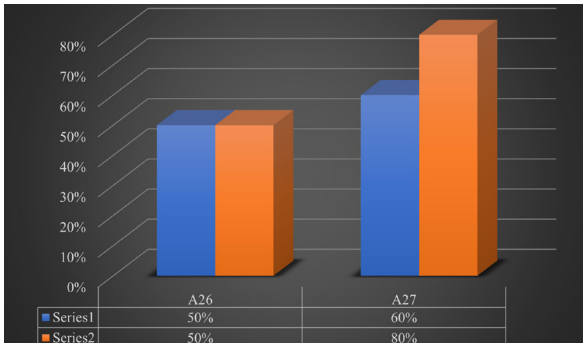


Figure (12). Shows the proportions for variables

9. Conclusion

- Selection not only gives difference and complete change but also preserves the formal existence of arches by generating different forms according to the possibilities of technology.
- Technological selection supports the creative side of design by generating new architectural forms by integrating heritage forms to develop a hybrid form due to the interaction of technology with the designer's self.
- The designer intends to adopt elements with symbolic dimensions in mosques and Islamic centers and maintain their presence more formally than other functional styles.
- The designer's tastefulness dimensions tend towards the adoption of arches and giving them an indirect suggestiveness, and this increases the exoticism and uniqueness of the element within the limits of reading them as arches, while maintaining the adoption of contemporary intellectual trends more than the traditional form of the arch and integrating it with modern trends
- Most types of repetition tend to the imperfect variable to give creative dimensions to the product, but the adoption of the arch element in multiple places within the interfaces remained direct and explicit in a way that preserves its symbolic power
- The designer deals with technological selection in several types, all focusing on the element's symbolic aspect in different visual styles. Both the balanced selection, which aims to adopt a formal language compatible with the contemporary orientation of the arch, is more than the focus on the contradictory selection to preserve its symbolism. The existence of the organized and free selection is necessary according to the designer's orientation, the first gives proportion and the other provides symbolism with its formal strangeness.
- The designer deals with arches according to several mechanisms, and balanced hybridization is one of the most common mechanisms that the designer resorts to to update heritage arches and link them to contemporary formal systems. The formal amplification of the arch also shows the symbolic aspects of the process of balanced hybridization.
- Both sculpture and inlay mechanisms depend on the designer's taste and the possibilities provided by technology as a technology and material to generate multiple options for the arch with high flexibility to integrate the arch with the

mass in a camouflaged image.

● The technological selection determines the most suitable possibility for the level of the design idea that the designer aims to highlight because the techniques combine several forms to give multiple possibilities, each of which is a suitable option at a specific time and circumstances

● Selection by amplification gives the specificity of the contemporary Islamic element by combining dominance and the melting of the component within the system and therefore differs from the traditional Islamic product, which gives dominance to the component of a future form of the overall system

● There are two types of arches in contemporary architecture. These namely flexible arches are characterized by high flowability, and vanishing arches, which are one of the most unique arches in terms of showing integration and complete connection with its central mass and in a compatible way. The formal evolution of arches gives an idea based on the fact that arches are symbolic elements with spiritual dimensions that do not adhere to a single form because they are temporal elements that appear in multiple forms and remain readable and clearly transparent to the recipient.

10. References

Abdelmonem, M. G. (2017). Architectural and urban heritage in the digital age: Dilemmas of authenticity, originality and reproduction. Archnet-IJAR: International Journal of Architectural Research, 11(3), 5–15. https://doi.org/10.26687/ARCHNET-IJAR.V11I3.1415

Abdul-Ahadd, E. S., & Mahdi, R. M. (2018). تبادلية التفاعل بين التراث والتقنية في الممارسة المعمارية المحليةInterchanging interaction between heritage and technical in the local architectural practice, An Empirical Study of the heritage elements in Baghdad,. Iraqi Journal of Architecture and Planning, 12(1). https://doi.org/10.36041/IQJAP.V12I1.180

Abudayyeh, R. (2021). Grafting Interiority: Generative Methodologies Between the Natural and the Synthetic. Interiority, 4(2), 249-266–249–266. https://doi.org/10.7454/IN.V4I2.160

Aggour, M. M. H. (2019). الهندسة الكسورية كنمط بنائي للتصميم في العمارة Fractal Geometry as a Structural Pattern for Design in Architecture. Journal of Urban Research, 34(1), 16–32. https://doi.org/10.21608/JUR.2019.85992

AL-ansari, T. M. S., & AL-Moqaram, A. M. (2021). Iterative systems in sold structures and filigree structures / study in structural surface strategy. Association of Arab Universities Journal of Engineering Sciences, 28(2), 69. https://doi.org/10.33261/JAARU.2021.28.2.008

Al-Eqapy, A. H., Al-Majidi, B. H., & Al-Shukri, N. A. (2020). Double Vision in Architecture. Association of Arab Universities Journal of Engineering Sciences, 27(4), 90–104. https://doi.org/10.33261/HTTPS://DOI.ORG/10.33261/JAARU.2020.27.4.009

Al Naim, M. A. (2018). The Mosque: The Architecture of The Moment And Place | Abdullatif Al Fozan Award for Mosque Architecture. Abdullatif Al Fozan Award for Mosque Architecture Announces the Short List of Qualified Mosques for the Fourth Cycle (2020-2023). https://alfozanaward.org/the-mosque-the-architecture-of-the-moment-and-place/

Al Naim, M. A. (2019, October 27). Parallel Heritage and Futuristic Mosque Architecture | Abdullatif Al Fozan Award for Mosque Architecture. https://alfozanaward.org/parallel-heritage-and-futuristic-mosque-architecture/

Alrawi, O. M. (2014). GAs and Evolutionary Design in Architectural Heritage-The Case of Islamic Architecture. 507–516. https://doi.org/10.1007/978-3-319-13695-0_50

BAZZAZ, I. AL, Al-Omari, H. R., & Abdullah Abdulrahman Al-Sarraf. (2017). التهجين آلية لإنتاج الشكل المعماري Hybridization mechanism to produce architectural form. Association of Arab Universities Journal of Engineering Sciences, 24(1), 19–34. https://jaaru.org/index.php/auisseng/article/view/26

Degwey, G. Al. (2018). The Functional Content of Islamic Architecture between Innovation and Sustainability. مجلة العمارة و الفنون و العلوم الإنسانية, 3 (Issue 10 (1)), 201–216. https://doi.org/10.12816/0045728

Elghonaimy, I., & Eldardiry, D. H. (2019). Mosque architecture: present issues and future ideas (عمارة المسجد: قضايا الحاضر وأفكار المستقبل). Mosque Architecture, Present Issues and Future Ideas, November, 87–103. https://asfaar.org/en/file/428

Elshafie, M. M., & El-Sharkhawy, D. H. D. (2022). Eclectic Thought is Between Ancient and Contemporary. Journal of Design Sciences and Applied Arts, 1(2). doi: 10.21608/JDSAA.2020.28500.1010

Fanjan, R. R. (2024). The role of symbolic resistance in the permanence of Islamic The role of symbolic resistance in the permanence of Islamic forms forms. Emirates Journal for Engineering Research, 29, 3–3. https://scholarworks.uaeu.ac.ae/ejer/vol29/iss1/3

Fanjan, R. R., & AL-Khafaji, A. M. (2022). THE ROLE OF COORDINATED RESPONSE IN THE PERMANENCE OF ISLAMIC ARCHITECTURE. Kufa Journal of Engineering, 13(2), 43–62. https://doi.org/10.30572/2018/KJE/130204

Fanjan, R. R., & Alboadam, H. S. (2023). The Role of the Bonding Strategy in the Identity of Islamic Architecture. International Journal of Design and Nature and Ecodynamics, 18(2), 269–278. https://doi.org/10.18280/IJDNE.180204

Hamza, A. A., Ibrahim, S. K., & Mubarak, A. M. (2017). أثـــــر التكنولوجيا في اســـتراتيجية التـــــأصيل The impact of technology in Indigenization strategy the local contemporary architecture as a case study. Iraqi Journal of Architecture and Planning, 16(2). https://doi.org/10.36041/IQJAP.V13I2.371

Hamzeh, R., & Xu, X. (2019). Technology selection methods and applications in manufacturing: A review from 1990 to 2017. Computers & Industrial Engineering, 138, 106123. https://doi.org/10.1016/J.CIE.2019.106123

Hanlon, D. (2006). Arches and culture. Nexus Network Journal, 8(2), 67–72. https://doi.org/10.1007/S00004-006-0018-6/METRICS

Hussein Ra, Z., & Al-Muqram, A. M. (2017). Facters affected trends of Contemporary Mosques Architecture. Journal of Engineering, 23(11), 1–29. https://doi.org/10.31026/J.ENG.2017.11.11

Huwaida, A. M. A. S. (2021). النظريات ا لإبداعية بين النحت والعمارة المعاصرة Creative theories between sculpture and contemporary architecture. بحوث في التربية الفنية والفنون, 43–31 ,(3)21. https://doi.org/10.21608/SEAF.2021.195774

Khalfallah, S. (2018). Analysis of Arches. Structural Analysis 1, 289–327. https://doi.org/10.1002/9781119544265.CH9

Naser, N. I. (2018). Iconic Mosque in Dubai, United Arab Emir|Mosque. LYX Arkitekter. https://amazingarchitecture.com/mosque/iconic-mosque-in-dubai-united-arab-emirates-by-lyx-arkitekter

Pakistan, N. (2011). Faisal Mosque, Islamabad | Pakistan Embassy Tokyo Japan. Pakistan Students Association Japan (PSAJ). https://www.pakistanembassytokyo.com/content/faisal-mosque-islamabad

Redjem, M., & Said Mazouz. (2019). The architecture of the mosque in Algeria between the identity of Islamic civilization and contemporary developments Meriem Redjem Senior Lecturer, department of architecture, university of Annaba, PhD. مجلة العمارة والفنون والعلوم الإنسانية. https://doi.org/10.21608/MJAF.2019.11810.1128

Saber, A. M. (2022). Digital design technology and its impact on contemporary architecture, in light of digital architectural trends. مجلة العمارة و الفنون و العلوم الإنسانية, 7(34), 1–27. https://doi.org/10.21608/MJAF.2021.51703.2092

Sabrina Santos. (2016). Traditional Indian Architecture Meets Contemporary Office Space in This Naturally-Lit Design by Studio Symbiosis | ArchDaily. ArchDaily -Architecture News. https://www.archdaily.com/791383/traditional-indian-architecture-meets-contemporary-office-space-in-this-naturally-lit-design-by-studio-symbiosis

Salah, W. B. (2014). تأثير الثورة الرقمية على مجال الوظيفة والتشكيـل المعماري The impact of digital revolution on the field of architectural function and form. Journal of Urban Research, 12(1), 1–12. https://doi.org/10.21608/JUR.2014.93034

Saleem, Y. M. M. S., & Salih, M. H. S. (2019). Methodology of evolutionary selection in energy efficient architecture Role of genetic algorithm in calculating the architectural spaces energy efficiency. Iraqi Journal of Architecture and Planning, 15(1), 29–43. https://doi.org/10.36041/IQJAP.V15I1.464

Steyn Studio. (2016). Bosjes Chapel | Steyn Studio, PERI Formwork Scaffolding Engineering | Archello. https://archello.com/project/bosjes-chapel#stories

Subbhy, R., & Mahmud, A. I. (2010). Architecture, Sculpture and Contemporary المعاصرة العمارة و النحت. Iraqi Journal of Architecture and Planning (IQJAP), 9(19). http://lebbeuswoods.wordpress.com

Tantawy, D.-E. M., & Khamis, N. E. E. D. (2021). Spiritual values between theological symbolism and design globalization in the contemporary mosque architecture. Journal of Architecture, Arts and Humanities, 6(26). https://doi.org/10.21608/mjaf.2020.23670.1505

Torabi, Z., & Brahman, S. (2013). Effective factors in shaping the identity of architecture. Middle East Journal of Scientific Research, 15(1), 106–113. https://doi.org/10.5829/IDOSI.MEJSR.2013.15.1.2357

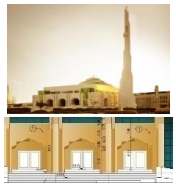
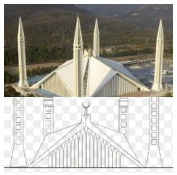
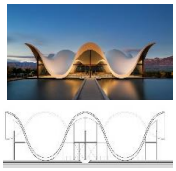
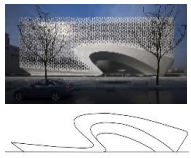
Vaisi, S. (2012). Smart Technology Creates A New Style in Architecture and Technological Aesthetics | PDF | Engineering | Architectural Design. Conference: ICCEA 2012At: Hong Kong. https://www.scribd.com/document/540635179/editmay10

Architects, n., 2018. ICONIC MOSQUE FOR EMAAR. [Online] Available at: https://www.naga.ae/iconic_mosque_for_emaar/

11. Appendix

Table (4). Shows the sample questionnaire formhers

The questionnaire for each sample is for the purpose of reading the details of its bracket (5 evaluators per sample)

S1	**S2**	**S3**	**S4**	**S5**	S6
					

variables	answers		Options	Number of answers	The ratio
A1	Does the use of the building play a role in determining the symbolism of the element: if it is religious, it differs from it, if it is another use		Yes, it has a clear effect	18	60%
			Not required	12	40%
A2	General suggestiveness of the building as a whole According to the presented model, what is the designer's orientation		Heritage significance	3	10%
			Contemporary revivalism	27	90%
A3	Does the arc element reflect a traditional reading at the figure level		Islamic trends	10	40%
			Contemporary trends	20	60%
A7	Does the use of the building play a role in determining the symbolism of the element: if it is religious, it differs from it, if it is another use		Reflects	15	50%
			Does not reflect	15	50%
A8	General suggestiveness of the building as a whole		Reflects	6	20%
			Does not reflect	24	80%
A9	Type of addition to the element	Traditional material	Traditional material	4	12%
			Contemporary material	26	88%
A10		The technology of integration with the building separately	The technology of integration with the building separately	12	40%
			The technique of merging (folding)	18	60%
A11	The type of formal source that is adopted to combine the element with the whole		Biological-environmental source	12	40%
			Heritage source	18	60%
A12	Did the form adopt partial or complete sculpture		Partial	11	35%
			The whole	19	65%
A13	The type of formal subtraction techniques adopted		Morphological subtraction without changing the properties of the figure	11	35%
			The technique of merging and form camouflage	19	65%
A14	The suggestibility reflected by the element of the arch according to its inlaying with the material and the techniques adopted		Giving Islamic heritage inspiration	3	10%
			Giving a contemporary inspiration	27	90%
A15	What is the relationship of the vaccination approved in the element with the building		Compatible relationship	27	90%
			A paradoxical relationship	3	10%
A16	Is the dependent element empty or reflects a mass (full)		Discharge	3	10%
			Dictation	27	90%
A17	Assessment of the state of hybridization of the element and its relationship to the building		Regular hybridization	25	83.4%
			Random hybridization	5	16.6%
A18	How can the dependent amplification be read in the bracket element		Amplification gives symbolic power to the element	18	60%
			Mass amplification contradicts the importance of the element	12	40%
A26	Determine the possible reading of the arch according to each model		Flexibility arches	15	50%
			The vanishing arches	15	50%
A27	How to read the symbolism of arches by definition of formalism		Formal symbolism	6	20%
			Spiritual symbolism	24	80%

Table (5). Shows the variable obtained from the descriptive measurement

Variables and sub-variables		Sample coding						Results	
		S1	S2	S3	S4	S5	S6	Realized property	unrealized property
A4	Direct translational complete replication				•	•		40%	
	repeatability of a reflexive variable	•	•	•			•	60%	
A5	Adoption of facades with distinctive entrance	•					•	40%	
	It is adopted by facades only without distinguishing the entrance		•	•	•	•		60%	
A6	Simulation of heritage	•		•			•	50%	
	Not related to heritage in any aspect		•		•	•		50%	
A19	(Element, system) (heritage +heritage)								0%
	(Element, system) (Contemporary, Contemporary)	•	•	•	•	•	•	100%	
A20	Adoption of flowing lines (formal exotics)								0%
	Solubility of the element within the whole			•	•			40%	
A21	Balanced ratios between the element and the system	•	•		•	•		60%	
A22	Complete symmetry of the element			•			•	40%	
A23	Independence element from the building		•	•	•	•	•	90%	
A24	Geometric system	•						10%	
	Organic system		•	•	•	•	•	90%	
A25	Adoption of flowing lines (Formal strangeness)	•	•	•	•		•	90%	
	Solubility of the element within the whole					•		10%	

doi:10.33948/JAP-KSU-37-1-4

دور مرونة الانتقاء التقني في توالد الشكلي والرمزي للأقواس

ريام رجب فنجان [1]* ارمين سركيس خسروف [2]

[1,2] قسم الهندسة المعمارية، كلية الهندسة، جامعة البصرة، البصرة، العراق.

riyam.rajab@uobasrah.edu.iq armen.kosrof@uobasrah.edu.iq

قدم للنشر في ١٢/ ١/ ١٤٤٦ هـ؛ وقبل للنشر في ١٧/ ٤/ ١٤٤٦ هـ.

ملخص البحث. تركز الورقة البحثية على إثبات أهمية استراتيجية الانتقاء التقني والتي تدمج خيارات فكرية وشكلية عدة لتوليد إما شكل تراثي محدث يتلقى القبولية ويعكس جمالية معينة وفقاً لرمزيته، أو شكل جديد متفرد يؤثر سلباً أو إيجاباً على الأشكال المدمجة المولدة له ويعكس خصوصية الحاضر. ينتقي البحث عنصر القوس والتوالدات الشكلية المتنوعة التي تنتج بفعل العمليات الفكرية الشكلية التي يقوم بها المصمم ودور التقنية في ذلك، مولداً التنوع والتعدد مع الابتعاد عن النسخ الشكلي. تأتي مشكلة البحث بعنوان «قلة الدراسات حول دور أنماط الانتقاء التقني في توليد نماذج متعددة لعنصر القوس يعكس خصوصية حاضره ويدعم ديمومته الرمزية الشكلية». كما يفترض البحث مرونة الانتقاء التقني المهيكل لتوليد صفات وخصائص جديدة توالدية للعناصر ذات الأبعاد الرمزية التعبيرية ضمن حدود تعريفها الشكلي. تضمنت المنهجية اعتماد واجهات لـ ٦ مبانٍ متنوعة من حيث الأقواس والوظيفة. كما أجري استبيان ومقياس وصفي شكلي. ووجد البحث أن الانتقاء التقني المهيكل هو استراتيجية متوازنة تدعم توالدات شكلية مشتقة من أصل العنصر الرمزي إذا تم اعتمادها وفقاً للمعايير الرمزية الأصلية للعنصر، أكثر من الانتقاء الحر الذي لا يقوم على أسس ثابتة. وتتجلى قيمة البحث في مرونة الخيارات الشكلية الناتجة عن التقنية وإبداع المصمم في الانتقاء، كما يوفر استراتيجية جديدة لإعادة استخدام الأقواس في أشكال جديدة ومحدثة تدعم القيم الرمزية للعناصر التراثية.

الكلمات المفتاحية: الانتقاء التقني، أنواع الأقواس، الانتقاء المهيكل، الانتقاء المتكافئ، الانتقاء الحر، إعادة التوالد.