

CHARACTERISTIC OF SPATIAL CONFIGURATION: ITS ROLE IN USER PERCEPTION IN CONTEMPORARY ARCHITECTURE (Duhok city architecture as a case study)

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ABSTRACT

Spatial configuration as a phenomenon in architecture plays a crucial role in shaping the function, and ease of use, which affects user perception or may be influenced by user experience to form interactions that lead to an understanding of the built environment and then spatial configuration. This research paper was prepared in a way that aims to discover the influence of the user's perception on characteristics of the built environment and the latter's influence on the user's perception. Through research into several previous studies, were able to identify a set of concepts that are directly related to the idea of spatial configuration and classified them into three types according to their characteristics: Syntactic characteristic is represented by (Integration). Geometric characteristic is represented by (Scale). Perceptual characteristics consist of (attention, Semantics, Visual communication, Ethics, Guidance, Meaning, Challenges, Materiality, and Vitality). These characteristics are used in measuring several cultural-educational and administration buildings in Dohuk Governorate, Kurdistan Region of Iraq, through the results of these methods. The first method is space syntax theory, The second method is a traditional analysis through mathematical calculations selected for this purpose. and the third is user participation in a questionnaire. Then, a comparison of the final result of the three methods. In the end, it was found that the form of the relationship between these characteristics is a directional nature. An increase in the form of one variable may lead to an increase or decrease in the other variable, it has also been shown that the function of the building affects the direction of this relationship.

KEYWORDS: Spatial configuration, syntactic, geometric, perception, build environment

1. INTRODUCTION

Contemporary architectural designs give user participation great importance in spatial decisions through a group of theories that encourage this approach. This study attempts to understand the relationship between the spatial composition phenomena that result from the design process and the spatial composition phenomena that result from the user's perception of the built environment.

According to Hasgöl (2015), Spatial configuration can be defined as a process of bringing together the built space. Which has a cultural meaning represented by the individual's living patterns, spatial behavior, and experience, to obtain a clear vision of the social logic of the built environment and its dimensions. Winston Churchill said, that we are shaped by our

buildings, and then by our buildings, we are shaped. Hillier and Hanson (1984), stated the distribution of spaces in buildings is consistent with the arrangement of social relationships between people. Rapoport (1980) says that spatial configuration is the product of the architects' prior thinking process about the space before designing it (Hasgöl, 2015). Soja (1996), says that the factors that complete the definition of spatial configuration are the spatial itself and historical and social. Lefebvre (1991) claims that spatiality is the fixed material envelope that is determined by the influence of individuals' practices in space as well as the historicity of the place (Grobler, 2006). Gudkova (2017) states that spatiality is determined by static structural masses and the dynamic processes of human activity (Gudkova, 2017). While Zimring (1981) asserts that reducing stress through the acquisition of

Table (1): Specification of spatial configuration characteristics. (Researcher

Types	Specification			No	Variables	
Independent variables	Syntactic characteristics			1	Integration	
	Geometric characteristics			2	Scale	
Dependent variables	Perception characteristics	Informative characteristics	A	Motivational characteristics	3	Attention
					4	Semantic
					5	Visual communication
			6	Ethics		
			B	Addressed characteristics	7	Guidance
					8	Meaning
		C	Expressive characteristics	9	Challenges	
				10	Materiality	
		Aesthetic characteristics			17	Vitality

environmental patterns leads to the acquisition of clear cognitive representations. Likewise, O'Neill (1991) envisions that the greater the level of understanding of spatial configuration, the greater the wayfinding tools (Kim Y. O., 1999).

Climatic, economic, and social factors and factors related to the site and its proximity affected on built environment. but what concern in this research, are the built environment characteristics that produce different shapes, and their impact on users. Therefore, how Users understand these decisions and examine the possibility of discovering the relationships in these decisions. The user's essential role in making them observers of the design process after and before the process, because the users' sensory and physical needs are directly related to the design work, as a set of decisions that serve the various dimensions of individuals' social life.

2. STUDY GOALS

- This thesis aims to explore the cognitive link between the characteristics of spatial configuration and users' perception in the built environment.
- Exploring the impact of the built environment's different functions on their spatial characteristics and their impact on users' perceptions.

3. SPATIAL CONFIGURATION CHARACTERISTICS

The research has classified the phenomenon of spatial configuration into its types and branches, which are as follows: Syntactic characteristics, Geometric characteristics, and Perception characteristics. Then Identify variables for each characteristic mentioned in previous research. As shown in Table (1)

3.1 Syntactic Characteristic:

Integration

Hillier (1993) introduced an important syntactical measure that expresses the relative depth of space compared to the rest of the spaces of the axial chart. The lower the value, the

higher the degree of integration, and the higher the value, the more isolated the space is from the group (Ali, 2007). Klarqvist (2015) also introduced a comprehensive measure that describes the average depth of the environment compared to other environments in the system and classifies it as the most integrated (Klarqvist, 2015). While according to Khalesian (2009) the average depth from one node in the system to all other nodes. This average decreases as the nodes get closer to each other, and as the average increases, it leads to an increase in Separate spaces, and the greater the permeability in the system, the greater the degree of integration (Khalesian, 2009). Carmona (2021) stated that the change in the value of the integration is an indicator of a change in movement and its nature. It can be measured through a network of a group of axial lines so that each line has a value within the system as a whole. The greater the movement along the line, the greater the value of the integration (Carmona, 2021).

3.2 Geometric Characteristic:

Scale

According to Ching (2023), it can be said that the standard is theoretically our perception of the size of a particular body compared to another body or space, and in practice. It can be referred to as a set of visual mathematical relationships between the dimensions of a shape compared to another shape or space to another space or between shape and space (Ching, 2023).

3.4 Perception Characteristics:

Attention

There (2002) introduced the term attention as it revolves around the cognitive function that filters unwelcome sensory information and increases awareness of information related to the individual's immediate need. This process is the result of our brain giving preference to one part over the other, and this in turn affects the way we

think and behave, which pays attention to one stimulus and reduces tools. Attention is of two types: the first (automatic), in which the sensory stimulus gradually escalates unintentionally. The second is intended to spread it to focus attention on it intensely, and then this effect disappears to a minimum (Thier, 2002).

Semantics

According to Yan (2014) semantic is a group of symbols or a single symbol, that appears in the external form of an object, and it is the basic value of this object regardless of its materiality and geometric structure, or materiality can be considered an important carrier of information and a component of visual communication. In psychology (Gestalt) indicates that the specific visual environment is achieved through the division of the brain and this phenomenon was intended to provide new aspects to define space and help us communicate to read the shape of the building and understand its meaning and the messages that the shape of the building can send to the user (Yan, 2014).

Visual Communication

Greif, in his book *The Visual Factory* (1991), through searching for new management methods, concluded that visualization is present among the users involved in the work. Visual communication is viewed here as (self-service information). This information is available at one moment to all users, and the more visual tools increase, the more workers adapt to the place (Andersson Schaeffer, 2011).

Ethics

According to Fisher (2008), ethics is a way to see from a variety of points of view, taking into account the feelings and values of others in the system, and moving towards what we believe. There is indeed opposition to the way we think about the lofty goal, considering the needs of the less powerful groups first. This is why design and ethics go hand in hand with each other over time. Design is often a means of communicating ideas expressed by ethicists for a better future (Fisher, 2008).

Guidance

According to Dursun (2009) The guiding in space, or we can call it the space that guides the user through a set of concepts related to shadow, light, length, width, and height, works as an architectural language that controls the amount of permeability or accessibility to other adjacent spaces, or rather implicitly defines the other

spaces around this place. Kurtuncu et al (2008) By linking an interwoven set of concepts such as body, size, proportion, experience, perception, atmosphere, senses, time, memory, context, light, structure, and materials, which in turn create a spatial experience and thus result in spatial knowledge (guidance). Lawson (2003) stated that we can take design as a phenomenon capable of processing a large group of information simultaneously through a set of advanced mental processes (Dursun, 2009).

Meaning

Midleg (2003), in his article, *The Concept of Meaning*, explains that meaning means what something means or what something does. Brown (2006) discusses that the purpose is not what is said, but rather what is referred to in terms of a term, a sign, or drawing attention. As for architecture, the meaning of architecture is related to similarities in architecture, such as defining a specific part in a space that helps to know the entire system, and it is not a language. Literary, rather, is the language of the sequence of events understood in a purely metaphorical way (Shahedi, 2010).

Challenges

According to Mitchell (2013), and Levebre (1966) challenges can be used in two different fields. The first: is the public sphere that creates rapprochement, conversation, and direct contact. It can be called participatory democracy. The second: is available spaces, or it can be said that mobility spaces, which represent interest in individual freedoms or the feeling of freedom to move through space and choose the type of practice that one desires. By the user under the slogan (*The Right to the City*) (Tonnelat, 2010).

Materiality

Bell (2020) stated among the tasks carried out by architecture is exploring the expected connections between materiality and human feelings. Organizing matter in a way that helps fundamentally convey meanings in drawing a human mission, and contributing to the common structure of the physical environment through the play on shadow, light, textures, and colours. All of these phenomena are produced through... Interactions and feelings it tell us about our essence from a certain scene of the time and a certain culture, and these scenes result from tangible processes such as sculpting, casting, animation, decoration, and decoration in a way

that suggests symbolism that pulsates with a life that mimics ours (Bell, 2020).

Vitality

(Lynch) claims that vitality is the user's ability to obtain the food, safety, and comfort he needs in space before all other needs. (Jacobs) believes that vitality is the level of interactions between individuals in space and gives great importance to the psychological and social state of the individual compared to physical needs through the diversity of activities at different times and these activities such as (increasing social interaction, the individual's feeling of safety and comfort. Hoggel (1967) in his book *Western Islamic Architecture* concluded the meaning of the building of the mosque, etc. (İşiklar, 2017).

4. THEORETICAL FRAMEWORK

According to Eisenhart (1991), The structure of the theoretical framework is built through formal theory or theories using a coherent and coherent explanation and clear relationships to guide the research. Lovitts (2005) stated that theories serve as a tool to complement your understanding of the outcomes of the research topic and thus add definitions and concepts related to these theories to the research (Grant, 2014).

4.1 Parallel Relationship between Spatial Configuration Characteristics as Variables and the Actors represented by (Built Environment and Users)

Hillier (1996), says that in spatial configuration, each local movement has its formative effect (Kim N. S., 2002). According to Tversky (1999), people, in different spaces are perceived and interacted with differently and are therefore planned differently (Tversky, 1999). Sovanagata (2001) stated that architecture is the end product of the two-way interaction between the act of design and the act of using (Suvanajata, 2000). While Lefebvre (1991) stated that space becomes a place as a result of social practices (Grobler, 2006). To Tuan (2001) space can transform into place when we start adding value to it (Andersson Schaeffer, 2011). Mannum (2005) stated that space can be defined by the behaviour and movement of the user and the nature of the effectiveness of the space (Mzoori, 2014).

According to previous studies, the syntactic and geometric characteristics of a spatial configuration can be considered the characteristics that are decided by the Architectural design represented by (design decisions and built environment) and the perception characteristics are the result of the user's perception (user experience) in the built environment. Therefore, the research was able to identify the parallel relationship between these characteristics on the one hand and the actors on the other hand. As shown in Figure (1).

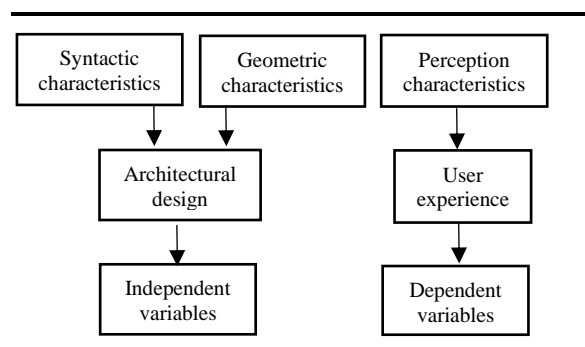


Fig. (1):- Parallel relationships between Spatial configuration characteristics of the actors. (Researcher

4.2 Hypothetical Structure of Theoretical Framework:

To find the relationship between the architectural design represented by the (design decisions, the built environment), and the user's perception of the architectural design, we assume

that there are theories that strengthen the relationship between the two elements. Therefore, the research must search for what theories can be found that connect the user with the architectural design. As shown in the Figure (2).

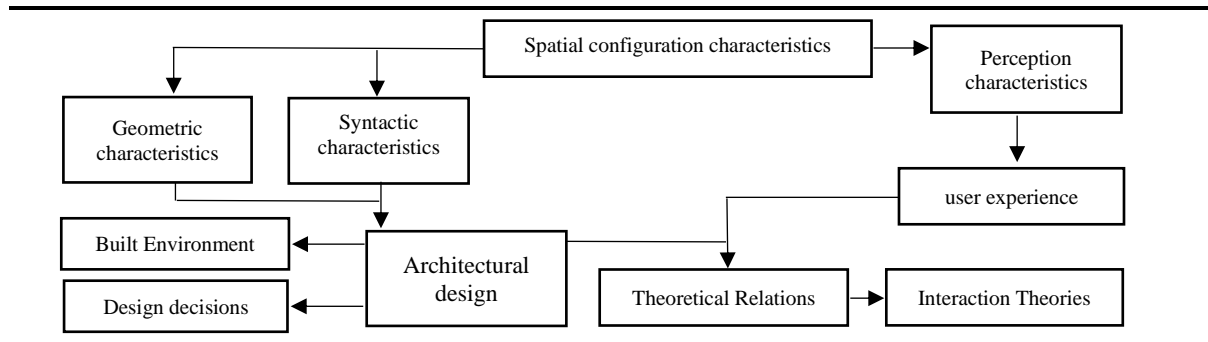


Fig.(2):- Hypothetical structure of the relationship between users and Architectural Design.(Researcher)

Cain (1998) stated that listening to what the user says about the built environment and observing what he does and what he uses expresses his needs in words, and these words translate into different ways of experience, which they seem to translate into stories and images. According to Polanyi (1983), Getting to know the users' thoughts about the built form shows us their vision of the experience, and this gives an incentive to empathize with what they feel. This procedure is a cognitive method to search for implicit signals that cannot be revealed by mere speech (Sanders, 2002).

Architectural Design and User (Interaction Theories)

To create a theoretical framework for research, the theories that link the user experience, the architectural design process, and the built environment must be understood. A theoretical framework can be structured to guide research on a specific topic, incorporating key concepts, theoretical perspectives, hypotheses, and justification for the chosen theoretical approach. Actual theoretical frameworks would be more detailed and tailored to the specific research context and objective.

Design for Experiencing

Users have sufficient potential and creativity when they are provided with the appropriate tools to present their ideas, and this requires contemporary mechanisms for renewal in intellectual and practical journals, resulting in a participatory experience consisting of a set of methodologies and methods that turn individuals into participating designers instead of considering them as users of the built form as stated by Sanders (2002).

User-centric design theory (UCD)

Design choices and choices, in general, are genuine to the degree that they are made by all people who constitute the design community, particularly by all those affected by long-standing

time frameworks as stated by Banathy (1997). According to Boland & Collopy (2004) and Brown & Katz (2009), User-oriented or user-centric design has along these lines ended up being a driving guide for various. In design, hone as well as in the school's client presentation may well be a priori, taken for ethical advantage and an objective for achievement (Sevaldson, 2018).

Human-Built Environment Interaction

According to Karakas (2020), to get the impact of the built environment on human behaviour, outstanding, passionate, and cognitive reactions. Considering the awesome potential inborn in combining information with human-specific resources, such as behaviour, thought, sensation, and feeling. Thus, the relationship between human involvement and the built environment decided to utilize approaches from neuroscience will eminently impact future considerations (Karakas, 2020).

Participatory design Theory

According to Charoenchim (2023), this approach aims to equalize control among members, encourage shared learning, and imagine the long haul. Through discovering spatial needs, and obliging spatial needs, distinguishing spatial needs of building clients by sharing individual and defining common objectives, and ending with collective visualization (Charoenchim, 2023).

Post-occupancy evaluation

According to Preiser & Nasar (2007). However, the process of involvement of building users in design, by utilizing information that can at that point be coordinated specifically and utilized to refine future designs, so that another venture learns from it, in looking to get it a more extensive extent of impacts counting comfort, satisfaction, efficiency, learning, and the more extensive community benefits as a result of engagement within the plan or construct preparation. They utilized an extension of

Table (1) The classification of the conceptual structure of interaction theories between users and architectural design. (Researcher)

N	Interaction Theories	The Reactant	Objectives	Study mechanism	Study Timeline
1	User-centric design	Users and Clients	Potential issues in design	Evaluate the user's experience by Interviews	During design process
2	Human-build Environment Interaction	Users	Future considerations	Evaluate user's experience by various disciplines	After finishing building the environment
3	Participatory design theory	Clients and various disciplines	Collective visualization	Share other disciplines	During design process
4	Post-occupancy evaluation	Users	Refine future designs	Evaluate the user's experience by Interviews	After finishing building the environment
5	Critical Theory of Design	Client and audiences	Conceptual designs	Self-critique by audiences	After finishing the design process or building environment

4.3 Theoretical Framework Structuring

During the study of the five theories (UCD, HBEI, PDT, POE, and CTD), and knowing the indicators for these theories that determine the relationship between the syntactic and geometric characteristics represented by architectural design, on the one hand, and the perceptual characteristics represented by the user's perception of the built environment on the other hand, it became clear that the theoretical relationship is a relationship of an infinite directional nature. Such that these characteristics affect each other in a recurring cycle by using the five theories as an intermediary. Therefore, this strategies and toolkits counting sensors and the checking, client overviews, building walkthroughs, and perceptions, focus bunches, and interviews, as well as visual and participatory instruments (Hay, 2018).

4.4 Critical Theory of Design

According to Dunne, the items of critical design are planning to incite reflection in their audiences, they express elective social hones, values, and innovative conceivable outcomes that evaluate the accepted roles and capacities such as gadgets that draw consideration to the physical

phenomena. To Guess, Critical theories point at liberation and edification, at making the agents mindful of covered-up constraint, subsequently liberating them from that constraint and putting them in a position to decide where their genuine interface lie (Bowen, 2010)

Each theory arrived at will be categorized in terms of the actors in the design process, the goals that are supposed to be achieved, the mechanisms used, and the timeline for the process. See Table (2)

relationship will be drawn through a graphic drawing that defines the mental model that explains the form of this relationship. As shown in the Figure (3).

After determining the type of relationship between the three types of characteristics and the theories that support the form of this relationship. The research was able to determine the form of the measurement tool through which the variables for each characteristic will be measured based on the Hypothesized relationship between the characteristics of the spatial configuration phenomenon and the theories that link these characteristics with each other. As shown in the Table (3)

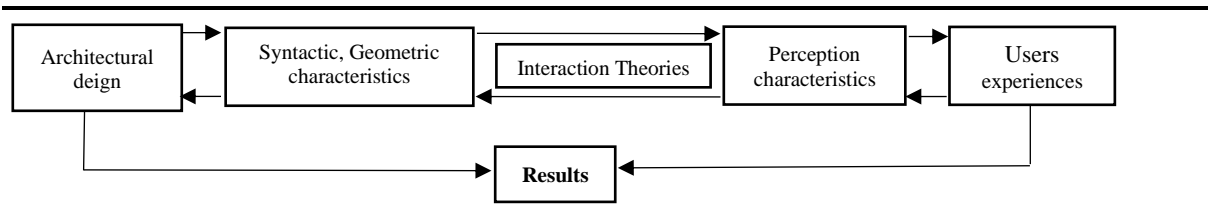


Fig. (3):- Description of the mental model of the Theoretical framework concept. (Researcher)

Table (2):- General Theoretical framework measurement tool Perspective. (Researcher)

Interaction Theories	Dependent Variables	Independent Variables	Hypothesized Relationship
User-centric design	P.C	G.C and S.C	Evaluate user’s experience through interviews during the design process.
Human-built Environment Interaction	P.C	G.C and S.C	Evaluate user's experience by various disciplines after finishing the built environment.
Participatory design theory	P.C	G.C and S.C	Share other disciplines during the design process.
Post-occupancy evaluation	P.C	G.C and S.C	Evaluate user’s experience through interviews after finishing the built environment.
Critical Theory of Design	P.C	G.C and S.C	Self-critique by audiences after finishing the design process or building environment.
Syntactic characteristics: S.C Geometric characteristics: G.C Perception characteristic: P.C			

Due to the limited research and time available for study and the difficulty of obtaining the appropriate basis for dealing with all the

interaction theories that link the user with architectural design, due to the lack of the

Table (3) :-Theoretical Perspective. (Researcher)

Interaction Theories	(Dependent Variables)	(Independent Variables)	Hypothesized Relationship
Post-occupancy evaluation	Attention	G.C and S.C	Evaluate the user’s experience (Comfort, Satisfaction and Efficiency) by (Counting sensors and checking, Client overviews, building walkthroughs, perceptions, Interviews, and Visual instruments) after finishing the built environment.
	Semantics	G.C and S.C	
	Visual communication	G.C and S.C	
	Ethics	G.C and S.C	
	Guidance	G.C and S.C	
	Meaning	G.C and S.C	
	Challenges	G.C and S.C	
	Materiality	G.C and S.C	
	Vitality	G.C and S.C	
Syntactic characteristics: S.C Geometric characteristics: G.C Perception characteristic: P.C			

5. METHODOLOGY

In formulating the research methodology, the theoretical framework will be relied upon as a basis for defining the components of the work. These components serve as a basis for determining the structure of the research methodology, including research procedures, data collection methods, sampling techniques, and data analysis procedures. As shown in the Figure (4)

required tools. In this research, the (post-occupancy evaluation) theory will be chosen as a knowledge base for measuring the syntactic,

geometric, and perception characteristics of spatial configuration. As shown in the Table (4).

5.1 Analyzing Methods

In this research, a set of different mechanisms were used to extract, discuss, and compare the results in different quantitative and qualitative ways. For this reason, the research relied on the two methods to analyze and interpret the data produced by the research.

Through studying previous research, the research was able to find a set of mechanisms and methods extracted from previous research that can be used to measure and analyze the variables.

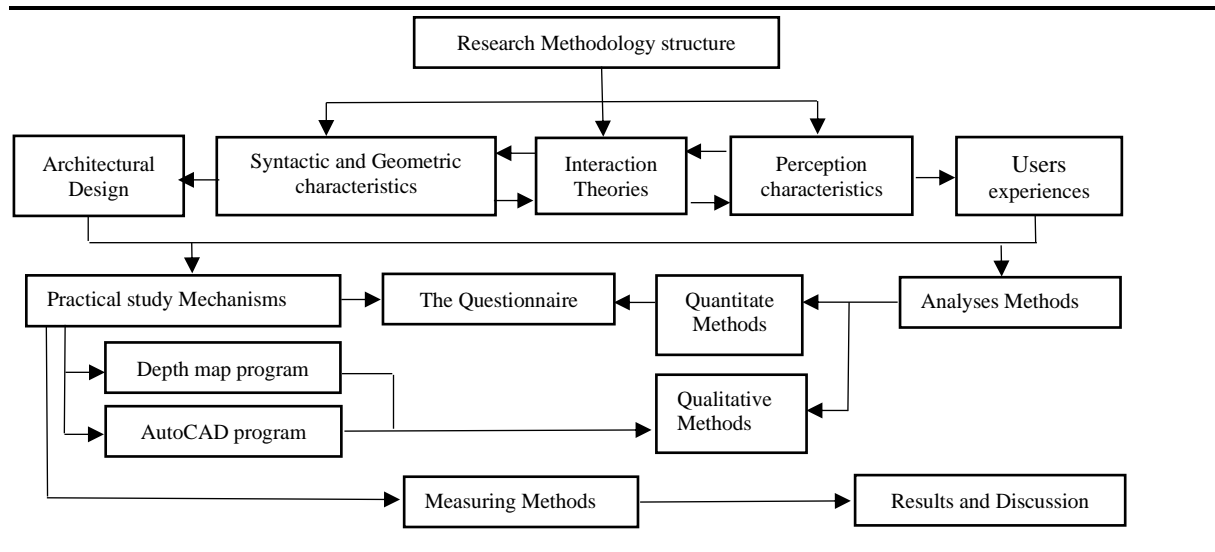


Fig. (4):- Research Methodology structure and Theoretical framework concept as a basic. (Researcher)

The process consists of three different mechanisms that aim to reach more accurate results, which are as follows. The First: is space syntax theory. that analyzed by the (Depth Map) program, which is the program’s graphical analysis of axial and visual maps. This mechanism will used to measure the syntactic characteristic (Integration). The Second mechanism: is the researcher’s geometric analysis of space form by taking measurements from selected samples with an (AutoCAD) program. This mechanism will used to measure the geometric characteristic (Scale). The Third mechanism: (The Questionnaire), consists of ten questions, the first nine of which, each question relates to one of the perception characteristics,

and the tenth question relates to the user’s preferred zone in the spaces that were chosen as samples for the research. This mechanism will used to measure the perception characteristics (Attention, Semantics, Visual Communication, Ethics, Guidance, Meaning, Challenges, Materiality, and Vitality).

5.2 The process of classifying independent variables as low or high Ranking

The variables that will obtain values (first and second Ranking) in the sample will be counted and classified into the first class, and the variables that will obtain values (third and fourth Ranking) will be classified into the second class. As follows in the Table (5).

Table (5) :-Values ranking for independent variables. (Researcher)

Independent variables			
Ranking 1	Ranking 2	Ranking 3	Ranking 4
first-class		second class	

5.3 The Process of Classifying the Dependent Variables as Degree of Significance

For dependent variables, the process will depend on the degree of significance of each variable from the results of the Questionnaire. The variables that will be obtained (First, Second, and Third rankings) were counted in the First

class. The variables that will be obtained (Fourth, Fifth, and Sixth rankings) were counted in the Second class. The variables that will be obtained (Seventh, Eighth, and Ninth rankings) were counted in the Third class. As follows in the Table (6)

Table (6) :-Degree of significance for dependent variables. (Researcher)

Dependent variables								
Ranking								
1	2	3	4	5	6	7	8	9
First class			Second class			Third class		

5.4 Selecting Samples

The research methodology was based on selecting a group of modern buildings in the city of Dohuk, especially after the qualitative leap in the architectural movement and development in construction, and the free trade of building materials. Various ideas were produced by architects and with the participation of users and beneficiaries of the clients and users of these buildings at the spatial design level, especially in the method of forming interior spaces, so it was necessary to research the phenomenon of spatial configuration through a group of variables related to this phenomenon in selected buildings in the period of contemporary architecture.

The architectural leap that occurred in the region produced a large group of administrative, recreational, university, and residential buildings. After lengthy studies, the researcher continued to take specific samples from these various buildings. These samples include buildings

(administration and cultural educational buildings) to which users flock significantly, and due to the limited study time, I was able to take four samples from these designed buildings, which are as follows:

Two of these are (Administration) buildings, which are the (Duhok Court) and the (Directorate of Urban Planning in Duhok City). The second category is the (cultural educational) buildings, which are the (Student Center and Central Library of the University of Dohuk) buildings.

6. RESULTS AND DISCUSSIONS

6.1 Results Integration

After obtaining the graphics generated by the Depth Map software and examining the areas identified by the program as having high value (highlighted in red), the next step involves selecting one or two zones from the sample-based

Table (8) Results of Scale variable from AutoCAD program. (Researcher)

Buildings	Scale1 L1/Hs	Scale2 L2/Hs	Scale3 W1/Hs	Scale4 W2/Hs	Scale5 H/Hs	Average
1 Duhok court	1: 11.6		1: 9.2`		1: 1.88	1: 7.56
2 Student center	1: 27	1: 23.31	1: 8.85	1: 18.28	1: 2	1: 15.88
3 Central Library	1: 29.54	1: 22.48	1: 10.94	1: 9.14	1: 2	1: 14.82
4 Urban Planning	1: 13.94	1: 12.11	1: 4.28	1: 7.08	1: 6.85	1: 8.85

DISCUSSION OF THE RESULTS OF INDEPENDENT VARIABLES

To compare the results of the independent variables, we will take a (statistical range of how the program highlights the high values of these zones. For instance, when it comes to variables such as integration, the program identifies multiple zones with high values.

Afterward, five specific values for each synthetic variable from every zone in a sample

were selected according to the specified method. Subsequently, we calculate the average of these five values. If two zones are selected for the same structural variable within a sample, the average value for each zone is calculated and then combined to determine the overall average for the variable in both zones. Thus, we obtain the initial result for each variable as the average value of the variable in the sample. as shown in the Table (7)

Table (7):- Final results of variables (Integration). (Researcher)

Q	Buildings	Integration
		Average of Zones
1	Duhok court	5.33
2	Student center	8.67
3	Central Library	8.54
4	Urban Planning	9.73

Scale

For the variable (Scale), the length, width, and height of the sample will be measured. If the shape of the area is irregular, all available lengths, widths, and heights will be taken, and then we will determine the form of all relationships (L1/Hs, L2/Hs, W1/Hs, W2/Hs, H/Hs) between these standard units. After that, all the lengths, widths, and heights on the human scale will be

divided (1.75m), and then the scale average from all these relationships for each sample. As shown in Table (8)

data) and spread over it the values of the variables that we obtained from previous analyses conducted for this purpose, then place these values from minimum to maximum. As in the Figure (5)

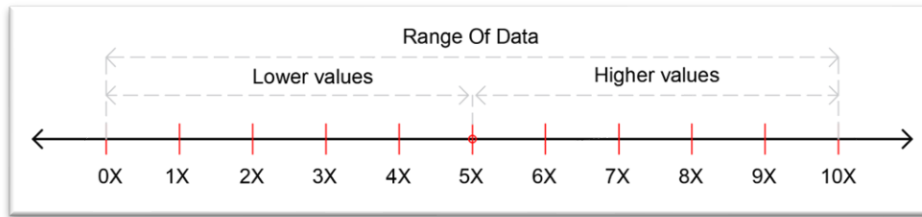


Fig. (5):- Statistical range of the data compares the results of all variables. (Researcher)

The ranging of independent variables according to a statistical range of the data

The value of the syntactic and geometric variables, whether high or low, depends on the specificity of the building in terms of function and

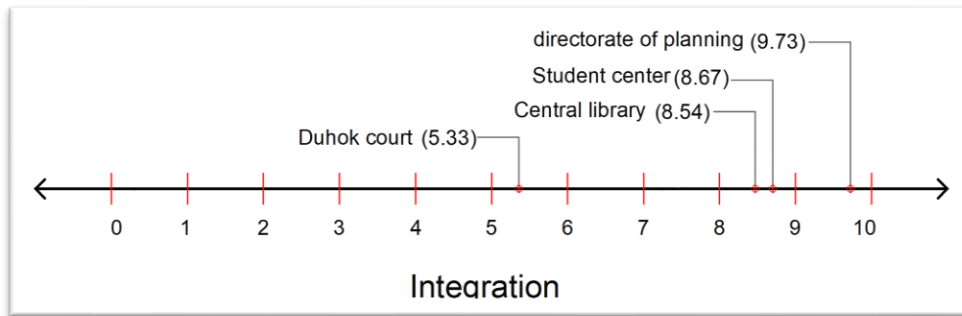


Fig. (6):- Description of (Integration) as an independent variable ranking for all buildings. (Researcher)

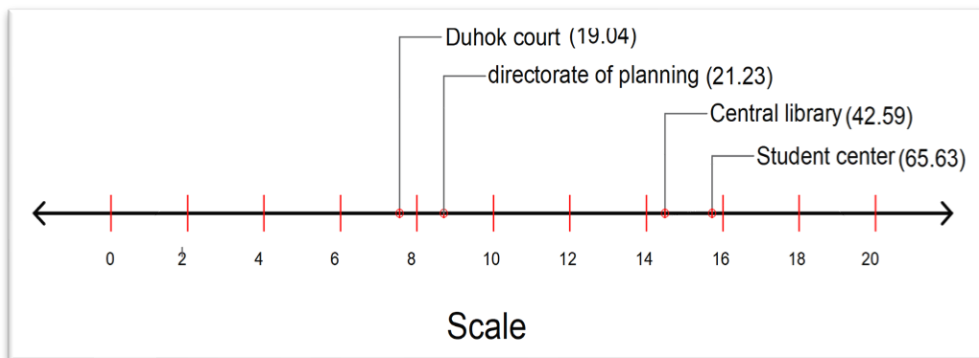


Fig. (7):- Description of independent geometric variable (Scale) ranking for all buildings. (Researcher)

Table (9):- Results of independent variables ranking according to their values. (Researcher)

Variables	Variables ranking according to values			
	Duhok court	Student center	Central Library	Directorate of Planning
1 Integration	4	2	3	1
2 Scale	4	1	2	3

form. The research is not about determining which buildings are the best. However, what is important to this research is exploring the direction and form of the relationship between the variables. As in the Figures (6 and 7) and the Table (9) for all samples.

6.2 The Questionnaire

The Significance Sequence of Dependent Variables According to Questionnaire Respondents

To know the extent of the sequence of significance for all variables, each variable is linked to a specific question that was presented to the respondents. The research concluded these results by conducting a set of statistical analyses. As shown in the following Tables (10, 11,12 and 13)

Table (10):- Variables ranking significance (Duhok court). (Researcher)

Variables	Average	Standard deviation	Response rate	Ranking
Attention	3.30	1.26	0.66	The first
Semantics	3.17	1.15	0.63	The second
Visual communication	2.60	1.05	0.52	VIII
Ethics	2.73	1.15	0.55	Fifth
Guidance	2.67	1.08	0.53	Seventh
Meaning	2.73	1.18	0.55	VI
Challenges	2.50	1.05	0.50	Ninth
Materiality	3.07	1.27	0.61	The fourth
Vitality	3.07	1.06	0.61	The third
General Average			2.8704	

Table (11):- Variables ranking significance (Duhok University student centre). (Researcher)

Variables	Average	Standard deviation	Response rate	Ranking
Attention	1.90	0.81	0.38	Seventh
Semantics	1.80	0.63	0.36	VIII
Visual communication	2.27	1.05	0.45	The fourth
Ethics	1.97	0.82	0.39	VI
Guidance	1.50	0.53	0.30	Ninth
Meaning	2.03	0.65	0.41	Fifth
Challenges	3.20	1.13	0.64	The first
Materiality	2.57	1.14	0.51	The third
Vitality	3.10	1.15	0.62	The second
General Average			2.2593	

Table (12):- Variables ranking significance (Duhok University Central library). (Researcher)

Variables	Average	Standard deviation	Response rate	Ranking
Attention	2.27	1.26	0.45	Seventh
Semantics	3.00	1.19	0.60	Fifth
Visual communication	4.37	0.91	0.87	The first
Ethics	3.67	1.36	0.73	The third
Guidance	1.87	0.89	0.37	Ninth
Meaning	2.17	1.13	0.43	VIII
Challenges	3.10	1.26	0.62	The fourth
Materiality	3.93	1.14	0.79	The second
Vitality	2.73	1.42	0.55	VI
General Average			3.0111	

Table (13) Variables ranking significance (Directorate of Urban Planning in Duhok). (Researcher)

Variables	Average	Standard deviation	Response rate	Ranking
Attention	1.90	0.47	0.38	Seventh
Semantics	2.33	0.90	0.47	Fifth
Visual communication	3.47	1.26	0.69	The first
Ethics	3.20	1.45	0.64	The second
Guidance	1.90	0.95	0.38	VIII
Meaning	1.77	0.69	0.35	Ninth
Challenges	2.23	1.04	0.45	VI
Materiality	2.53	1.19	0.51	The fourth
Vitality	2.60	1.42	0.52	The third
General Average			2.4370	

Discussion of the Dependent Variables (Perception Characteristics) for all Samples

As for the dependent variables, the arrangement was done based on the results of the questionnaires conducted by the researcher in the four samples. The results showed the significance of each question to the respondents when each question corresponds to a specific variable. As shown in Table (14)

Duhok court

- The variable (Attention, Semantics, and Materiality) came in the (first class).

- The variable (Vitality, Ethics, and Meaning) came in the (second class).

- The variables (Guidance, Visual communication, and Challenges) came in the (third class).

Duhok University Student Center:

- The variables (Visual Communication, Ethics, and Vitality) came in first class.

- The variables (Challenges, Semantics, and Materiality) came in (second class).

- The variables (Attention, Meaning, and Guidance) came in the (third class).

Table (14):- Results of dependent variables ranking according to their significance. (Researcher)

Variables	Variables ranking according to significance			
	Duhok court	Student center	Central Library	Directorate of Planning
1 Attention	1	7	7	7
2 Semantics	2	5	8	5
3 Visual communication	8	1	4	1
4 Ethics	5	3	6	2
5 Guidance	7	9	9	8
6 Meaning	6	8	5	9
7 Challenges	9	4	1	6
8 Materiality	3	6	2	3
9 Vitality	4	2	3	4

Demonstrate the Form and Direction of Relationships Between (Syntactic and Geometric Characteristics) and (Perception Characteristics)

The research will present the form and direction of the relationships of the independent and dependent variables with each other through a set of indicators prepared for this purpose, which are as follows: As shown in Tables (15, 16, 17 and 18)

Positive direct relationship

If the value of the independent variable increases and the significance of the dependent variables increases.

Non-linear relationship

If the value of the independent variable increases or decreases and the significance of the dependent variables increases, and vice versa.

Inverse relationship

If the value of the independent variable decreases and the significance of the dependent variables increases, and vice versa.

Duhok University Central Library:

- The variables (Challenges, Materiality, and Vitality) came in the (first class).

- The variables (Visual Communication, Meaning, and Ethics) came in the (second class).

- The variables (Attention, Semantics, and Guidance) came in the (third class).

Directorate of Urban Planning in Duhok.

- The variables (Visual communication, Ethics and Materiality) came in the (first class).
- The variables (Vitality, Semantics, and Challenges) came in the (third class).

- The variables (Attention, Guidance, and Meaning) came in the (third class).

Negative direct relationship

If the value of the independent variable decreases and the significance of the dependent variables increases.

Table (15):- Classifying of form and direction of relationship for the (independent, dependent) variable for Duhok court. (Researcher)

Class	variables	Class 2	
		Integration	Scale
Class 1	Attention	⊙	⊙
	Semantics		
	Materiality		
Class 2	Vitality	⦿	⦿
	Ethics		
	Meaning		
Class 3	Guidance	○	○
	Visual communication		
	Challenges		

● Indicator of a positive direct relationship
 ⦿ Indicator of Non-linear relationship.
 ○ Indicator of a negative direct relationship
 ⊙ Inverse relationship.

Table (16) Classifying of form and direction of relationship for the (independent, dependent) variable for Duhok University student centre. (Researcher)

Class	Variables	Class 1	
		Scale	Integration
Class 1	Visual communication	●	●
	Ethics		
	Vitality		
Class 2	Challenges	⦿	⦿
	Semantics		
	Materiality		
Class 3	Attention	⊙	⊙
	Meaning		
	Guidance		

● Indicator of a positive direct relationship
 ⦿ Indicator of Non-linear relationship
 ○ Indicator of a negative direct relationship
 ⊙ Inverse relationship

Table (17) :-Classifying of form and direction of relationship for the (independent, dependent) variable for Duhok University Central Library. (Researcher)

Class	Variables	Class 1	Class 2
		Scale	Integration
Class 1	Challenges	●	⊙
	Materiality		
	Vitality		
Class 2	Visual communication	⦿	⦿
	Meaning		
	Ethics		
Class 3	Attention	⊙	○
	Semantics		
	Guidance		

● Indicator of a positive direct relationship
 ⦿ Indicator of Non-linear relationship
 ○ Indicator of a negative direct relationship
 ⊙ Inverse relationship

Table (18) Classifying of form and direction of relationship for the (independent, dependent) variable for directorate of Urban planning in Duhok. (Researcher)

Class	variables	Class 1	Class 2
		Integration	Scale
Class 1	Visual communication	●	⊙
	Ethics		
	Materiality		
Class 2	Vitality	◐	◐
	Semantics		
	Challenges		
Class 3	Attention	⊙	○
	Guidance		
	Meaning		

- Indicator of a positive direct relationship
- ◐ Indicator of Non-linear relationship
- Indicator of a negative direct relationship
- ⊙ Inverse relationship

Form and direction of the relationships between syntactic, geometric, and perception characteristics

Positive direct relationship

In this type of relationship, the independent variables (Integration, Scale) affected the dependent variables (Attention, Semantic, Visual communication, Ethics, Challenges, Materiality, and Vitality). but the dependent variables (Guidance and Meaning) were not affected by the independent variables. See Table (19)

Non-linear relationship

In this type of relationship, the independent variables (Integration, Scale) affected the dependent variables (Semantic, Visual communication, Ethics, Meaning, Challenges, Materiality, and Vitality). but the dependent

variables (Attention and Guidance) were not affected by the independent variables. See Table (19)

Negative direct relationship

In this type of relationship, the independent variables (Integration, Scale) affected the dependent variables (Attention, Semantic, Visual communication, Guidance, Meaning, and Challenges). but the dependent variables (Ethics, Materiality, and Vitality) were not affected by the independent variables. See Table (19)

Inverse relationship

In this type of relationship, the independent variables (Integration, Scale) affected the dependent variables (Attention, Semantic, Visual communication, Ethics, Guidance, Meaning, Challenges, Materiality, and Vitality). but the dependent variables (Ethics, Materiality, and Vitality) were not affected by the independent variables. See Table (19)

Table (19) :-Conclusion of independent and dependent variables within the same relationship for all samples. (Researcher)

All samples	Independent variables	Dependent variables	
	Integration and Scale	Attention, Semantics, Visual communication, Ethics, Challenges, Materiality and Vitality	●
		Semantic, Visual communication, Ethics, Meaning, Challenges, Materiality and Vitality	◐
		Attention, Semantics, Visual communication, Guidance, Meaning and Challenges	○
		Attention, Semantic, Visual communication, Ethics, Guidance, Meaning, Challenges, Materiality and Vitality	⊙

7. CONCLUSIONS

7.1 Theoretical Conclusions

The research concluded that the user’s perception of built environments is an integral part of the characteristics of the phenomenon of spatial configuration. the process of perception is what shapes the user’s experience through a set of characteristics that can be considered dependent variables that are affected by the main independent variables. This link can be considered as the knowledge base for the role of

the phenomenon of spatial configuration in user perception.

By understanding the relationship between the geometric, syntactic, and perceptual characteristics of spatial configuration in architecture, the research arrived at five theories that link the characteristics of the built environment to users’ perception. These theories were developed in the research as a theoretical basis for measuring the various characteristics of spatial configuration with the possibility of

defining goals, strategies, mechanisms, methods, and times of operations, and determining the form and direction of the relationships between these characteristics that take place in the architectural field. These theories are as follows:

- User-centric design theory
- Human- build environment interaction
- Participatory design theory
- Post-occupancy evaluation theory
- Critical theory of design

The research discovered that the relationship between the characteristics of the spatial configuration related to the built environment (syntactic and geometric characteristics) and the characteristics related to the user’s perception (perception characteristics) has a directional nature and does not depend on their intensity or strength.

The research was able to explore four types of relationships of linear or non-linear directional

nature through the influence of the syntactic and geometric characteristics of the spatial configuration, on the one hand, and the perception characteristics, on the other hand, effect on each other. As follow:

- Positive direct relationship
- Non-linear relationship
- Negative direct relationship
- Inverse relationship

7.2 Practical Conclusions

It has been shown that these syntactic, geometric, and perception spatial configuration characteristics change in order of significance from one building to another, even if the buildings’ functions are similar. Or we can say that the function of the built environment was not a decisive factor in determining the significance values of these characteristics. This would show us that each built environment affects the perception of its users differently, forming a complex dynamic relationship. See Table (20)

Table (20) :-Description of Samples with different significance values. (Researcher)

Dependent Variables	Variables significance values			
	Administration buildings		Cultural -Educational buildings	
	Duhok court	Directorate of Planning	Student Center	Central Library
Attention	1	7	7	7
Semantics	2	5	5	8
Visual communication	8	1	1	4
Ethics	5	2	3	6
Guidance	7	8	9	9
Meaning	6	9	8	5
Challenge	9	6	4	1
Materiality	3	3	6	2
Vitality	4	4	2	3

The study discovered that the relationship between characteristics of the spatial configuration of these buildings with similar functions is characterized by the identical direction of the relationship. This would show us

that the user's perception of the built environments was not spontaneous, but rather resulted from a real evaluation of these environments. See Table (21)

Table (21) :-Description of Samples of the same relationships. (Researcher)

Building types	Samples	No. of Relationships			
		●	◐	○	◑
Administration buildings	Duhok court	2	8	6	8
	Directorate of urban planning				
Cultural -Educational buildings	Student center	6	8	2	8
	Central Library				

Based on the respondents' answers to the four buildings that were taken as samples for the research (Dahuk Court, Duhok University Student Center, the Duhok University Central Library, and the Directorate of Urban Planning in Duhok). The research reached the significance of the nine perception characteristics for

contemporary architecture in general in the city of Dohuk, for all samples. It was found that the variable (Vitality) comes first and the variable (Challenges) comes last at the level of all samples concerning its significance by the respondents, as shown in Table (22)

Table (22):- a percentage of average significance for all dependent Variables in all samples. (Researcher)

Q	Dependent Variables	Ranking significance
1	Vitality	92.78 %
2	Visual communication	92.23 %
3	Materiality	92.23 %
4	Ethics	91.12 %
5	Semantics	88.89 %
6	Guidance	88.89 %
7	Attention	87.78 %
8	Meaning	84.45 %
9	Challenges	81.67 %

7.3 Statistical Conclusions

For Syntactic and Geometric characteristics, variables (Integration and Scale), it was found that there are no significant differences between all samples because the p-value for all samples is less than (0.05).

For Perception characteristics, and variables (Attention, Semantics, Visual communication, Ethics, Guidance, Meaning, Challenges, Materiality and Vitality.), it was found that there

were no significant differences between all samples because the p-value for all samples was more than (0.05).

However, regarding the respondents' tendency to disagree with the samples (Duhok University Student Center and Directorate of Urban Planning in Duhok), it was found that there was a significant difference.

Table (23) :-Orchestral device for the characteristics of spatial configuration. (Researcher)

Spatial configuration characteristics	Independent variables (Syntactics and Geometric Characteristics)				Architectural design Results
	The Manipulation of Ranking		Increase or Decrease of Values		
Dependent variables (Perception Characteristics)	Increase or Decrease of Significance		●	●	○
	○		○	○	○
	●		○	○	○
	○		○	○	○

● Indicator of a positive direct relationship ○ Indicator of a negative direct relationship
 ○ Indicator of Non-linear relationship ● Inverse relationship

7.4 Summary

This study concluded that by controlling the order of significance of spatial configuration characteristics, we can control the characteristics of built environments. These characteristics can be used as mechanisms for many processes that guide and influence the user in one way or another. It helps the architect control the bulk of the interactions that occur within the built environment.

The conclusions showed that the relationship between syntactic and geometric characteristics on the one hand and perception characteristics on

the other hand in theories of interaction between the user and the present or future built environment has a two-way effect, as the syntactic and geometric properties form the users' perceptions, and the users' perceptions form the syntactic and geometric characteristics of the phenomenon of spatial configuration. This iterative approach ensures that architectural environments are designed to meet the needs and preferences of the people who inhabit them. Ultimately, the research was able to reach the final form of this relationship and it was named

the orchestral device for the characteristics of spatial configuration. As shown in Table (23)

REFERENCES

- AL-Dabbagh, S. a.-D. (2019). Similarity Between Inside and Outside in Architecture A Comparative Study Between Mies Van der Roh& Robert Venturi Trends.
- Alfirević, Đ. a.-A. (2019). Design principles for achieving spatiality in living space.
- Ali, O. (2007). Legibility in the Urban Environment.
- Andersson Schaeffer, J. (2011). Communication space: Spatial design in the manufacturing industry.
- Andersson Schaeffer, J. (2011). Communication space: Spatial design in the manufacturing industry.
- Awan, N. T. (2013). *Spatial agency: Other ways of doing architecture*.
- Bell, D. a. (2020). *Political theory and architecture*.
- Bowen, S. (2010). Critical theory and participatory design.
- Carmona, M. (2021). *Public places urban spaces*.
- Charoenchim, N. (2023). Participatory Design in Architecture: A toolkit to communicate needs between architects and users.
- Ching, F. D. (2023). Architecture: Form, space, and order.
- Devmane, S. O. (2022). "Human-building interaction towards a sustainable built environment: A review.
- Dursun, P. (2009). Architects are talking about space.
- Eşingen Kınayoğlu, G. (2022). The architectural cogitatio: a phenomenological critical realist contact for the ethical-political prognosis of the 21st-century architecture theory.
- Fisher, T. .. (2008). *Architectural design and ethics*.
- Fujita, H. (2019). A history and geography of contemporary architecture.
- Gabr, M. M. (2019). Spatial configuration pattern an approach to space assessment.
- Grant, C. A. (2014). Understanding, selecting, and integrating a theoretical framework in dissertation research: Creating the blueprint for your "house.
- Grobler, A. a. (2006). *Criteria for spatial definition: architectural and urban interiors of the Constitutional Court, Johannesburg*.
- Gudkova, T. V. (2017). "Spatial Modernist Architectural Artistic Concepts."
- Günaydin, A. S. (2020). *Evaluation of the history of cities in the context of spatial configuration to preview their future*.
- Hasgül, E. (2015). Space as configuration: Patterns of space and culture.
- Hay, R. e. (2018). Post-occupancy evaluation in architecture: experiences and perspectives from UK practice.
- Hidayatun, M. I. (2014). Vernacular architecture as an alternative design approach with the interpretation of Paul Ricoeur's critical theory.
- Ibrahim, A. M. (2006). Architectural Design Process Based on Spatial Human Behavior Parameters through Computational Methodology." 5th International Conference on Mediterranean Cultures in Art and Architecture.
- Işıklar, S. (2017). *Vitality of the Cities*.
- Jamal-E-Din Mahdi Nejad, A. S. (2018). Interaction between Architecture and Environment; Investigating.
- Jiang, B. C. (2000). Integration of space syntax into GIS for modelling urban spaces.
- Karakas, T. a. (2020). Exploring the influence of the built environment on human experience through a neuroscience approach: A systematic review.
- Katona, V. (2015). From static space to dynamic architecture: The changing principles of contemporary European church architecture.
- Khalesian, M. P. (2009). . "A GIS-based traffic control strategy planning at urban intersections.
- Khan, A. Z. (2014). *Integrative spatial quality: A relational epistemology of space and transdisciplinarity in urban design and planning*.
- Kim, N. S. (2002). *Challenges for architectural level power modelling*.
- Kim, Y. O. (1999). Spatial Configuration, Spatial Cognition and Spatial Behaviour: the role of architectural intelligibility in shaping spatial experience.
- Klarqvist, B. (2015). *A space syntax glossary*.
- Longo, D. A. (2022). PROXIMITY" AS A DESIGN STRATEGY FOR SUSTAINABLE, COLLABORATIVE AND INCLUSIVE URBAN PUBLIC SPACES.
- Martyniv, O. a. (2017). "Using a systematic approach in the analysis of the factors that influence on a form formation of buildings of higher educational establishments.
- Mzoori, F. A. (2014). Spatial configuration and functional efficiency of house layouts.
- Papastergiadias, N. (2010). *Spatial aesthetics: Art, place and the everyday*.
- Piethaan, M. (2012). Perception of proximity.
- Pradono, B. (2019). The interiority of proximity between nature and architecture in contemporary and tropical contexts with case studies.
- Rana, J. P. (2021). Quantitative Methods.
- Sanders, E. B.-N. (2002). From user-centred to participatory design approaches.
- Sevaldson, B. (2018). Beyond user-centric design.
- Shahbazi, M. M. (2018). A comparative analysis of spatial configuration in designing residential houses using space syntax method (case studies: houses of Isfahan and modern architecture styles.

- Shahedi, B. N. (2010). Classification of Meaning in Architecture.
- Sinton, D. S. (2017). Critical spatial thinking.
- Skaza, M. (2019). Architecture as a Consequence of Perception.
- Soltani, S. e. (2022). The role of spatial configuration in moderating the relationship between social sustainability and urban density.
- Suvanajata, R. (2000). Relations in Architectural Space.
- Thier, P. T. (2002). *The functional architecture of attention*.
- Tonnelat, S. (2010). The sociology of urban public spaces.
- Tversky, B. e. (1999). *Three spaces of spatial cognition*.
- Ugwu, C. ". (2023). Qualitative Research.
- Üngür, E. (2015). *Space: the undefinable space of architecture*.
- Usman, M. e. (2018). Interactive spatial analytics for human-aware building design.
- Xavier, J. C. (2022). Enhancing Functionality and User Experience through User.
- Yan, P.-H. (2014). The Study of Design Semiotics and Architectural Space Semantics.