

THE CONCEPT OF DYNAMISM AND MOVEMENT IN ARCHITECTURE

A.B. MOHAMMED¹

ABSTRACT

The research addresses the concept of dynamism and movement in architecture; also the role of time, the human's eye, and perception to classify it “latent or movement”. In addition, analyzing international projects about the thought of dynamism, and employing the vocabulary of the formation. Because of the thought of some architects in the static of the building, which gives the feeling of boredom. In addition, fixed forms are no longer able to meet the needs of users, especially with the increasing of climatic changes and advanced activities. Besides, the misconception that dynamism is only to move the building without looking for the architectural thought behind it, which depend on definite rules and the designer's experience and practice. Therefore, the aim of the research is to guide and employ the concept of dynamism in design, what governs it from the architectural thought to be interactive dynamic buildings by concluding and formulating a methodology to link and reconcile among opportunities of movement, technology “systems – materials”, the required performance, and the factors affecting. Moreover, determining any types of movement more properly and suitable for the nature of the project to root the concept of dynamism, and to give the building an architectural character.

KEYWORDS: Dynamism, form, perception, vitality, latent, movement, virtual, construction technology, interactive dynamic building.

1. INTRODUCTION

From the advantages of the movement is that it makes the buildings and the projects as attractive and distinctive signs in their environments and take into account environmental design. This reflects on the users in breaking the monotony and boredom, spreading the spirit of vitality, excitement, and pleasure. Therefore, the building turns from the state of stability to an active building that interacts with the inside and outside together [1]. The concept of movement reflects what architecture accessed from technical changes, evolving the methodological rules, controlling in the

¹ Lecturer, Architectural Engineering Department, Faculty of Engineering, Fayoum University, Egypt.
Email: abg00@fayoum.edu.eg

forms of movement, and selecting masses and designs inspire the dynamism. Also, vitality in the elements of the project, which require the knowledge of them, and consist of it the architectural elements that give the sense of movement, what the impact and power of each it, which emphasizes the idea of smart interactive architectural environments [2].

2. RESEARCH PROBLEM

The thought of some architects, which leads to the stability of the building and its façades, which gives the sense of monotony and boredom, as well as the difficulty of obtaining the movement in the buildings have fixed forms and masses. Also, the fixed forms in the traditional architecture are no longer able and appropriate to meet human's needs, especially with the increase of climate change and developed activities within the building [3]. Therefore, some architects go to search for the dynamism in design as a different vision in the architecture of the future to get vitality and excitement in the forms, external and interior formations to give a spirit for the buildings. These all have demonstrated the need to search for mechanisms and principles that work on employing and activating the thought of dynamism, whether the latent or movement in its designs.

3. RESEARCH OBJECTIVE

Formulating and preparing a mechanism and a methodology that guides the process of dynamism (latent or movement) and any the types of them are more appropriate and suitable for the type of building to be an interactive dynamic building.

It can be achieved through the following sub-objectives:

- A. Studying and analyzing the concept of dynamism in design, and its development as one of the contemporary smart environmental trends.
- B. Tracking and monitoring the evolution of movement with time because of the technological development and the human's eye in the perception of movement.
- C. The designer should recognize the different concepts of movement and thought which governs it, and the addition of vocabulary and new tools for the formation

that can be based on reassessing the building in terms of its classification as static or dynamic.

D. Restructuring the types of dynamism (latent or movement), and achieving higher levels of the movement as the level of interaction with the surrounding environment and the virtual movement.

E. Rooting the concept of movement and the features of dynamic in the buildings by concluding and formulating a mechanism or a methodology to guide and employ the dynamism in design to reach to an interactive dynamic building.

4. RESEARCH METHODOLOGY

4.1 Theoretical Approach

The inductive method of studying the concept, development, and classification of dynamism according to the perception side, and the role of time in design, and the perception of movement, and exposure to the applications of dynamism to classify the dynamic thought according to the cognitive aspect.

4.2 Analytical Approach

Analyzing the applications of the dynamic and movement through the stability of the design, and classifying the movement. The role of methods and physical components to express about the movement, technology in moving the building and the thought of virtual movement. In addition, studying the design thought of the movement and varied sources of the designer in modeling, and benefiting from each case in supporting the thought of dynamism as a methodology to find an architecture is characterized by the strength, vitality, and give an architectural character of the building.

4.3 Deductive Approach

Concluding and formulating a mechanism and a methodology to guide and employ the concept of dynamism in design, as a dominant architectural thought impose itself, and it became was targeted by architects to reach to an interactive dynamic building.

5. FIRST: THEORETICAL APPROACH

5.1 Architecture and the General Concept of the Dynamism

The concept of movement in architecture is a reflection of the changes that happened in the past and continuous developments in the fields of science and technology, which led to space, which lost its traditional dimension to create unconventional architecture. The movement involves two ideas: the change and time. The change may occur objectively in the visual or mental field in the process of cognition or both. The time here, in all the cases, we must differentiate between the objective and mental aspects of the movement in the design [4]. The movement in the design occurs in the visual or mental field, and getting the movement in the formation requires specific rules to perform it. Identifying the dynamic values of each element of the elements of the formation, where the movement produced from ordering the elements of formation in design in sequence to indicate to the movement, but at a lower rate. The existence of many changes among the elements leads to the sense of movement; to produce a dynamic force that gives vitality to the project; by adapting the characteristics of formation elements of the line, surface and texture [5]. In addition to the technology of computer in the choice of a design that inspires the dynamism, which makes these projects attractive points and landmarks in their surrounding urban [6].

5.2 Evolution of the Concept of Dynamism

The concept of movement began in the fields of art and literature in Italy, where the desire for the change, elimination of the stalemate and adoption of speed, energy and movement, then inserting it into the field of architecture. In many ancient civilizations, human transformed the buildings into a great symbol and increased its stability to resist time. Architects in the 1920s used a number of the methods to express the movement, which means using oblique levels, emphasizing on the horizontal and speed of the rhythm of facades and the dynamic curves, which are still used in the architectural projects [7]. However, with the beginning of the current century, the architect began in realizing a dream of the application of movement in

buildings as one of the smartest solutions for their treatment in an integrated environment with the requirements of the users of the building. Architect started, applying the movement through the large kinetic roofs in the sport and entertainment buildings, because of the need of architects to implement a variety group of the integrated activities with the outdoors and at the same time, it can be controlled it to become a closed space. Now it has begun to focus on applying the movement on the cover of the building so that it is able to regulate the internal environmental conditions with the external environmental changes [2]. Even if the design of the mass of the building is simple in terms of the formation. Multimedia and technology changed in features and the language of architecture by changing its external facades and dissolving the boundary between form and function. Architecture has become a reaction to this electronic age, and not a spatial and a temporal container to its civilization [8]. The integration of nanotechnology and its potentials to change the properties of materials, control the characteristics of form, change the volumes, raise the level of energy efficiency and treat materials; to interact with the internal and external environment to architectural output, and change the attributes; to achieve “environmental-formative-technological-climatic” objectives and the fifth dimension “Informatics”. This integration resulted in a development in the concept and level of movement to the interaction with the surrounding environment [6]. The tools used in drawing that affect the way of thinking to come out with the design directly affect the design stages. When using the tools of flat drawing “ruler and triangle”, the solution was based on a square grid and the cubes in the architectural form. While in the era of the digital revolution, and using the computer has become one of the formation alternatives in the hands of the architect, and can meditate and prepare the executive drawing, whether they are explicit or complex forms that in the past have been difficult and they are reluctant to agree to implement. In addition to using the smart software and nanotechnology has re-looked at the shapes that are classified as simple in the architectural form as the cube with a new vision using the interactive surfaces, and a simulation all these tools seek to achieve the highest levels of movement and formation which expressing of the era.

5.3 The Classification of Dynamic

The term of dynamic refers to both the total movement and partial movement:

5.3.1 The movement “partial movement”

It is the change in the situation does not require the changing in the place.

5.3.2 The motion “total movement”

It is the continuous change in a location of the body in relation to a location of another object are assumed it is constant.

The movement in architecture depends on two main factors: [1]

- The first factor: Benefiting from the human perception of dynamism in giving the spirit of movement in the still image, where the movement is only a developing concept to the conscious dynamism [3].
- The second factor: It relates to the same form where the dynamism does not use the usual coordinates of design (X, Y, Z), but depends on temporal time coordinates similar to the coordinates of energy [5].

5.4 The Concept of Time in Design

Many scientists, also the architects addressed the concept of time as a term that has an impact on all aspects of life. Science until this moment still reveals to us that the time has a great importance. This was at the level of physiological influence on human or on his environmental and urban surroundings or on his tools and uses. However, the virtual worlds through the means of communication can jump on the time, crossed the borders and exceeded the distances, and this forces us to understand the impact of time in the world in architecture and urban design now [9].

5.4.1 The concept of time and the perception of movement

Human defined the concept of time by perceiving the change that occurs in one place and its memories, and the most prominent of these changes refer to this concept:

- The first: what human is sensing and noticing as the physiological change in his body of the disability or old age [5].

- The second: human is noticing the cyclical change in the movement of the universe, sun, and moon. These two types had a particular importance, where the physiological type has a clear direction from young to old, but the direction of human's memory confirmed on the idea of time at him [10].

5.4.2 The concept of time and the contemporary

The concept of movement in architecture expresses the dual relationship between the time and place, also the continuous developments in the science and communications, the changes occur in all aspects of life, which made a new unconventional architecture. The concept of movement in architecture represents one of the developments, which made architecture enters the contemporary reality [7]. “Hassan Fathi”, says that the change and transformation in architecture to be appropriate and not random require its compatibility with changes in the surrounding environment to make it contemporary to its time and place [10]. Since “Vitruvius”, architecture has been understood as an organization between the space and time. Now the mention of space and time is often associated with the modern technology and informatics. “Fischer”, defines time as the most powerful dimension in life. Skyscrapers are a new era in architecture, and it comes as a reaction to a life that changes very rapidly and these changes in the scale of time are repeated as clockwork; so the changes in architecture have their associated trends with the human’s psychophysical developments. This development shows its effects on the architectural product [4].

5.5 The Importance of The Role of Eye in the Design

The eye distinguishes between the types of movement, either dynamic or static in the design. Therefore, we have to think during the process of design with the movements of the eye that we put this as a fixed system for the routes of the eye. However, it is better for us to distribute the attractiveness and important direction, as well as a strength of the ideas of various movements to create a dynamic form of its own. This means finding the distribution that keeps the movement of the eye within the design to attract attention and there should be no gaps allow the eye to escape from

the shape [5]. The architectural projects that give the sense of movement, give the design the pleasure and excitement. The movement represents the continuous change in the position of the image, as long as it does not interfere with the function required by the power of formation. We cannot force the eye to walk in a decrepit way. The good movement design requires hundreds of the ways to read it, and this factor has a big role in distinguishing between the fertile form and the simple form. We must think in the designs with two ways, either show the fully clear movement is or be less clear, which is due to the design concept and the ability of the designer.

6. SECOND: ANALYTICAL APPROACH

6.1 The Applications of Dynamism

The concept of dynamism is a concept that adds the life to the design by controlling in the dynamic strength of fixed elements, and guiding the user's eye in the project in an infinite experiment [11]. The thought of movement in architectural design has a great importance in a reflection of psychological, environmental and aesthetic implications on human, which represents a new vision of human that helped a lot of technological progress that the world reached in all fields. This strongly prompts the emergence of this trend not only at the level of the general form of the mass, but expanded to the spaces, interior details, furniture, external spaces, other elements and creative ideas [12]. The interest in the movement translated into a number of the applications, in directing the integrated mechanical capabilities with the systems of the computer and sensor to merge with some to show the movement in the building, and the applications of dynamic in the buildings are known as:

A. The first case: the applications of dynamic, which have the variable mobility, according to its structural system through the simple difference between the methods and means. The methods mean the obvious movement of the naked eye, such as the folding, sliding, zoom in and out or conversion. While the means are used to achieve this type of the movement and include all the instruments ranging from the mechanical technology to the chemical technology; the application of dynamism shows according to (the direction of movement and rotation) [13].

B. The second case: the applications of dynamic through the formation, it is a change that occurs in the same location without affecting the area that works in [12].

From the above, we can classify the thought of dynamism according to the cognitive aspect of the design to two basic concepts:

6.1.1 The mental movement in the process of perception “The latent dynamism”

It exists in all aspects of the perception, represents the idea of movement in a simple and formal manner and what including constant formative relationships resulting from the simulation of movement and time. There are many potentials and relationships, such as the formation, juxtaposition, overlay, friction, exaggeration, absence as a few of the techniques and potentials used by the architect to express the apparent movement without the existence of time [13]. The main idea of the static movement does not depend on the direct physical movement, but is indirectly represented by the expressive form of the movement that depends on the nature of form, where each shape has values different in its mental movement or in parts of it in the same field [14]. The movement through the stability in design is the dynamic of architectural form of the building means the dazzling with the movement, which simulates the dynamic movement, but at rates lower than the changes resulting from the dynamic movement [8]. Therefore, the line and curved surface of the highest variables that give a continuous change in the building mass and architectural space that includes several components such as the position, direction and size [6]. It is the movement by inspiring through the arrangements of the elements, lines, basic forms and levels of the building to give the sense with the movement. The theories of architecture spoke about the different concepts of the forms, convergence of edges, transcendence and sequence. Also, the movement is resulted from the disassembly, inclination, torsion of mass, or which resulting from the influence of certain cosmic phenomena on the building and its facades as the wind or earthquake [7] as in Fig. 1, which give vitality to design as in Fig. 2. All of these give the ability of the architect on the formation, complexity and hybridization among the elements [12].

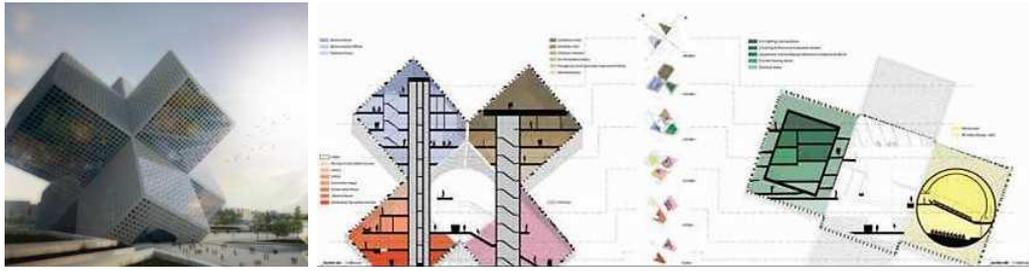


Fig. 1. Istanbul disaster prevention and education center; shows the mass of the building and the method of latent dynamic [8].

The concept suggests that these disaster rehabilitation programs are cubic units connected to each other, suffer from the impact of natural disasters, fall to achieve structural stability on the ground, and the outer shell of the facade in the form of engineering units gradient openings that act as filters for lighting and ventilation.



Fig. 2. The museum of the drawings and animated films at the international annual festival of animation at China [8].

The concept of the project depends on the choice of the modular unit and oval shape. Also, dealing with the characteristics of the shape and its transformations in the third dimension, and its idea of design a series of six spaces in the form of balloons in order to allow a circular round of the entire building. Each balloon occupies a component of the project such as education, theaters, three cinemas, and a comic book library. The interaction between the balloons in the interior creates a large gap between the spaces that is used as storage units, natural ventilation, and cooling. It promotes the sustainability of the building, exploits the spaces among the balloons to improve the efficiency of the energy and reduces the need for air conditioning.

6.1.2 The objective movement in the visual field “The movement dynamism”

The dynamic here means the change in time that is as the fourth factor “time” in design to become a dimensional quadrilateral. Where this concept can change the

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building from the movement of all or some of its elements at a constant or variable speed, until it has the ability to rotate around itself as in Fig. 3. The objective movement in the visual field is characterized by being the largest area of the movement in the process of cognition [10]. Dynamic architecture offers enormous and unlimited potentials in the outer surrounding based on a unique and developed architectural structure by combining among the movement, green energy, and effective structure that change the entire moving building or some its elements as in Fig. 4. Therefore, dynamic architecture promises a new era for dynamic buildings are environmentally sustainable, and it has the ability to generate energy, for themselves and for others around them, despite using the high technology, they are economic buildings that provide energy consumption. In addition to the potential of controlling in the form of facades and reduce the emission of heat, which reduces the consumption of energy used in air conditioning [14]. The dynamic with its aesthetic concept represents a new vision of human, where this concept emphasizes that the area in which human lives must be dynamic as in Fig. 5, adaptable and the change according to his wishes and needs [13].



Fig. 3. Rotating Skyscraper Project United Arab Emirates shows the form, the shape of the plan and style of the movement dynamism and balance of mass [4, 15].

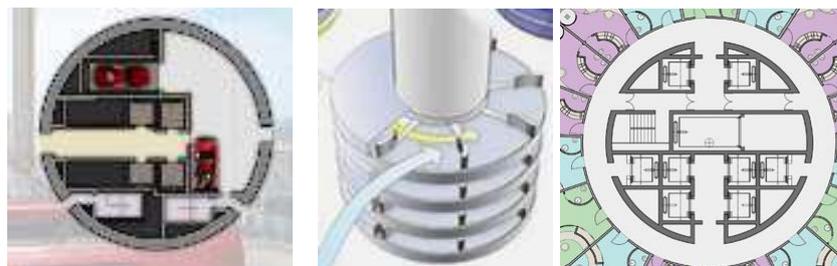


Fig. 4. Illustrates the movement structure system and style of the movement [4].



Fig. 5. Rotating Skyscraper Project United Arab Emirates Illustrates the movement dynamism of the formation and changing its exterior shape constantly [4, 15].

Dynamic in its executive concept requires tremendous technological progress, and by the architectural applications, a process of the integrating of static movement aesthetics with the technological innovations can be reconsidered by using the mechanical motors, sensors, monitoring and microcontrollers with the systems of the computer as in Fig. 6. This integrated system can combine the time with the traditional static movement to the design of dynamic movement in an integrated way [12].



Fig. 6. The Poseidon hotel: The submerged and movement hotel underwater-2008, Canada - South Pacific, shows the form, the shape of the plan and style of the movement [4, 16].

- The analysis of the dynamic structure of the tower:
 - a) It consists of (core system) floors revolving around the core.
 - b) Between each two floors there is rotary gear rotates independently.
 - c) The floor consists of prefabricated box units.
 - d) The maximum speed of rotation of the floor is full cycle 90 minutes.
 - e) The tower comprises administrative and commercial units and the upper floors have the apartments and villas.

The world's first luxury underwater resort as a series of luxury submarines and will be submerged next to a private island at a depth of 40 feet with a spectacular view of the floor of the ocean, the culmination of an innovative vision for underwater

floating hotels to enjoy the marine environment and explore the floor of the ocean In a new concept that depends on the design of the movement dynamism.

- The analysis of the dynamic structure of the hotel:
 - a) The technology of the age has helped to achieve it, the body of an underwater hotel that has hotel suites in the form of transparent capsules and Submarines attached to the surface of the water by the reception elevators through a marina for boats and the building of the reception at the roof. When the hotel moves, the guest inside the hotel capsule can see and explore the ocean floor and its living beings.
 - b) The most prominent feature of the project is the rotation of the hotel suites around the center of the hotel that allows visitors to enjoy more of the surroundings.

6.2 The Virtual Movement of the Building and its Elements

Some designers are skeptical of the concept of place because of the IT revolution. What it means to occupy a place when it can be at the same moment in everywhere or no place [17]. From here, we conclude that all traditional architectural interests such as identifying a land, defining a place. While representing the cultural values need to be redefined according to the data of modern technologies by integrating the digital environment into the design of the physical environment that means the integrating of the physical and imaginative field into a new complex field [18]. Therefore, the buildings lose their stability and are controlled by the user's experience. The shape is as an organism whose architecture is flexible and animated, its interest in the biosphere is the basis of formation, but it is continuous, convergent, free, streamlined and spontaneous. It can be said that the physical and dynamic elements of the design can be used individually or in combination to reflect the latent mental movement. This is due to the ability of the architect and his imagination to the formation, the hybridization and complexity to serve the design. Therefore, this drives to searching for standards and concepts to control in the process and thought of dynamism; as a dominant architectural thought on the projects.

7. THIRD: DEDUCTIVE APPROACH

From the results of the theoretical and analytical approach, we can devise and formulate a mechanism or a methodology; to guide the concept of dynamism in the design; to arrive at an interactive dynamic building. As in Fig. 7 where the architectural thought governs it by linking and reconciling among both of “opportunities to move the building – the technology “systems, materials” – the performance required” its methodology is as follows:

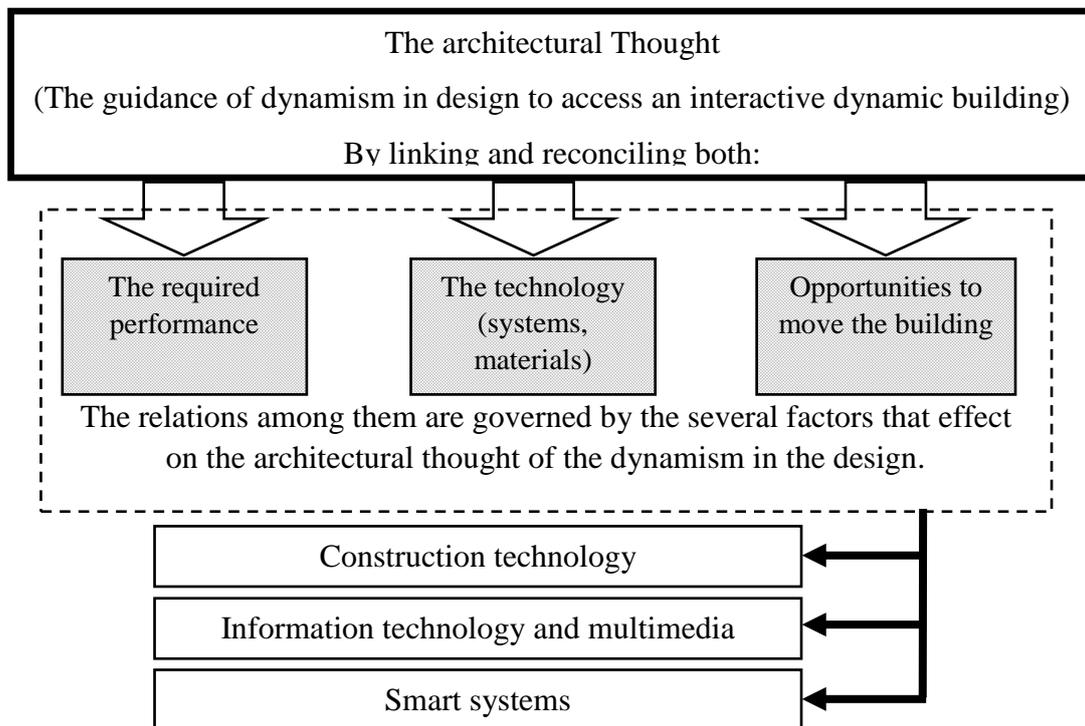


Fig. 7. The methodology for guiding the dynamism in design to reach to an interactive dynamic building.

7.1 The Architectural Thought

1. In the evolution from the static perception to the dynamic perception, there have been changes in architectural concepts, and the main concern is the need to express the movement in architecture, which has resulted in new concepts of the dynamic equilibrium and a new sense of weight "architecture against gravity". These all finally led to a new concept of the space that expresses the spirit of movement and

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depends on transparency, dynamism, energy, technological progress, systems and materials.

2. Architecture should reflect the time and weightlessness, which initially seems to contradict each other, while not abandoning its main functional objectives.
3. The movement in the architectural works classified into three categories:
 - a) The metaphorical movement.
 - b) The actual movement.
 - c) The imaginary movement.
4. The buildings have evolved from static masses to dynamic masses more movement and have evolved into designing the dynamic spaces in the virtual reality programs.
5. The movement in architecture depends on two factors; the first is the dynamic human perception, and the second is the form itself.
6. Making the building already moves, and especially with the IT revolution; the digital environment has been integrated into the design of the physical environment and interactive buildings emerged that allow the users to interact with [19].
7. The thought of the place is modified and changed, and the transfer and travel to any place became momentary without transition to it; which has a biological impact on the human's life because of the generation of these interactive virtual environments.
8. Laws and various legislation on construction, and population inflation factors guide design towards the stability of the building, but with the continuous development of architectural thought, and with technological progress there are opportunities to control the movement of parts of the building if not all [20].
9. Light, shade, and shadows are the most important elements that affect the visual perception of space, so the human's eye is an upscale tool that transmits the surrounding objects because it depends on seeing things in light, shade, and shadows [9].
10. The climate is a major determinant in formulating the masses and facades, which makes us, think differently about the production of buildings and dynamic facades, whose shape is constantly changing [21].

11. Enjoying with a visual environment that is constantly changing and getting a building that is always developing through the integration of movement, green energy, and the effective structure of environmentally sustainable buildings [13].

This architectural thought of the dynamism is always searching in opportunities of the movement of the building by the technology (systems-materials) to achieve the required performance as will come later:

7.1.1 Opportunities to move the building

1. The methods of design used to active the techniques of movement in the parts of the building. The kinetic membrane allows the geometric patterns in case of changing with an emphasis on the importance of the kinetic architecture to be integrated with the engineering theories of architecture. This can be emphasized by defining the spatial movement through four spatial geometrical transformations in the space, are:
 - a. The translation that describes the movement of the element in a constant level.
 - b. The rotation is the movement of element around any axis.
 - c. The stretching and shrinkage in the size of element.
 - d. The modification and change where material properties are exploited, which allow progressive distortion of the material.

These transformations represent the main styles of the movement in the building, which are combined to produce many the patterns of movement more complex.

2. The principles of the sustainability depend on integrating the potentials of movement, and what they include the element of time. Now developing the automated systems and electronics has begun to integrate with design to achieve sustainability [22]. Therefore, many of the applications of the movement that focus on the principles of the sustainability during design through the process of the formation based on the latent and movement dynamism.

7.1.2 The technology “systems - materials”

- 1) The impact of technological factors and time factors on materials of construction that make up the moving parts so as not to affect movement.

- 2) Building technology is one of the factors that influence on the formation, and hence the perception where the systems and materials of construction strongly contribute to the possibility of adding the movement to the design, it strongly influences on the mental movement in the design [23].
- 3) The movement represents by the shapes and surfaces that appear with a dynamism and deal with it, and currently, the digital and construction technology are involved in the control of movement to integrate with time and activity.

7.1.3 The required performance

- 1) Transforming through the activities of the interior spaces of the building, the movement here to transform the building from the state of the inactive activities; to create an objective movement to integrate with the rate of the occupancy and humanitarian activities in the building [24].
- 2) The movement of the users' body within the building, and the impact of the latent energy of the human's body on the space of the building.
- 3) Feeling with the movement due to the changes in the visual effects of the lighting or in case of the humidity, where the movement is affected by the changes in the environmental conditions.
- 4) Dealing with the cover of the building, the design of the masses and the constant formation of the latent dynamism. It is noted that these applications have been distributed to apply especially on the outer cover of the building that is a major component of the building which separates the internal building spaces and the general location of the building, but the difference in the applications of movement [25].
 - a. The elements of the cover of the building integrate into one component or apply to each element separately.
 - b. Differences in the materials of the building such as the membranes, air, metal joints, the materials of the building manufactured and operable.

- c. Applying the movement with a fixed static manner or a movement dynamic with developed manner inspires with the depth of the aesthetic formation and environmental thought.
- d. The movement elements can be installed it and replaced it with static or moving parts and in a different movement pattern or these elements are an integral part of the design of the outer cover cannot separate it.
- e. In case of the dynamic applications, a comprehensive management system connects the moving element in the cover of the building with its spaces to control the pattern and appropriate time to apply and activate the movement to adapt to the activity and needs of internal functions.

7.2 The Affecting Factors on the Architectural Thought of Dynamic in Design

The main concept of the moving buildings comes from the smart architecture. Where the main idea revolves around the smart interactive architectural environments, and the ability of these environments to gather comprehensive information about the continuous change of the environment around the building to synchronize with the occurrence of changes in the environment and user activities. Then applied it as a movement form by the affecting factors the dynamism, which are as follows:

7.2.1 Construction technology

- a. The twentieth century witnessed a rapid development in systems of the materials of construction and the methods of implementation. This development contributed to the change and the diversity of the features of architecture and its forms [23].
- b. The structural systems and used materials are the most important factors that reflect the balanced of the buildings and its stability at the level of perception. The balanced structural systems are actually either static or dynamic, but some of them may visually inspire to the opposite. As well as it plays a key role in forming the basic features of the buildings, especially latent or movement dynamism [14].
- c. The materials of the building are a significant factor in the level of the cognitive equilibrium from several important aspects such as the proportions, structural performance and texture, where the shape of materials serves the idea of movement

(agile materials such as iron or interactive as materials). The effect of materials related to the dynamism of structural system directly. As we use flexible lightness materials, as increased the flexibility of formation, as increased correlation and continuity among the structural elements that giving the opportunity to create advanced applications of the dynamic equilibrium [26].

- d. The type of materials used in finishing is affected by texture. The smooth surfaces can be increased in contrast to the coarse surfaces in the evolution from the static to the dynamic. The materials have become lighter, and the structure has become more dynamic, active and less specific [23].

7.2.2 Information technology and multimedia

There is no doubt that the evolution of information technology and communication has directly affected the development of architectural thought with the launch of the twenty-first century and has been supported by the increasing development of the building technology system, for example:

- A. A computer as an aided tool in the design: the first phase of the reliance on the computer in the architectural design in which the software plays the role of mediator in the conversion of architectural thought from the imagination and imagining a reality. At the beginning of twenty-century where architects had a large number of software packages that the nature of each to work based on the method and the purpose of use. The criteria of selection any of this software vary from an institution to another and from an office to another that depends on their respective design philosophy, the design objectives, also according to the circumstances and stage of the project [6].
- B. The design through the computer: the computer leads the design process, and it has conducted many of the researches and scientific studies in this regard. It is noted that all attempts were within the scope of ideas and scientific studies only at the beginning of the twenty-first century where the actual reliance on the computer appeared as a design tool. Also, architects who have discussed unprecedented ideas

in this field through a computer to produce an interactive design with the data and final design of the project [27].

- C. The influence of the computer on the systems of structure: the impact of the computer on the structural systems was great. It began with the design of “Sydney Opera House” using the applications of the computer to implement the structure for the first time. Since then, the engineers have relied on software in analyzing, calculating and putting structural loads [25]. It can be relied on it in designing, proposing the system and structural formation of any building based on previous data [28]. It has become possible to deal with any surface, whatever its complexity, its formation and calculating all the factors affecting it starting with earthquakes, wind and loads. The materials of the suitable building can be chosen according to the time and cost. Where the materials are no longer a major impediment to the processes of structural design [24].

7.2.3 Smart systems

- a. The smart architecture offers the strongest levels of communications among the systems of building such as the mechanics, structure, security, lighting, management of building, maintenance, interiors networks and management of energy. The smart building offers the control and management through the systems of the building and a user is good at using the computer to achieve the needs of users [29].
- b. The reliance on the smart systems in the building has emerged as a tangible reality at the end of the 20th century; these systems have evolved significantly with entering the 21st century as one of the affecting factors in the processes of the implementation [27].

8. CONCLUSIONS

The main conclusion of the research is to guide and root the concept of movement in buildings by achieving the attributes and principles of dynamism “latent or movement” to guide the concept of dynamism in design and arrive at an interactive dynamic building is governed by the architectural thought. This new architectural

thought based on linking and reconciling among both of “opportunities to move the building – the technology “systems and materials” – the required performance” that have its special methodology. Therefore, the relations among them are governed by the several factors that effect on this architectural thought to produce and employ movement, and are based on other conclusions as follows:

1. The role of the human’s eye and perception in the sense of dynamism and classifying the dynamism to latent or movement.
2. Restructuring the types of dynamism and achieving higher levels of the movement, such as the levels of interaction with the environment, and benefiting from the potentials of virtual movement to study and know the methods and means that give the sense of dynamism.
3. The dynamism has become from the criteria for the evaluation and design of interactive smart buildings and any building later to root the thought of movement.
4. One of the entrances of dynamism in architecture is the ability of the architect to absorb and translate the thought of dynamism among the different elements of the design to give vitality to the project.
5. It is not easy to get the mental movement in the forms, and there are no rules for performing this that depends on the nature of the formation of each shape that has values that differ in its mental movement. The dynamism here means the change in the time as the fourth factor where the concept can make the building of a movement of some or part of its elements at a fixed or variable speed.
6. The movement dynamism made the process of design is a dimensional quadrilateral takes a character is more visible to the outer perimeter and it wants to demonstrate the enormous potentials that produced by technology, as it is called architecture from the formation of life and design of the time.
7. The designer should give movement energy to the mass and form of the project by using the simulation for a dynamic movement and other of the methods to produce a dynamic force that gives vitality to the project.

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فكر الديناميكية والحركة في العمارة

يتناول البحث فكر الديناميكية والحركة في العمارة، ودور الزمن، وعين الإنسان في تصنيف حركة المباني الديناميكية إلى كامنة، ومتحركة، بسبب فكر بعض المعماريين الذي يعطى الإحساس بالملل كما أن الأشكال الثابتة لم تعد قادرة على تلبية احتياجات المستخدمين، هدف البحث الى توجيه مفهوم الديناميكية وتصحيح المفهوم الخاطئ بأن الديناميكية ليست إلا تحريك المبنى دون البحث عن الفكر المعماري وراء ذلك من خلال تحليل لنماذج عالمية وكيفية توظيف مفردات التشكيل وأي أنواع الحركة أكثر ملائمة للمبنى لصياغته آلية أو منهجية للربط والتوفيق لفرص تحريك المبنى والتكنولوجيا والأداء المطلوب، والعوامل المؤثرة عليه ليكون مبنى ديناميكي تفاعلي.