

## **The role of smart architecture in developing educational buildings to achieve the efficiency of the educational process in facing the Corona epidemic**

**Marwa Ahmed Kamer Eldawla - Azza Sobhi Ragab Elsakka**

Lecture in faculty of engineering architectural engineering section Tanta  
University

### **Abstract:**

Providing a sound learning environment for students with the spread of the Corona epidemic is one of the most important factors that the architectural and urban design must pay attention to, and with a focus on the architectural field, a large part of the epidemic spread inside buildings can be overcome with the help of modern design methods aware of the importance of preserving the environment and energy and reviewing the design of buildings. to develop its vacuums.

Since architecture has a wide impact on emissions from buildings and on the impact on the surrounding environment, and large numbers of students meet with it daily to study, and it is considered one of the places most vulnerable to the outbreak of the Corona epidemic. Therefore, it is necessary to demonstrate the importance of architectural techniques in preserving the environment, as many contemporary buildings ignored the climate and its factors, so the glass shell dominated their buildings and the buildings went outside instead of inside, and their openings were exposed to direct sunlight and the depletion of energy and resources for the purpose of cooling increased. Today, the architectural designer has to use progress and technological growth to counter negative impacts on the environment, so the research will address two parts, the first part: the role of the architectural design process (smart design) in providing an environment that can face the challenges of the spread of the epidemic, the second part: the role of architectural design in upgrading the spaces used in buildings in post works.

**Key words** (smart architecture, developing, educational buildings, efficiency, Corona epidemic)

**Research problem:**

The problem of research is that educational buildings are one of the most important sectors that must be developed in order to receive their students and provide educational services and various activities in order to preserve the health of users.

**Research goals:**

**The main goal of research:** is to highlight the central role of the architectural design process of buildings in achieving a healthy educational environment that works to achieve its function in its highest efficiency.

**The sub-objectives of the research are:** (extrapolation of the building of the architectural department at Tanta University - proposed approach to achieving a smart architectural environment that fulfills its educational function and keeps users healthy.)

**Research methodology:**

**Inductive approach:** A brief reading of the local situation in its five aspects in order to implement intelligent architecture (environmental, technical, economic, social and structural) in order to determine whether the selected criteria are compatible with the local realities of the Tanta University Architecture Department.

**Exploratory approach:** Conducting a series of questionnaires to identify the pros and cons of applying intelligent architecture standards to architectural Spaces at the University of Tanta Architecture Department in order to achieve the local reality of architectural Spaces.

**Destructive analytic approach:** To evaluate the building of the Department of Architecture of Tanta University's Faculty of Engineering - as a model of the buildings used by evaluating the intelligent design aspects of some of the building's post-work Spaces.

**Applied Methodology:** By presenting a proposal to upgrade the architectural Spaces in the Department of Architecture to convert the school Spaces into smart architectural Spaces that achieve a sustainable environment facing the outbreak of the Corona epidemic

### **Introduction:**

Smart architecture means using special electronic systems to operate some parts of the building and control some of the systems contained in the building such as lighting, air conditioning, ventilation, energy, etc., and this required the architect to be fully aware and fully acquainted with the latest science of modern technologies in order to be able to benefit from them in the design process and construction works of buildings and various projects, and that the architect in this era should not only be creative in how to link the different technological systems of the building, As he puts the idea in making different control programs using the computer, in order to achieve a specific thought in the process of managing and operating the building, and this of course is reflected in the design process in all its stages.

The technical systems used in the buildings that have helped to increase the functional efficiency of the buildings (heating, air conditioning, security, safety, lighting, water systems, conservation of the environment), as well as the systems for their management and operation in order to save the energy used to operate them. The general thinking of the smart architecture school depends on the construction of buildings (administrative, residential, scientific, commercial, etc.) that are constantly interacting with the changing climate in these buildings throughout the day and throughout the year, in addition to having the latest Telecommunications technology and remote smart control, to facilitate users' continuous control of the building either from the inside or from the outside in addition to the ability to cope with epidemics such as the current Corona epidemic.

### **1. Intelligent architecture from the perspective of local reality:**

Given the fundamental differences between the data on environments that witnessed the emergence and development of smart architecture theory and local reality data, smart architecture is discussed according to a proposed structure that begins with environmental, technical, economic, social, and structural aspects, to monitor and extrapolate the public and private positives and disadvantages posed by multiple smart architecture visions in these five areas, as well as identifying the requirements necessary for application.

### **1.1 Smart architecture and environmental aspects:**

The principle of immateriality is one of the most important principles on which smart architecture is built. Immaterialism can be achieved through the automation of activities, the efficient use of immaterial digital media, the transfer of activities to virtual environments, and dependence on the non-spatial / temporal presence, where this principle ensures for architecture the ability to conserve physical resources. Reducing the load on natural environments and reducing pollution rates to a minimum. The principle of non-mobilization also ensures the reduction of daily trips, whether for materials or people, in order to transform activities and services into a digital model, which means reducing fuel consumption rates, reducing costs and reducing pollution, and the ability to face spreading epidemics

Such as the current Corona epidemic<sup>1</sup>

The advantages provided by the environmental aspects of smart architecture can be identified (conserving resources - supporting the quality of the natural environment - reducing pollution - reducing the accumulation of means of transportation - reducing the volume of material waste and facilitating its management - sustainability of development programs and plans - intergenerational justice).

### **1.2- Smart architecture and technical aspects:**

We find that the chances of facilitating work, improving performance and increasing productivity by applying automation systems take different dimensions if the local reality data are taken into account. We find that on the list of positives comes the reduction of human intervention to a minimum and the liberation of the user from a large number of manual and stereotypical tasks, which leads in turn, it saves time and effort, supports user comfort, and raises individual productivity and it gives the ability to confront spreading epidemics such as the current Corona epidemic, the advantages provided by the technical aspects of smart architecture can be identified (Facilitating work, improving performance and raising productivity - liberating the user from typical tasks - saving time and effort and supporting flexibility - liberating the user from time and place restrictions - reducing congestion - taking advantage of the current technical boom).

### **1.3- Smart architecture and economic aspects:**

On the list of economic negatives presented by the visions of smart architecture is the challenge of providing and localizing the main components without which it is not possible to activate the opportunities presented by these visions, such as the initial cost of creating a digital infrastructure capable of efficient and rapid transfer of information, the localization of digital equipment and access to the necessary software, and the provision of smart labor. In addition to the cost of the life cycle to upgrade and develop these components, it is worth noting that this challenge acquires its features from the local economic reality and its indicators, the collapse of the local currency in front of its foreign counterpart, the steady rise in prices as a result of this collapse, the high rate of inflation, low growth rates, the growing budget deficit, and the increase in foreign debt. The increase in the internal debt, in addition to the deficit in the trade balance of technical equipment, all seem to put the transformation towards the digital model and the complete reliance on technologies in front of a real challenge.

Despite these challenges, but if the infrastructure is provided, the advantages provided by the economic aspects of smart architecture can be identified (reducing the cost of attendance - raising productivity - attracting investments and creating the appropriate climate for them - contributing to solving local problems due to the absence of the inevitability of spatial or temporal presence - providing non-discriminatory solutions traditional problems of unemployment and low individual productivity - support for creating better environments for work).

### **1.4- Smart architecture and social aspects:**

In its general framework, visions of automating activities and services and their transition to virtual reality through the technical equipment available in the smart building offer opportunities to support social relations outside the traditional framework and the stereotypical boundaries of society, so that the system of social relations transcends local and regional geographical boundaries. People with a common interest from different parts of the world to communicate and form atypical relationships through the so-called two- and three-dimensional participatory environments, or interactive

virtual environments, to enable these environments for the user to extend his virtual entity to its maximum without leaving its spatial and temporal coordinates, which gives the ability to confront widespread epidemics such as the current Corona epidemic. This proposition necessitates a reformulation of the system of social relations and the architectural features of buildings and residential spaces concerned with accommodating social activities<sup>ii</sup>.

It is possible to identify the positives provided by the social aspects of smart architecture (supporting social relations outside the framework of the traditional society - evaluating the family institution and the system of social relations by providing the opportunity for mothers to work remotely from inside the house - achieving solidarity between segments and groups of society and offering non-typical job opportunities for people with special needs Expanding the space for freedoms, supporting participation in decision-making, and supporting its independence. Reducing the absolute power of the central government and supporting the freedoms of individuals and groups).

### **1.5- Intelligent architecture and formative aspects:**

With the presence of technical equipment that enables the building to self-respond to the variables and requirements, the user is freed from the typical manual and mental tasks that would support the strength of the relationship between the building as a physical entity and its users, and to the extent that activities, services and architectural environments shift towards virtual reality, the relationship between the physical architectural environment and its users is affected according to the level of Adopting the mechanisms and tools of virtual reality.

The advantages provided by the formative aspects of smart architecture can be identified (liberating the architect from the physical constraints of traditional architectural and planning theories - liberating the architect and the user from the constraints of natural physical forces - reviving complex and organic formations - reviving the local personality and regional identity - maximizing the chances of creating local architecture and urbanization compatible with the environment depends on the availability of the necessary tools to achieve this compatibility)<sup>iii</sup>.

## **2-Evaluating the performance of smart buildings:**

The purpose of evaluating the performance of buildings is to make theoretical and practical studies that allow for identifying the pros and cons of buildings, both existing and under construction, in order to ensure their validity and achievement of the goals expected of them.... The criteria for evaluating an intelligent building will first be studied by extrapolating the attributes of intelligence available in it. Second, evaluate the building of the Tanta University Architecture Department in order to determine the extent to which the proposed methodology for promoting local reality can be applied to the building.

### **2.1 Criteria for assessing the performance of smart buildings by their intelligence features:**

A set of criteria has been derived that, if available, denotes the characteristics of a building's intelligence, as shown in figure, which in turn constitutes the smart building system.

#### **2.1.1 Automated control:**

Automated control of building functions is the basic principle that underlies the idea of building intelligence, and therefore this feature is an indispensable element of any smart building, since the smart building is the building that manages itself, that is, its functions manage itself<sup>iv</sup>.

The building's automated control feature is determined by the intelligent systems available in the building, which are controlled automatically without any human intervention, primarily the building management system (BMS), which controls all the building's systems in an integrated way. The office communications and control systems, which are used to transmit data, voice and video and integrate them with the building management systems to transmit signals related to the building's automatic control<sup>v</sup>.

### **2.1.2 Response:**

Building response is "the ability of the building to respond to the wishes and requirements of its occupants and to changes in the internal and external environment of the building ". In order for a building to be called an intelligent and responsive building, it has to respond in both kinds: Responding to changes in the internal and external environment - Responding to the needs of the occupants<sup>vi</sup>.

#### **a- Learning capacity(Intelligent response):**

To obtain this capability is to use neural networks, database-based mathematical computation software with a Fuzzy Logic integration are used to obtain neural networks, all of which provide the ability to know the current state of energy in a building and the thermal characteristics of a building, with the ability to link current weather data with prevailing weather conditions.

#### **b- Responding to occupants' needs "Building occupants control" :**

This is what an intelligent building does, takes care of itself and rationalizes the amount of user control required, and when an error occurs, the BMS alerts the user or does not allow the work to continue.

### **2.1.3 Compatibility with the environment and sustainability:**

The compatibility with the environment and sustainability feature is an important pillar of building intelligence to achieve environmental balance and contribute to solving environmental problems. This feature of a building is realized when the equitable consumption and utilization of resources among generations is achieved and renewable and clean natural resources are utilized at balanced rates. Key design tools indicative of a smart building's sustainability include: (Environmental Efficiency, Environmental Data, Use of renewable energy sources, Self generation, and Energy generation).

## 2.2- Architectural education system:

The education system consists of basic elements (material equipment - human elements - courses and teaching methods) and includes:

Material equipment (Lecture halls - classrooms - laboratories- library -offices of faculty members and the supporting body - administrative offices -human elements (Instructor - Student - Employees).

(Courses (university requirements - engineering college requirements - specialization courses in architecture - precision specialization courses), Teaching Methods (enhanced lecturing - interactive learning "cooperative learning, e-learning" - self-learning - experiential learning - brainstorming - "individual, group" projects - field visits ).

## 2.3-The relationship between the aspects of architecture intelligence and the elements of the architectural education system:

The main elements of the table represent the smart aspects of architecture, which are environmental, technical, economic, social, and organizational aspects. The horizontal elements of the table represent the components of architecture, which are the physical equipment, the human elements, and the Courses and teaching methods.

Table 1: shows a diagram of how to analyze the relationships between each aspect of architecture intelligence and the elements of the architecture education system

Elements of the Architectural Education System								
Physical Equipment				The human element			Courses and Teaching Methods	
Classrooms,	The library	Offices of faculty members	Admin offices	teacher	student	employees	Courses	teaching methods

**The relationship between the intelligent aspects of architecture and the elements of the architecture education system.**

The smart side of the architecture.	Environmental aspects																			
	Technical aspects																			
	Economic aspects																			
	Social aspects																			
	formative aspects																			

## 2.4- Study of the local reality of the building of the Department of Architecture - Faculty of Engineering - Tanta University:

In this part, it is submitted to apply the proposed methodology to advance the local reality of the building of the Department of Architecture through two stages, the first stage in which the plan of the Department of Architecture is presented as a model to meet the challenges of architectural education In the crisis of Corona. The presentation will be followed by a review of the department's local situation: the features of its physical equipment, its society, and its requirements and challenges in order to achieve its educational efficiency, which in their entirety constitute inputs to the development process, the second stage is the application of the proposed methodology to elevate local reality of this building.

### 2.4.1 - Architecture Department's plan to confront the Corona crisis:

**A-Physical equipment:** reducing student densification in classrooms (amphitheaters - major lecture halls.....), following up good ventilation of Spaces, continuous sterilization of Spaces after each use of students.

#### **B-The human element:**

**Students:** Reducing the number of days students attend college and completing the educational process through Microsoft Team program, monitoring the temperature and sterilization of students before entering the study building, providing appropriate distances to achieve spacing during the period of the study day in the classrooms.

**Faculty members:** Provide Microsoft Team software to reduce the contact of members with students and use direct communication with students to explain the course and conduct tests on some materials

that do not require college communication and devote direct contact to the courses (architectural design, architectural construction, executive designs, urban planning), use of university mail to all transmitters, conducting meetings and holding scientific seminars via social media.

**Employees:** Dependence on university leaning in all communications to reduce contact with administrative offices.

**C-Courses and teaching methods:** Break up team courses into courses that are fully studied within the department, practical and theoretical parts on Microsoft Team that meet students by schedule, and theoretical courses on Microsoft Team that meet students by schedule.

Raising lectures and teaching videos on Microsoft Team - Teaching Methods (Enhanced Lecture - Interactive Learning "Collaborative Learning, E-Learning" - Self-Learning - Experimental Learning - Brainstorming - Individual, Group Projects - Field Visits).

### **3-Study aspects of smart architecture in the Department of Architecture:**

#### **3.1- Smart architecture and environmental aspects of the Department of Architecture**

the Department of Architecture of Tanta University are located outside the building block of the city of Tanta at the Colleges Complex in Spray, and the mass was directed in the direction of the east for the group of buildings that formed the departments of the Faculty of Engineering, used a rectangular formation suitable for the functional use of the classrooms, The classrooms were oriented in the direction of the east and it is the best direction for the maximum use of lighting, large opening areas for the maximum use of natural lighting<sup>vii</sup>.

#### **3.2 - Smart Architecture and Technical Aspects of Architecture Department:**

We present the equipment of the Architecture Department that is expected to influence and influence the development process to advance the local reality. The following topics are: Internet connectivity, computers, and peripherals. With regard to the connection to the International Information Network, the service was utilized within the Section as of 2007, so that 20 of the 24 points available, with a speed of 10 megabytes, are currently in use. As well as being connected to the International Information Network,

the department has 6 computers, 2 laser printers, an inkjet printer, a plotter printer, a scanner and 4 data projector.

**3-3- Smart Architecture and Social Aspects in the Department of Architecture:**

The community size of the Department of Architecture in the academic year 2020/2021 was about 513 individuals, 32 faculty members and teaching assistants, 383 undergraduate students, 68 graduate students, 4 employees (secretaries, workers), as well as research assistants. According to the data shown, the average ratio of the number of undergraduate students to the number of faculty members and their assistants is about 12%, and the circumstances of the Corona crisis led the architecture department community to rely partly on simultaneous non-spatial attendance.

**3.4- Smart Architecture and Economic Aspects in the Department of Architecture:**

The Department of Architecture depends on the budget allocated to the Faculty of Engineering from Tanta University.

**3-5- Smart architecture and formative aspects in the Department of Architecture:**

No smart materials were used in the construction, large glass flats were used in the facades to rely on natural lighting, and smart shades were not used.

**4- The relationship between the smart aspects and the design process in the Department of Architecture at Tanta University:**

**Table (2): shows the relationship between each of the smart aspects of architecture and the elements of the architectural education system**

	Elements of the architectural education system								
	physical equipment			human elements			Courses and teaching methods		
The relationship between the smart aspects of architecture and the elements of the architectural education system	Classrooms, Labs	The library	Offices of faculty members	Admin offices	teacher	student	employees	Courses	teaching methods

<b>The smart side of the architecture.</b>	<b>Environmental aspects</b>	conserve resources																			
		Supporting the quality of the natural environment	■	■	■	■															
		reduce pollution																			
		Reduce transportation congestion							■	■	■										
		Reducing the volume of physical waste and facilitating its management																			
		Sustainability of development programs and plans																■	■		
		intergenerational justice																			
	<b>Technical aspects</b>	Facilitate work, improve performance and raise productivity								■	■	■	■	■	■						
		Freeing the user from typical tasks								■	■	■									
		Save time and effort and support flexibility								■	■	■	■	■	■						
		Freeing the user from the limitations of time and place								■	■	■	■	■	■						
		Reduce crowding																■	■		
	<b>Economic aspects</b>	Take advantage of the current technology boom	■	■	■	■	■	■	■	■	■	■	■	■	■						
		Reduce the cost of attendance								■	■										
		Increase productivity								■		■									
		Attracting investments and creating the appropriate climate for them																			
		Problem solving imperative spatial or temporal presence																	■	■	
	<b>Social aspects</b>	Providing solutions to the problems of unemployment and low productivity																	■	■	
		Support the creation of better working environments																			
		Support the creation of better investment environments																			
Supporting social relations outside the framework of society																				■	
Offering non-typical opportunities for people with needs																				■	
Supporting participation in decision-making and supporting its independence																					

<b>formative aspects</b>	Reducing the absolute power of the central government									
	Supporting social relations outside the framework of society									
	Offering non-typical opportunities for people with needs									
	Supporting participation in decision-making and supporting its independence									
	Reducing the absolute power of the central government									
	Architectural liberation from the physical limitations of traditional architectural and planning theories									

By analyzing the relationship table between the smart aspects of architecture and the elements of the educational process:

The relationship of physical equipment is weak with aspects of smart architecture. As for the relationship of human elements, courses, and teaching style, it is average with aspects of smart architecture, and the technical aspects are the most prominent and clear aspects of smart architecture, where the human element clearly uses and applies them in teaching methods for courses.

**5- Monitoring the Positives and Negatives of applying the smart architecture aspects on the Architecture Department to confront the Corona crisis:**

It was necessary to resort to information assistance sources through which it could monitor the existing pros and cons that should contribute to solving it, and the performance indicators that should be raised, and the wishes and aspirations of the department's society that can be achieved in whole or in part. Thus, a questionnaire was applied to a sample of 83 subjects from the Department of Architecture (faculty members, staff members and associate staff members) The survey results produced a number of important issues that should not be overlooked. Personal observation, data and abstract numerical statistics support these results in terms of monitoring problems, extrapolating performance indicators, and identifying desires and aspirations. In this section, key survey results and measurements are presented and analyzed.

**Table (3): Showing the Positives and Negatives of applying the smart architecture aspects on the Architecture Department to confront the Corona crisis**

<b>Positives</b>	<b>Negatives</b>
<ul style="list-style-type: none"> <li>-Adopting the non-spatial / simultaneous presence pattern as a ruling reference pattern for the relationship between the human elements of the architectural education system to confront the Corona crisis.</li> <li>-Achieving educational goals with the least amount of technical equipment possible by re-designing academic contents and teaching methods, in order to achieve the department's mission and educational goals.</li> <li>-Uploading scientific research, bulletins, periodicals, thesis and scientific research materials on the department's website and supporting the possibility of browsing and downloading them as needed.</li> <li>-Supporting scientific relations between research institutions and scientific departments so that research materials can be exchanged digitally and without the need for spatial / simultaneous presence (moving to libraries in the Republic and places to provide information).</li> <li>-Digital advertisement on the department's page about scientific events such as conferences, symposia, and international, local and future scientific and research activities.</li> <li>-The presence of a separate page for each faculty member and assistant that can absorb his scientific and research activities and the possibility of browsing or downloading it as desired, as well as areas of research interest in order to support scientific research and establish research relations outside the traditional borders to establish such relations</li> <li>-Transfer of administrative information to the department's digital database.</li> <li>-Using the international information network as a medium through which tasks and instructions are passed, which means reducing the volume of paperwork.</li> </ul>	<ul style="list-style-type: none"> <li>-According to the results of the questionnaire, the lack of basic technical equipment was indicated as one of the most important problems and obstacles within the Department of Architecture, so the automation feature offers suggestions to solve this problem</li> <li>Establishing a library for the department and providing it with a number of computers to automate the search for library materials.</li> <li>-Automating the activities and vocabulary of the department and freeing the department community from typical tasks</li> <li>-It should be noted the need to localize the basic technical equipment on each administrative office in the department and link them to facilitate the performance of administrative tasks.</li> <li>-The use of auxiliary technical equipment that supports the automation of administrative tasks.</li> <li>-Training the user on how to use the computer and basic technical equipment.</li> <li>-Students' dependence on the personal subscription to the information network.</li> <li>- The inability of some students to communicate non-spatial due to poor capabilities, whether due to the unavailability of a personal computer or due to poor connections to the information network.</li> </ul>

The entire sample of respondents (100%) indicated that there are deficiencies in the architectural environment of the department and its architectural spaces. These results, supported by personal observation, indicate that there are many architectural problems in the classrooms, drawing galleries, and faculty assistants' room more than other main architectural spaces in the department. In an attempt to identify problems and shortcomings, the results appeared to indicate the growing severity of the problems of lack of technical equipment and the inability of architectural spaces with their current characteristics to accomplish tasks, and to confront epidemics and diseases such as the current Corona epidemic.

#### **6- Explore development proposals:**

-It is possible to extrapolate the impact of these visions and theses on the architectural environment of the building of the Department of Architecture as a case study, and to show the extent of the contribution of these features to achieving the goals system according to the priority map. Autonomous response and remote control, By using comprehensive automation systems and advanced technical equipment, the virtual feature aims to move activities and services to virtual reality, and rely on the international information network as an incubator for these activities and services, to reduce the need for physical functional architectural spaces in the building as much as the transformation towards the virtual digital model.

-On the other hand, the feature of sustainability appears to aim at upgrading the general performance of the department with the least possible technical equipment, and adopting the mechanisms for performing activities in smarter ways on the localization of equipment and technologies. , and used, respectively, as a step for formulating a development proposal.

#### **6.1- General proposal for development:**

In this part of the study, after exploring the proposals for developing activities, studying the proposals for developing the building and functional spaces, and finally knowing the proposals for developing the user's ability, the general proposal for development is formulated, which consists of the following dimensions:

### **6.1/a- First dimension: Determining the location of the building on the international information network:**

Based on the results of the questionnaires, the study proposes to support the performance of activities according to the map of development priorities to confront the Corona crisis (contribute to solving existing problems, improving general performance, and meeting the desires and aspirations of the user) to the extent that the first dimension of the development proposal is achieved. Parallel of requirements on top of it:

- The basic technical equipment and software needed to transform activities and services into a digital model.
- Intelligent workers who are able to manage this transformation and periodically update the site.
- Obtaining sufficient space on the international information network that enables this site to transform from a mere digital representation of a physical architectural entity to a medium capable of accommodating activities and providing services.
- Improving the connection to the international information network (network speed – number of points).

### **6-1/b- The second dimension: Automation of architectural vocabulary and technical equipment:**

To achieve a compatible environment that provides thermal performance and appropriate ventilation and monitors the commitment to social distancing for students to confront the Corona crisis, the study proposes the second dimension of the development proposal.

- Technical equipment needed for the automation process (such as sensor cells, actuators).
- Necessary connections (infrastructure).  
Supporting technical equipment (such as information supply units)
- A central control room (as an architectural, functional, physical space and its necessary technical equipment).
- Preparing a database that is compatible with reality data and user requirements.
- Intelligent labor capable of handling, operating and maintaining the automation system.
- Preparing a plan to maintain and upgrade systems.

It should be noted here that the automation system vocabulary should be selected and installed according to changing needs and based on

current and future goals and priorities.

**6-1/c- The third dimension: the localization of the basic technical equipment:**

Since it is not possible to achieve any of the first and second dimensions of the development proposal without the presence of the basic technical equipment, the third dimension of the development proposal came to emphasize the inevitability of computers and auxiliary devices as a priority dimension in the development process, Without the presence of these equipment, the concept of automating architectural vocabulary and technical equipment, as well as automating activities and services, shifting towards the virtual digital model and relying on the pattern of non-spatial / synchronous or asynchronous presence becomes a theoretical concept with no possibility of its applications on the ground.

**6-1/d- Fourth Dimension: Re-designing some of the current functional spaces:**

A number of inputs that impose on the design process to reconsider the architectural formulations of the functional spaces to fit these incoming developments, one of the aspects in which the re-design of some spaces can benefit is what is related to the functional activities inside the building. And its relationship to the sizes of spaces and furniture, due to the emergence of the pattern of non-spatial presence as one of the most important proposals for a plan to confront the Corona crisis, where surfaces can be reduced due to the integration of some devices and the cancellation of some activities.

**6-1/e Fifth Dimension: Conducting a series of environmental studies:**

A number of proposals also meant achieving the concepts and visions of automation and virtualization. Another number of these proposals put forward visions of achieving conservation and sustainability represented in adopting the concepts of reducing energy consumption, reusing and searching for new energy sources and making maximum and optimal use of them, Reducing the heat load on the existing air-conditioners in the building, and then reducing the environmental load of the system, with the least possible technical equipment. This proposal seems to open the door for environmental studies specialists to conduct many researches that are concerned with trying to achieve goals and theses of preservation and sustainability with the least possible technical equipment, and it opens the door to a series of One of the studies that evaluate the environmental impact of

the equipment proposed by the automation and virtualization proposals to determine the extent of its ability to achieve these goals.

#### **6-1/f The Sixth Dimension: Developing the User's Ability:**

Based on the results of the questionnaires, the study proposes to support the performance of activities according to the map of development priorities to confront the Corona crisis:

- The necessity of upgrading the user's ability so that he can deal with the development proposal in its three dimensions: automating vocabulary and equipment, transforming activities into virtual reality, and shifting towards the concepts of preservation and sustainability.
- Training the user on how to use the computer and basic technical equipment.
- It is imperative to have a specialized team or labor to maintain and follow up the automation of architectural vocabulary and technical and technical equipment, and this labor becomes an integral part of the project requirements, and this team serves the entire project.

#### **Results:**

- The aspects of smart architecture are among the most important tributaries that supported facing the Corona crisis, and the architectural education system was able to achieve the efficiency of the educational process.
- The simultaneous or asynchronous non-spatial presence reduces the accumulation of means of transportation and reduces the transmission of infection in light of the Corona crisis.
- Technological progress in terms of the availability of computers and information networks contributed to solving practical educational problems in the face of Corona, in addition to reducing the cost of attendance.
- Using the international information network as a medium through which tasks and instructions are passed, which means reducing the volume of paperwork, is one of the most important ways to confront the Corona crisis.

### **Study recommendations:**

- To raise the efficiency of the education system and confront the Corona crisis, it is necessary to study the local reality of buildings and compare it with the extent to which aspects of smart architecture have been achieved.
- Benefiting from the technical dimension, which achieves the liberation of the user from the restrictions of time and place and improves the performance of the educational process.
- Re-designing academic contents and teaching methods to achieve distance education to achieve educational goals.
- A general plan must be drawn up in the country to support information networks at the general level, because the most important problems facing the human element in the architectural education system to confront the Corona crisis.
- Educational institutions, in cooperation with the university administration, must face the weakness of the capabilities of some students (their lack of ability to own a personal computer - the lack of connections to information networks - their weak ability to deal with programs).

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