

Digital architecture and its impact on architectural engineering education

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Abstract:

In fact, the world is witnessing daily discoveries and developments in modern computer, communications and technology, the result turned into the industries, and then emerged new scientific concepts, which led to a radical change in these sciences or the emergence of new science, and not all these developments are moving in a fast pace Not only in quantitative and qualitative changes, but also as the nucleus of the birth of a new era.

The revolution resulting from the development of computer and communications and the information revolution is one of the most influential factors in engineering education in general, architectural education and professional practice in particular, as it has worked to make radical changes in the concept of architecture itself. It is now a specialization that tends to use technology directly and fundamentally. The combination of architecture and technology has resulted in architectural trends that were not previously known to have contributed to the upgrading of architectural architecture and the built environment and to gradually improve the awareness of the community.

This paper presents the strong effects of developments in computer, software, the Internet, virtual reality technology and the implications of architectural engineering. New types of architecture have emerged as a powerful indicator of the demise of the traditional architectural architecture. And the structure of the current (traditional) architecture and its development so that it is in line with modern technological developments.

Key Words: New Modernism - Smart Architecture - Intellectual Trends - Digital Revolution - Building Technology

Introduction:

Education is considered as one of the cornerstones by which the societies build their renaissance. It is one of the main axes of the civilizational progress system. There is no doubt that contemporary changes and technological developments are faster than it can be absorbed and applied in the field of engineering education. The emergence of modern technology of education and its various means has probably helped to use and transform information to multiple innovative image, in addition to providing students with the ability to think and connect information in accordance with the modern curriculum concept. Therefore, the digital technology plays a major role in rebuilding knowledge and creating innovative practices for students of architecture department.

Research Problem:

The concepts of traditional education are no longer able to absorb the current challenges and the future technologies imposed by the nature of the challenges. These challenges have no

value in the fields of knowledge only by using advanced technology and new methods according to international standards. In order to keep the design process within the design studio, it is necessary to be rearranged to keep up with the scientific and technical developments, using new information technology inside it and focus on the practical aspect to enable the learner to keep pace with the times, take advantage from the modern technological thought in the educational process and help him to perform well in various academic stages.

Search Hypothesis:

The components of the learning environment in the traditional and virtual design ceremonies are an important factor in improving the level of communication and interaction in the design ceremonies, which increase the efficiency of achieving the goals of architectural design education.

Research Objectives:

The research aims to develop future scenarios for architecture and architectural design to keep up with the latest developments through the following:

1. Identifying the development of engineering education in line with the successive technologies in all technical fields.
2. Being aware concerning the relationship between the digital divide and architectural education.
3. Identifying the latest developments and its impact on the techniques used in the structure of architectural engineering education.
4. Developing the form of design studio, which helps to raise the level of engineering education to cope with the latest developments and today's challenges.
5. Analyzing the current situation of the case study in the traditional design ceremonies at local government universities in Egypt.

Research Methodology:

To achieve the research objectives, the research depends on these three stages:

- 1- Reviewing the impact of the digital revolution and its impact on architectural education by examining, analyzing and applying the techniques used within the educational environment of traditional and virtual design ceremonies.
- 2- Comparing and analyzing the current situation of the educational environment vacuum design effect in traditional design ceremonies and the extent to which the indicators of communication, interaction and creativity are achieved teaching the architectural design.
- 3- Conclusions and recommendations.

A local analytical university study to examine the structure of the traditional architectural design:

The applied study is based on the selection of a university building which has design characteristics that conform to the design principles of the university buildings. The buildings should be located within the Greater Cairo area due to the diversity and large number of governmental and private universities in this region. These university buildings contains drawing rooms with different sized and its occupancy rate is higher than anywhere else of the university buildings; as it is a key element, specially the buildings of the faculty of

engineering, fine arts and Art Education faculty ... etc. Similarly, the drawing rooms are large spaces of multiple use; as it can be used in lectures, drawing times and as exhibitions for student projects.

In particular, the Faculty of Engineering, Architecture department building, Cairo and Ain Shams University were studied for the following reasons:

- 1- The two buildings have opposite directions. The Cairo University building represents 15 degrees north west and Ain Shams University building represents 69 degrees north east.
- 2- Each one of the two buildings contains drawing rooms with different sizes, including the small and large ones, with a total area of 1090 m² in Cairo University building and a total area of 878m² in Ain Shams University building.
- 3- The two buildings halls have large and different openings with different sizes, located at the top and on the side.

7-1 Faculty of Engineering, Architecture department building, Cairo University.

General Location: The Architecture Department is located in a multi-storey building inside the Faculty of Engineering at Cairo University. It was established in 1992 by Dr. Ali Bassiouni. Figure 7 shows the roads surrounding the Faculty of Engineering, which bordered as follows:

- It is bordered on the north by Nahdat Misr Street.
- It is bordered on the west by Cairo University St.
- It is bordered on the east and the south by the Zoo.

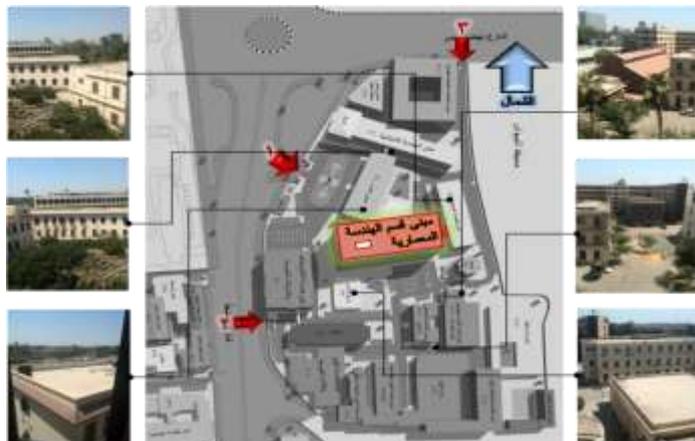


Figure 7. general location of faculty of engineering, Cairo University. The department of Architecture is shown

الإقليم المناخي	البيانات والقاهرة الكبرى
الموقع	الجزيرة
مساحة العيني (الطابق)	1017.00 م ² (2240)
عدد الطوابق	أرضي و ٧ طوابق
نوع الفراغات	مدرجات - قاعات رسم - قاعات سينمائي - مكاتب أعضاء هيئة التدريس - معامل - مكتبة ...
متوسط عدد الأفراد	1200 شخص
التوجيه	15° شمالي غربي
الحواسن الخارجية	أضواء خارجية بتخليلها إضاءة الرافعات بها زجاج
النظف	Grids Slabs Paneled Beam

A - Visual analysis of the drawing rooms, Architecture department. Cairo University:

The drawing rooms are characterized by the natural lighting in the space; as the windows are located to the right of the painting boards in the northwestern walls. The windows have a large area and occupy large area of the facade up to 44%, using the traditional glass with thickness of 6mm. The halls are equipped from inside with painting boards, its chairs, blackboard, high-ceilinged counter and chairs for teachers. Granite floors and walls of light colors were used, as shown in Fig. 8.



Fig 8. Drawing room used in architecture department, Faculty of Engineering, Cairo University

B - Engineering analysis of the space of drawing rooms inside the architecture department building, Cairo University:

It contains 10 architectural drawing rooms belonging only to the Department of Architecture, which are distributed from the first floor to the fifth one, as shown in figures (9,10).

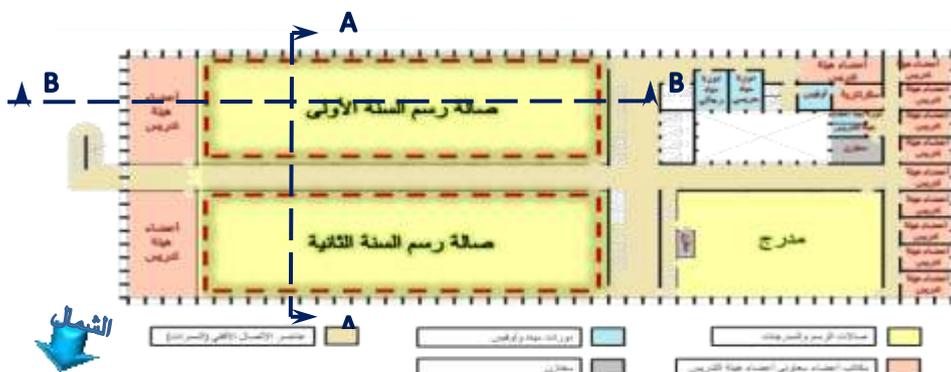


Fig.9: Horizontal skylight of 3th floor of the University. Two drawing rooms are shown.

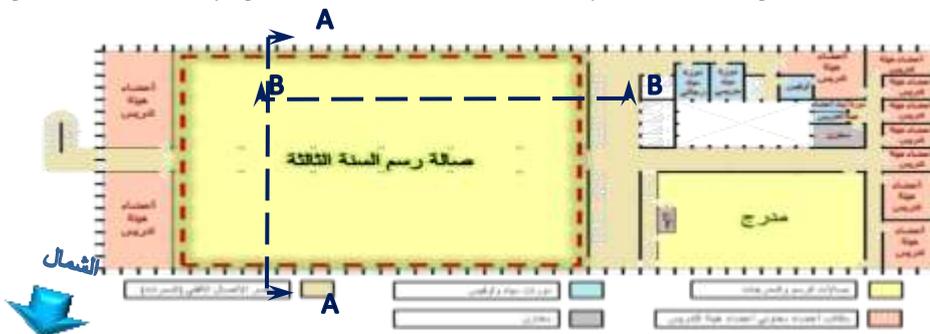


Fig.10: Horizontal skylight of 4th floor of the University. One drawing room are shown.

C - The exterior shape of the building, architecture department, Cairo University:

The shape of the studio space is rectangular. It is characterized by the use of aluminum and concrete units. It is a modular interface with 50 weapons which are repeated in each building's floor from the top to the bottom, as shown in Figure 11. The Department of Architecture is now being developed to be able to use the computer in different design stages.

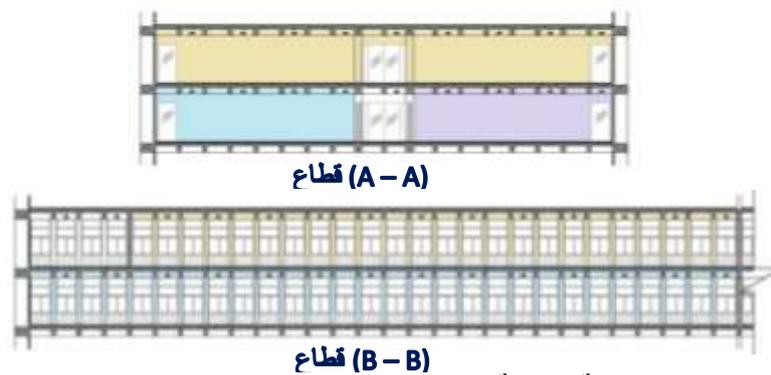


Fig. 11: the two sections in the 3th and 4th floor

7-2 Faculty of Engineering, Architecture department building, Ain Shams University

General Location: The faculty of engineering, located at Abdou Pasha square, near Abbassiya square, Cairo. In 1950, Ibrahim Pasha University was established. It is the former name of Ain Shams University and also the Higher Institute of Engineering developed by the School of Arts and Industries and the School of Applied Engineering. After the infrastructure and facilities were completed, it has become one of the faculties listed in the university currently known as "Ain Shams University."

Figure (12) shows Faculty of Engineering building and its relation to its surrounding roads. It is bordered as follows:

- It is bordered on the north by El Sarayat St.
- It is bordered on the south by Al Masanea St.
- It is bordered on the west by Ali Khalil St.
- It is bordered on the east by the Greek Hospital.



Figure 12. general location of faculty of engineering, Ain shams University. The department of Architecture is shown

الإقليم المتلقي	البيانات
الموقع	القاهرة
مساحة المبني (الطنن)	١٠٠٠٠ (٢١٣٠)
عدد الطوابق	أرضي و٥ طوابق
نوع الفراغات	مدرجات - فناءات رسم - فناءات مبيتات - مكاتب أعضاء هيئة التدريس - معمل - مكتبة ...
متوسط عدد الأفراد	١١٠٠ شخص
التوجه	٩١° شمالي شرقي
العوازل الخارجية	أعداد عرساتية بتشطيبها فناءات خشبية بها زجاج
الأسقف	Column & Beam

A - Visual analysis of the drawing rooms space, Architecture department, Ain Shams University:

The drawing rooms are characterized by the natural lighting in the space; as the windows are located to the right of the painting boards in the northeastern walls. The windows have a large area and occupy large area of the facade estimated 12.7-55%, using the traditional glass with thickness of 6mm. The halls are equipped from inside with painting boards, swivel chairs, blackboard, high-ceilinged counter and chairs for teachers. White cement floors and walls of light colors were used, as shown in Fig. 13.



Fig 13. Drawing room used in architecture department, Faculty of Engineering, Ain Shams University

The Department of Architecture aspires today to be regionally and internationally recognized in distinct areas of sustainable development and information technology. It aspires also to produce leading architects and innovators well prepared for the information age challenges at the scientific and professional level.

B - Engineering analysis of the space of drawing rooms inside the architecture department building, Ain shams University:

It contains architectural drawing rooms belonging only to the Department of Architecture, which are distributed from the first floor to the fourth one, as shown in figures (14,15).

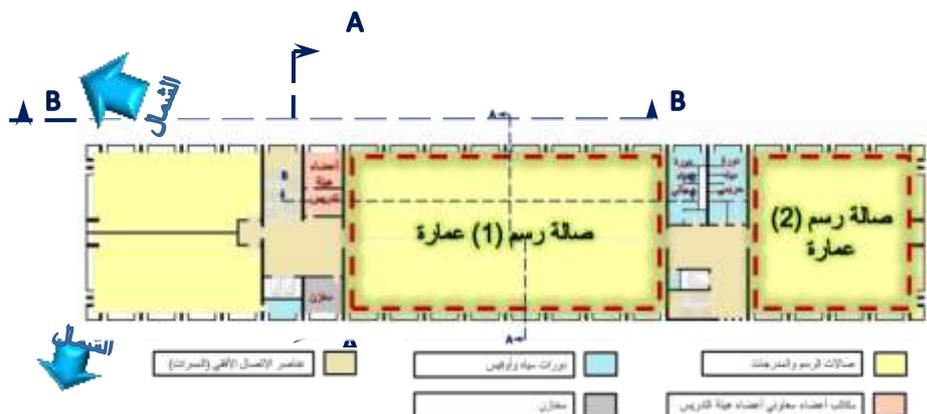


Fig.14: Horizontal skylight of 4th floor of the University. Two drawing rooms are shown.

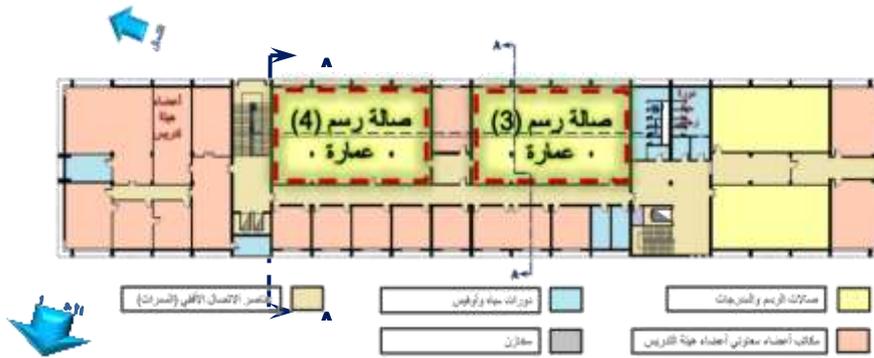


Fig.15: Horizontal skylight of 3th floor of the University. One drawing room are shown.

C - The exterior shape of the building, architecture department, Ain Shams University:

The shape of the studio space is rectangular. It is characterized by the use of classical form of glass and columns such as the wooden Mashrabiya used to achieve the natural ventilation of the building, as illustrated in Figure (16). The Department of Architecture is now being developed to be able to use the computer in different design stages.

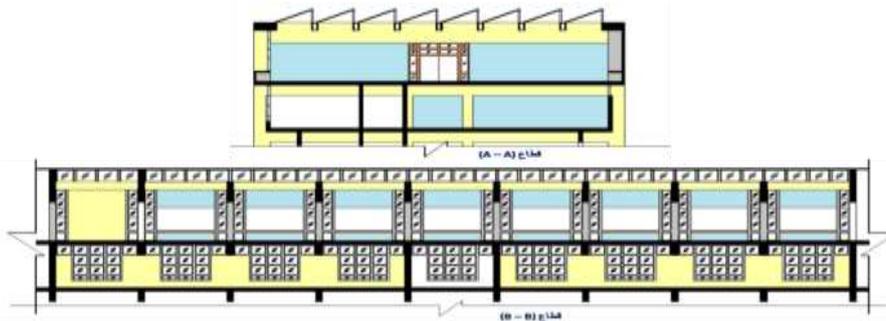


Fig. 16: the two sections in the 4th floor

Hence, the traditional ceremonies were presented through the study buildings of the Egyptian universities, with the need to use the modern thought and smart applications in finding non-traditional alternatives to different designs, introducing new dimensions in the field of education and how to apply it; to be able to keep up with the technology development, understand and deal with the contemporary changes.

Results:

- 1- The digital technology revolution and the development of its techniques gave the architectural design another dimension of imagination and creativity and opened up new horizons to launch towards new, unprecedented and unrecognizable architecture designs.
- 2- The development of computer, software, Internet and the virtual reality technology in the era of digital technology and its techniques, plays a central role in the process of architectural innovation and the future of the architectural product and giving the student the ability to

think and connect information in accordance with the concept of modern curriculum and the ability to achieve his ideas and imagination, after it was a tool only for drawing and showing.

3- Digital technology Applications plays a major role in rebuilding knowledge, creating innovative practices for, in particular, the students of the architecture department and the emergence of non-traditional designs. These digital forms has changed the shape of the architectural product.

4- A great gap has occurred between our dealings in the Arab world with the new technology and the dealings of the developed world with the new technology, especially after this significant progress and development caused by the digital technology in the field of architectural engineering.

Recommendations:

1- It is recommended to develop an educational model for the possibility of employing the 3D simultaneous virtual environments in improving communication and interaction in architectural design studios, which must take into account the temporal and spatial conditions and people targeted, taking into consideration the possibilities that contribute to facilitate the employment of the virtual environment and interesting with the challenges which may hinder to be applied.

2- It is necessary to take advantage of this technical development of digital technology in the profession of architecture in general and architectural education in particular in our Arab world in order to reduce the gap between us and the developed world in the use of these techniques.

3- It is important to seek to develop the structure and environment of the traditional design studio in accordance with the development achieved.

4- 4 – It is necessary that the architect benefits from the smart applications apply it on his work, which enables to create a successful sustainable environment.

5- Identifying the virtual reality technology in the field of education will lead to a rapid development in the architect's experience because of the different experiences of the architectural reality and correct errors before be implemented, which saves time and cost.

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