Investigating the Relationship Between Architecture Education Curricula in Egypt and Graduates' Readiness for Professional Practice

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Abstract

While higher education is often seen as a stepping stone to a good job, the education methodology leads to a different path. The profession of architecture is always changing, while the architecture education has been slow to respond to this change, especially in the Middle East. This research aims to investigate the level of readiness of graduates of architecture schools in Egypt to the market competencies of the 21st century, with special reference to ASU and AASTM, then proposing suggestions to improve graduates' readiness for professional practice. A literature review was done to investigate the philosophies followed by different Architecture schools in Egypt for their curricula, and to present the ILOS and methods used in two specific universities in Egypt. Then a questionnaire survey targeting architecture employees graduated from Egyptian universities was done to identify the points of weaknesses graduates encountered during their work practice and how did they managed to proceed. Then interviews targeting founders and CEOs of multi-national firms in Egypt were done to identify the market demanded employability skills and the missing knowledge and skills of Egyptian universities' graduates. Finally, a set of actions is proposed to narrowing the gap found between architecture education in Egypt and market demanded employability skills.

Keywords

Architecture Curriculum, Employability Skills, Intended Learning Outcomes (ILOS), Graduates' Competencies, Research and Development (R&D).

1. Introduction

It's undeniable that universities all over the world always strive to demonstrate that their graduates are best fit into the job market, however, architecture schools need to reconsider the ways in which the curriculum helps to develop the skills and the 21st century competencies needed in the world of work (Adedapo Oluwatavo, 2016). Worth mentioning students are highly concerned about what to submit rather than how to present it, since most of the weight

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goes to the technical part of the submission, while in real life the how is as important as the what. Students should also have an awareness of the opportunities they will find in the labor market from an early stage of their undergraduate years so they can determine their career interest and focus on its' demanded employability skills through university study.

2. Research problem and objective:

This study is concerned with the new challenges facing educational systems, and how architecture education is equipping graduates to ensure their success in today's global competitive society. Educational systems are asked to pay more attention to the 21st century competencies that graduates should attain to be prepared for workmarket continuous changes. The evolution of the needed attention by educational systems requires changes in their curricula, including missions, visions, methods and contents.

The aim of this research is to directly relate architectural schools' curricula in Egypt to the market demanded employability skills.

3. Methodology

The methodology of the research should be as follows:

A literature review was done to investigate the philosophies followed by different Architecture schools in Egypt for their curricula, and to present the ILOS and methods used in two specific universities in Egypt.

A survey questionnaire targeting graduates from architecture schools in Egypt, with the aim of identifying the graduates' readiness for professional practice. Data of this survey includes the responses of 77 employees graduated from public and private architecture schools in Egypt, with different years of experience working in small, medium and large scale architecture firms.

Then interviews were conducted with 7 expert employers (Founders – CEOs & Project coordinators) of medium to large scale multi-national Firms in Egypt with the aim of identifying the key skills required for the work force and measuring the graduates' readiness for the work practice.

4. Literature Review

Number of architecture schools' curricula philosophies in Egypt were compared based on their visions and missions, including public schools such as Ain Shams University (ASU) and Cairo University, and private schools such as Arab Academy for Science and Technology and Maritime Transport (AASTM), German University in Cairo (GUC) and the American University in Cairo (AUC) as follows in table 1.

Architecture school	Vision	Mission
ASU	They aspire to be leading regionally & internationally in the fields of sustainability and information technology, providing innovative graduates ready for the 21st century competencies in the scientific and professional practices (Sabry. H, 2018).	To provide professional, technology-based and strongly obliged to sustainability design education. Thus, providing graduates who have the appropriate intellectual & transferrable skills, as well as the required technical knowledge and research techniques for professional practice.

AASTM	They aspire that the university acts as a bridge linking between graduates and academy through continuous and rapid communication.	To prepare graduates to the recent labor market needs in the local and international fields by providing career development activities and boosting scientific research.
AUC	Provide Egypt and the Middle-East by architects who can integrate the digital technologies and an understanding of the context as means of respecting local heritage. Information and Communication Technology (ICT) evolution are of great importance in the architecture program, while paying attention to the construction engineering and profession industry needs.	To provide designers with comprehensive vision, able to integrate all aspects of the built environment and realizing how people deal with it. This will be done through a curriculum design that combines the utilization of the latest digital design methods, responds to the market needs, provides contextual humanistic sustainable awareness and emphasizes on graduates' intellectual and transferrable skills through research-based education.
GUC	To provide graduates with the attributes that enable them to work in different paths with various scopes and perform scientific studies and researches that support the profession of architecture, thus being strongly required.	To provide practice-based curriculum through establishing connections with universities, researchers, developers and visionaries that help the continuous development of graduates, as well as ensuring the graduates' exposure to the market demands, situations and professional ethics through academic study.
Cairo University	To achieve leadership in architecture education and achieve developed sustainable societies.	The program's curriculum mission is to perform mutual dialogue and cooperation with other disciplines and non-traditional activities, aiming to enhance the innovation and awareness of graduates and equip them with self-learning skills to achieve a sustainable built environment compatible with the 21st century life competences.

Table 1: Architecture schools' curricula Philosophies in Egypt.

Through studying the philosophies followed by public and private architectural schools in Egypt for their architectural curricula, it's obvious that architectural schools in Egypt have slightly different verbal definitions of their mission and visions, **but almost with the same core aims and objectives which are concluded as follows:**

- The university to be acting as a bridge linking between practice and academy.
- To be leading in the fields of sustainability and information technology.

- Provide graduates who are ready for the labor market needs, 21st century competencies in the scientific and professional practice, able to deal with all aspects of the built environment, use the latest digital design methods and be able to work as both specialists or generalists.
- Providing research based educational methods.
- Ensuring the graduates' exposure to the market needs and situations during academic study.

Continuing the investigation of architectural curricula from the side of educational institutions in Egypt, two case studies were chosen, one to present the public sector (Ain Shams University), and the other to present the private sector (Arab Academy for Science, Technology and Maritime Transport).

Architecture programs intended learning outcomes (ILOS) in both universities were summarized as developing knowledge of advanced construction materials, methods and techniques, technical systems & advanced mega structure systems, providing different design methods & approaches, architecture criticism principles, legislations, codes of practice, increasing awareness of sustainability principles, interior design principles, advanced lighting, acoustics & smart systems, project management basics and objectives, enhancing presentation skills and the latest different software skills. Along with other soft skills including innovation, imagination, critical thinking, problem solving, communication (graphical, verbal and written), research, reporting, flexibility, team work, coordination, planning, time management, decision making, self-learning and expressing. While using methods including: Lectures, class activities, seminars, discussion sessions, studio workshops, practical training, research assignments, site visits, group work, student independent study, brain storming, individual project-based learning and book reviews. Educational institutions in Egypt are preparing students to work in the careers of architecture design, tender documents, urban design, detailed planning, construction industry, building technology, rehabilitation, conservation of buildings, urban context, physical planning, and they can also join research centers. The two studied universities had almost the same curricula content, with very minor differences, while the teaching methods are slightly different.

5. Application of the survey questionnaire:

The questionnaire target group were graduates from architecture schools in Egypt, weather public or private universities, with the aim of identifying the graduates' readiness for professional practice. Graduates were asked to rate the acquired knowledge, techniques, intellectual skills and software skills from their university education, aiming to identify the points of weaknesses and strengths experienced by graduates.

5.1.Design of the survey questionnaire:

The questions were classified into three sections, the first one was rating group of knowledge, skills and techniques, which were selected carefully from the Intended Learning Outcomes (ILOs) from the curriculum courses of different universities in Egypt. The courses were classified as follows:

1. Architecture design.
2. Theories of design and architecture.
3. History of Architecture.

4. Computer application and 3d modelling.
5. Building and working drawings.
6. Environmental design and sustainability.
7. Project management.

The selection of the measured areas in the curriculum courses, was based on a previous literature review and interviews with some graduates who experienced problems in these areas. The objective of this section is to compare the intended learning outcomes of the courses in the architecture curriculum to the actual learning outcomes of the architecture graduates, in order to get recommendations for reframing the curriculum content if needed. Section two is concerned with the teaching methods in architecture schools in Egypt, and to which extent graduates used to benefit from these methods, with the aim of using the most efficient method, while eliminating traditional methods if proved to be purposeless. The last section is concerned with the methods used by graduates to fill the gap they experienced while their transition from university to work and their suggestions concerned with the architecture curriculum in Egypt for the same purpose.

The structure of the questionnaire and its' objectives are shown in ***Table*** as follows:

Questions	Objectives
Respondents' background Information	
1. University graduated from	To link the respondents' answers with his/her architecture schools' curriculum.
2. Years of Experience	To determine the target group level of experience effect on their answers.
3. Job title	To determine the effect of career path on the acquired skills.
4. Company	To estimate the scale of the architecture firm and scope of work
Section 1	
5. For each of the following subjects, please rate the **provided knowledge** from your university education.	To figure out the points of weaknesses and strengths graduates experienced in their professional practice, as a result of their architecture schools' education, then comparing them to the ILOs of architecture curricula and recommending changes in the curricula content if needed.
6. For each of the following subjects, please rate the **enhanced intellectual skills** from your university education.	
7. For each of the following subjects, please rate the **enhanced software skills** from your university education.	
8. For each of the following subjects, please rate the **acquired techniques** from your university education.	
Section 2	
9. Which of these methods were used in your undergraduate studies?	To determine the effect of used teaching methods on the graduates' comprehension,

10. From your experience, Please rate the importance of each of these undergraduate teaching methods	and measuring the efficiency of the methods, therefore rearranging the usage of each method and adding new methods if needed.
Section 3	
11. How did you improve the skills that were not covered in your university education?	To collect ways that could be added to Architecture Curricula for development.
12. Please suggest methods to improve the graduates' readiness for employment while university study.	To find out different solutions for narrowing the gap between architecture curriculum in Egypt and employability skills demanded in the 21st century.

Table *2*: Questionnaire structure with objectives

5.2.Analysis of the questionnaire responses:

5.2.1. Respondents background information:

The data of this survey includes the responses of 77 employees, graduated from architecture schools in Egypt, as shown in Error! Reference source not found., of which 65% are in public universities, and 35 % are of private universities in Egypt. The major of the respondents (62%) were of junior level (2 to 5 years of experience), 16 % are of senior level and team leaders (6 to 10 years of experience), 14% are expertise (more that 10 years of experience) and 8% were fresh grads. (0 to 1 year of experience) as shown in Error! Reference source not found.. The majority of the respondents' background experience is in the technical and design areas (44% Technical architects and 30% design architects) as shown in Error! Reference source not found., 13% are interior designers, 11% projects managers and coordinators and 2% are landscape architects and teacher assistants. The firms that respondents are working in varies from local studios to multi-national companies with different scales as shown in Error! Reference source not found., 49% medium scale enterprise (number of employees between 250 to 500), 34% large scale enterprise (number of employees is more than 500) and 17% are of small scale enterprise (number of employees are less than 250).

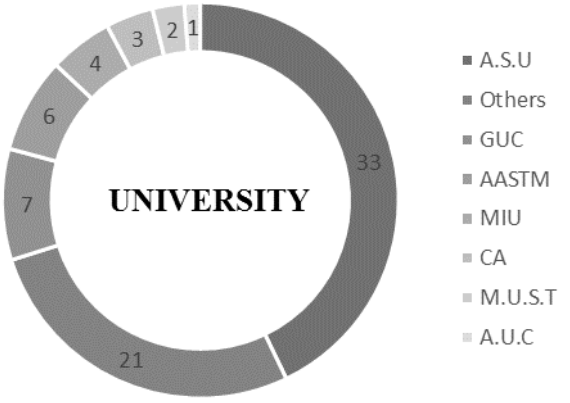


Figure 2

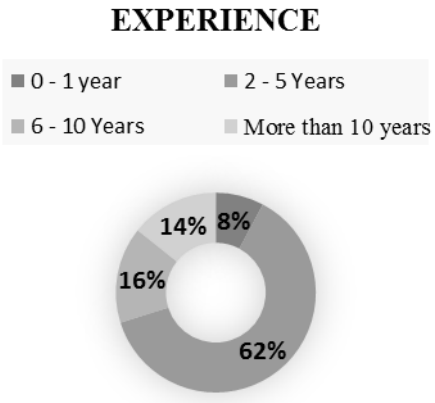


Figure 1

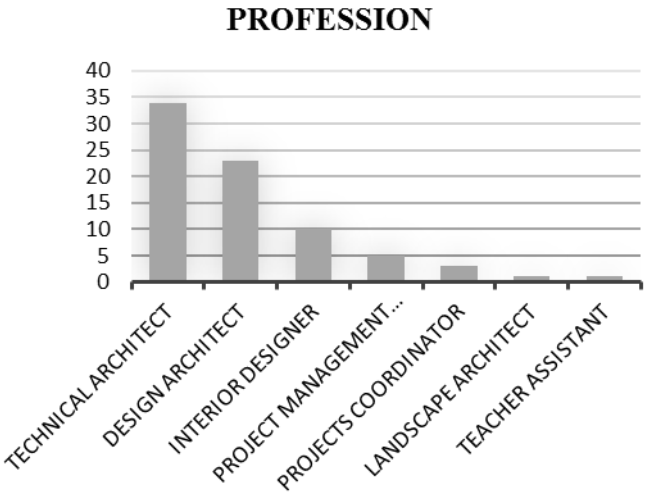


Figure 4

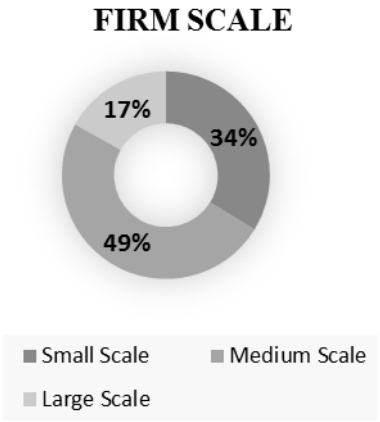


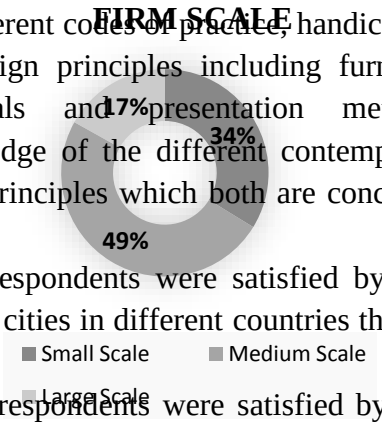
Figure 3

5.2.2. Analysis of the graduates' learning outcomes:

Graduates were asked to rate their satisfaction level of their acquired technical knowledge, techniques, intellectual and software skills from university education in selected areas that appeared to have argument on.

5.2.2.1.Technical knowledge:

As for the **Architecture Design courses**, graduates were satisfied by their knowledge at the areas of architecture design fundamentals, approaches and processes. On the other hand they had a lack of knowledge in the areas of application of different codes of practice, handicapped needs & disability access certificates, and interior design principles including furniture, lighting, flooring, contemporary finishing materials and presentation methods. Most of the respondents were satisfied by their knowledge of the different contemporary architecture movement styles and architecture criticism principles which both are concerned with the **Theories of Architecture courses.**



At the **History of Architecture courses,** 90% of the respondents were satisfied by their knowledge of the different art movements & formation of cities in different countries through different eras.

Building and Working Drawing courses: Most of the respondents were satisfied by their knowledge at the building construction and finishing materials & structure systems basics and 65% were satisfied by their knowledge at the building construction process and technologies. While nearly 52% were dissatisfied with their ability in integrating other disciplines spatial requirements including mechanical, electrical & sanitary requirements into buildings.

While for the **Environmental Design and sustainability course,** graduates were satisfied by their knowledge of the environmental design principles and sustainability related topics including indoor thermal comfort, lighting, acoustics, elimination of wastes, etc. On the other hand, they had a lack of information about different building rating systems' concepts, categories and importance. **Figure 2** shows the employees' satisfaction level regarding their acquired technical knowledge from their undergraduate courses in details.

5.2.2.2.Acquired Techniques:

Respondents were almost satisfied by their acquired techniques including freehand sketching and physical modeling in the **Architecture Design Courses**, while they were dissatisfied by their architecture photography skills & technical reports writing techniques. Concerning the Buildings and Working Drawings courses, 60% of the respondents were satisfied by their ability to produce execution drawings using coding systems, while the dissatisfaction lies in the techniques of projects' items specifications & B.O. Qs and the production of interior design development drawings. It is orth mentioning that most of the respondents didn't or hardly acquired the techniques of identifying installation problems on site and performing post occupancy evaluation process (P.O.E). **Figure 1** shows the employees' satisfaction levels regarding their acquired techniques from their undergraduate courses in details.

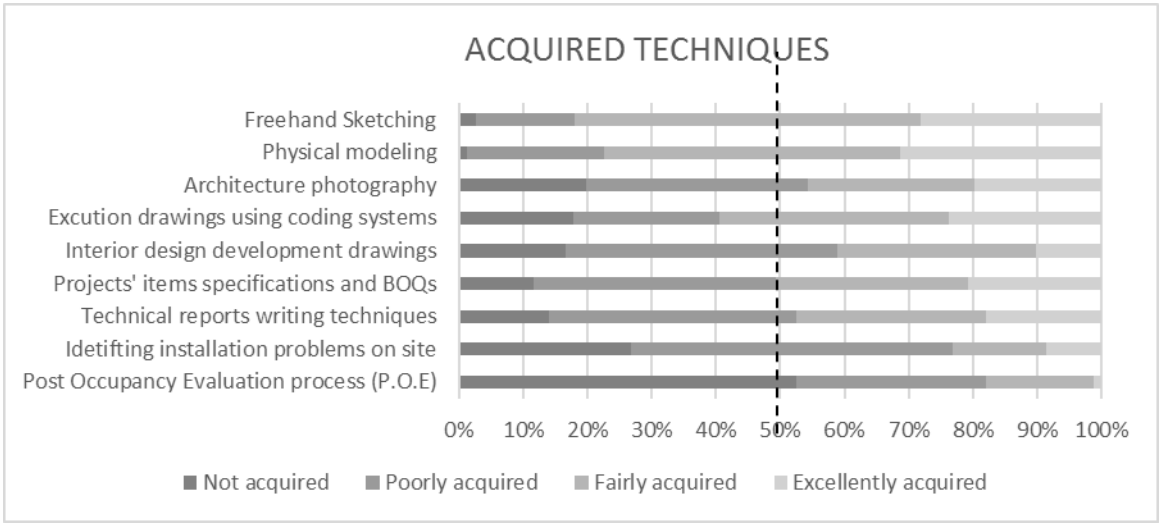


Figure 1: Graduates' acquired techniques through their undergraduate studies.

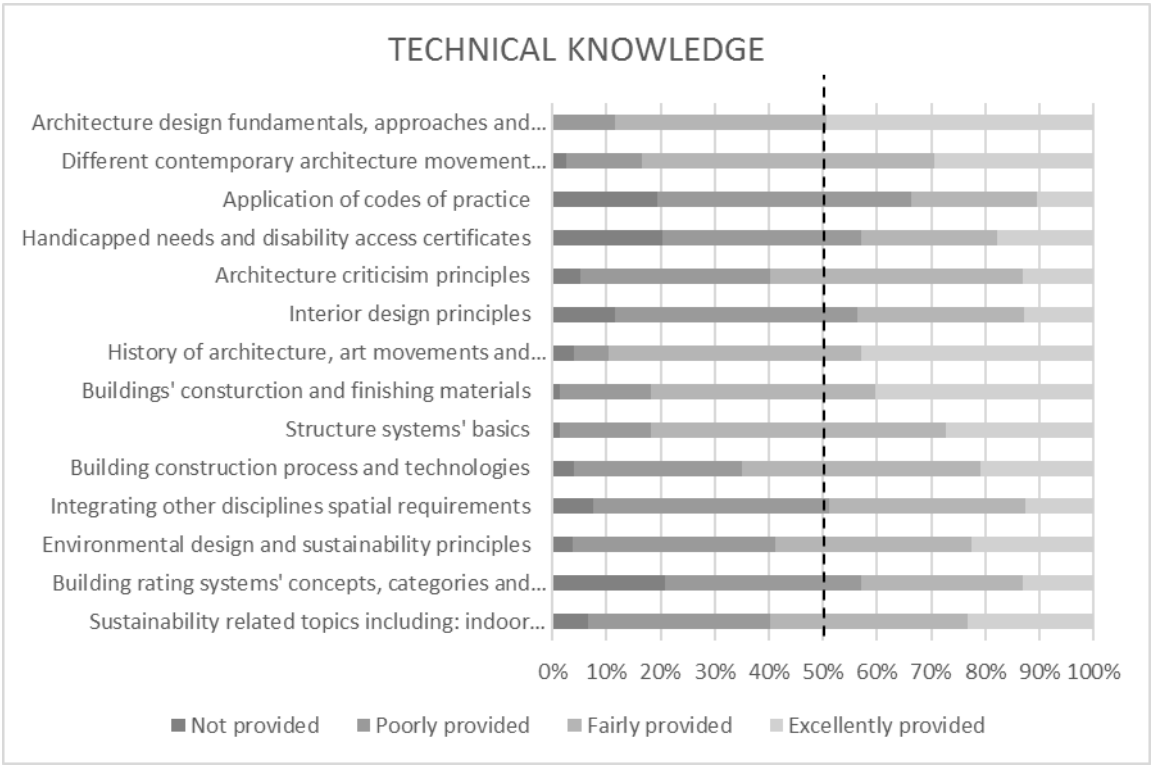


Figure 2: Graduates' acquired technical knowledge through their undergraduate studies.

5.2.2.3.Enhanced Intellectual skills:

Most of the respondents were quite satisfied with their intellectual skills acquired from their architecture education as shown in Figure 3.

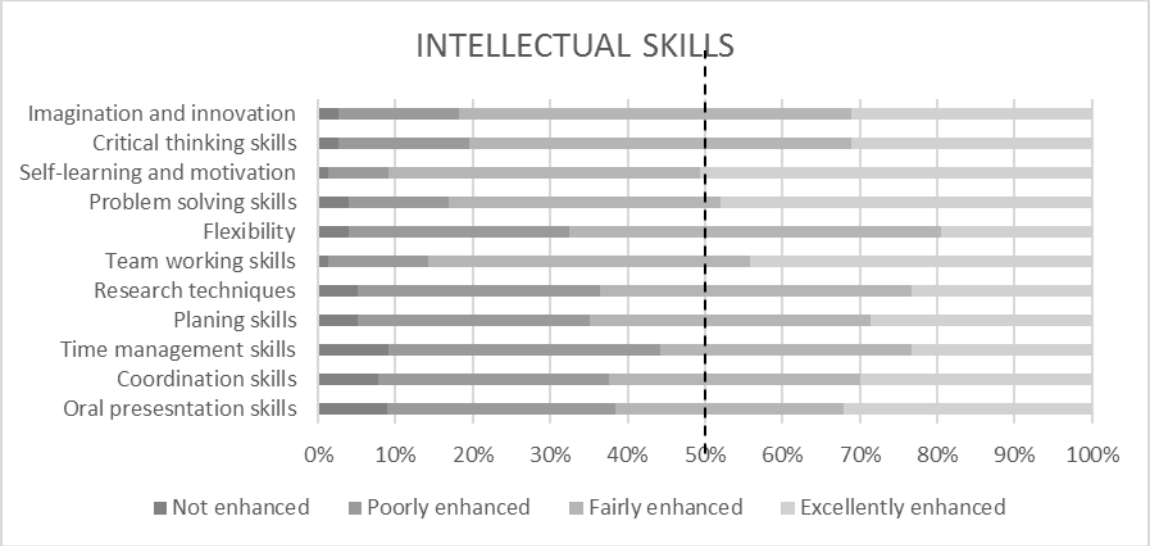


Figure 3:Graduates' enhanced intellectual skills through their undergraduate studies

5.2.2.4. Enhanced software skills:

Respondents were extremely dissatisfied by their software skills except for the 3D modeling software tools, while other **Architecture Design** aiding software tools including rendering & animation, parametric form generation & modeling and generative design techniques and digital fabrication were poorly enhanced for architecture graduates during their academic studies. As for the **Project Management courses**, the intended learning software which is the LCA is hardly known for most of the respondents. The software tools concerned with the **Environmental Design courses** also were poorly enhanced, including building's performance simulation and evaluation programs. Concerning the **Building and Working Drawings courses**, BIM tools were poorly enhanced for 80% of the graduates. Figure 4 shows the satisfaction level for each software according to architecture graduates.

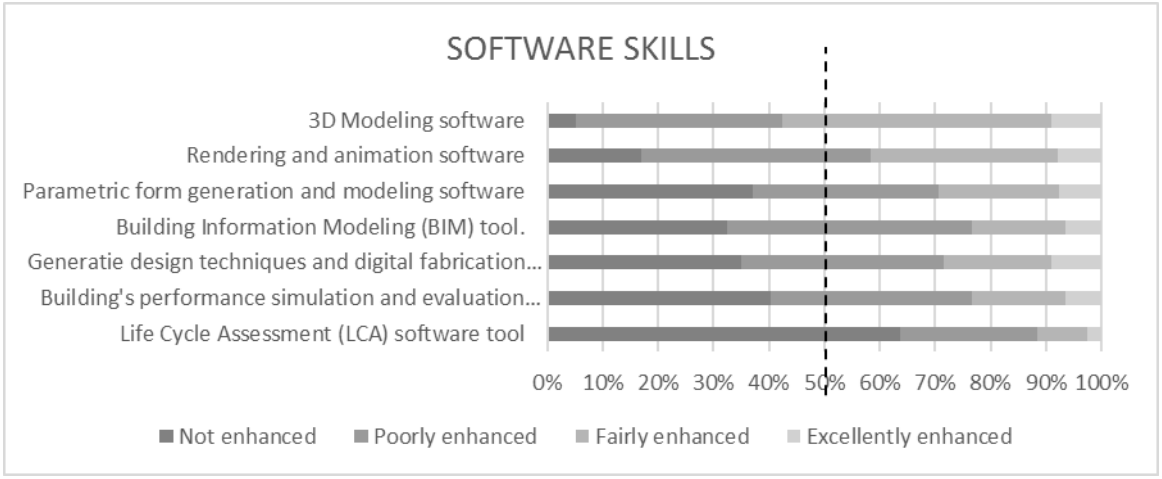


Figure 4: Graduates' enhanced software skills through their undergraduate studies

5.2.3. Analysis of the graduates' received teaching methods:

The respondents received teaching methods used at their architecture schools during their undergraduate studies were arranged from the most to the least used as follows: lectures, tutorials, studio activities, assignments, discussion sessions and site visits. On the other hand, graduates rated these methods according to their efficiency for them as follows: tutorials, assignments, discussion sessions, site visits, studio activities and lectures. **Figure 5** shows the relationship between the usage frequency and efficiency of the teaching methods used in architecture schools in Egypt.

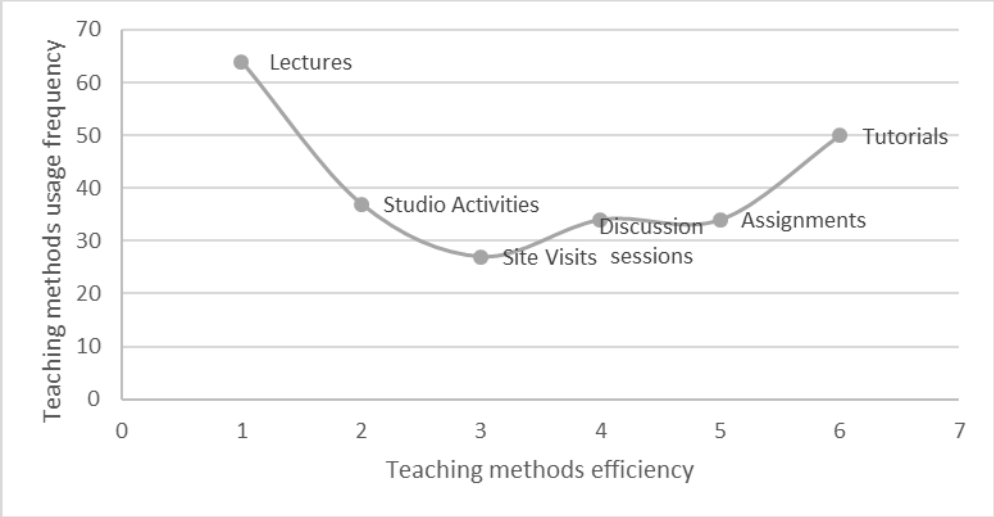


Figure 5: The relationship between teaching methods usage frequency vs efficiency

5.2.4. Graduates' tools to improve their competencies for professional practice:

Graduates overcome the lack of knowledge and skills mentioned in section 1 of the survey by different methods shown in Figure 6, including work practice, research, online courses, workshops, post graduate studies, accrediting programs and courses.

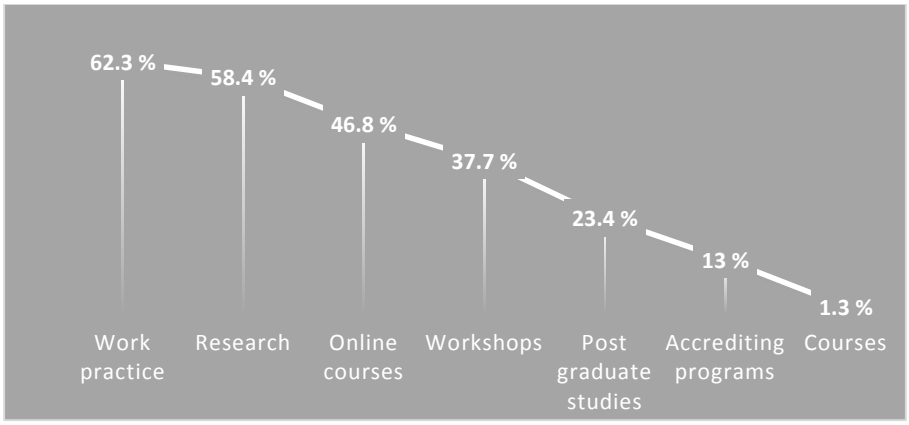


Figure 6: Methods used by graduates to improve university to work transition

6. Application of the survey interviews:

Interviews are conducted with 7 expert employers (Founders – CEOs & Project coordinators) of medium to large scale multi-national Firms in Egypt with the aim of identifying the key skills required for the work force and measuring the graduates' readiness for the work practice.

Employers were asked to rate the graduates' skills and knowledge and how to overcome the missing graduates' demanded competencies.

6.1.Interview objectives

- Identifying the key competencies necessary for the graduates' success in professional practice.
- Figuring out the points of weakness employers find in fresh graduates.
- Figuring out their preferred architecture schools graduates and the reasons.
- Identifying their recommendations to fill the gap found between architecture schools' curricula and demanded employability skills.

6.2.Interview questions:

- What are the necessary skills for success in the workforce nowadays?
- On a scale from 1 to 4, please rate your satisfaction level with the graduates' technical knowledge and skills.
- Is there any university you prefer their graduates? why?
- What do you suggest for universities to improve university to work transition?

6.3.Analysis of the interview responses:

6.3.1.Key competencies required for professional practice vs actual graduates' competencies:
Employers were asked to categorize a set of knowledge and skills according to their importance in the workforce, and to mention the skills that are not necessary for the fresh graduates to have, as they will be acquired by the work practice. Then they were asked to evaluate these points acquired by fresh graduates**. Figure 7** and **Figure 8** show the employees' evaluation of graduates' technical knowledge and skills.

6.3.1.1. Technical knowledge from employers' points of views:

Application of codes: Employers expect graduates to have the awareness of different types of national and international codes and methodologies of how to search in them. They are not meant by fresh graduates' knowledge of codes' contents (Baligh M., 2020).

Architecture criticism principles: Most of employers are satisfied by the graduates' architecture criticism ability, however they claim that graduates need more self confidence to express their points of views (Fahmy A., 2020).

Interior design principles: graduates lack the sense of interior spaces scale and users' experience, as well as they always design from the exterior perspective only. Employers require that graduates have sufficient information at this field as they see it as a mandatory base for architecture forms and functional spaces (Fouda N., 2020).

Construction and finishing materials: Employers are satisfied by the graduates' knowledge of construction materials, while the lack is found in the finishing materials. Graduates' have knowledge of different traditional finishing materials names and look, however they are not aware of the materials' characteristics and functions. Employers also focus on the importance of enriching graduates' knowledge with environmental new materials that are being used nowadays (Mohsen H., 2020).

Structure systems basics: Graduates need to integrate the structure systems they learnt with their building design. As employers claim that graduates have a theoretical knowledge of different structure systems, but they don't apply this knowledge in their design as if they were two separate subjects.

Integrating other disciplines spatial requirements: Most of employers are not satisfied by the graduates' knowledge of other disciplines including mechanical, electrical, sanitary and other buildings services integration. They are not aware of their priorities, or spatial requirements, while employers focus on the importance of such knowledge from the early beginning since it's highly demanded for the professional practice (Mohsen H., 2020).

Environmental design and sustainability principles: Employers claim that graduates have background knowledge of the environmental design and sustainability principles, but their knowledge is not enough for the practicing of green buildings design. 70% of the interviewees see that environmental design and sustainability are not demanded nowadays in the Egyptian market, however they are very important internationally. They require graduates to practice zero energy/green buildings' oriented design exercises from their academic studies and to integrate BIM modeling with sustainable design. They require that graduates have background knowledge of the current rating systems, their types and importance without deep study of any (ElBeheiry A., 2020).

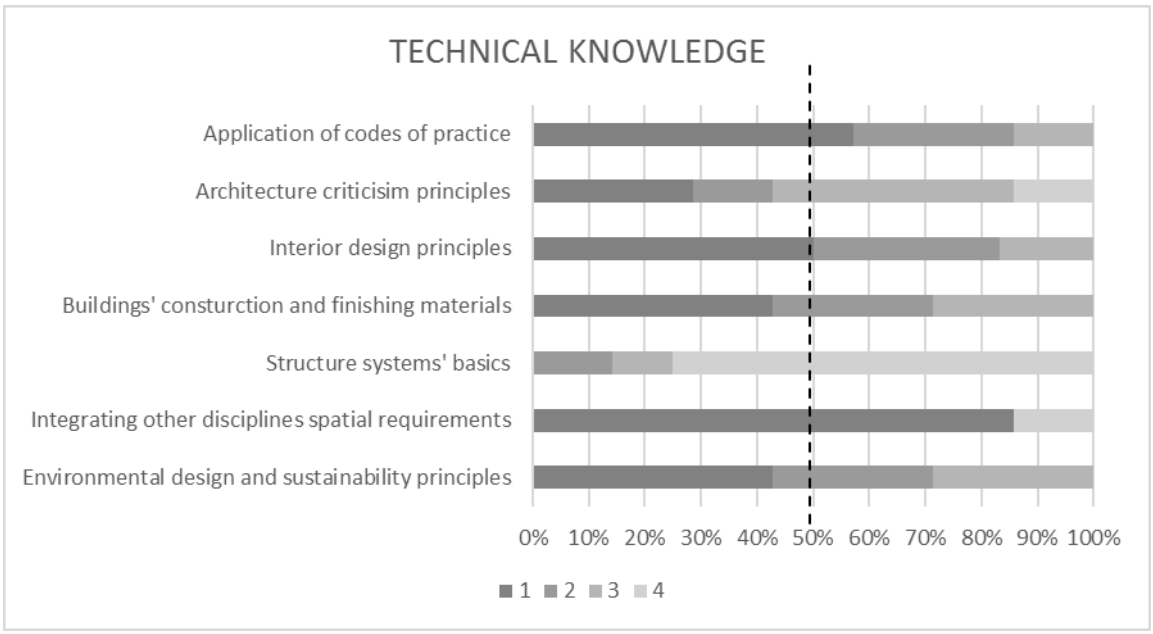


Figure 7: Employers' satisfaction level of the graduates' technical knowledge

6.3.1.2.Intellectual and software skills from employers' points of views:

Intellectual skills: employers claim that the key skills for the success of the work force are imagination & innovation, critical thinking, self-learning & research techniques, flexibility, team working and time management skills, in addition to oral presentation and freehand sketching techniques. They are also satisfied by all the mentioned graduates' skills and techniques except for time management, oral presentation and some have comments on the team working skills. As for the time management skills, employers are dissatisfied with the graduates' lack of awareness of the economic dimension of time and their inability to estimate

specific time for executed tasks. While for the team working techniques, employers claim that graduates can work in teams but they are not aware of the ethics of team work.

Software skills: Employers categorized software into:

1- Modeling and rendering: Most of employers were satisfied by the modeling and rendering graduates' techniques.

1- BIM tools: employers were dissatisfied with the graduates' tools at this area, as graduates' knowledge is only concerned with the Revit software tools and they have insufficient knowledge of the building and information modeling system as a whole.

2- Parametric design tools: most of the interviewees were not satisfied with the graduates' skills of the parametric design tools.

3- Buildings' performance simulation software: employers claim that a very small number of graduates have the simulation software skills, however they are not concerned with these software tools, as it's very specific and not demanded a lot in the local market nowadays.

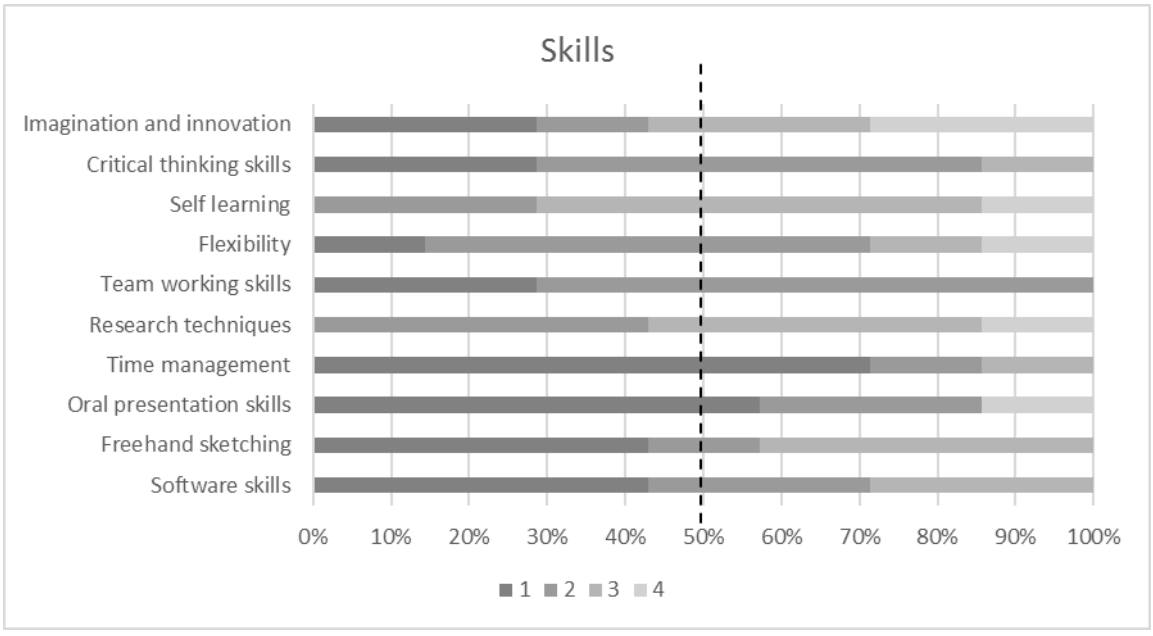


Figure 8: Employers' satisfaction level of the graduates' intellectual and software skills

6.3.2. Employers' preferred university graduates:

Employers were asked to state their preferred university graduates and they stated the universities mentioned below in **Figure 9** for the following reasons:

1.Ain Shams University: Teaching staff is qualified, reliable and keen on the teaching process. ASU candidates are hard-workers, have high innovation, critical thinking and self-learning skills, modeling and rendering techniques, good listeners and have good criticism principles.

2.American University in Cairo: AUC candidates have good presentation and critical thinking skills. Moreover, they are also widely exposed to various knowledge in their academic experience including humanities and arts.

3.Cairo university: employers trust the old name and deep experience of Cairo university in the teaching process.

4.Arab Academy for Science and Technology and Maritime Transport: AASTM candidates have high confidence and can express their ideas and opinions clearly. Most of them also have awareness of the BIM systems and sustainability principles.

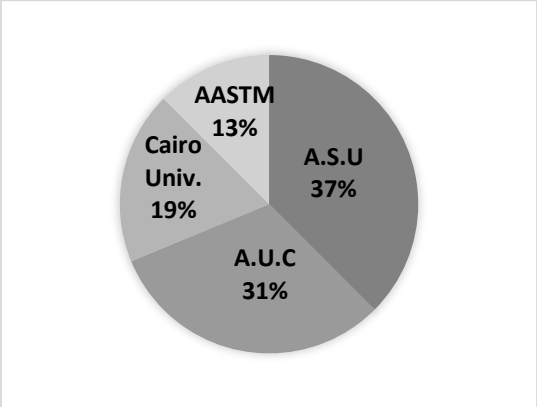


Figure 9:Employers' preferred university graduates

6.3.3. Employers' Architecture products evaluation criteria:

Two architecture design projects for a mixed-use tower of high and average grades, for students from the third year of architecture at Ain Shams university were presented to the interviewees, in order to obtain their evaluating criteria on these projects. The criteria appeared to be as follows:

1. Design process and concept justification which appear in different studies including site analysis, form generation and environmental studies: employers were satisfied by this point as the studies indicate a promising design process, however the weakness appeared in the buildings relations to their surroundings.
2. Innovation: employers considered both students to have raw talent, vision and composition skills, however they claim that the two projects are over inspired by other existing towers.
3. Plans solutions were of good impression as students solved different building functions, while paying attention to different services and core elements, however the core elements were not calculated and appeared to be insufficient and the plans were not much related to the elevations' treatment.
4. Economic factor: Employers were dissatisfied by the students' awareness of the buildings' economic factor, as they claim that the product is an art work more than being an investment project, which is needed for the real practice.
5. Presentation skills: appeared to be of average to good level of satisfaction.

7. Suggestions for improving graduates' readiness for professional practice:

Graduates and employers suggested a set of actions to narrow the gap between architecture education and professional practice, these actions were analyzed and translated into curriculum modifications into three categories: courses content, methods and teaching staff.

7.1. Courses content:

1. Research and Development (R&D) courses should be provided and new technologies should be continuously enrolled in the curriculum courses.
2. Materials' courses should be more oriented to the types, uses and characteristics of different finishing materials, rather than the technical components of construction materials.
3. Focusing on B.O. Qs practice.

4. Focusing on interior design courses to deepen the knowledge of principles including furniture, lighting, flooring, contemporary finishing materials and presentation methods.
5. Software tools should be introduced from year one of undergrad. study.
6. Soft skills' courses in the fields of presentation, work ethics, team working and problem-solving skills, different management and research techniques should be provided by specialists.
7. Providing start-ups business development techniques.
8. Introductory lectures about different architecture careers rather than technical and design fields only.
9. Different accrediting programs background knowledge through undergraduate studies.
10. Courses references and content should be updated yearly.

7.2. Teaching methods:

1. Mandatory summer site and office internships, where universities and architecture firms collaborate to create comprehensive training programs (Khodeir . L, 2019).
2. Creating work place simulation in architecture schools' studios.
3. Integrating different courses with each other to make students relate all interconnecting aspects of the architecture design process and continuously relating the curriculum theoretical information to its application in practice when applicable.
4. Simulating the coordination process for integrating different disciplines spatial requirements into buildings in real practice, by executing coordination tasks between university departments, where the architecture student is the lead who is responsible for producing coordinated section/plan.
5. Increasing the number of site visits, workshops, discussion sessions between students and staff rather than theoretical lectures as proposed in **Figure 10.**
6. Enrolling real projects in the academic courses, for example: graduation projects could be done with real clients like developers, under the supervision of the teaching staff, where students will be dealing with real stakeholders.
7. Continuous exchange programs with international architecture schools.

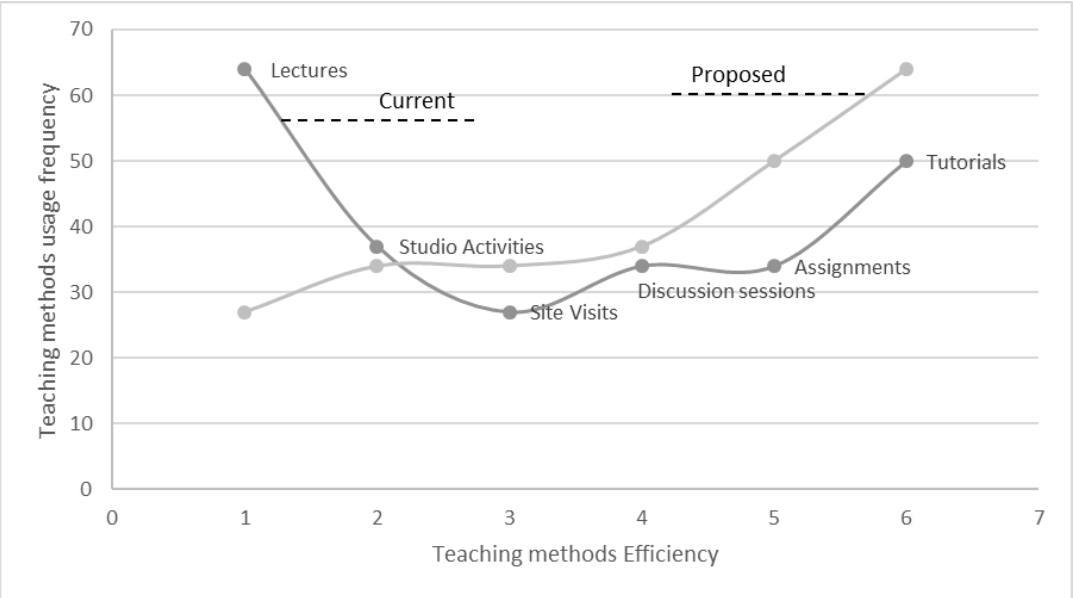


Figure 10: The relationship between current and proposed teaching methods usage frequency vs efficiency

7.3. Instructors:

1. Teaching staff should have a large number of practicing architects.
2. Experts in the fields of sustainability, BIM and different software tools could assist in these courses content or lecturing.
3. Continuous seminars presented by well-known architects and interior designers in the market field.

7. Conclusion:

The aim of this research was to improve the architecture graduates' readiness to the professional practice and to directly relate the architecture education curricula in Egypt to the market demanded employability skills. It was obvious from the surveys that architecture graduates are properly equipped by a set of technical knowledge, techniques, intellectual skills and software skills that are demanded in the professional practice, while on the other hand, there are some points that graduates and employers are not satisfied with, including but not limited to:

1. Technical knowledge and techniques including: application of codes & handicapped needs, architecture criticism principles, interior design principles, integrating different disciplines requirements into buildings design, finishing materials types, uses & characteristics and building rating systems.

Interior design development drawings package, projects' items and B.O.Qs, technical reports writing, identifying installation problems on site and Post Occupancy Evaluation process (P.O.E).

2. Intellectual and Software skills: Time management & oral presentation skills and software skills including rendering & animation, parametric design tools, BIM tools, Building's performance simulation software and LCA software tools.

A set of actions is developed to cover the weakness areas at the architecture education curricula concerned with courses' contents, teaching methods and teaching staff including, but not limited to, proposing mandatory summer trainings in specific fields, introducing R&D, developing some courses contents such as materials, B.O.Qs, interior design, software skills, Human resources management courses, creating work place simulation in studios, enrolling real projects in academic study, holding seminars for well known architects and increasing number of practicing staff.

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