

## The future of interior design industry in the light of Artificial intelligence spread

Dr. Sarah Nabih Nasif Farag

Lecturer –Interior design department Faculty of Arts and design – October University  
for modern science and Arts (MSA).

[Sara.n\\_nasif91@yahoo.com](mailto:Sara.n_nasif91@yahoo.com)

### ABSTRACT:

With the spread of artificial intelligence in an unprecedented way especially after the outbreak of covid-19, fear of computer replacing human is constantly increasing, and here comes the important question which is: Will artificial intelligence pose a threat to certain jobs by replacing human beings with computers? Is the interior design industry (with all careers attached to it) one of those threatened industries? The research problem relies on the fact that most of the limited studies available are attempts to predict future jobs in general, but none of them is directed towards accurately analyzing the future of interior design sectors specifically. This research paper aims to evaluate to what extent did artificial intelligence influence the interior design industry overall? Where is it expected to go? And undergo analysis if indeed. Artificial intelligence will have a role in dispensing of human element in various fields related to interior design in one way or another and if so what can be the alternative solutions available for interior designers to be well prepared for future challenges and seize opportunities? The research assumes that the negative impact of AI on the interior design industry is leading to disappearance of several related careers. The evaluation process took place using the analytical-comparative method by analyzing current case studies for AI integration in different interior design sectors in addition to analyzing jobs and careers whose future is already forecasted, and comparing them with other ones of similar or close nature (close task type) in interior design to predict their future as well as forecasting new ones created by AI if found. Several conclusions were reached, the most prominent is the denial of the research hypothesis partially, specifying the most and least affected careers, the ones who will need further skills to keep up with the new requirements, and the ones which will completely appear due to AI, resulting in some recommendations to face future challenges and seize opportunities.

### KEYWORDS:

Artificial intelligence; future of interior design industry; interior design future careers.

### المخلص :

مع انتشار الذكاء الاصطناعي ، يتزايد باستمرار الخوف من استبدال الإنسان بالكمبيوتر . وهنا يأتي السؤال الهام وهو: هل سيشكل الذكاء الاصطناعي تهديداً لوظائف معينة من خلال استبدال العنصر البشري بأجهزة الكمبيوتر؟ هل التصميم الداخلي من تلك القطاعات المهددة؟. يمكن مشكلة البحث في أن أغلب الدراسات المحدودة المتاحة هي محاولات للتنبؤ بوظائف المستقبل بوجه عام ولكن لأحد منها موجة إلى تحليل مستقبل قطاعات التصميم الداخلي على وجه التحديد.

تهدف هذه الورقة البحثية إلى تقييم مدى تأثير الذكاء الاصطناعي على صناعة التصميم الداخلي بشكل عام حتى الآن ، وإلى أين من المتوقع أن يصل كما يحلل البحث ما إذا كان الذكاء الاصطناعي سيكون له دور في الاستغناء عن العنصر البشري

في مختلف المجالات المتعلقة بالتصميم الداخلي بطريقة أو بأخرى وإذا كان الأمر كذلك فما هي الحلول البديلة المتاحة لمصممي التصميم الداخلي والعاملين بالمجال بشكل أو بآخر حتى لا يفقدوا وظائفهم إستعداداً للتحديات المستقبلية واغتناماً للفرص. افترض البحث التأثير السلبي للذكاء الاصطناعي على صناعة التصميم الداخلي بوجه عام مما سوف يؤدي إلى اختفاء العديد من المهن ذات الصلة . إستخدم البحث منهج التحليل والمقارنة من خلال تحليل الحالة الحالية لتكامل الذكاء الاصطناعي في قطاعات التصميم الداخلي المختلفة لمعرفة الوضع بدقة بالإضافة إلى تحليل الوظائف التي تم التنبؤ بمستقبلها بالفعل ومقارنتها بمهن قريبة بطبيعتها (طبيعة المهمة ) في التصميم الداخلي للتنبؤ بمستقبلها أيضاً بالإضافة إلى التنبؤ بمهن أخرى كنتاج للذكاء الاصطناعي إن وجد ولقد تم التوصل إلى عدة استنتاجات أبرزها إنكار فرضية البحث جزئياً ، تحديد المهن الأكثر والأقل تأثراً ،المهن المستمرة التي سوف تحتاج إلى إكتساب مهارات إضافية للتوأكب مع الإحتياجات الحديثة والمهن الحديثة كلياً التي سوف تظهر كنتاج للذكاء الاصطناعي وصولاً إلى إقتراح بعض التوصيات لمواجهة تحديات المستقبل واغتنام الفرص.

### الكلمات الإفتاحية :

الذكاء الاصطناعي ؛ مستقبل التصميم الداخلي ؛ وظائف المستقبل في التصميم الداخلي.

### INTRODUCTION:

Over years and decades, humanity has always wondered to where technology is going to take us. Many predictions of a future ruled by technology has already been presented through different mediums. We have already seen movies visualizing the future as fully automated by robots and computers with no role for human being categorizing it as a fiction that won't be achieved one day. Surprisingly, we are very close to this. Technology has evolved at a terrifying lightning speed and people have grown more suspicious of what was once illusion and has almost become a reality. Technology is replacing humans gradually and rapidly and the question is, to what extent can computer replace human generally and in the interior design industry specifically?

Forecasting the future being already artificially intelligent has already been approved as future mega trend years ago (Hajkowicz et al., 2016), and there is no doubt that the breakout of the pandemic (Covid -19) has even contributed in speeding and spreading the use of Artificial intelligence more. The surrounding has obliged us to make an instant digital transformation that has been delayed for many years or at least would have taken more years to reach (if in normal conditions) and it is here to stay. Now, the challenge is how to cope with those sudden changes and deal with them? What are the type of jobs and careers attached to interior design that are going to disappear? What of those careers won't, but will still need additional skills? And will this technology help in the emergence of other alternative related careers all together?

### RESEARCH PROBLEM:

- Artificial intelligence taking the world by storm suddenly and rapidly (specially after the Covid- 19 crisis )and heading toward an unknown future regarding its impact on Interior Design related careers, unknowing how to be well prepared for future challenges and how to seize opportunities?

- The limited studies found, forecasts future of industries generally, with no reference to interior design industry and within careers future in specific.

#### **RESEARCH HYPOTHESIS:**

The research assumes replacing the human race with artificial intelligence in many professions related to interior design which will lead to the disappearance of many jobs related to the field.

#### **RESEARCH AIM:**

- Investigate the future challenges facing different current careers that are expected to continue in interior design field with the aim of getting well prepared to those changes (Regarding the skills required).
- Explore if Artificial intelligence can really replace human generally in different careers related to interior design specifically and investigate if this will lead to the disappearance of some careers related to interior design. (Forecasting Future of interior design industry).
- Explore if there are new careers that could appear as a result of this digital transformation to start preparing for it as well.

#### **RESEARCH IMPORTANCE:**

- Understand the deep meaning of Artificial intelligence and the difference between several near expressions that are used to be understood as being the same (ex: smart technologies).
- Exploring and analyzing to what extent did Artificial intelligence had an impact on interior design industry (through different related careers) till this date.
- Forecasting the future of different interior design careers through the dominance of Artificial intelligence.

#### **RESEARCH METHODOLOGY:**

The analytical – comparative method is used to get an accurate forecasting for future of interior design related careers by analyzing current applications available and comparing interior design industry careers with similar ones in nature (same type of task) that are already forecasted.

#### **RESEARCH LIMITS:**

Since the start of clear influence for Artificial intelligence in interior design industry till now (2021).

#### **RESEARCH STRUCTURE:**

The research is divided into five main sections as follows:

**Table (1) – Research structure and points covered in each section – by the researcher (2021)**

<b>Research structure</b>	<b>Points covered</b>
General historic review on Artificial intelligence	<ul style="list-style-type: none"> <li>● History of Artificial intelligence.</li> <li>● Identifying the real deep accurate meaning of artificial intelligence through differentiating in</li> </ul>

	meaning between artificial intelligence and other near expressions (smart technologies) etc.
Artificial intelligence and interior design careers future	<ul style="list-style-type: none"> <li>● Analyze impact of artificial intelligence on the appearance and disappearance of jobs in the future and investigate if interior design industry including different related careers will be affected.</li> <li>● Classify careers attached to interior design that will be completely cancelled, careers that will need further skills and new careers all together.</li> </ul>
Evaluate the current applications of Artificial intelligence in interior design industry.	<ul style="list-style-type: none"> <li>● Explore case studies for implementations that took place in the industry and careers related till now.</li> <li>● Investigate if those cases are considered intelligent applications.</li> <li>● Answering the research hypothesis.</li> </ul>
Concluding different challenges and opportunities facing the interior design industry	
Recommendations on how to get well prepared face challenges and capture opportunities.	

## GENERAL HISTORIC REVIEW ON ARTIFICIAL INTELLIGENCE

Artificial intelligence is an expression that has always been widely associated with what is considered contemporary or new or even futuristic. To the surprise of all, this expression has been around for the longest time now. It dates back to the ancient Greek era where it is proven that various ideas about humanoid robots have been carried out (İzzet Kılınc, et2019). A lot of trials had been done till the most prominent break through happened in the year 1950 through (Alan Turing) who provided a new turning point regarding the concept of “thinking machine”, trying to be the nearest possible to real human being functioning mind. He asserted that the question “Can a machine think?” is an ambiguous question and the issue of “intelligent machine” can be solved by Turing Test. The test is an imitation game and considers intelligent behavior the ability to perform human-level intelligence in all cognitive tasks, and a machine that is able to pass the test can be considered as “intelligent” (Russell and Norvig, 1995).

Around the same era, difficulties around a real application arose and investments were greatly reduced. Further research and interest in artificial intelligent showed gradual diminishing and no significant interest from researchers. As a result, research in this field has remained constant for the longest time. By the year 2011, a significant growth was apparent once again and related researches reached its peak by the year 2019 (Figure 1) and it's expected to be in continues growth once again.

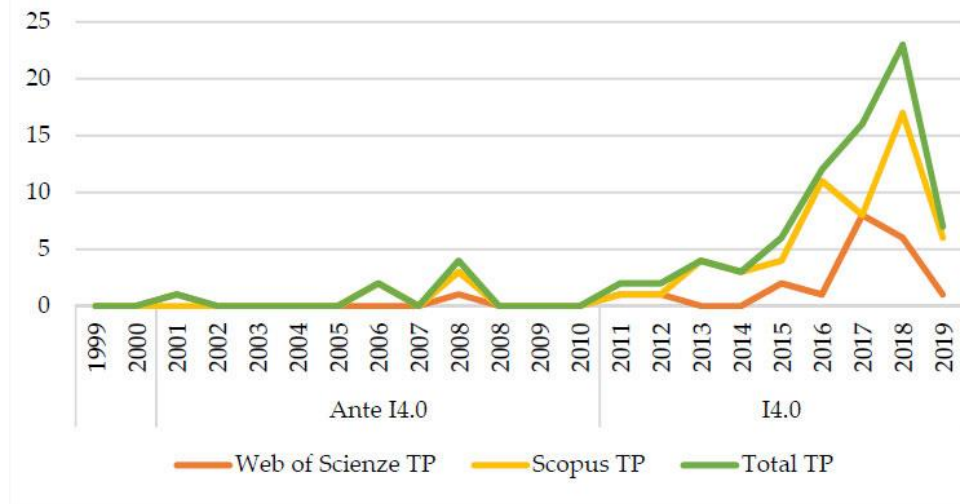


Figure (1)- Research percentage related to AI through the years (Raffaele Cioffi, et2020)

It is worth mentioning that not all of those researches reflect a pure accurate rightful meaning of artificial intelligence as well, but what is thought to be artificial intelligence. Unfortunately, throughout years, researchers and specialists were trying to find an accurate definition to artificial intelligence and there is still a lot of controversy around it. There is no existence to a widely accepted definition till now (Bhatnagar et al., 2018). “Theories of intelligence and the goal of Artificial Intelligence as well have been the source of much confusion both within the field and among the general public” (Monett and Lewis, 2018), and the gap that happened in the research related to the field definitely contributed in delaying reaching a consistent understanding of artificial intelligence till this date, and the inability to determine whether any available applications could be identified as artificial intelligence in the first place.

Associating the word intelligent to human beings as a reference to evaluate the degree of intelligence of computers was a point of contention for some researchers. For instance, (Hutter) stated that an ordinary human is not very intelligent. In addition, traditional computers are already included as intelligent (though maybe at a lower level). This makes the most known concept about artificial intelligence is not so accurate as well. (Hutter, 2005).

On the other hand, (Pei Wang) on his journey to find an accurate definition for artificial intelligence, he stated that AI should show Fundamental Differences when compared with the traditional systems, rather than merely being able to solve more problems. Intelligence should demand a different way to design and to use computers compared to the traditional way which is already captured by the definition of computation (Pei Wang 2019), he further added that intelligence of a system is evaluated according to its problem-solving capabilities, which eventually corresponds with a definition launched by Wang in the year 1995 which states that intelligence is the capacity of an information-processing system to adapt to its environment while operating with insufficient knowledge and resources.”

(Wang 1995), this definitely through machine learning which takes several levels as follow:

**Table (2)- Classification and levels of machine learning (the Researcher 2021)**

Level of intelligence	Level 1	Level 2	Level 3
<b>Name</b>	The Supervised learning	The Unsupervised learning	Reinforcement learning
<b>Methodology</b>	Based on the comparison of computed input and expected output.	Based on discovering and adopting according to an input pattern.	Based on output with how an agent ought to take actions in an environment so as to maximize some notion of long-term reward.
<b>Explanation</b>	This type of learning is considered mostly a smart approach than an intelligent one, where the machine is given a certain input and is being taught to respond a certain way accordingly.	The users do not need to supervise the model. Instead, it allows the model to work on its own to discover patterns and information that was previously undetected. It mainly deals with the unlabeled data.	A machine learning algorithm trained to make a sequence of decisions.  This is one of the highest level of intelligence which is based on self-improvement, functioning the closest to human mind.
<b>Examples</b>	There are a lot of examples around us which can be a good reflection of this. Ex.: Automatic mails	Ex. : uncover fraudulent transactions or payments classification of more complicated data to get predictions.	Ex. : Computer games

By analyzing the examples around us applying all the previously mentioned levels of machine learning, it's clearly obvious that the level of machine thinking that can be a replacement to human and cause a real danger is "reinforcement learning" which is already being applied to a lot of projects that started controlling our life, mostly in a negative way. Example of this is the famous Pub-G game which has been proved to be strongly related to narcissism and social isolation. (Maria, **Tooba**, et 2020).

From the previous analysis for types of machine learning, it can be concluded that the extent of how can machines replace human in the interior design industry generally is determined by to what extent reinforcement learning is applied in machine and the extent of automation in the process which is being proved to be taking baby steps in improving due to its complexity (Matthew Botvinick, Sam Ritter. et, 2019) which is a prove in itself that danger won't be in the near future.

## DIFFERENCE BETWEEN ARTIFICIAL INTELLIGENCE AND CLOSE TERMS

When Artificial intelligence is mentioned, smart applications can come to mind immediately, though there are difference between both. By deeply analyzing, type of machine learning associated with Artificial intelligence, it can be concluded that smart applications (if even considered intelligent) are at a very low level of intelligence.

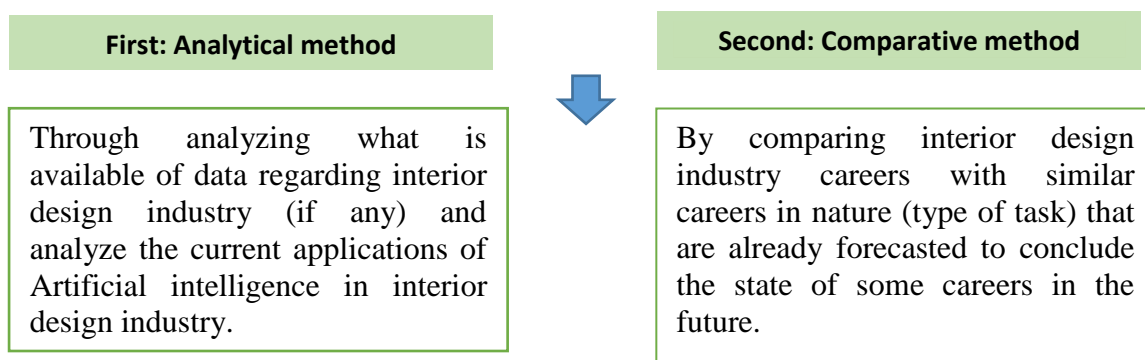
Smart technologies generally, are taught to act a certain way to a certain input, being taught to the machine previously which means that it still cannot act individually or even take decisions by itself. It is still completely controlled by human mind. By analyzing the common state of smart applications that became dominant, starting with our very own smart phones and it being a non-replacement to human beings in different domains till now, it can be easily concluded that this level of smartness hasn't posed a threat to the human element till now but it definitely made life easier (Researcher 2021).

## ARTIFICIAL INTELLIGENCE AND INTERIOR DESIGN CAREERS FUTURE

There is no doubt that artificial intelligence will definitely have an impact on myriad careers in the future and initial predictions confirmed people's fears. Several old forecasts already suggested that artificial intelligence is likely to eliminate almost half of present jobs by 2025, resulting in massive unemployment (Rutkin, 2013), still there are Jobs that are predicted to disappear completely, and others that won't be affected the same way and by the outbreak of Corona virus in 2019, job nature as well has changed. It contributed in accelerating the digitalization of work processes with a percentage of 84%. In addition, working remotely became the norm with a percentage of 83%, automation of tasks happened with a percentage of 50% in 2020 and it's expected to be the norm as well (Future of Jobs Survey 2020, World Economic Forum).

But the question is to what extent will this affect the interior design industry with all the careers attached to it directly and indirectly?

The methodology used to forecast future of interior design industry will be the analytical comparative method as follow:



**Fig (2)- Summarizing the methodology used to forecast the future if interior design industry and attached careers. (Researcher 2021)**

There is no doubt that the word “Interior design industry” is huge and there are a lot of careers directly and indirectly attached to it. But as a general classification, the industry can be classified as follows (fig 3).



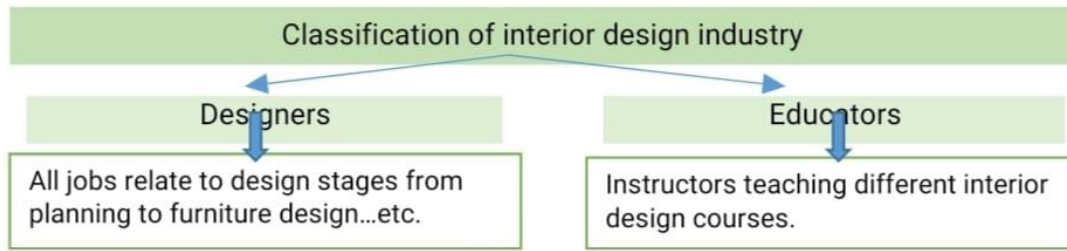


Fig (3)- Classification of interior design industry (the Researcher 2021)

Artificial intelligence will definitely impact both sectors, but to what extent? And is it in the near future? What is the current state?

### FIRST: ANALYTICAL METHOD

By scanning the current state, it can be said that trials till now can be classified into two main categories.

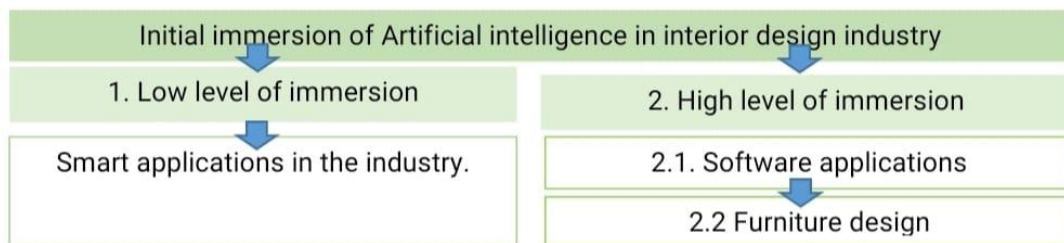


fig (4)-Artificial intelligence current applications in the industry (Researcher 2021)

#### 1. Low level of immersion:

The word “smart home” is not new at all, smart applications in different interior design elements from furniture materials, flooring, ceiling, Windows and doors in addition to lighting, temperature, safety, and security control are already applied and has been around for the longest time. The concept is based on the internet of things and it is mainly a type of “supervised learning” where each interior element has a reaction to a certain input. It is evident that the main aim of smart application appearance and dominance was sustainability goals, trying to achieve a safer environment (through using smart materials and different smart interior space elements. Nowadays studies focus on the same to analyzing the same (W. Rashdan, 2016) which is a very positive aspect of technology when it is rightfully used.

#### ► Researcher analysis and conclusion:

Regarding designers:

Smart design did not impact interior designer roles completely, and the evidence is that there is still plenty of work though smart application dominance.

Regarding educators:

Teaching smart applications in design institutions is already there and from the educator’s side, there is a clear interest in the topic. In addition, new smart technologies have helped in the education process, but it didn’t cancel educators’ role completely.



## 2. High level of immersion

### 2.1. Software applications

Several applications had come out based on generating several ideas on certain inputs. The most famous of those applications are planner 5D home by me, smart draw, Havelly and Hutch.

Most of these soft wares are based on teaching the machine some interior design rules and matching colors, and others are based on learning from previous examples and solutions which means that it can be categorized with in the supervised and unsupervised machine learning (based on table 1, p.5).

► Researcher analysis and conclusion:

Still an interior designer with more complicated type of knowledge will be needed. Though those soft wares are expected to improve and maybe other soft wares are expected to appear, still this won't be in the near future and those mentioned are still fed by humans and learning by experience but cannot be a complete replacement.

### 2.2. Furniture design

We can confidently say that the first attempts are completely attached to product design in this case (Furniture design). One of the first and most famous examples of these is the “elbow chair designed by Autodesk engineers Brittany Preston and Arthur Harsuvanakit whom depended completely on dream catcher software. The engineers just gave some inputs to the application and the rest was automatically generated. The input can be summarized in creating a chair of certain dimensions to support (136 kg) with the least materials possible. Accordingly, the software generated several options, till the last output was being agreed on. The methodology of AI applied in this software is still considered level 2 of machine thinking (unsupervised machine). The process begins by prompting the user to input certain design goals ranging from functional requirements and material type to manufacturing methods and cost restrictions. From there, the system cycles through a prescribed design space to evaluate a large number of software generated designs that meet the requirements of the input data then generate several solutions that covers the requirements to be chosen from (Fig.5). Another example with the same main idea but with a different concept is the famous TAMU folding chair exposed in Milan design week in 2019 designed by the French designer Patrick Jouin inspired by nature, where the designer main concept was to try and reproduce organic processes using mathematical algorithms with the least possible used material (Fig 6.)

Another extinct example based on the generative design concept as a result of some inputs like the previous two examples but of different input type is the famous “**nóize chairs**”. **The chair was designed by a group of Brazilian designers and was generated as a result of mixing** recorded sounds that were captured by cellphones on the streets of são paulo, with the original CAD design files using artificial intelligence, resulting in several distorted forms, were the required output designs are selected and applied using the 3d printing technology as prototypes (Fig 7 ).



Fig (5)\_Elbow chair (source : <https://gallery.autodesk.com>)



Fig (6) \_TAMU foldable chair (source : [www.3dnatives.com](http://www.3dnatives.com))



Fig (7) \_ One of the generated designs from mixing city audio recorded noises and a typical chair. (Source: <https://www.designboom.com>)

► **Researcher analysis and conclusion:**

- The previous case studies can conclude that the application still depends on previously generated ideas and experiences, but still not intelligent enough to “create from scratch “and keep improving ideas like human brain in creative industries in general.
- Application of Artificial intelligence in Furniture design is still very limited and most of them are prototypes not generated to public use.
- All limited case studies found are generated under the supervision and inputs of designers and not fully controlled by computers, which confirms that designer role is still very much there.
- Though artificial intelligence helped in generating Unconventional designs (in the little examples found) ‘still this doesn’t ensure perfect functionality, as most of those designs can be uncomfortable for a large portion of the society. In addition, strange forms don’t necessary mean high aesthetic values.
- Artificial intelligence in furniture design has still a long way to go to achieve both aesthetic values as well as functionality.

**SECOND: COMPARATIVE METHOD**

Measuring to what extent will Artificial intelligence replace human different jobs depends on to what extent this Job can specifically be automated, still it's worth mentioning that there are a lot of factors that will definitely impact the degree of automation in a certain job, and the rate of achieving it will be mainly related to economic and political factors that will (with no doubt) make some countries achieve such situation faster than others.

Generally speaking, Automation level has already reached certain levels in 2020 and has already been applied all around us and it can be classified to three main waves as follow:

**Table (3) \_ Automation types (Source:pwc.com)**

<b>Wave name</b>	<b>Algorithm wave</b>	<b>Augmentation wave</b>	<b>Autonomy wave</b>
<b>Description</b>	Focused on automation of simple computational tasks and analysis of structured data in areas like finance, information and communications.	Focused on automation of repeatable tasks.	Focused on automation of physical labor and manual dexterity, and problem solving in dynamic real-world situations that require responsive actions.
<b>Current state of implementation in the year 2020</b>	Already well underway.	Underway, and is likely to come to full maturity in the 2020s.	Under development already but not to reach its maturity before 2030s.

By deeply analyzing the three types, the most dangerous type on human is the “Autonomy wave” since it's a direct replacement to humans. Still it's worth mentioning that all type of jobs would be affected according to the type of skills required within the same Job. Each Job regardless of its nature include manual tasks, routine tasks, computer based tasks, management and social skills.

By analyzing which part of the job would be automated, we can identify which sector will face danger regarding losing their jobs. In this regards, some studies are already generated analyzing the type and percentage of automation according to the type of work within a certain sector (Fig 8).

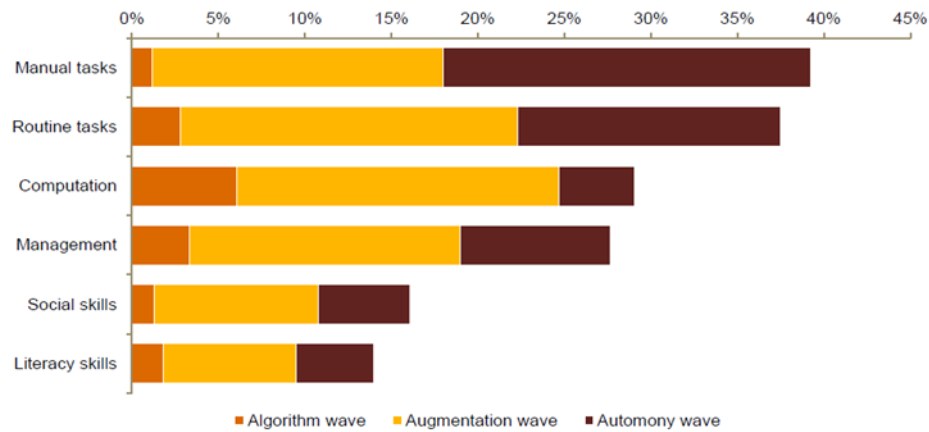


Fig (8) \_showing the relation between automation type and type of task within a job (source:pwc.com)

As per this study, it can be concluded that manual and routine tasks generally are the tasks likely to be automated with the highest percentage. But what are the type of tasks involved in different interior design related careers that would be affected?

To answer this; a deep analysis of the task type within each career should be determined, accordingly careers directly attached to the industry, their duty and task type can be categorized as follows:

**Table (4) \_classification of most popular interior design jobs, the duty and type of task (by researcher 2021)**

Career related	Duty	Task type and skills
Interior designer consultant.	Lend their expertise to assist in developing interior spaces regardless of the type and scale of interior design according to client needs.	Management task.
Interior design project manager.	Manage the day to day production on specific projects to meet deadlines accurately. Responsibilities include reviewing shop drawings, project submittals, etc. for document compliance; documenting code review and compliance; communicating and coordinating with management, clients, consultants and contractors related to daily business operations.	Management task.
Draft person-space planner	The ones responsible for preparing all the drawing documents on paper and soft wares.	Computation task
Design and sales associate	They are responsible for the sales part of the project, and they are mostly specialists in interior design for a good understanding.	Social skills

Furniture designer	Responsible for generating furniture design as well as preparing the related shop drawings.	Computation task
FF AND E specialist	<b>Preparing projects' related documents related to furniture, fixtures and equipment.</b>	Computation task
BOQ specialist	<b>Preparing documents by the cost consultant (often a quantity surveyor) that provides projects' specific measured quantities of the items of work identified by the drawings and specifications in the tender documentation.</b>	Literacy skills + Computation task.
Lightning designer	Designing lighting units	Computation task
Interior design educators	Major instructors	Literacy skills + computational task + social skills + routine task

### **Data analysis and comparison (by the researcher 2021):**

#### **•Regarding (current) different designer Jobs:**

By analyzing the previously mentioned data and getting back to fig (6) , the careers depending on management tasks ( e.g. : interior design consultant and manager ) won't be affected completely , still the human element is important .Tasks depending on computers as per table (3) as well won't cancel designer role as for the near future since most of the available soft wares depend on human inputs and previous experiences of machine learning methodology and it still didn't acquire the type of intelligence to completely surpass human ( not in the near future at least ). Careers depending mainly on social skills (ex: sales) won't do without human element, may be if there is a routine task portion within the job, it would be automated.

In addition, most of careers indirectly attached to interior design have workers (laborers) involved, the only tasks that would be automated as per the data mentioned before is the repetitive and routine work, this would definitely be applied in a very limited portion of laborers work specially when related to interior design work as most of the work is usually un-repetitive and creative.

#### **• Regarding educators:**

Routine tasks are the only type of tasks that would be completely removed for educator's benefit to focus on more important aspects. Several studies already published out there have ensured this theory by confirming that artificial intelligence can never be a total replacement to teachers but a collaboration is essential between teachers and AI (Lei Wang 2020 ) and now

it's the teachers' role to upgrade their skills and know more about artificial intelligence for a better , richer learning experience.

In this regard, a lot of (AI) based soft wares generated by Microsoft and other key players in the field (e.g.: Pearson, IBM, Amazon, Nuance Communications, Cognizant, Quantum and Blackboard.) to name a few in order to improve the education process in general, which have gained even more focus after the pandemic and the need for distant learning.

Those applications could help in a lot of learning proceedings starting with student grading and evaluation, to test the degree of student's engagement to the material offered by analyzing his face through AI to offering a personified education as per student diverse needs and much more (kashif, junaid, 2020).

Though, those AI based applications are already being used at lots of universities, this didn't cancel the instructor role till today, but the maestro of all those tools by using it to help him/her teach in an easy engaging way. From this, it can be concluded that this can be a re-assuring message that educators are going nowhere.

### **FUTURE JOBS FORECASTING:**

Several studies out there have already started to forecast what type of jobs shall appear in the near future and in the farer future, some of them are completely new. According to a report that was published in 2019 by Deakin University about the top 100 future jobs. The jobs were categorized into 10 main categories (technology jobs, people jobs, business and law jobs, Environment jobs, health jobs, data jobs, Agriculture jobs, space jobs and experience jobs). The criteria of choice to this study in specific is that it includes the largest selection of Jobs in different selections with the largest name of jobs, which makes us conclude in the most accurate way to what extent will the interior design industry be affected in comparison to other industries.

By analyzing the forecasted jobs and their relation to the creative industry, it is concluded that the major that will have the greatest impact in the future is Graphic design and product design by generating programs and products that are mostly generated and functioning with the help of artificial intelligence .Programing related jobs can be easily linked with graphic design which makes those two majors having most of the opportunities and jobs in the future when mastering Artificial intelligence with just some new skills gained with around a percentage of 30% just for directly linked jobs with graphic design in addition to other jobs which are indirectly linked to it (Researcher 2021).

On the other hand, by scanning the forecasting Jobs related to Interior design major in specific (based on Deakin University study), there is almost no direct jobs associated with the major, but some that are indirectly linked which is a good sign that there won't be major changes in the interior design industry, at least not in the near future (Researcher 2021). The Jobs indirectly linked would be dependent on gained artificial intelligent skills.

All in all, regarding future jobs and jobs created by AI,

close careers that can be linked to interior design major can be summarized as follows:

**Table (5) \_Future interior design related jobs filtered from Deakin University study (by researcher 2021)**

Future interior design related jobs		
Design related Jobs		Education
Completely new Jobs	Continues jobs	AI educator
Machine-Learning Developer	Human Habitat Designer	Lifelong Education Advisor
Trend watcher		
Off world Habitat Designer		

### Researcher analysis to the closest selected careers:

By analyzing the jobs concluded in the study list, the only ones that can have a link to interior design in a way or another are only 6 jobs out of 100 with a percentage of 6% only (Researcher2021).

It is noticed as well that most of them are still not directly linked to interior design major. Regarding Machine learning developer; it is mostly attached to Computer science and programing language in general, but definitely no one can train the machine to produce right better than an Interior designer. As a result, I assume a machine learning developer with an interior design background can train machines and programs related to the major in a better way with better outcomes. By analyzing other jobs that can be linked, most of them are person based jobs. Forecasting specialists are already there, but by the future quick constant changes and development resulting from technology, they would be of a greater importance. Regarding “Human habitant designer “, interior designers would surly have a small role with other designers and engineers (it is not a purely dependent career on interior design), while “off world habitat designer “is about designing new worlds and planets when we find life on other planets, interior designers along with architects and different engineers would have a role then, even though not in the near future of course.

While in the education field, Artificial intelligence will surly have an impact. Artificial intelligence educators will be needed as well as educators in ways of implementation of Artificial intelligence in interior design. In addition, lifelong educator advisors would be important, coaching students and people in major generally with constant and rapidly changing needs in addition to the ones who would have multiple careers will be required.

In the process of trying to forecast and include accurate careers in the interior design industry, different studies should be kept in consideration. Accordingly, another Global study that was done in 2017 summarized the jobs created by artificial intelligence and classified it into three main categories as follows: trainers, explainers and sustainers (H. James., paul, et.,2017). Trainers for AI and its different applications. Explainers include people responsible for designing smart decision, AI usefulness strategists that take decisions whether AI needs any development in a certain field and sustainers responsible for continues evaluation of machine performances. etc.

This study confirmed that futuristic careers in interior design would be completely attached to teaching AI to others (in this case, its application in interior design as well) and related programming (may be evaluating future machines and programs related to interior design ).



**CONCLUSION:**

By analyzing the current state of Artificial intelligence applications (currently) and comparing similar career task type to forecast its future it can be concluded that:

- There is no significant and influential penetration of artificial intelligence in the interior design discipline that pose major threat causing sweeping changes in the field currently or in the near future.

**Regarding currently available careers:**

- The research hypothesis is not completely true, several careers based on management tasks (e.g.: consultants, project managers) won't be replaced.
- Careers based on Social skills as well (interior designer sales) won't be replaced as well.
- Careers based on computational skills, which forms the majority of jobs (e.g.: Drafts men, Furniture designer, Lightning designer, etc.) Won't be replaced in the near future at all since most of the application that started to surface are still very limited in intelligence and can only process limited inputs with predictable outputs yet under the supervision of the designer, and even the limited examples found couldn't achieve both the supposed functionality and aesthetic values equation with the required percentage.
- Educators won't be replaced as well, but a lot of routine tasks related would be done by Artificial intelligence (as an assistant) in addition to a definite integration of AI as a tool within the process.
- Smart technologies already applied in the interior design industry already (as a type of limited initial artificial intelligence) do not pose a risk to the available jobs since the design process is still in the interior designer's control.

**Regarding future careers in the industry:**

- Interior design industry is the least one within art and design industry that would be affected with AI and the changes will be in a slower pace that other creative industries like graphics and product design.
- Completely new Future careers created by AI can be counted to teaching AI and evaluating future machine learning to industry used programs.

All in all, it can be all summarized as follow:

**Table (6)- Summarizing Research conclusion on future interior design careers- Researcher2021**

<b>Most affected Interior design careers</b>	<b>Least affected Interior design careers</b>	<b>Continues careers with new required skills</b>	<b>Completely new careers</b>
None in specific. But any repetitive /routine portion within the job will be completely replaced by AI. Which is a positive thing and guaranties minimum	All management and sales based careers attached to Interior design "Jobs based on Full human interaction".	-Interior Design Instructors. (New tools influenced by AI that can be used in teaching). - Jobs Based on using soft wares in	-AI instructors (within interior design sectors). - Coaching and Advisors. -Trend watcher (though already

risk on the industry.		case those soft- wares are upgraded due to AI (still not in the near future).	available but will be given a new importance and spread all over the world).
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### RECOMMENDATION:

- All industry related careers (Design field and Education field), need to start getting the knowledge of programming language as well as Artificial intelligence as it will definitely impact most of the current and continues related careers (especially education) and will surely be the hero of future careers that may appear.
- Developing a multi career mentality, as most of future careers will be an integration of several careers together.
- As a part of preparation for this technology –dominated future, education must be given the priority as it will surely have vital role in preparing globally competent students capable of facing the rapid demanding future. In this regard, interdisciplinary work between majors is being encouraged for the best results, accordingly a series of sub recommendations are concluded and preparing educators for this change is an urgent necessity.
- Future studies are needed, focusing on ways of Artificial intelligence integration in different sectors in Egypt as per the latest Government Artificial Intelligence Readiness 2019 report published by Oxford Insights, Egypt is ranked 111 out of 194 which means that we are still far behind and steps have to be taken quickly.
- Continues monitoring for development of Artificial intelligence and its impact on the industry is required to be well prepared.
- Different employers and institutions are required to offer continues trainings and awareness sessions for AI implementations in the industry to be up to date and always ready for new challenges.

### RESEARCH LIMITATIONS:

Limitations in references as this study can be considered an absolute pioneer in trying to forecast careers within interior design industry specifically. There are no previous studies on this issue. The analysis, forecasting and conclusions are based on (mainly) trying to compare interior design careers with the ones closest in nature with other disciplines that are already forecasted and predicted, with trying to get the most accurate results.

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