ATTEMPTS TO INTEGRATE AI TECHNOLOGIES INTO INTERIOR ARCHITECTURE STUDENTS' DESIGNS – APPLIED EXPERIENCE

محاولات دمج تقنيات الذكاء الاصطناعي في تصميمات طلاب العمارة الداخلية ــ تجربة تطبيقية

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ABSTRACT

The 21st century has witnessed major developments in various aspects of human life, including artificial intelligence. As the design world of interior architecture is constantly evolving, artificial intelligence techniques have revolutionized the way we design and innovate them. This field is evolving rapidly. At the same time of writing this research, more sophisticated technologies can emerge bearing future innovations.

The research problem attempts to respond to the conflict between the academic community in the feasibility of experimenting with this world and how to legalize it. And whether the integration of AI applications has ethical concerns such as intellectual property rights and the extent to which students can be allowed to use them.

The research aims to recognize the concept of artificial intelligence, its applications, its tools, its sophisticated capabilities, and knowledge of opportunities and challenges for the educational process. Demonstrating applied experience for interior architecture.

The research concluded with a set of findings illustrating the importance of integrating AI into the educational process. And recommended to experiment the world of AI and keep abreast of this development to establish controls for the educational process and its development within specific controls.

KEYWORDS:

Artificial Intelligence, Interior Architecture, Practical Projects of Interior Design Courses.

ملخص البحث

شهد القرن الواحد والعشرون تطورات كبيرة في مختلف جوانب الحياة البشرية، ومن ضمن هذه التقنيات الذكاء الاصطناعي، ونظراً لأن عالم التصميم للعمارة الداخلية في تطور مستمر فأظهرت تقنيات الذكاء الإصطناعي ثورة في الطريقة التي نصمم بها ونبتكرها، وهذا المجال يتطور بشكل متسارع، ففي نفس وقت كتابة البحث يمكن ظهور تقنيات أكثر تطوراً تحمل ابتكارات مستقبلية لا يمكن تخيلها، وهناك خلاف كبير حول أهمية الذكاء الاصطناعي واستخدامه ومدى تأثيره على العملية التعليمية وتحسين تجربة المستخدم على المجتمع الأكاديمي وسوق العمل.

وتحاول مشكلة البحث الاجابة على الصراع الدائر بين مجتمع الأكاديمين في مدى جدوى تجريب هذا العالم وكيفية تقنينه، وهل دمج تطبيقات الذكاء الاصطناعي لها مخاوف أخلاقية مثل حقوق الملكية الفكرية ومدى إمكانية السماح للطلاب باستخدامها.

ويهدف البحث إلى التعرف على مفهوم الذكاء الاصطناعي، وتطبيقاته، وأدواته، وإمكانياته المتطورة، ومعرفة الفرص والتحديات للعملية التعليمية وعرض تجربة تطبيقية لطلاب العمارة الداخلية في استخدامه وتطبيقه.

وخلص البحث بمجموعة من النتائج توضح أهمية ودور دمج الذكاء الاصطناعي في العملية التعليمية، واوصى البحث بتجريب عالم الذكاء الاصطناعي ومواكبة هذا التطور لوضع ضوابط للعملية التعليمية وتطورها ضمن ضوابط محددة.

الكلمات المفتاحية

الذكاء الاصطناعي؛ العمارة الداخلية؛ المشاريع العملية لمواد التصميم الداخلي

1. INTRODUCTION

Artificial Intelligence (AI) is an advanced field focused on developing systems and software that can simulate human intelligence. It is one of the most prominent areas of research and development in the digital age and has wide-ranging effects on various aspects of daily life and industries. AI is the technology of the future and the most important output of the fourth industrial revolution due to its multiple uses in different fields. In the field of interior architecture design, the functional role has witnessed a significant development in the field of industry, especially with the emergence of modern technologies such as Artificial Intelligence (AI) and Virtual Reality (VR) and Augmented Reality (AR), where the field has become wider and better. Many of these programs have saved a lot of time and effort thanks to their ability to process an unlimited amount of data, testing a range of different ideas in a short time and with ease, accuracy and high objectivity (Al-Haqqan, 2023)

The field of design education for interior architecture is undergoing accelerating transformations thanks to technological advances, including the integration of artificial intelligence (AI) into teaching and training methods. It offers unprecedented possibilities to improve the learning experience and provide innovative learning tools that contribute to enhancing students' skills and enable them to interact with modern tools and techniques. AI technologies have the ability to revolutionize the way we design and innovate them. They can generate innovative ideas that reflect interior architecture trends in designing spaces and pieces of furniture that are designed to the customer's cost and environmental needs. (Zigmars, 2023)

This research addresses the recognition of AI technologies and how they improve the effectiveness of learning design for interior architecture. And challenges that may arise as a result of the use of these technologies, and how to overcome them to ensure that technology is utilized without adversely affecting the quality and ethics of education. Finding an answer to the conflict between the academic community in the feasibility of experimenting with the world and how to legalize it. And whether to integrate its applications into design practices have ethical concerns such as intellectual property rights and the extent to which students can be allowed to use them.

The research aims to recognize the concept of artificial intelligence, its applications, tools, its evolving capabilities, knowledge of opportunities and challenges for the educational process. Exploring how it affects students' learning experience and teaching for teachers, and proposing solutions and strategies to overcome challenges. The research includes presenting an applied experience for interior architecture students in using and applying it.

1.1 Significance of the study

Artificial Intelligence improves teaching methods by offering personalized learning experiences. AI-enabled systems can analyze students' performance and make educational recommendations based on their individual needs. (Ayeni, 2024) AI enhances the effectiveness of hands-on training such as interactive simulation programs that allow students to experience virtual interiors in interactive and realistic ways. It also helps provide automatic support and instant feedback using its tools, and students can get instant evaluations of their work and designs, enabling them to continuously improve their performance. (Tarun Kumar Vashishth, 2024). The importance of this research for the community of designers, researchers and students is evident as artificial intelligence plays a pivotal role in promoting and teaching interior architecture to improve the learning experience and provide advanced training tools, contributing to the development of more efficient and innovative interior designers.

2.Research Objectives

− Recognize the concept of artificial intelligence and applications used in the field of interior architecture, what challenges and opportunities students and instructors face, analyze its applications in design and the potential to utilize this technology as a tool for design and designers.

− Recognize available AI technologies and tools that can be applied in interior architecture design, highlighting its potential and the damage it can cause to areas that require creative thinking to succeed.

− Explore how to develop the educational process of interior architecture using artificial intelligence to make it more modern and sophisticated, and guide designers and those interested in interior architecture on how to use artificial intelligence to improve user and designer experience.

3.Research Question

The research attempts to answer the conflict between the academic community of interior architecture in the feasibility of experimentation in this world and how to legalize it. Does integrating AI applications into design practices have ethical concerns such as intellectual property rights? And the extent to which students can be allowed to use them. Identifying opportunities and challenges and how to overcome them to ensure that technology is maximized without negatively affecting education's quality and ethics.

4.Research Limits

Time limits: This is the current period, since the beginning of AI design techniques in late 2022 until today.

Spatial limits: the local and regional academic community.

Human limits: the research was applied to students studying interior architecture in applications designed by artificial intelligence.

5. Methodology

This research follows different methodologies, including the analytical descriptive methodology, by studying and analyzing concepts and terminology related to artificial intelligence, researching the pros and cons of design through it, and the challenges and opportunities to integrate artificial intelligence into design education for interior architecture. As well as, the experimental methodology applied in the experiences of interior architecture students to design with artificial intelligence technology. Due to the novelty of the subject and the difficulty of applying it to all students, the experience was applied individually to one of the students. In case of showing positive results, it will be applied to all students after taking into account the dissemination of the experience and the teaching of technology within the practical course of interior architecture design.

6.Artificial Intelligence Definition

AI includes a range of technologies aimed at enabling machines to perform smart tasks. It is defined as the ability of computer systems to perform tasks that require human intelligence. (Stuart Russell, 2022) AI is also defined as an important branch in computer science and forms one of the foundations of today's technology industry. The ability of computers and digital systems to carry out tasks like or similar to the capabilities of smart creatures.

Such as being able to think, learn from past experiences and perform other mental processes to provide users with a variety of services like: education, guidance and interaction.

Artificial intelligence can also be described as a simulation of human intelligence processes. And it is characterized by its ability to think and learn by analyzing huge amounts of data for the completion of tasks, making predictions, and identifying patterns that may be difficult for humans to detect. AI also indicates a computerized system's ability to correctly interpret data, learn from it and use it to achieve specific goals and tasks. (Haenlein, 2109) This includes creating algorithms that enable artificial intelligence to solve problems and accomplish human tasks quickly and accurately. (Nikesh Muthukrishnan, 2020)

The objective of artificial intelligence is to build machines that have the capabilities for intelligent, self-aware, independent work. It can be argued that artificial intelligence is an advanced and diverse field that evolves rapidly and significantly affects various aspects of life. We have to understand its evolution, applications and associated challenges, to make the most of this technology while ensuring that it is used with responsibility.

7.Importance of AI and its Effect on the future

The impact of artificial intelligence extends to various aspects of social, economic and technological life. We review the importance of artificial intelligence and its impact on the future in multiple areas. In the field of efficiency and productivity, to help improve them in various industries to accomplish routine and complex tasks. It revolutionizes medical and health care to improve diagnosis, treatments and drug development, improving patient outcomes and reducing costs. It also contributes to the development of solutions to environmental challenges such as climate change to improve weather forecasting models and manage natural resources in more effective ways. .(Lynn H. Kaack, 2023) Furthermore, it provides advanced educational tools in the field of education and training, which contribute to the customization of educational experience and improve teaching and training methods, making learning more interactive and effective. (Jian, 2023) It also contributes to stimulating and promoting economic growth and creating new jobs in the technical and research fields, to improve process efficiency and to find innovative solutions to economic challenges. (Dobrescu, 2018) AI enables improving customer experience, services and companies by providing customized services and anticipating customer needs, thus enhancing customer satisfaction and loyalty.

8.AI History

The history of artificial intelligence spans several decades, and has witnessed remarkable developments that have led to the formation of the modern digital age. The beginning of its history dates back to the mathematician and computer inventor, Alan Turing (1912-1954) (Wooldridge, 2021) as a student at Cambridge University in Moncef, 1930, who participated in the development of a practical machine known as The Bombe.

This machine was designed for the British government during World War II and aims to decode the enigma bomb used by the German army. (Haenlein, 2109)

Artificial intelligence began as a field of study virtually in the mid-20th century. In 1956, the famous Dartmouth Conference, an official start of the field of artificial intelligence, was held. The conference emphasized the possibility of building machines that can simulate human intelligence. (McCarthy, 2006) Between 1956 and 1974, known as the "Golden Age of Artificial Intelligence" (Wooldridge, 2021)

This era witnessed the initial surge in artificial intelligence, and although computers were then restricted or slow, researchers used tricks and software techniques to power their complex software, and these technologies are still used today. (Wooldridge, 2021) The field experienced many successes and failures in the 1960s and the field faced problems with limited computing capabilities and lack of data. In the 1980s and 1990s, AI experienced a remarkable recovery. (Stuart Russell, 2022) In the past two decades, the age of big data and advanced artificial intelligence has emerged.

9. AI Advantages

Reduce human error: computers do not make human errors if properly programmed. Using artificial intelligence, decisions are made from pre-collected information by applying a certain set of algorithms. So, errors are reduced.

Risk robots instead of humans: Overcoming dangerous constraints by developing an artificial intelligence robot that does dangerous things. Like going to Mars and deep-sea research, coal and oil mining, and its effective use in natural or man-made disasters.

Available 24 hours a week: using artificial intelligence, we can make machines work 24/7 without any breaks and not be bored, unlike humans.

Assisting with recurring functions: Using artificial intelligence, we can accomplish normal tasks such as mailing, checking documents, removing "boring" tasks for humans and free them to help them be increasingly creative.

Digital assistance: The use of digital assistants to interact with users which saves the need for human resources. Interact with websites, talk to users and design automated chat programs.

Faster decisions: We can make machines make decisions faster than human and implement actions faster. During decision-making, the AI machine works on what has been programmed and delivers results faster and without emotion.

Everyday apps: Everyday apps like Apple's Siri, Window's Cortana and Google's OK are frequently used in our daily routines such as searching, taking a selfie, making a phone call, answering mail and much more.

New inventions: AI operates many inventions in almost every field, that will help humans solve most of complex problems. (kumar, 2019)

10. AI Disadvantages

High construction costs: as AI is updated daily, hardware and software need to be updated with time to meet the latest requirements. Machines need to be repaired and maintenance requires huge costs because they are very complex machines.

It makes humans lazy: AI makes humans lazy when its applications do the majority of work. Humans tend to be addicted to these inventions that can cause trouble for future generations.

Unemployment: AI replaces repeated tasks; human intervention is less than it was which will lead to a major problem in employment standards. Each organization looks to replace individuals with artificial intelligence robots that can do similar work more efficiently.

It doesn't have emotions: there's no doubt that machines are much better when it comes to working efficiently but they can't replace the human connection that makes the team. And machines can't develop a relationship with humans.

Lack of out-of-the-box thinking: Machines can perform only those tasks they are designed or programmed to perform, anything besides that they tend to crash or give irrelevant outputs which could be a major backdrop. (kumar, 2019)

11. AI and its role in teaching design for interior architecture

Design education for interior architecture has undergone a major transformation thanks to rapid technological advances. One of the most notable is the use of artificial intelligence (AI) in promoting and renovation design methods, as artificial intelligence is a powerful tool that improves the efficiency and creativity of the design process in multiple ways. Here are some points about the importance and role of artificial intelligence.

- Artificial intelligence can improve teaching methods by offering specialized learning experiences. Where students' data can be analyzed and recommendations made to improve their educational experience at the educational and learning levels. Students' performance can be assessed, their areas of vulnerability and strength identified, and recommendations made based on their individual needs to meet them. (Chen, 2020)

- AI enhances the effectiveness of practical design training for interior architecture. Providing interactive and realistic simulation software such as Virtual Reality (VR) and Augmented Reality (AR) in the design field of interior architecture. This enables experimenting their designs in virtual environments before they are actually implemented, to enhance students' understanding of the environments they design. (Kamińska, 2023)

- AI tools help improve design efficiency by offering automatic suggestions and analyzing design solutions. AI can accelerate the design process by analyzing data and offering options based on past patterns and trends. (Balakrishnan, 2024)

- AI provides development and problem-solving skills and tools that help them explore creative design solutions to offer multiple design options to help them enhance their problem-solving capabilities, automatic support and immediate feedback. To improve their performance and skills in doing tasks, provide quick and effective solutions and improve the quality of student work. (Almaz, 2024)

- Provide interactive learning tools such as online courses and interactive resources that enhance students' understanding of complex design concepts of interior architecture. The use of artificial intelligence contributes to the delivery of interactive educational content that has achieved an increase in students' interaction which enhances the quality of education. (Ali, 2024)

Based on the above advantages, AI clearly plays a pivotal role in promoting and teaching design for interior architecture. It improves the learning experience and provides advanced training tools, contributing to the development of more efficient and innovative interior designers. This contributes to improving the quality of education and learning experience.

12. Artificial intelligence and its role in the labor market for interior architecture design

AI has become an integral part of many industries, including the labor market of interior architecture designers where it contributes to improving work efficiency, promoting creativity, and providing innovative solutions in designing spaces.

It provides tools and techniques that help designers achieve better results saving time and cost. Here are some points about its importance and role in the labor market:

- Enhances design experience by providing personalized and interactive solutions. AI algorithms are used to analyze data on customer preferences and needs, offer designs that are more compatible with individual tastes. Its use in analyzing customer data and improving the design experience is one of the biggest technological gains in this area. (Omar Adnan AlShkipi, 2024)

- AI is used in interior architecture design to improve work efficiency; its tools allow designers to create multiple and innovative designs based on specific criteria. AI-enabled software is used to analyze requirements and offer multiple design options in a short time, enhancing the speed of project completion. (Li, 2024)

- Its techniques contribute to enhancing the creativity of designers to provide analytical tools and techniques for computer vision. Trends in design can be analyzed, and suggestions can be made corresponding with customers' personal taste and unique needs. Its machine learning tools are used to analyze customers' data and anticipate their trends, helping designers deliver more personalized design solutions. (Yüksel, 2023)

- It contributes to improving customer experience by providing personalized and interactive services. These services can include augmented reality (AR) and virtual reality (VR) experiences that allow customers to visualize designs in a virtual environment before they are actually implemented. These technologies enhance the customer's experience and help make design decisions based on a more accurate experience. (Vaidyanathan, 2023)

- AI allows improved project management through data analysis and task management tools. Artificial intelligence can track project progress, analyze data on resources and costs, and make predictions about potential challenges. This helps improve decision-making and project management more efficiently.

- AI enhances the efficiency of the design process to accomplish many routine tasks. Smart software can take over the task of drawing initial charts and designs quickly and accurately, allowing designers to focus on creative and detailed aspects. . (Omar Adnan AlShkipi, 2024)

- The internal space can be managed by controlling all devices in the building and the monitoring, security and protection system.

- It contributes to improved design quality to provide accurate analyses and data-based recommendations. It can also evaluate the optimal distribution of spaces, colors and lighting based on scientific and behavioral standards. (Amira Fawzy Almaz, 2024) It is also considered as a powerful tool to promote creativity, improve customer experience, and managing projects.

13. Applications and software used to design interior architecture using AI

Design applications have evolved under AI increasingly recently. And the designer has many applications to help create schemes and give the designer many different preferences more efficient in a more professional way. The final conception includes two and three-dimensional, furniture placement, color and material choices and multiple design directions, which are not time-consuming. And presenting virtual images that allow the user to focus on the creative process and make appropriate decisions to design interior architecture spaces. These most popular and recently used applications include:

Reimagine Home Application

It is a fast application, which gives preliminary ideas as it offers virtual redesigns and diverse ideas for interior architecture design. It provides its services to designers and those interested in the field, allowing users to design spaces, showcasing features in multiple design styles quickly, easily and cost-effectively. It offers immediate designs and ideas allowing the discovery of new materials, colors and patterns of the internal space without much effort. It's distinguished for space organization tools and the creation of realistic design ideas for kitchens and bathrooms, design for the outer space, virtual modifications in the garden of various design elements, materials and design backgrounds, such as: sky, plant types.

And the creation of realistic design ideas. Figure (1) shows the interface of the application with one of its applications. (McFarland, 2024)

Homes Tyler Application

It is a powerful and easy to use application, allowing users to create 2D and 3D interior architecture design projects. Providing an extensive library of furniture and interior design elements from real brands, facilitating design using actual products. This gives a realistic perspective of space. It brings together a community of designers. Users can share their designs with others, get feedback and find inspiration from the community. This collaborative aspect makes it a great tool for those interested in the field who want to learn and grow. Figure (2) shows the interface of the application with one of its applications. (McFarland, 2024)

Foyr Neo Application

It is a comprehensive tool that allows users to create 3D charts, as it is considered as an interior designer that helps real designers complete their projects faster and more efficiently. Users can go from empty horizontal projector charts to final display in less than two hours. This makes it a great tool for time-sensitive projects. It includes 3D models of furniture and accessories. And the application interface does not require any prior training on computer assisted design or 3D modeling, which makes it accessible to all users. Figure (3) shows the interface of the app with one of its applications. (McFarland, 2024)

Figure (1)
 Shows REimagineHome application interface and one of the app outputs. (Source: reimaginehome.com, 2024)

Figure (2)
 Shows Homestyler application interface and one of the app outputs. (Source: homestyler.com, 2024)

Figure (3)
 Shows the Foyr Neo application interface and one of the application outputs. (Source: foyr.com/.com,2024)

DécorMatters Application

One of the design applications of interior architecture that adds technology and augmented and virtual reality to a realistic conception of interior architecture design. It is characterized by an easy-to-use facade, an extensive library of furniture and design materials from the best brands. It brings together a community of designers to share their designs with others, get feedback and find inspiration from the community. It allows a realistic perception of the designs in the actual space. The app also hosts design competitions to engage and inspire the community. Figure (4) shows the interface of the application with one of its applications. (McFarland, 2024)

Midjourney Application

It is considered one of the first platforms to use artificial intelligence, where it made its name in the field of artificial intelligence that can be used to create design concepts. It changed the rules of the game for both professional and amateur designers. So, it is a starting point for design projects for interior architecture and allowed to explore new design possibilities with creative vision.

- It has the ability to create unique and innovative designs related to exciting creativity and inspiring users to think outside the box to build a generation of professional designers. The platform's commitment to expanding imagination powers with continuous progress, providing unique and creative design concepts. Provide users with new, exciting and attractive design capabilities. And the production of a realistic image that rivals other applications with 1792×1.024 pixels resolution.

- It offers a limited number of free photos, before selecting the paid plan, providing features and a range of commands that help to adjust the dimensions in the images and control the final result. Providing a group of activists that enables the user to share his images, thoughts and questions to receive assistance from others. Figure (5) shows the interface of the application with one of its applications. (McFarland, 2024)

It is worth mentioning that there are many applications and platforms that have emerged in the last two years that are used in the design of interior architecture that may reach dozens, even hundreds, of them. Like (Stable Diffusion - DALL-E2 - Starry AI - NightCafe - DeepDream - pix2pix).

14. Experimental beginnings of the use of artificial intelligence in design for interior architecture

It started applying the trial by the end of the second semester of the university year 2021/2022 using the Midjourney app. And the app was completely free, as it was released as a trial version and experience was limited to a specific description of the design to be done. The app gives the user multiple experiences, the idea can be developed afterwards. Within limited months the app has turned into a paid in advance app, developing amazingly in the innovative output of the user's description. So, the application was developed leaving the designer to choose what suits him in the design process and creative ideas.

A brief overview of the PromeAI application on which students relied in the applied experience

The research presents an experience drafted on the PromoAI app where it has all the advantages mentioned for interior and architectural design programs, as well as the possibility of uploading some manual sketches or images. The app also makes multiple suggestions as described in the attached image, as well as uploading two-dimensional AutoCAD files, or uploading 3D files such as Rivet, 2D Max, SketchUp. The app offers free trials of limited quality and offers high quality paid experiences, in terms of image size and accuracy.

PromeAI's AI Art Generator is an innovative tool aimed at building and innovating design, supporting the process of artistic creativity. This promotes algorithms and machine learning technology, to create a variety of art content, from photos and charts to complex graphics, videos or other visual elements. It opens up new horizons for creativity, offers help and inspiration to artists and designers seeking to explore the endless possibilities of artistic expression. It also offers 30 free trials per month for users. (promeai, 2024)

It provides a comprehensive innovative experience for designers across different disciplines including design for interior architecture, architecture and animation design, and product design.

The most important features of the application are:

- Provide an architectural conception of 3D modeling schemes and models, converting images into Sketches and vice versa, as well as creating images based on text that is designed according to their needs.

- The possibility of changing or removing the background and conducting scans and replacing certain items, using smart models and modifying lighting on images, converting images and texts into videos. Improving the accuracy of images, creating selfies using AI. Figure (6) shows the interface of the app with one of its applications. (promeai, 2024)
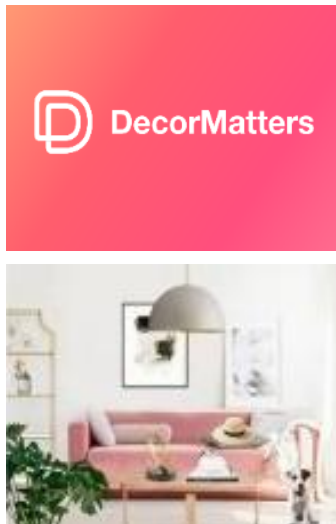
Figure (4)
 shows DecorMatters application interface and one of the app outputs. (Source:
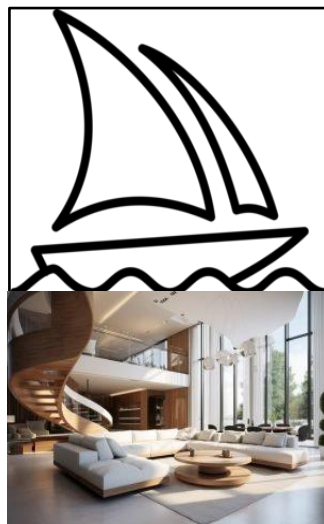
Figure (5)
 shows Midjourney application interface and one of the app outputs. (Source:
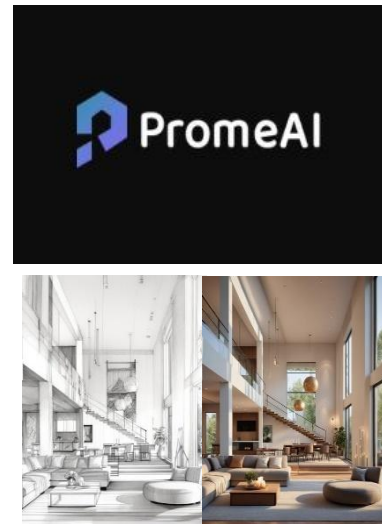
Figure (6)
 shows PromeAI application interface. (Source: promeai.pro,2024)

15. The experimental methodology followed using the integration of artificial intelligence into the design applied experience in practical materials for interior architecture students.

The experience was applied to students of the final year of the graduation project for interior architecture major of a regional private university. Using the experimental applied methodology in the experiences of interior architecture students to design with artificial intelligence technology. Due to the novelty of the subject and the difficulty in applying it to all students, the experience was applied individually to one of the students. In the case of positive results, it will be applied to all students after taking into account the dissemination of the experience and the teaching of technology within the practical course of the interior architecture design course. The timetable for this article is a series of phases:

- The student studies a requirement prior to the graduation project, in which the student conducts research studies on the project and a detailed study of the principles and standards of the project's dimensions. Studying local and global models, the student offers a full study of the proposed project of spatial analysis and site study, construction and architectural studies,

concept design and supporting raw materials, furniture, colors and all design styles. The role of artificial intelligence in this course is shown for research purposes with constant monitoring of the course instructor.

- The student moves to the subject of the graduation project in the next semester. Then he begins applying what has been studied in the research phase to the proposed project by offering design solutions for all horizontal projections and dividing the internal spaces, distributing furniture and landscape flats, floors and ceilings in traditional ways starting from sketches, correcting them and then applying this to two-dimensional programs AutoCAD.

- The student designs the vertical segments of all spaces to suit the concept design on two-dimensional programs. Moving to the final stage of making 3D graphics on SketchUp, 3D Max or any program that the student is good at. And the student reaches Modeling stage, then relies on applying the full project demonstration stage using AI.

- The student presents the previous work and preliminary studies of the project with the concept design. He submits for preliminary discussion by a committee determined by the academic department. At this stage, AI does not interfere in the student's work, which was followed up with the course instructor. By then, the student has passed 75% of the total work for the graduation project.

- The student uses AI to show all the proposed designs, by uploading 2D and 3D files, prepared in the previous stages. And through the preparation stage of the project, the student has a full description of all the spaces, project design ideas, specifications, raw materials, colors, design styles to be used in the presentation process. The student receives many ideas and suggestions for each design space, and begins by differentiating and selecting designs that suit him and can be modified multiple times, in record time and with high-quality accuracy of the concept design.

- The following figures illustrate one of these experiments, where the student designed an entertainment city and the associated figures of the project include AI experiments and how to integrate it into the presentation process. The final stages of the project, figures (7) and (8) illustrate the design stages of the vertical sectors of one of the entertainment city games. From the horizontal projections the student extracted the vertical sector of the area which being proposed for. The work to be corrected by the course instructor and the student begins uploading and attaching the files to the application with all the design descriptions written. Then, the student receives a set of high-quality and accurate suggestions quickly and begins to differentiate and modify the proposed model.
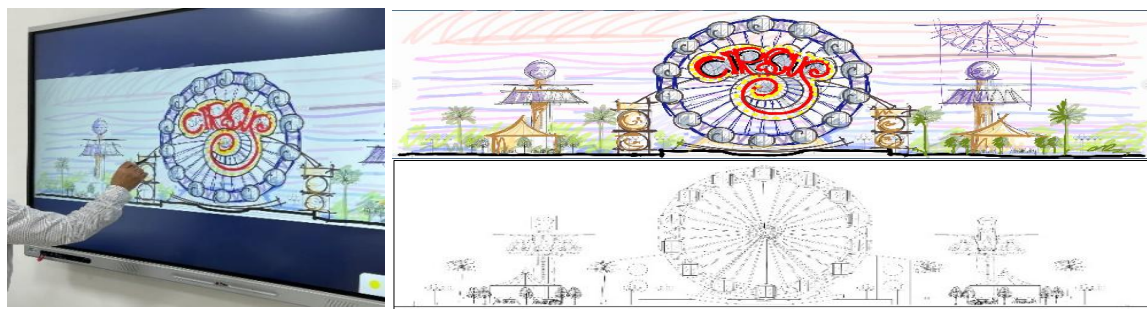
Figure (7)
shows the design of one of the vertical sectors of the project after the correction of the course instructor and choosing the two-dimensional design on the AutoCAD software which was uploaded on the PromeAI app and the student's reception of proposals from the application (Source: Author,2024)
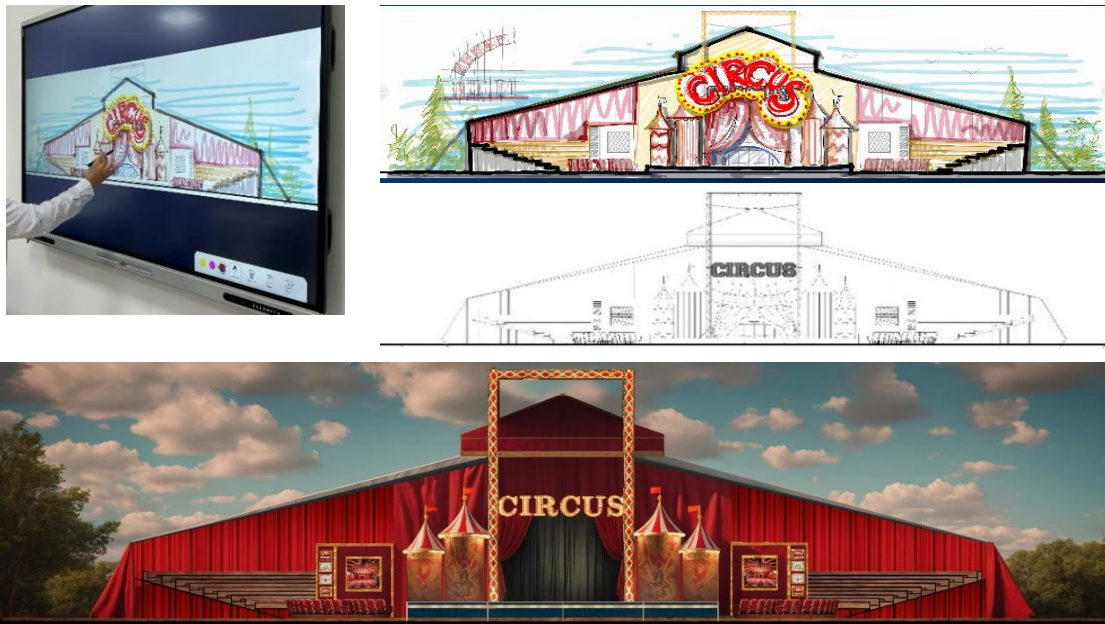
Figure (8)
Illustrates some proposals from the PromeAI application that transformed the design into reality by suggesting colors, materials, and backgrounds based on the student's preparatory studies, focusing on a front-end section of an entertainment city game in the project's outdoor area. (Source: Author, 2024)

Figure (9) illustrates another aspect of the applied experience in designing a vertical section for an internal space of a circus in the entertainment city, through the stages indicated by the student's design. Then the course instructor corrects through interactive screens. After that, uploading and attaching the files, and the student receives proposals through the description the student enters into the application.

Figure (9)
Illustrates proposals from the PromeAI application that turned the design into reality by suggesting colors, materials, and backgrounds based on the student's preparatory studies, focusing on the

After	*Before*

Figure (10)

shows one of the three-dimensional experiments that introduced the 3D files of the inner spaces of the circus area and the images show the file before and after receiving the proposals. (Source: Author, 2024)

Figure (11)

shows some of the two and three-dimensional experiments introduced for internal and external spaces and receives suggestions from the application used. (Source: Author, 2024)

Figure (10) shows the proposals for three-dimensional spaces, where the student entered the files on the SketchUp program with descriptions and suggestions of colors and raw materials. And the figure shows the files before and after receiving suggestions for internal spaces within the entertainment city, and figure (11) shows some of the two and three-dimensional experiments introduced for internal and external spaces and receives suggestions from the application used. .[1]

16. Available opportunities as a result of the integration of the use of artificial intelligence into the design education of interior architecture.

Integrating AI into interior architecture design education is not just a technological addition, but a radical shift that redefines how skills are acquired and applied. These new opportunities not only contribute to improving the quality of education, but also enhance students' ability to innovate and create in the evolving and changing world of interior design. Here are some opportunities and advantages of this integration for students and interior architecture instructors:

-Modern technology provides opportunities for students to better interact with academic content. Students can use design simulators and programming tools to practically apply design theories. Using interactive tools in education enhances students' understanding of complex concepts and contributes to improving their academic performance. (Ahmed, 2024) The student enjoys the super speed in presentation suggestions for the files he uploads. For he used to spend hours in front of digital image processing software such as Photoshop to present these experiences which were not so accurate and creative suggestions. These applications also offer animated graphic material allowing it in the future to produce enhanced and supportive videos of its designs in more comprehensive ways than 3D designs.

-AI-supported systems can offer personalized learning experiences based on students' performance and individual needs. This enhances students' skills more effectively which consequently improves student outcomes. (Jian, Personalized learning through A, 2023) For example, preparing student reports, measuring learning outcomes, studying individual needs, studying their evolution and addressing deficiencies in their performance.

-Modern technology allows students to access global educational resources such as case studies, academic articles, and online courses, expanding their academic horizon. Access to global resources enhances the learning experience and increases students' interaction. (Priya Katyara, 2023) And the application proposes multiple and varied alternatives, providing many creative ideas in the presentation process. The main part of the design has done its work with two-dimensional and three-dimensional programs, and the amount of work is limited to the presentation process for which it was prepared and described using the application.

-AI can provide instant assessments of students' work and provide quick feedback that helps students continuously improve their skills and improves the quality of student work. (Vashishth, 2024) So, it contributes to saving time, effort and money through its quick alternatives. In the graduation project, interior architecture students ask for professional and specialized assistance for 3D work. Although this is not acceptable, unfortunately this is a

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[1] The applied experience of the student: Sama Abidu - the attached images of the work where the use of artificial intelligence has been incorporated into the project only, and not the entire work of the project - for the second semester of the university year 2024 under the supervision of the researcher -The University of Applied Sciences in the Hashemite Kingdom of Jordan

reality that must be recognized in the student community. If financial comparison is made against subscription to these applications, it is way cheaper.

17. Challenges that face design education for interior architecture as a result of the integration of the use of artificial intelligence.

AI offers promising opportunities to improve teaching and learning methods. However, its integration into interior design education faces a number of challenges that may affect its effectiveness and application. Some of these challenges are presented below:

-Some students and instructors have difficulty adapting to new technology and digital tools, which can affect the effectiveness of learning and teaching (Yadav, 2024) The misuse of this technique is one of the most important design problems. Students must identify all elements, materials and components of their earlier designs. It is possible to produce designs that are random and do not reflect the design ideas to be reached and the possibility of modification is limited. The application produces patterns that are different from the desired ideas and can't be modified.

-Lack of technology or poor Internet access can lead to uneven educational opportunities among students, affecting academic evaluation fairness. Equal technological resources must be made available to all students. (Rubi, 2024) The student community could be exposed to the unfair comparison of the workload's volume of delivery. There is certainly a difference between the use of traditional methods and artificial intelligence in the design process, how to achieve justice in evaluation system, and how much achievement done with these applications.

-Using AI tools and modern software requires new skills from students and teachers, which needs additional time and effort to train, adapt and develop new skills to keep abreast of technological developments in education. (Kalyani, 2024) Therefore, the academic community should try constantly to experiment with the integration of AI technologies into design processes and the constant interest in developing teaching staff to cope with the rapid development of these technologies to develop the skills of students and teachers.

-There is a risk of excessive reliance on AI in education, which can reduce personal skills development, creative abilities and critical thinking. There are many aspects of this dependence such as full reliance on these applications, easy and fast production without effort like in traditional academic teaching methods. These techniques also offer ideas that tend to be fantastic or not applicable in real life, usually characterized by excessive dazzlement and difficult to be achieved in the labor market.

18. Ethical dimensions of using artificial intelligence in interior architecture design

The issue of the use of AI in design for interior architecture, and its impact on intellectual property rights, raises important questions about ethics and the protection of designers' rights. This disagreement arises among the academic community, who consider that the use of artificial intelligence to create ideas is an inherent right of the user who does the description process, and adjusts the design output of different AI applications. These designs are not so much a designer's right as a set of design vocabulary for an infinite number of data and information, which when incorporated doesn't belong to a particular designer. In the latter's view, these designs are a breach of intellectual property rights. Between this and that, we must discuss the matter objectively. There are multiple aspects to be taken into account in assessing whether the use of AI in this context is ethical or not. This challenge can be discussed through the following points:

-AI creates interior architecture designs based on analysis and previous designs, which can lead to infringement of original designers' intellectual property rights if there are no clear restrictions. There is an urgent need to develop intellectual property rights regulations to keep pace with the use of artificial intelligence.

-It needs to be determined who is legally responsible for potential violations of intellectual property rights resulting from artificial intelligence work. Is it the tool used, the developer, or the end user? Today's legal frameworks are often inadequate.

-AI uses require transparency in how data is collected and analyzed. Using existing design data without permission may lead to ethical problems related to rights violations. Transparency in the use of data and its impact on intellectual property rights are certainly important.

-Excessive reliance on AI can reduce the value of original human creativity, as smart systems can produce works that may look similar to existing designs. There are concerns about the challenges AI poses to the authenticity of creative work.

-Lack of clear regulations on the use of AI in design for interior architecture can lead to unethical exploitation of techniques without taking into account the designers' rights. There is a need to develop clear regulatory frameworks to ensure the ethical use of technology in creative industries. (Piskopani, 2023)

In response to the above considerations, some solutions to these problems can be provided as follows:

-Academics' good view of everything that is new in this field and knowing how much these technologies are used in design processes, how much they are beneficial, where the student's role is, and how much work done in using these technologies. The research also focuses on "integrating the use" rather than relying entirely on these technologies.

-I think the scale of the increasing sophistication of these technologies requires the search for legal frameworks regarding responsibility in the use of AI tools in design.

-Not placing data on the Internet until the owner has obtained his or her material and literary right, through the return paid for the use of these technologies.

-Excessive reliance on AI will reduce the value of human creativity. Given the ease with which these technologies are used for current generations of students, as an academic community we have to share students in their experiences and limit work volume done using these applications.

19. Conclusion

Artificial intelligence has become a reality and it must be recognized that it exists like it or not. And that experience went through the design from the end of the nineteenth century until today. Beginning with the industrial revolution and the invention of the machine, this coincides with the arts and crafts movement and its refusal to evolve. It could not resist this development, but eventually blended with it. Then, going through modernity and the spread of raw materials that the designer is not used to using. After that, came the middle of the twentieth century, the digital revolution and the invention of the computer, which had the greatest impact in the world of design. Then the end of the twentieth century and the development of raw materials technology and techniques to keep pace with this evolution. And ending with the era of artificial intelligence, which we do not know where it's leading the world of design. So, integrating AI into design education for interior architecture offers enormous possibilities and opportunities to improve the quality of education and students' experience. Through the effective use of technology, the training of teaching staff and the use of modern tools and techniques. Learning

experiences can be achieved which help students acquire the skills needed to succeed in the field. It requires investment in technology and ongoing training to ensure the best possible outcomes, enhancing students' abilities and better preparing them for the labor market.

The research concluded with a set of conclusions and recommendations as follows:

20. RESEARCH RESULTS

- The study showed that integrating AI into design education for interior architecture improves and enhances the effectiveness of students' learning and interaction with educational content. Such as: smart learning platforms, interactive software, interactive chats, virtual assistants provide a more interactive learning experience, and new ways to interact and receive immediate support.
- AI can adjust the learning process to each student's needs, provide advanced assessment tools that can analyze the quality of student work, provide accurate and personal feedback, and help identify students' strengths and weaknesses more effectively. Educational systems can track students' progress and provide content based on each student's performance.
- The study showed that the use of AI in education provides access to advanced educational resources such as interactive simulations, 3D design-models and practical training opportunities that enhance students' understanding of techniques, modern design methods for interior architecture, and help students acquire more effective practical skills.
- The study found that AI enhances students' self-learning abilities, providing learning experiences based on students' interests and preferences by providing educational tools and resources that enable them to explore subjects in depth and autonomy, analyze student interactions, make recommendations about appropriate content and customize study tasks.
- The study confirms that AI tools are a means and tool for brainstorming and visual feedback that promotes and contributes to improving the efficiency of the design process, creative imaginary capabilities. It is not a replacement for the designer, but a helpful tool for him, and that the resulting designs need further modifications to become enforceable.
- The study asserts that integrating the use of AI has an effective role in the educational process, such as facilitating and reducing the design process by saving time, effort and money to carry out the work entrusted to them, developing their design skills, increasing their imaginary abilities, and facilitating the creation of the overall design idea through the concept design panel and the Mood Board.
- AI tools contribute to improved communication between students and faculty. Smart interaction systems provide effective channels for brainstorming and asking questions. Thus, enhancing the quality of academic interaction, providing advanced analysis of students' performance and providing detailed reports that help improve educational strategies.

21. RECOMMENDATIONS

The research recommendations included a set of proposals whose main objective is to improve the status of interior design education using artificial intelligence techniques. The recommendations are also keen to achieve a sustainable development goal (SDG) that includes quality education for design students for interior architecture that promotes innovation in educational practices.

- The research recommends the effective integration of AI tools into the curriculum and the development of educational content that supports and integrates with design courses to provide an interactive learning experience. This includes the use of smart learning platforms and interactive design tools, to help students understand the design of interior architecture more deeply.

- Faculty members should be trained on how to use artificial intelligence tools and apply them effectively in teaching. Educational institutions must conduct periodic evaluations in education, and gather feedback from students and faculty members to determine the impact of these tools on the learning experience to improve the education experience and evaluate students.

- It is advised to continue exploring future applications of AI in the design education of interior architecture. Such as simulation techniques, augmented reality, and machine learning to enhance the learning process. These technologies provide interactive and practical experiences that help students understand their designs in a realistic way.

- It is recommended to develop tools that use AI to provide immediate feedback to students about their projects and work. Also, provide interactive educational content, and design environments to improve the learning experience. This helps students improve their skills and provide immediate development recommendations.

- Periodic assessment studies should be conducted to measure the impact of the integration of AI on the quality of education in interior architecture design. By collecting data on the effectiveness of tools in improving learning outcomes and the experience of students and faculty. Taking into account technical and human gaps when integrating AI into education.

- Students should be encouraged to make use of AI tools to enhance their self-learning. Provide ongoing support and educational resources to help students explore topics and improve their skills independently to improve the learning experience and enhance the effectiveness of educational tools.

- Design instructors must establish specific controls on the extent to which AI interferes in design processes, be fully aware of the proportion of AI interventions in overall design. This ratio must be codified to maintain justice in evaluation, and take into account individual differences between students. The design concept must be established to students; that AI is only a tool to improve design efficiency.

- Encouraging researchers to push them into future research and studies including how AI is applied in design for the practical courses of interior architecture students. In order to enhance and improve their design skills, which helps to enhance the effectiveness of the educational process and keep abreast of the continuous and progressive development of AI technology.

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