Employing Modern Artificial Intelligence Technologies to Support Design Education Processes in The Field of Metal Furniture.

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Research Summary:

As a result of the rapid waves of contemporary change in the fields of knowledge, science, and technology, the designer has become more capable of generating knowledge, innovating applications, and employing them within a superior framework made possible by modern technology, which culminated in in-depth studies of human intelligence and how to simulate it in the form of computer programs that allow the completion of work that requires a degree of intelligence and experience. necessary to keep pace with development. This can be summarized in artificial intelligence systems that have succeeded in simulating human intelligence methods and transferring part of it to programming systems related to design, using several techniques that include sensing, understanding, planning, learning, environmental simulation, decision-making, solving complex problems, and learning from previous experiences. And imitate patterns. According to these variables, it has become assumed and necessary for the educational process in the field of design to keep pace with the current developments of the current era in order to ensure awareness of the continuous acceleration in the global development of this field. So, the research problem is The urgent need to study the multiple capabilities of artificial intelligence technologies, and how to link them to contemporary design education variables and the relationship of the above to design management processes and design processes, and to explore how to make the most of these capabilities to achieve the goals of the design education process efficiently and effectively.

The research aims to monitor the elements, components and methods of applying artificial intelligence in the field of design education, and how to make the most of its various applications while investigating the expected risks of its use in this field, anticipating a more advanced future in the field of design education.

Given the current implications, it is expected that artificial intelligence systems will penetrate all areas of future life, the most important of which is education and the preparation of future cadres. Therefore, it is necessary to anticipate future developments and link them to the field of metal furniture design by monitoring and analyzing in preparation for anticipating the future of design in light of development. Accelerating technology.

Keywords:

Artificial intelligence, Metal Furniture, Design education processes

ملخص البحث:

نتيجة لموجات التغير المتسارعة المعاصرة في المجالات المعرفية والعلمية والتقنية، أصبح المصمم أكثر قدرة على توليد المعارف وابتكار التطبيقات وتوظيفها ضمن إطار فائق أتاحته التكنولوجيا الحديثة بلغ أوجه بدراسات متعمقة للذكاء البشري

وكيفية محاكاته في شكل برامج حاسوبية تتيح إنجاز الأعمال التي تتطلب قدرا من الذكاء والخبرة اللازمة لمسايرة التطور. وتلخص ذلك في نظم الذكاء الاصطناعي التي نجحت في محاكاة أساليب الذكاء الإنساني ونقل جانب منه إلى نظم البرمجة المتعلقة بالتصميم وذلك باستخدام عدد من التقنيات تتضمن الاستشعار، والفهم, والتخطيط, والتعلم, والمحاكاة البيئية, وصناعة القرار, وحل المشكلات المعقدة, والتعلم من التجارب السابقة, وتقليد الأنماط. تبعا لتلك المتغيرات صار من المفترض بل والضروري أن تواكب العملية التعليمية في مجال التصميم مجريات العصر الحالي ضمانا لإدراك التسارع المستمر في التطور العالمي لهذا المجال.

ونظرا للإرهاصات الحالية فإنه من المتوقع تغلغل نظم الذكاء الاصطناعي في جميع مجالات الحياة المستقبلية ومن أهمها التعليم وإعداد الكوادر المستقبلية، ومن ثم فإنه من الضروري استباق ما سيلي من تطورات وربطها بمجال تصميم الأثاث المعدني وذلك بالرصد والتحليل تمهيدا لاستشراف مستقبل التصميم في ظل التطور التكنولوجي المتسارع.

لذا هدف البحث إلى رصد عناصر ومكونات وطرق تطبيق الذكاء الاصطناعي في مجال تعليم التصميم, وكيفية الاستفادة القصوى من تطبيقاته المختلفة مع تحري المخاطر المتوقعة من استخدامه في هذا المجال, استشرافا لمستقبل أكثر تقدما في مجال تعليم التصميم.

من خلال رصد وتحليل المحاور الأربعة للبحث أمكن للباحثة وضع رؤية مستقبلية تتواكب مع الاستراتيجية الوطنية المصرية للذكاء الاصطناعي ٢٠١٩-٢٠٢٤ التي تعتمد على محوري: بناء القدرات, وتحديد المهارات وتدريبها, بحيث تستند الرؤية المقترحة إلى ضرورة وضع نموذج للعمل يستوعب التحولات والتغيرات المعاصرة في تقنيات AI في مجال عمليات تعليم نصميم الأثاث المعدني, مما يرفع من كفاءة النظام التعليمي وتحقيق التنافسية في التعليم عالميا لدعم المتعلم والخريج.

تتضمن الرؤية المقترحة العناصر التالية:

- ضرورة تحقيق الدعم المادي والتمويل اللازم لمواكبة التغيرات المعاصرة في عمليات تعليم تصميم الأثاث المعدني.
- التركيز على إنشاء المؤسسة التعليمية لإدارة خاصة بالذكاء الاصطناعي تتكفل بتعليم أساسياته وتوفير المتخصصين لهذا التعليم.
- عمل مسابقات دورية بمكافآت للمتعلمين تشجع أفضل الأفكار والنتائج التصميمية القائمة على استخدام تطبيقات AI.
- عقد ندوات ولقاءات ودورات تدريبية للأساتذة الجامعيين والمتعلمين والإداريين بالمؤسسة, للتعريف بالمميزات والإمكانات, والتحذير من السلبيات والمخاطر.
- إعادة تأهيل البنية التحتية للمؤسسة التعليمية لاستقبال تقنيات AI, وتوفير جهاز لوحي لكل متعلم في مجال التصميم.
- إعداد برامج تعليمية متطورة ومواكبة للتغير المتسارع في تقنيات AI.
- إعداد وثيقة معايير معتمدة لتطبيقات AI في مجال تعليم التصميم.
- تحويل أقسام تعليم التصميم إلى وحدات منتجة وليست مستهلكة فقط.

الكلمات المفتاحية:
الذكاء الاصطناعي؛ الأثاث المعدني؛ عمليات تعليم التصميم

Introduction:

Since the 1990s, our contemporary world (the knowledge society/post-information society) has been living in what is known as the post-industrial third wave civilization, which is characterized by basic features, the most important of which are: Knowledge, and the critical thinking it entails resulting from freedom of democratic expression, which leads to a higher human ability to communication, thinking and learning for work, the revolution in scientific research and the dominance of the knowledge economy, with the intertwining and integration of knowledge fields between human sciences.

This contemporary civilization is also characterized by the characteristic of indeterminism, and it is the product of the achievements of three scientific revolutions: The quantum revolution, the computer revolution, and the molecular biology revolution. These revolutions have relied on technology, communications and information systems, and the superior technological

applications that support them, almost infinite information, and nanomaterials that have removed many manufacturing restrictions, in addition to the discoveries of neuroscience, which has facilitated the way for attempts to simulate human intelligence, consciousness, the ability to learn, and feel, those processes that depend on feeding information to computers and imitating the human nerve cell in its ability to learn from the surrounding environment and respond to external influences, and then make the appropriate decision, and then it was possible to manufacture machines that have the ability of self-growth and interaction to serve humans.

In an era with these characteristics, the lack of knowledge leads to a digital gap that will suffer from fields that cannot employ the new revolution represented by artificial intelligence applications, which is expected to be the greatest support for all fields of human activity, including the field of design, as the designer will be required to obtain a number of the skills that the future labor market will require. Therefore, the design education process must include knowledge and exploitation of the capabilities of these superior technologies to serve the future designer.

Today, the developed world is witnessing rapid growth in the field of artificial intelligence as a result of the cumulative development in the two fields: Big data and deep learning, and consequently in the research and software related to the development of this field, which is one of the most important fields of computer-based interactive learning, which develops machines capable of simulating human thinking so that it accomplishes tasks and store experiences and knowledge in the form of facts, concepts, theories, and systematic discovery methods in a virtual electronic container called the "knowledge base". The main goal of artificial intelligence is to simulate human intelligence using advanced software that can be used to solve atypical problems based on scientific logic that requires the average individual to exert great human effort for a long time.

1 Artificial Intelligence: The Future Revolution

1-1 Concept & Development

The definition of artificial intelligence (AI) has evolved over the years as follows: "The science and engineering of making intelligent machines." (*John McCarthy* 1956), "Creating computer programs capable of simulating intelligent human behavior." (*Alain Bonnet* 1985), "The study of mental abilities through the use of computer models." (*Winston* 1992), "Building computer programs that accomplish tasks requiring higher-level mental processes such as perceptual learning, memory organization, and critical thinking." (*Marvin Minsky* 2000), "The science that combines algorithms, theories, and applications with the goal of automating decision making with the ability to adapt, measure, and predict." (*Samia Shahbi* 2018).

According to *Gheorghe Tecuci's* opinion, artificial intelligence is: "The science related to both the practical and theoretical aspects of advanced systems that share intelligent human behavior such as Perception, Natural Language Processing, Reasoning, Planning, Learning, and Problem Solving." It aims to understand the principles that make intelligence possible, build and develop intelligent systems, create knowledge and reasoning mechanisms, and make interaction with computers as easy as interaction with humans.

The field of artificial intelligence research was established in a workshop at Dartmouth College in 1956. Those who attended this workshop became research leaders in this field for several

decades to come, and they were: *John McCarthy, Allen Newell, Marvin Minsky, Herbert Simon*, who founded the artificial intelligence laboratories at the Institute of Art. MTI and CMU. This was after the creation of the Turing Test in 1950, which determines the ability of a machine to display behavior that mimics human intelligence. Then their research became generously funded by the US Department of Defense after Simon predicted in 1965 that within twenty years machines would be able to do any work that humans could do, after the creation of the ELIZA program, the first natural language processing program in 1964. And after the Deep Blue computer succeeded in 1997 in defeating chess champion Gary Kasparov, the rapid development of artificial intelligence systems continued until the emergence of Generative Pre-Trained Transformer: ChatGPT in 2022, achieving a breakthrough in the use of directed and reinforcement learning techniques to simulate human behavior.

1-2 Related areas of knowledge

Artificial intelligence is closely related to several areas of knowledge that affect it, Figure (1), including:

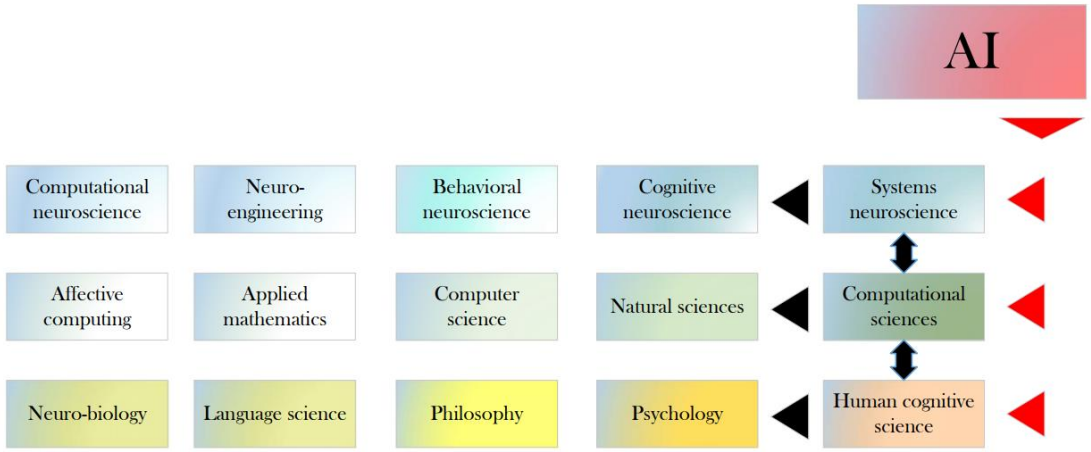


Figure (1) Areas of knowledge related to AI.
Derived by author from: https://www.researchgate.net/figure/AI-as-multidisciplinary

A- System Neuroscience:

• Neuro-Engineering: It is concerned with studying the logical and mathematical characteristics of the decision-making process.

• Cognitive Neuroscience: Discoveries in this field have led to the development of artificial intelligence to mimic the reactions of human intelligence.

• Computational Neuroscience: The scientific study of visual perception, which supports the recognition and generation of images and designs.

• Behavioral Neuroscience: Provides artificial intelligence with the logical reasoning necessary to understand human behavior and perceive information.

B- Computational Sciences:

• Applied Mathematics: It is the core of artificial intelligence that provides the basic structure such as logic, computing, and probability theory.

• Computer Science: It is the basis for operating artificial intelligence, including programming, operating devices, storage capacity, and memory.

• Natural Sciences: It represents the chemical, physical and biological scientific base for understanding the world surrounding humans.

• Affective Computing: It is an interdisciplinary field that combines computer science, psychology, and cognitive science.

C- Human Cognitive science:

• Philosophy: The origin of modern science, concerned with studying problems that represent the foundations of artificial intelligence, such as: Knowledge representation, logical reasoning, and goal-based analysis.

• Neurobiology: On its basis, computer neural networks were built that mimic the neural structure of the human brain.

• Language Science: The scientific study of human languages, which supports the fields of natural language processing, and computational linguistics.

• Psychology: It simulates human emotion and human interaction methods.

1-3 Patterns - Fields - Levels

There are seven basic patterns of artificial intelligence, from which nine sub-patterns branch out, as shown in Figure (2).

Based on these patterns, today there are many applied fields for using artificial intelligence systems to include a wide range of human activity, which is detailed in Figure (4).

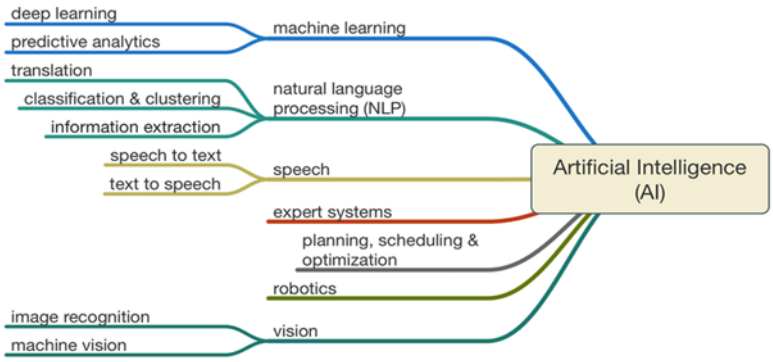


Figure (2) AI Basic patterns
https://www.researchgate.net/figure/Fields-of-artificial-intelligence-10_fig1_324183626

And there are three main levels of artificial intelligence, Figure (3), which can be identified in:

A- Narrow AI:

Systems that are designed to perform specific tasks or functions with a high level of efficiency to excel in a particular domain or solve a particular problem but lack the ability to transfer their knowledge to other domains. They focus on narrow, well-defined tasks and operate within a limited scope. Examples include voice assistants such as Siri or Alexa, image recognition systems, and chatbots.

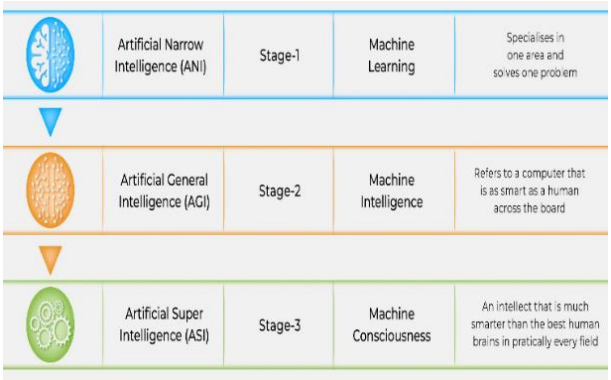


Figure (3) AI Levels
https://deltalogix.blog/en/2023/03/08/artificial-intelligence

B- General AI:

Systems possess human-level cognitive capabilities in various domains and a wide range of intellectual abilities;

including learning, reasoning, problem solving, and understanding natural language. They can transfer knowledge from one field to another and adapt to new situations.

C- Super AI:

An advanced form of artificial intelligence that possesses cognitive capabilities far beyond what any human mind can comprehend.

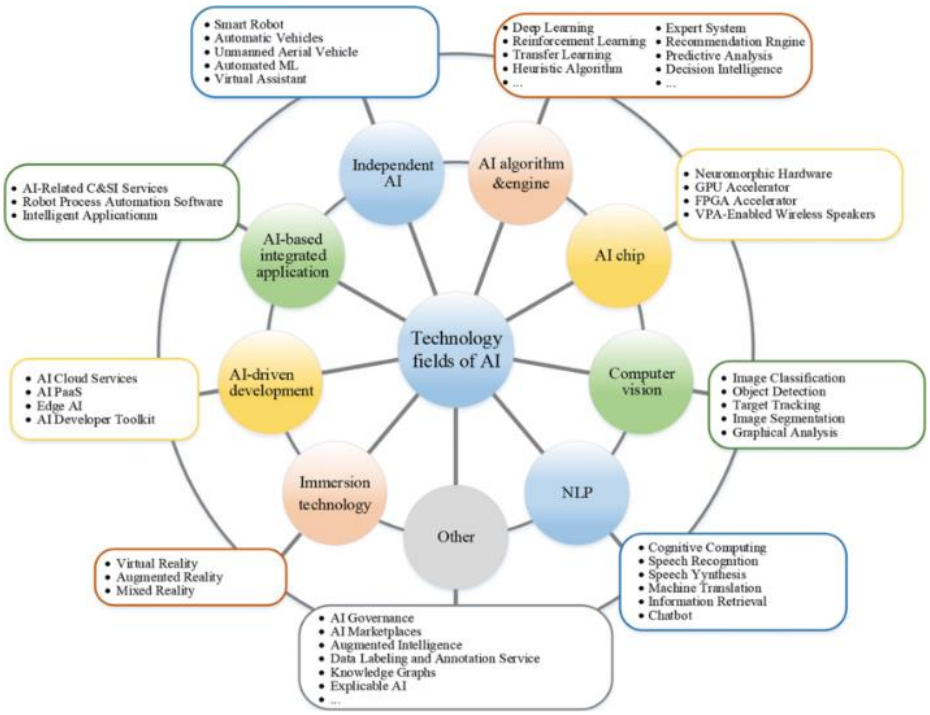


Figure (4) AI Applied fields.

https://www.researchgate.net/figure/Technological-fields-of-artificial-intelligence

Not only will they demonstrate a greater ability to learn and solve problems, but they will also demonstrate a deep understanding of complex systems, exceeding human capabilities in almost every field. It is a model that does not currently exist, but it may be under development soon. It can be noted that the nine sub-models mentioned above include two basic models directly related to design education processes, namely: Image Recognition and Deep Learning.

2 Design Education Process

2-1 Thinking - Intelligence - Design

Man, honored by God Almighty, is distinguished from other creatures by his mind and thinking functions. The human mind has functions: Perception, analysis, prediction, imagination, creativity, and innovation, storing information and experiences, remembering, and forgetting. The mind is divided into consciousness, which is aware of time, place, and people, and unconscious, which is the subconscious that is unable to perceive them.

Thinking is the process of using the mind to solve problems after collecting and exploiting information with thoughtful investigation of experience to achieve goals. Accordingly, human thinking achieves many goals, including understanding, planning, making decisions, solving

problems, judging situations, and carrying out tasks. These are the basic goals in the design process.

There are many styles of thinking in the field of design, including: Analytical/inventive, visual/audio/sensual, individual/collective, and realistic/abstract. Thinking in the design process is additionally characterized as scientific thinking, as scientific thinking is characterized as: Logical, predictive, and critical. Then it follows the steps of the scientific method, which are: Observation, defining the problem, developing concepts/hypotheses, collecting data, testing the concepts, and arriving at a result/product.

As for design intelligence, its definitions have varied widely to include:

• The ability to think about relationships constructively and directed towards a goal.

• The mind's ability to establish logical relationships in the face of circumstances and thus adapt to them.

• The ability to learn and acquire different knowledge and benefit from it in solving problems.

• The ability to learn how to confront situations with new responses, adaptation, and flexibility.

• The interaction of mental abilities and acquired skills to control experiences and make decisions.

• The ability to quickly learn and recall information to reach insights and make judgments.

2-2 Aspects of AI supporting Design education process

There are three basic axes to the educational process in general, and they implicitly apply to design education processes in the field of metal furniture, which are: Educational administration, university professor, and learners. Recent research trends classify the areas of use of AI in the education process into: First; the technical aspect, in terms of employing huge educational data and analyzing the outcomes of the learning process. Second; the educational aspect, in terms of personal learning paths, adaptive learning, and smart learning. Third; the developmental aspects that include the use of intelligent agent systems and applying Smart Learning Management Systems (SLMS) strategies. Accordingly, appropriate support is selected for the three parties to ensure the quality of the design education process.

2-2-1 For Administration & Professor

Academic administration can benefit from artificial intelligence to improve the institution's performance, raise the quality of academic results, and automate some administrative tasks to save time and effort. It can also increase the quality of setting policies regulating student activities, organizing files, and managing the institution efficiently. AI technologies can be used to prepare reports, solve student registration issues, and efficiently manage all routine administrative requirements. AI enhances the academic institution's capabilities in supporting the educational process in the field of design.

This requires preparing a specialized body in formulating policies for the use of AI technologies, identifying use cases and technologies appropriate to the institution's policy, reviewing the institution's current policies and knowing how to integrate them with artificial intelligence requirements, providing continuous training for professional cadres including professors, lecturers, and administrators, and finally following up on the latest developments in intelligence systems, contemporary artificiality and keeping pace with its establishment.

As for the university professor in the field of design education, contemporary AI technologies represent a strong support for him and open new horizons for developing design education if they can be provided and exploited effectively, noting that they are complementary tools and not a substitute for the creative human effort of the university professor, as AI technologies allow the possibility of generating content. A specialized study that suits the capabilities of each student, helps increase the effectiveness of learning, and allows how to manage specialized discussions and brainstorming processes. It is also a supportive tool in reducing the time needed to evaluate students, prepare the scientific material, design tests, and exercises to support design learning.

This requires defining the goals of using AI in the course and design workshops, choosing the appropriate AI tools to achieve these goals, guiding learners on how to best use AI applications, and finally understanding the capabilities and limitations of using different technologies and verifying the validity of its results and not relying completely on it.

2-2-2 For learners

Design learning process is a complex process that brings together all levels of thinking to fit the stages of growth or construction of knowledge or skill, or both, in the learner. Learning in its initial form may require a wealth of thinking that comes to from a previous experience and the initial information he/she is proficient in and stores that is considered as a learning project for him. Then He soon uses it as raw material with other information, observations, and experiences to help the higher levels of thinking, using it to solve the problems he faces, to gain new experience that he uses in other automatic thinking, and thus the individual's learning cycles continue.

Artificial intelligence intersects with the processes of teaching and learning design thanks to its increasing capabilities in simulating human performance and its ability to automate many tasks, which reduces many of the routine burdens on both parties of the design education process by playing the role of an assistant in responding to logical inquiries and statistical and ergonomic information, and it can develop plans, courses, suggesting scientific content for lectures. He can also help in drawing sketches, suggesting color solutions, making observations, contributing to the completion of preliminary research, and supporting people with special needs.

The process of teaching design through these techniques is characterized by:

• Supports active interaction between the learner and the educational program.
• It allows the student to develop individually according to his personal aptitude.
• Educational situations are enriched by many human and non-human learning sources.
• It helps in linking learning to the visual and auditory senses, which enriches learning stimuli.
• It allows the learner to go beyond local borders, compensates for the lack of information, and enriches his visual experiences.

Some global higher education institutions, including Stanford University in the United States, the University of Hong Kong, and the Russell Group, which includes the Universities of Oxford and Cambridge, have worked on formulating policies for the use of artificial intelligence (generative in particular) in education, and developing principles aimed at enabling scholars, professors, and administration to use its techniques in an ethical and responsible manner, free training courses were also provided to encourage its use with the aim of promoting innovation, leadership and sustainability.

2-2-2-1 Extended Reality (VR /AR /MR)

Virtual Reality (VR) is a computer-generated simulation of a three-dimensional image or environment that the design student can interact with in a way that appears real or physical using special equipment such as helmets and gloves equipped with sensors and communication. It is believed that this technology has the ability to develop student-centered self-learning by exploring a more realistic and interactive world. It also enables the student to wander within the scene, which develops his ability to visualize, understand, and realize complex scientific knowledge.

Augmented Reality (AR) is one of the modern learning technologies that combines real physical reality with virtual reality. It is a technology that combines physical objects in the real world with digital content to provide direct access to digital information integrated with the real environment. It also enhances the designer's perception of the real world by enriching what he sees, feels, and hears in the real environment. The characteristics of AR technology are evident in the integration between the real physical environment and virtual learning elements in one system via mobile devices, the interaction between learners and virtual learning elements in a timely manner, allowing the viewing of digital information several times at any time and place, and the ease of linking virtual information with elements of the real environment; providing clear and audited information to the user, its appropriate cost, and its ability to expand and develop.

Mixed Reality *(MR)* is a user environment in which physical reality and digital content are combined in such a way that we enable interaction with sentient and virtual objects. It is adding virtual elements or objects to the real environment to produce new hybrid environments and visuals, in which the student can walk, change the location and size of objects, and control them using hand gestures, eye movements, and voice commands.

All these three technologies are now commonly said to be Extended Reality (ER), which will be the mainstream for the next generation in all fields, including the area of design learning.

2-2-2-2 Robotics & Chatbot

AI has been associated with robotic systems mainly since its beginnings, as robots can perform wide-ranging tasks without human intervention sometimes, and they greatly support the learner in the field of metal furniture design in the applied aspect related to preparing for operational processes, producing prototypes, graduation projects, training projects, and various operating and shaping processes which can represent a certain risk, such as welding, painting, cutting, assembly and installation operations.

As for Virtual Assistants, it is one of the most important assistive technologies for the design learner. It is a technology that can communicate with the learner via text or voice interaction

using mobile phones and tablets to perform a set of tasks including setting reminders, answering questions, and requesting services. The most popular of these applications are Siri, Alexa, Google Assistant, and Cortana. Day after day, the ability of these systems to understand, learn, respond, solve problems, and provide information increases.

2-2-2-3 Generative Artificial Intelligence

GAI is a type of AI technology that generates content in the form of text, image, video, or conversation, by learning complex patterns from data to produce new creative content. This type is characterized by the ability to generate diverse and unlimited results from the required content, Figure (5), which represents a qualitative shift in the field of design education and provides promising horizons in the field of creativity and innovation.

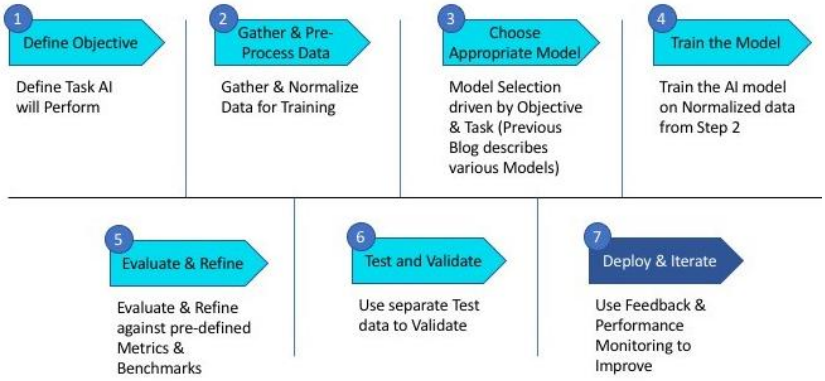


Figure (5) GAI Phases
https://www.linkedin.com/pulse/generative-ai-end-to-end-process-blog-2-shiv-kumar

Generative artificial intelligence relies on advanced technologies, including Deep Neural Networks and Large Language Models, which allow the ability to track huge data from books, social networking sites, and the Internet. Table (1) shows a few currently existing applications that can be used to support the design education process, clarifying the type of outputs available to be generated through these applications. Table (2) also shows a breakdown of the features of the most important of these applications in the field of design.

Table (1) Types of uses & outputs of some AI applications.

Application	Type of Use	Outputs
• ChatGPT • Microsoft Bing • Google Bard	• Content generation. • Summing up. • Answering questions.	Script
• Murt AI • Play.ht • Resemble AI	• Generate words from text. • Speech recognition. • Speech modification.	Speech
• Bing Image Generator • Adobe Firefly • Nvidia Picasso • Midjourney	• Generate an image from text. • Image Processing. • Improve image resolution.	Image
• Syntheses • Make-A-Video • Adobe Premiere	• Generate video from text or image. • Video manipulation • Improve video quality.	Video

Table (2) Features of some widely used AI Applications Supporting Design Education.

Application	Field of Use	Advantages	Type
ChatGPT	• Brainstorming • Summarizing • Explaining, simplifying concepts • Translation • Programming	• Based on a large linguistic model. • Able to chat with the user and answer questions. • Easy and clear language. • Generates innovative content.	Free Limited/ prepaid
Bing Chat	• Answering questions. • Generate artistic images. • Create visual designs.	• An intelligent assistant that provides an integrated search and conversation experience. • Provides 3 styles of conversation • Creative – Balanced Precise	Free
Perplexity	• Solve mathematical equations. • Data analysis. • Writing scientific research.	• Extensive search in databases • Referring to sources • Intelligent search assistant	
Bard	• Writing/translating/summarizing • Generate multi-format content.	• Handling most human languages and dialects	Free
Migjourney	• Generate artistic images. • Create visual designs.	• Based on a large linguistic model. • Generates innovative content.	Free Limited/ prepaid

Obviously, Text-to-Image Synthesis is one of the most common techniques in the field of design, using neural networks that are taught how to generate images from text descriptions by collecting data and linking words and phrases to certain characteristics of the image, and then the neural network becomes able to create a wide range of images. The same logic can be applied if Image-to-Image Synthesis is used.

To obtain the best results required from GAI, the user must learn Prompt Engineering, which is the process of formulating text instructions by choosing the most appropriate words and setting the appropriate context for the required task, which leads to the generation of high-quality content, through; defining the goal of dealing with the application, using clear language and be specific, avoid making requests out of context, and avoid colloquial and ambiguous terms.

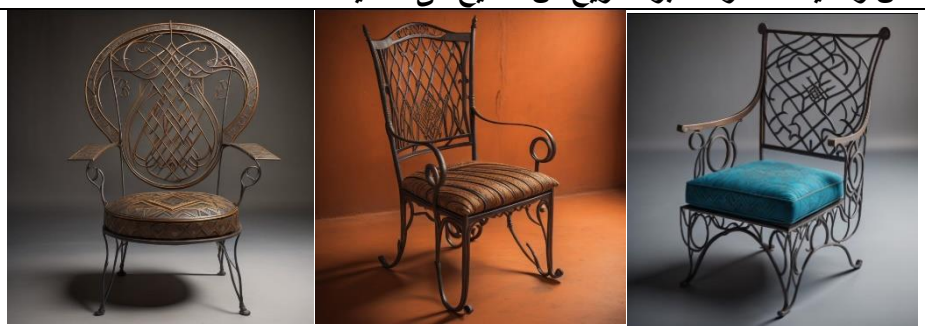
3 GAI Practical Experiment

The practical application was carried out with a limited sample of users using Text-to-Image Synthesis through the ***Midjourney*** website, as follows: Subscribe to the website, create a personal account, use the text box, request the generation of designs for three-dimensional metal products that have a specific function and follow a specific design model, while specifying

specific design principles such as symmetry and centrality. Then select the desired output processor, and then send the command. Accordingly, the site created a few unique visualizations, each of which is different from the other, while allowing images to be uploaded in the required size and full quality, with the possibility of modifying the words describing the desired design to obtain more appropriate results. The results can be reviewed in Table (3).

Table (3) Utilizing GAI to create Applied visualizations of metal furniture.

	**First trial: Ethnic Style Metal Dining Table**
	**Second Trial: Ethnic Style Metal Armed chair**

	
 	**Third trial: Ethnic Style Metal Dining chair**
 	**Fourth Trial: Ethnic Style Metal Coffee Table**

4 Using GAI in Design Education Process: Challenges, Risks & Ethics

The ethics of artificial intelligence in general, and necessarily including the field of design education, assumes principles of use that ensure preserving privacy, supporting justice, equal opportunities, inclusivity, in addition to preventing misuse in a way that may harm any of the three parties to the educational process, or negatively affect the course of the process itself.

Based on the "Future of Humanity" report issued by the University of Oxford, in which 352 academics specialized in the field of industry and machine learning participated, it is expected that human jobs will be completely automated after 125 years, which will negatively affect the global labor market, unemployment rates, and restrictions on quality jobs and competencies, which will result in economic, psychological, behavioral, social, moral and value disturbances. Therefore, studies have been developed that focus on the ethical aspect that ensures the use of artificial intelligence techniques in a way that can avoid their expected dangers. Although the matter has so far been within the scope of monitoring and sensitizing the various aspects of the subject, it has been possible to note several considerations, some of which can be monitored in the form of:

1- Challenges:

• Dependence: Excessive reliance by both sides of the educational relationship on artificial intelligence, especially generative intelligence, negatively affects research and critical thinking skills and a decline in the level of creativity.

• Poor quality of content: Content may not always be accurate, scientific, or logical; it may be misleading.

• Loss of human contact: Constant interaction with artificial intelligence affects the designer's ability to work within a team.

• Lack of resources: The educational institution may not have the resources to integrate AI tools into the education process.

2- Risks:

• Increasing the digital divide: The delay in the use of artificial intelligence in the field of design education today may lead to a widening of the digital gap between developed and developing countries in the field of quality education.

• Loss of competitive advantage: This is due to educational institutions that are late in using artificial intelligence, which affects the capabilities of design students to keep pace with future labor market requirements.

• Weak privacy and security: The lack of national legislation to monitor artificial intelligence applications puts privacy at risk and violates the intellectual property rights of design scholars.

• High resource consumption: Artificial intelligence applications are expensive in terms of financial, technical and operational resources, which may burden the educational institution's budget.

Accordingly, some principles for using artificial intelligence in an ethical manner in the field of design education can be established in accordance with the principles adopted by the Organization for Economic Co-operation and Development (OECD):

3- Ethics:

• Inclusive growth and sustainable development: Encouraging the use of artificial intelligence with the aim of enhancing the design learning process, not replacing it.

• Human values and justice: Avoid using artificial intelligence in a way that discriminates between a specific category of learners
• Transparency and understanding: Ensuring that the professor and student are able to understand all aspects of using artificial intelligence applications.
• Security and safety: Ensuring the accuracy and relevance of educational content generated by artificial intelligence.
• Responsibility and accountability: Preserving the integrity of the educational process and ensuring that students and professors take responsibility for their work.

Conclusion:

By monitoring and analyzing the previous axes of the research, the researcher can develop a future vision that is in line with the Egyptian National Strategy for Artificial Intelligence 2019-2024, which relies on the two axes: Capacity building, and identifying and training skills, so that the proposed vision is based on the necessity of developing a work model that accommodates contemporary transformations and changes in AI technologies. In the field of metal furniture design teaching processes, which increases the efficiency of the educational system and achieves competitiveness in education globally to support the learner and graduate. The proposed vision includes the following elements:
• The necessity of achieving the necessary financial support and funding to keep pace with contemporary changes in the processes of teaching metal furniture design.
• Focus on establishing an educational institution for a special department for artificial intelligence that will be responsible for teaching its basics and providing specialists for this education.
• Conduct periodic competitions with rewards for learners that encourage the best design ideas and results based on the use of AI applications.
• Holding seminars, meetings, and training courses for university professors, learners, and administrators at the institution, to introduce the advantages and capabilities, and warn of the negatives and risks.
• Rehabilitating the educational institution’s infrastructure to receive AI technologies and providing a tablet for every learner in the field of design.
• Preparing advanced educational programs that keep pace with the rapid change in AI technologies.
• Preparing an approved standards document for AI applications in the field of design education.
• Transforming design education departments into productive units, not just consumers.
• Expanding the spread of the culture of digital education and the use of AI systems.
• Educating civil society about the importance of digital transformation in the educational process.
• Spreading a culture of AI ethics to avoid potential risks.
• The importance of employing modern applications of artificial intelligence as an **auxiliary element** in developing the student’s innovative skills must be emphasized, as it cannot be relied upon completely at the present time.
• It is necessary to prepare educational curricula that contain programs in which the ethics and responsibilities of the designer are taught when using artificial intelligence applications.

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