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Design Technology: Bridging the Gap between Concept and Implementation Towards a Creative Digital Future

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Abstract

This study investigates the role of design technology in bridging the gap between conceptual ideas and practical implementation, with a focus on fostering a creative digital future. Technological advancements have significantly influenced design processes, providing tools that enhance efficiency, reduce time and costs, and improve comfort while maintaining quality, safety, and budget requirements. The study employed a descriptive developmental approach to explore the reality and expected levels of technology use in design among professionals in graphic, architectural, and engineering design. A total of (384) participants were selected randomly, and data were collected through a structured questionnaire divided into three dimensions: Design Technology, Concept-to-Execution Gap, and Digital Future and Creativity. The validity of the instrument was confirmed by expert review and Pearson correlation analysis, while reliability was verified using Cronbach's alpha. Results revealed a significant gap between the actual use of technology and the expected level, highlighting the need for greater integration of digital tools in design practice. The study also found a high-level concept-to-execution gap, emphasizing that technology serves as a crucial bridge between creative vision and project realization. Furthermore, participants recognized the importance of digital transformation and technology-driven creativity in shaping the future of design, underscoring the necessity of incorporating technological and digital creativity concepts into educational curricula to prepare innovative designers for the evolving professional landscape.

Keywords: *Design Technology, Gap, Concept, Implementation.*

Introduction

The design has witnessed remarkable technological advancements in recent years, with the expansion of digital innovations and devices, this has helped develop both the design and execution processes. Technology offers numerous benefits to interior design, including saving time and effort during the design process, as well as energy and money during execution. It has also diversified the means and tools for enhancing comfort, while remaining consistent with budgets, quality and safety requirements.

Another benefit of technology is the ability to visualize the design before implementation by creating a virtual reality simulation in three dimensions. These programs are closely linked to the world of interior design. Despite the precision of details in hand-drawn architectural sketches, the final appearance of the space remains difficult to imagine without these realistic simulations. To experience entering a space virtually, one wears virtual reality masks, making the viewers feel as if they are inside the virtual space, with the space depicted in a way that is closer to reality than printed drawings (Al-Mizari, 2019).

Modern technologies have played a significant role in human life, contributing to the adaptation of lifestyles and environmental conditions. This stems from the individual's desire for continuous improvement and innovation, aiming to create comfortable and attractive environments, where the interior designers have harnessed numerous technologies to create highly precise designs, reflecting the evolution of the interior design landscape. This evolution is achieved through the integration and synergy of diverse technologies, embodying the vision of designers constantly seeking new and innovative ideas (Vrancic, Zadravec & Orehovacki, 2024).

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Many technologies have emerged and been utilized in interior design. Their continuous development and the introduction of new types have facilitated the realization of designers' visions (Johnson & Acemoglu, 2023). In the past, designers often faced difficulties in implementing their ideas due to a lack of suitable materials. However, skilled designers have not been deterred by these obstacles, which once hindered the realization of their aesthetic visions. They have skillfully adapted these technologies, which have become widely available today (Almizari, 2019).

While designers traditionally operated within the realm of conventional architectural design, relying on traditional concepts, terminology, and standards—even through hand-drawn sketches and measurements on paper, followed by real-world application in large spaces or small-scale models—many execution errors frequently arose. This was due to discrepancies between drawing scales and actual dimensions, often resulting in project failures and the need to completely redesign, leading to significant wasted time (Vrancic, Zadravec & Orehovacki, 2024).

However, with technological advancements and the emergence of numerous architectural design software programs, this sector has gained popularity among architects. This is particularly true with the use of design software in light of the digital transformation and the integration of artificial intelligence, virtual reality technologies and software. Which has resulted in the development of modern architectural designs based on consistent and precise standards, enabling error-free execution. This has significantly reduced the time required to achieve ideal designs, bridging the gap between concept and execution within the framework of creative digital systems (Al-Mizari, 2019).

The concept and its practical application (implementation) come with the use of modern digital tools, with the aim of building a future based on innovation and technology in architectural design. In other words, it is not enough to have new and innovative ideas, but they must be transformed into a tangible reality through digital technologies, such as: 3D design, artificial intelligence, virtual reality, and programming. This approach seeks to integrate human creativity with technical capabilities to create unique, error-free architectural designs (Karsh, 2004).

Problem of the Study

The problem addressed by this study lies in the clear shortcomings in applying digital technology in the fields of architectural and interior design.

Many design practices still rely on traditional methods that limit opportunities for innovation and creativity. Despite the significant advancements in digital design tools and techniques, a gap persists between the theoretical concept of design—which embodies creativity and a future vision—and its practical implementation, which often faces challenges in translating these visions into reality.

Furthermore, previous studies in this field remain limited in their exploration of digital transformation and its direct impact on design quality and effectiveness. Research lacks a scientific and analytical framework that connects conceptual creativity with the use of technology as a means of practically realizing this creativity. This highlights the need for a study that seeks to explore the potential of design technology as a tool capable of bridging the gap between concept and implementation, and contributing to shaping a digital future that integrates creative thinking with applied practice in interior and architectural design, ultimately leading to a higher level of efficiency and innovation in this field.

Questions and Objectives of the Study:

The study aims to answer the following research questions.

- What is the level of reality and expected of the design technology dimension?
- What is the level of Concept-to-Execution Gap towards a creative digital future in design technology?
- What is the level of Digital Future and Creativity in the design?

Significance of the Study

The Significance of this study stems from two aspects:

Theoretical Importance: It is expected that this study will serve as an important reference for researchers in the field of architectural design, given the scarcity of related studies – to the best of the researcher's knowledge. This study can also enrich both Arabic and international libraries with this type of research in a specialization that has become one of the most important in the fields of civil and

architectural engineering. Furthermore, the study can contribute to building a theoretical framework that covers the subject matter in a way that researchers can benefit from.

Practical Importance: It is expected that this study will benefit those working in the interior and architectural design sector. The study can also assist decision-makers in Jordanian universities in integrating digital technologies, such as artificial intelligence and virtual reality, to help university professors teach interior design courses. Finally, this study can benefit those working in the interior design sector by encouraging them to adopt digital technologies in their specialized fieldwork in interior and architectural design.

Scope of the Study:

The study included the following boundaries:

Human Boundaries: The study focused on professionals working in the fields of interior design, architecture, and graphic design.

Time Boundaries: The study was conducted during the first semester of the academic year 2025/2026.

Spatial Boundaries: The study was limited to interior design offices in Jordan.

Literature Review

Technology has progressively integrated into the design field across all disciplines, beginning with basic two-dimensional digital drafting tools and advancing toward sophisticated 3D modeling and simulation platforms that revolutionized the way projects are conceptualized and developed. As software capabilities evolved, parametric and algorithmic design approaches emerged, using programming logic and mathematical parameters to create complex, dynamic forms that are difficult to realize through conventional methods, thereby expanding designers' creative potential and enhancing accuracy (Melendez, 2019). Additionally, virtual reality and augmented reality technologies introduced immersive, interactive environments that allow stakeholders to explore and evaluate projects prior to construction, strengthening communication between designers and users (Gardiner, 2024). At the same time, 3D printing technologies enabled digital models to be transformed quickly and efficiently into tangible prototypes (Reffat, 2007). With the integration of artificial intelligence into design workflows, designers are now able to analyze large datasets, generate optimized design options, and forecast project performance with greater reliability (Sbai, 2025). In this way, technology has become a transformative force, fundamentally reshaping the design process and contributing to greater precision, adaptability, and innovation.

Technological progress is intended to serve society rather than control it, and its various forms should ultimately contribute to improving human life. Designers continually pursue the latest advancements to strengthen the effectiveness and success of their work (Reffat, 2007). The greater the integration of modern technologies within the design process, the more contemporary, efficient, and streamlined the outcome becomes—saving time and effort for both the designer and the user (Ahmed, Bande, Al-Marzouzi, Zaneldin & Alhamad, 2025). These advancements have introduced a wide range of innovative solutions, enabling the creation of environments that excel both functionally and aesthetically (Sbai, 2025).

The global trend is shifting toward technologies that reduce energy consumption, optimize material use, and respond directly to human needs while meeting contemporary functions and standards. Aligning with progress and modernity, and bridging the present with the future, ensures that design remains relevant and forward-thinking. When technological innovation is combined with intellectual depth, environmental responsibility, and thoughtful design principles, it results in high-quality outcomes across all design fields (Llach, 2015; Sbai, 2025; Ahmed et al., 2025).

Figure (1) A garden design created using 3D technology with Canva software.

Source: https://shadowdesignco.com

Figure (2) Contemporary design through technological implementation using 3ds Max software

Source: https://cgway.net/3ds-max-all-informations-and-details/

Figure (3) AI-powered logo design

Source: https://maatloob.com/services/

Figure (4) AI-powered engineering design

Source: https://www.noec.sy/artificial-intelligence-and-architecture/

Technology has become an essential component in all design fields, whether architectural, interior, industrial, or digital (Demirarslan & Demirarslan, 2020). The rapid development of technological tools and platforms has profoundly changed ways of thinking, creating, and executing ideas, resulting in increased accuracy, efficiency, and quality of design outputs (Ahmed et al., 2025). The importance of technology lies in its ability to support modeling, simulation, and analysis processes (Llach, 2015). It enables designers to test their ideas in advance and predict the performance of materials, products, and spaces, contributing to more informed and effective design decisions (Melendez, 2019). Technology has also succeeded in expanding the horizons of creativity thanks to its advanced software, including 3D modeling, virtual and augmented reality technologies, artificial intelligence, and parametric design (Demirarslan & Demirarslan, 2020). These tools not only facilitate the visualization of designs but also empower designers to create new and complex solutions with greater flexibility, handle intricate details, and make immediate adjustments to evolving requirements. Furthermore, technology has played a crucial role in supporting sustainability initiatives by analyzing energy efficiency, selecting environmentally friendly materials, and minimizing resource waste (Ahmed et al., 2025). Thus, technology has become a pivotal element that fosters innovation, enhances performance efficiency, and reshapes design methodologies to better meet the needs of the future and the demands of users and society.

The Importance of Technology in Design

Technology is a fundamental pillar in the development of design fields in all their forms, contributing significantly to the advancement of design methodologies and the enhancement of the quality of creative outputs. Advances in digital tools, including 3D modeling software, advanced simulation techniques, and artificial intelligence, have enabled the creation of integrated work environments that empower designers to explore and refine ideas more efficiently than traditional methods. (Fischer, Peine & Ostlund, 2020)

The importance of technology is evident in its ability to reduce the time and effort spent in design processes, in addition to increasing the level of precision in details, thus allowing for the development of prototypes that can be tested and analyzed before implementation (Giaccardi & Redstrom, 2020).

Technology has also contributed to expanding the scope of creative thinking by enabling designers to create complex forms and new concepts that are difficult to achieve with manual design methods. This is clearly demonstrated in algorithmic and parametric design techniques, which offer broad capabilities for producing innovative and flexible design solutions that adapt to functional and aesthetic variables. Furthermore, virtual reality and augmented reality technologies have enhanced interaction between designers and users by providing 3D models that support decision-making and reduce design errors (Ahmed et al., 2025).

On another level, technology has contributed to supporting sustainability within the design process (Fischer, Peine & Ostlund, 2020). Digital analytics tools have enabled the assessment of energy efficiency, waste reduction, and the selection of environmentally friendly materials based on accurate data. Thus, technology emerges not only as a tool to support creativity but also as a pivotal element guiding the design process toward greater efficiency and environmental responsibility, in line with contemporary demands and user needs (Giaccardi & Redstrom, 2020).

The Benefits of Technology in Design

Technology plays a pivotal role in developing the design process across its various fields. It contributes to enhancing accuracy and quality through advanced modeling and simulation tools that reduce the likelihood of errors and support data-driven design decisions (Thelma, Sain, Mpolomoka, Akpan & Davy, 2024).

Digital software also accelerates work processes, leading to greater efficiency compared to traditional methods. Technology provides a fertile environment for creativity by enabling designers to create complex and sophisticated forms using parametric and algorithmic design techniques. Furthermore, virtual reality and augmented reality technologies allow for realistic representations of designs before implementation, enhancing the ability to evaluate projects beforehand and minimizing subsequent modifications (Parveen & Ramzan, 2024).

Digital platforms help improve communication and coordination between designers and stakeholders, supporting the achievement of a comprehensive design vision. Technology also promotes sustainability by analyzing energy consumption, reducing waste, and selecting environmentally friendly materials (Thelma et al., 2024). Digital tools offer high flexibility in making design modifications, as well as the ability to build accurate and complex models through 3D printing technologies, which makes technology an essential element in improving the efficiency and innovation of the contemporary design process (Parveen & Ramzan, 2024; Thelma et al., 2024).

Technology plays a pivotal role in advancing design across all fields and specializations, introducing a transformative shift in both creative practices and professional workflows. With the integration of sophisticated digital tools, the design environment has become more accurate, adaptable, and capable of supporting innovative solutions that would be challenging to achieve using conventional techniques. Its significance is particularly evident in the improvement of design quality through the use of 3D modeling and simulation, which enable designers to assess concepts in advance and anticipate their performance prior to execution. This reduces the likelihood of errors and promotes informed, data-driven decision-making based on well-defined standards (Ozowe, Sofoluwe, Ukato & Jambol, 2024).

Moreover, technology streamlines the design process through automation and intelligent software systems, enabling designers to devote more attention to conceptual and creative work rather than repetitive tasks. Parametric and algorithmic design approaches have broadened the horizon of innovation, allowing the creation of highly complex and adaptable forms with advanced technical precision (Johnson & Acemoglu, 2023).

In addition, virtual and augmented reality technologies enhance communication between designers and users by offering immersive, realistic visualizations of projects before construction, thereby improving understanding and minimizing the need for later revisions. Technology also plays a critical role in promoting sustainable design practices by facilitating energy analysis and supporting the selection of environmentally responsible materials (Nwokedieqwu, Ibekwe, Ilojianya, Etukudoh & Ayorinde, 2024).

As such, it has become an essential force driving progress in architectural, interior, industrial, graphic, and product design—boosting creativity, increasing efficiency, and elevating the overall quality of design outcomes (Parveen & Ramzan, 2024; Thelma et al., 2024).

Without the use of technology, design systems encounter considerable limitations, the design process reverts to traditional methods, which lack the speed, precision, and adaptability provided by contemporary digital tools. In the absence of technology, all drawing and planning must be done manually, increasing the risk of errors and extending the time needed to create plans and prototypes (Nwokedieqwu et al., 2024). Designers also lose the ability to visualize projects in 3D or simulate the functional and environmental performance of spaces and materials, making evaluations less accurate and more dependent on assumptions rather than reliable data (Thelma et al., 2024).

Innovation is also constrained without technological support. Creating intricate geometric forms and dynamic models becomes highly challenging, if not impossible, using conventional methods, whereas modern parametric and algorithmic design techniques rely heavily on digital tools (Parveen & Ramzan, 2024). Communication between designers, clients, and engineering teams suffers as well, since advanced visualization technologies such as virtual and augmented reality are unavailable, potentially causing misunderstandings and necessitating more revisions (Ahmed et al., 2024).

Moreover, decision-making is less effective due to the absence of digital analysis and simulation capabilities, limiting the assessment of sustainability, energy efficiency, and material optimization. The creative process slows down as designers lack tools for rapid prototyping, experimentation, and real-time adjustments (Ozowe, Sofoluwe, Ukato & Jambol, 2024).

Prior Studies:

The study by Obaidat and Al-Shara' (2023), titled "The Impact of Technological Development and Modern Techniques on Interior Design," aimed to identify the impact of technological development on interior design. The study demonstrated that employing modern technologies is effective in updating interior design outputs in light of user requirements and maximizing the use of available spaces. The study used a descriptive-analytical approach, which was suitable for its purpose, focusing on the use of technology in interior design within the information era. The results showed that technology has a significant impact on improving the quality and implementation of interior design. Furthermore, this type of design contributes to entertainment, enjoyment, and creativity, while also enhancing the designer's expertise. The study recommended the necessity of keeping abreast of technological developments in the field of design and the importance of incorporating contemporary interior design technologies into universities architecture and design curricula.

Karrar (2022) conducted a study to identify modern technology and its impact on the concept of contemporary interior design. Science is developing remarkably in all fields, and this development naturally serves humanity. Designers are always looking for everything new and modern to make their designs more successful. The more a designer incorporates modern technologies into interior design, the more contemporary the space becomes, saving a lot of time and effort for both the designer and the occupant. Modern technology has provided numerous and varied design solutions and produced functionally and aesthetically successful spaces. The world is now moving towards using modern technologies and advanced technology that achieve savings in both energy and materials, which also serve human needs and are compatible with the interior space and its modern requirements and functions. This keeps pace with progress and modernity, connects the present with the future, and integrates the authenticity of thought and environmental character with technology and development. Interior spaces become smart spaces where multiple systems—including energy use, temperature control, lighting, sound, and communication—are integrated. Electronic systems are incorporated to control various aspects of lighting, air conditioning, energy, and more. This is where the importance of this research lies, as it presents applications of modern technology in interior architecture with its impact on the concept and vocabulary of interior design.

Mohammed's (2025) study aimed to identify modern technology and its impact on developing interior design process management. The study highlighted the importance of using technology in design work, including 3D visualization software and virtual reality, which facilitates the expression of designers' ideas, enables quick solutions, and reduces time and effort in design and implementation. The study employed a descriptive-analytical approach to Building Information Modeling (BIM) technology, deemed suitable for its objectives, and explored its application in managing interior design processes. The study concluded that BIM, which allows for the creation of intelligent digital models, effectively reduces the risks that projects may face during execution. Furthermore, the system is effective in transmitting information related to time, effort, and cost management, and it adopts key building maintenance methods with high quality and efficiency. The study recommended the integration of this program into specialized design curricula at universities and emphasized the importance of staying informed about the latest technologies in interior design.

The study by Kakouli and Al-Sarraf (2018), which aimed to identify modern technology and its impact on interior design through modern design thought, concluded that the design equation of contemporary interior architecture has been influenced by new elements, trends, and conflicting concepts as a result of several factors, most notably technological development, the information revolution, increasing environmental concerns, and the resulting changes and growth in human needs. Technological advancement has led to an infinite number of design possibilities, placing a significant burden on designers, but at the same time providing them with diverse techniques and concepts to assist them.

Al-Houti's study (2024) employed digital architectural technology in the field of sustainable interior design, focusing on the role of parametric design in enhancing the efficiency of interior spaces throughout a building's lifecycle. The study indicated that digital architectural applications, as an analytical design function, contribute to studying building performance and operations based on

engineering and digital technologies. This, in turn, improves the effectiveness of interior design functions and extends the lifespan of building systems and finishing materials to achieve long-term sustainable efficiency. The study also demonstrated that digital technology is a key influence in shaping modern interior design through parametric systems, which offer broad potential for achieving sustainability dimensions in interior spaces. The study's findings showed that parametric construction of interior spaces can fundamentally transform the design and implementation phases, enabling the creation of economical, efficient, and sustainably adaptable spaces. The study also emphasized the importance of leveraging the capabilities of digital architectural technology and parametric design to produce highly adaptable interior environments that provide comfort for users while reducing energy consumption. The study concluded that parametric design is an effective tool for achieving innovative and sustainable design solutions, given its reliance on generative systems, algorithms, and programming languages in developing design ideas, and its profound impact on creative thinking mechanisms in shaping final interior spaces.

Al-Awamra's study (2022) aimed to identify the impact of technological development on the structure of sustainable architectural form. The study revealed that, over the past fifty years, there has been a paradigm shift in technological development, resulting in a technological impact across various disciplines. The study aimed to examine the topic of technological development and its impact on the field of architecture. Furthermore, the researcher sought to propose strategies for implementing this technological impact in university classrooms. The study explored the evolution of the sequential production process to an integrated production process, known as Concurrent Engineering (CE). Additionally, it highlighted the necessity of re-evaluating the methodological principles of architectural design teaching in response to the need for architects who can develop their skills in concurrent environments. The results confirmed the impact of technological development on the structure of sustainable architectural form.

What distinguishes the current study from previous studies

The current study distinguishes itself from previous studies by its comprehensiveness and broad scope compared to those that addressed technology in design in a specialized manner, such as those by Obaidat and Al-Sharah (2023), Karrar (2022), Muhammad (2025), Kaqouli and Al-Sarraf (2018), Al-Houti (2024), and Al-Awamra (2022). It connects technology with various design disciplines—interior design, architecture, and graphic design—within a single framework, whereas previous studies focused on specific areas such as interior design, parametric technology, Building Information Modeling (BIM), or contemporary design thought. Furthermore, the current study boasts a large sample of 384 participants with diverse specializations and experiences, lending its findings greater reliability and generalizability compared to descriptive or theoretical studies. In addition, the study focuses on measuring the actual use of digital technologies in design environments rather than merely relying on theoretical analysis. It also integrates technology and sustainability within a single framework, a dimension that previous studies have not addressed with the same comprehensiveness. The study also highlights the role of technology in bridging the gap between design concept and implementation, in addition to providing a future vision for digital transformation in design fields, making it more relevant to reality and more capable of anticipating future developments compared to previous studies.

Study Methodology

The current study was based on the use of the descriptive developmental approach, as it is suitable for the study's purposes related to design technology: bridging the gap between concept and implementation towards a creative digital future.

Participants

The study population consisted of designers in the fields of graphic design, architectural design, and engineering design. The study population is considered fairly large, given the large number of individuals working in this field. It is not possible to enumerate the study population. If the population is large, the participants will be chosen randomly, reaching (384) participants according to (Sekaran & Bougie, 2016). The researcher distributed the study instrument (questionnaire) to them directly, and the following are the demographic characteristics of the participants.

This study included 384 designers and specialists from various design fields, representing a diverse range of professional practices. Participants were distributed across academic and professional specializations as follows: interior design (40%), architecture (35%), graphic design (20%), and other

related disciplines (5%). This academic diversity demonstrates the comprehensiveness of the sample and its ability to represent different branches of design.

In terms of years of experience, 30% of participants had less than 3 years, 38% had 3–5 years of experience, and 32% had more than 5 years of experience, reflecting a balance between novice and highly experienced designers.

Regarding the use of digital technologies in design work, 25% of participants indicated low technology use, 45% reported moderate use, and 30% stated they rely heavily on digital technologies. This distribution reveals clear differences in the extent of technology adoption across diverse disciplines and experiences, enriching the study's findings and enhancing its reliability.

Study Tool

The study tool was built to bridge the gap between concept and implementation towards a creative digital future related to design technology, to reveal the reality and the expected. Here, reality refers to the level at which technology is used in design, and the expected is the wish to reach a good level of concept and implementation of design.

The questionnaire was structured as follows:

- Demographic Information.
- First Dimension: Design Technology (5 items).
- Second Dimension: The Concept-Implementation Gap (5 items).
- Third Dimension: The Digital Future and Innovation (5 items).

Validity:

The study scale was presented to a panel of design experts, including faculty members and specialists from Al-Zaytuna Private University and other Jordanian private universities. The experts modified some items and removed others. The researcher considered the experts' feedback and made the necessary adjustments, resulting in a final scale consisting of 15 items distributed across three main dimensions. The validity of the study instrument was verified using the Pearson Correlation Test to assess the item discriminatory power and its correlation with the main dimensions. A value of 0.30 was adopted to indicate item validity, as illustrated in Table 1.

Table (1): Pearson's correlation coefficient to identify the internal construct validity of the scale

1st dimension*		**2nd dimension****		**3rd dimension*****	
#	(R)	#	(R)	#	(R)
1	.894**	1	.899**	1	.846**
2	.913**	2	.891**	2	.797**
3	.908**	3	.914**	3	.826**
4	.896**	4	.881**	4	.813**
5	.908**	5	.390**	5	.869**

***: Statistically significant at the significance level (0.01).*

***1st dimension:** Design Technology, ****2nd dimension:** The Concept-Implementation Gap, *****3rd dimension:** The Digital Future and Innovation.

Table (1) shows that the values of the correlation coefficients between the items of the scale and the total score of the dimension to which they belong were higher than (0.30), which is the minimum acceptable level for distinguishing items. This indicates that all items of the study scale contribute effectively to the total score of the scale, and that all items of the scale measure the same characteristic, which confirms the validity of the internal structure of the scale. This is an indication that the scale consists of (33) items, all of which can be submitted for statistical analysis.

Reliability of the Scale

The researcher measured the reliability of the study using Cronbach's alpha test, the results of which are shown in the following table (2) and the values more than (0.70) which acceptable based on (Risher & Haire et al., 2017):

Table (2). Cronbach's Alpha test to show the reliability of the scale

Dimensions	Statements	Cronbach's Alpha
First Dimension	5	0.978
Second Dimension	5	0.944
Third Dimension	5	0.939
Total	15	0.914

Statistical Techniques

The research used SPSS Program, Version - 25 to analyze the data, based on the (5-Likert Scale) which was used to collected data, and the response rate was in a low level from (1.00- 2.33, Medium level from 2.34 – 3.67 and the high level from 3.68 – 5.00).

And the research used:

- Pearson Correlation test to investigate from the construct validity of the study tool.
- Cronbach's Alpha test to investigate from the reliability of the study tool.
- Mean and Standard deviation to show the level of responses of the study sample to the study questions.
- Paired Samples T-test to show the statistical significance difference between the reality and expected on the statements.

The Result

The Results of the Reality and Expected of the Design Technology Dimension.

The study used Mean, Standard deviation and Paired Samples T-test to show the statistically significant differences between the reality and expected of the design technology dimension.

Table (3). The results of the reality and expected of the design technology dimension

		Mean	N	Standard Deviation	T value	Sig.
I regularly use digital software and technologies (such as 3D design and simulation) in the design process.	Reality	2.90	384	0.50	-42.684	0.00*
	Expected	4.44	384	0.50		
I believe that using technology improves the quality of design ideas and speeds their implementation.	Reality	2.93	384	0.56	-39.323	0.00*
	Expected	4.43	384	0.50		
I feel that technology helps designers transform abstract ideas into realistic, applicable designs.	Reality	2.92	384	0.53	-40.096	0.00*
	Expected	4.42	384	0.49		
Using modern technologies (such as virtual reality and 3D printing) enhances a designer's creativity.	Reality	2.90	384	0.57	-39.557	0.00*
	Expected	4.42	384	0.49		
I feel there is a need to develop designers' skills to keep pace with the digital transformation in the field of design.	Reality	2.95	384	0.59	-37.316	0.00*
	Expected	4.45	384	0.50		
Total	Reality	2.92	384	0.53	-40.800	0.00*
	Expected	4.43	384	0.49		

***: Significant Level of (0.05).**

The results of the study showed a gap in the use of the technological dimension in design in general among designers, as the statistical values (t) reached (-42.684), (-39.323), (-40.096), (-39.557), (-37.316), (-40.800), respectively, which are statistically significant values at the significance

level of (0.05), and the differences were in favor of the (Expected) measurement, which indicates a gap between reality and Expected with regard to the technological dimension in design.

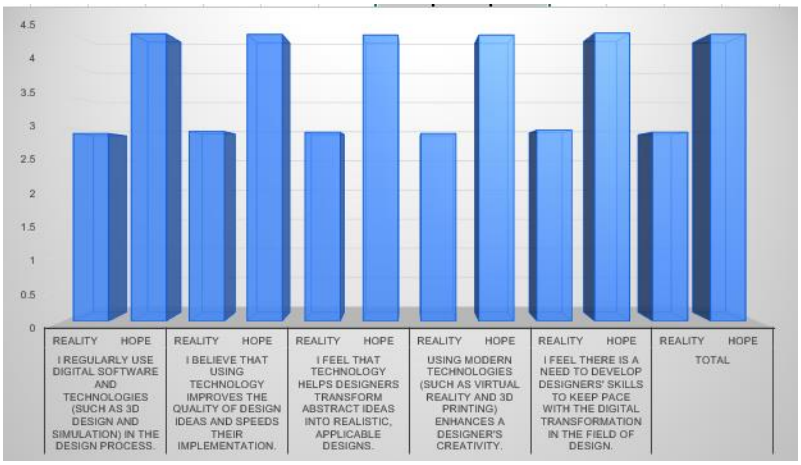

Figure (5) reality and expected of the design technology dimension

The Results of the Concept-to-Execution Gap

The study used Mean, Standard Deviation to show the level of Concept -to-Execution Gap towards a creative digital future in design technology.

Table (4). Mean, Standard Deviation, Rank and the level to show the level of Concept -to-Execution Gap towards a creative digital future in design technology.

No.	Statement	Mean	Standard Deviation	Rank	Level
1	A clear gap still exists between conceptual designs and actual project implementation.	4.41	0.51	1	High
2	Using technology reduces the gap between creative ideas and real-world implementation results.	4.39	0.53	2	High
3	Poor communication between design and implementation teams leads to the failure to achieve the original concept as planned.	4.38	0.56	3	High
4	Digital tools help accurately convey the design concept from the designer to the implementer.	4.35	0.61	4	High
5	Technology acts as a bridge connecting creative vision with the physical execution of projects.	4.33	0.60	5	High
	Total	4.37	0.51		High

The results showed that the level of concept -to execution gap towards a creative digital future in design technology was of a high level, mean value = 4.37, statement (1) (A clear gap still exists between conceptual designs and actual project implementation) ranked first with mean of (4.41) and standard deviation of (0.51), statement (2) (Using technology reduces the gap between creative ideas and real-world implementation results) ranked second with mean of (4.39) and standard deviation of (4.39) with of high level.

Statement (5) (Technology acts as a bridge connecting creative vision with the physical execution of projects) ranked last with mean of (4.33) and standard deviation of (0.60) with of a high level. These results ensure that the gap was of a high level.

The Results of Digital Future and Creativity in the Design.

The study used Mean, Standard Deviation to show the level of Digital Future and Creativity in the design.

Table (5). Mean, Standard Deviation, Rank and the Level To Show the Level of Digital Future and Creativity in the Design.

No.	Statement	Mean	Standard Deviation	Rank	Level
1	Digital transformation represents the future of architectural and interior design.	4.39	0.55	1	High
2	Creativity in design increasingly relies on the application of modern technologies.	4.38	0.55	2	High
3	Digital technology opens new horizons for creative thinking and design experimentation.	4.36	0.58	3	High
4	I believe that the digital future will bring about a qualitative shift in the ways we think and implement in design.	4.34	0.63	4	High
5	It is important to integrate the concepts of technology and digital creativity into educational curricula to cultivate designers capable of innovation.	4.31	0.62	5	High
	Total	**4.36**	**0.52**		**High**

The results showed that the level of digital future and creativity in the design was of a high level, mean value = 4.36, statement (1) (Digital transformation represents the future of architectural and interior design) ranked first with mean of (4.39) and standard deviation of (0.55), statement (2) (Creativity in design increasingly relies on the application of modern technologies) ranked second with mean of (4.38) and standard deviation of (0.55) with of high level.

Statement (5) (It is important to integrate the concepts of technology and digital creativity into educational curricula to cultivate designers capable of innovation) ranked last with mean of (4.31) and standard deviation of (0.62) with of a high level. These results ensure that the digital future and creativity in the design was of a high level.

Discussion

The results indicate a clear and statistically significant gap between the current (Reality) and expected (Expected) levels of technological use in design, as evidenced by the high negative t-values ranging from –37.316 to –42.684, all significant at the 0.05 level. These findings confirm that designers' actual engagement with digital design technologies remains well below what is required in contemporary practice. This gap suggests that although technology is widely acknowledged as essential for enhancing design quality, innovation, and efficiency, it is still not fully integrated into daily professional workflows, likely due to limited training, inadequate institutional support, or restricted access to advanced digital tools. The consistent direction of differences in favor of the expected level also indicates that designers value technological advancement but struggle to translate this awareness into practical application, revealing a disconnect between aspirations and available resources or skills. The substantial magnitude of the t-values shows that this discrepancy is broad and systematic, underscoring the need for targeted measures such as enhancing technological education in universities, expanding professional development programs, improving access to advanced software, and incorporating emerging technologies—such as parametric design, BIM, and VR/AR—into professional practices. These findings align with global trends pushing for increased digital integration within design fields and highlight the urgent need to bridge the gap between current capabilities and technological expectations to equip designers for the demands of modern, digitally driven design environments.

The results indicate that the concept-to-execution gap in design technology is perceived by designers as significantly high. Participants strongly agreed that a clear gap still exists between conceptual ideas and the actual implementation of projects, suggesting ongoing challenges in translating creative visions into built reality. At the same time, the findings show that designers believe technology plays an essential role in reducing this gap, highlighting its potential to improve clarity, accuracy, and alignment between the design phase and execution. Despite this positive outlook, the persistence of the gap suggests that available technologies may not yet be fully utilized or effectively integrated into design workflows. Additionally, participants emphasized that technology serves as an important bridge connecting creative vision with the physical realization of projects, reinforcing its value in achieving more coherent outcomes. Overall, the results underscore a strong consensus that although

technology offers powerful tools to support the transition from concept to execution, its current application remains insufficient to completely overcome challenges in contemporary design practice.

The results indicate that the dimension of digital future and creativity in design is perceived at a high level, reflecting strong recognition among designers of the pivotal role technology plays in shaping contemporary design practices. Participants highlighted that digital transformation represents the future of architectural and interior design, emphasizing that integrating digital tools and methods is essential for keeping pace with evolving professional standards. Additionally, creativity in design is increasingly tied to the application of modern technologies, demonstrating that innovative solutions are no longer achievable solely through traditional methods but are strongly supported and enhanced by digital capabilities. The findings also underscore the importance of incorporating technology and digital creativity into educational curricula to prepare designers who are capable of innovation, although this was ranked slightly lower, suggesting that practical application may currently take precedence over formal educational integration. Overall, the results reflect a consensus that embracing digital tools is crucial not only for fostering creativity and innovation but also for ensuring the profession evolves in line with technological advancements, preparing designers to meet future challenges in a rapidly changing design landscape.

Recommendations

- Encouraging the adoption of contemporary technologies, including artificial intelligence and advanced software, in design across various fields.
- Offering professional training programs to improve designers' skills and enhance their productivity.
- Incorporating modern technological tools and methods into design education curricula.
- Undertaking further research to explore and address the existing gaps in technology utilization across all design disciplines.

References

[1] Ahmed, W., Bande, L., Al-Marzouqi, A. H., Zaneldin, E., & AlHamad, I. M. (2025). Integrating 3D Printing Practices Within Academia. In Additive Manufacturing Teaching and Training Case Studies: Education Strategies for Additive Manufacturing (pp. 389-405). Cham: Springer Nature Switzerland.

[2] Al-Awamra, Abdullah (2022) The Impact of Technological Development on the Structure of Sustainable Architectural Form, Arab Journal of Scientific Publishing, Issue (43), 516-526.

[3] Al-Houti, Iman (2024) Achieving Sustainable Interior Design Through the Use of Digital Architectural Technology and Parametric Design, Journal of Architecture, Arts and Humanities, Volume (9), Issue (11), 1-21.

[4] Demirarslan, D., & Demirarslan, O. (2020). Digital technology and interior architecture. Mimarlık ve Yaşam, 5(2), 561-575.

[5] Fischer, B., Peine, A., & Östlund, B. (2020). The importance of user involvement: a systematic review of involving older users in technology design. The Gerontologist, 60(7), e513-e523.

[6] Gardiner, J. (2024). Exploring the emerging design territory of construction 3D printing-project led architectural research (Doctoral dissertation, RMIT University).

[7] Giaccardi, E., & Redström, J. (2020). Technology and more-than-human design. Design Issues, 36(4), 33-44.

[8] Johnson, S., & Acemoglu, D. (2023). Power and Progress: Our Thousand-Year Struggle Over Technology and Prosperity| Winners of the 2024 Nobel Prize for Economics. Hachette UK.

[9] Johnson, S., & Acemoglu, D. (2023). Power and Progress: Our Thousand-Year Struggle Over Technology and Prosperity| Winners of the 2024 Nobel Prize for Economics. Hachette UK.

[10] Kaqouli, Abdullah & Al-Sarraf, Ali (2018), Modern Technology and its Impact on Interior Design through Modern Design Thought, Industrial Institute, Shuwaikh, Public Authority for Applied Education and Training, Alexandria University, Egypt.

[11] Karrar, Salma (2022) Modern Technology and its Impact on the Concept of Contemporary Interior Design, 4th International Conference of the Future Foundation for Heritage, Development, and Innovation and the Italian Cultural Center, 1-11.

[12] Karsh, B. T. (2004). Beyond usability: designing effective technology implementation systems to promote patient safety. BMJ Quality & Safety, 13(5), 388-394.

[13] Llach, D. C. (2015). Builders of the Vision: Software and the Imagination of Design. Routledge.

[14] Melendez, F. (2019). Drawing from the Model: Fundamentals of Digital Drawing, 3D Modeling, and Visual Programming in Architectural Design. John Wiley & Sons.

[15] Mohammed, Iman (2025) Modern Technology and its Impact on the Development of Interior Design Process Management, Journal of Design Sciences and Applied Arts, (6), (2), 391-402.

[16] Nwokediegwu, Z. Q. S., Ibekwe, K. I., Ilojianya, V. I., Etukudoh, E. A., & Ayorinde, O. B. (2024). Renewable energy technologies in engineering: A review of current developments and future prospects. Engineering science & technology journal, 5(2), 367-384.

[17] Obaidat, Ahmed & Al-Shara, Raed (2023) The Impact of Technological Development and Modern Techniques on Interior Design, Studies: Humanities and Social Sciences, (50), (5), 34-42.

[18] Ozowe, C., Sofoluwe, O. O., Ukato, A., & Jambol, D. D. (2024). Advances in well design and integrity: Areview of technological innovations and adaptive strategies for global oil recovery. World Journal of Advanced Engineering Technology and Sciences, 12(1), 133-144.

[19] Parveen, S., & Ramzan, S. I. (2024). The role of digital technologies in education: Benefits and challenges. Int. Res. J. Adv. Eng. Manag, 2(06), 2029-2037.

[20] Reffat, R. M. (2007). Three-dimensional CAD models: integrating design and construction. In Design and Construction (pp. 291-305). Routledge.

[21] Risher, J., & Hair Jr, J. F. (2017). The robustness of PLS across disciplines. Academy of Business Journal, 1, 47-55.

[22] Sekaran, U., & Bougie, R. (2016). Research methods for business: A skill building approach. john wiley & sons.

[23] Sbai, O. (2025). Digital modelling, physical modelling, augmented reality for design communication. = (Doctoral dissertation, Politecnico di Torino).

[24] Thelma, C. C., Sain, Z. H., Mpolomoka, D. L., Akpan, W. M., & Davy, M. (2024). Curriculum design for the digital age: Strategies for effective technology integration in higher education. International Journal of Research, 11(07), 185-201.

[25] Vrančić, A., Zadravec, H., & Orehovački, T. (2024). The role of smart homes in providing care for older adults: A systematic literature review from 2010 to 2023. Smart Cities, 7(4), 1502-1550.