

Designing the Future: How AI and Immersive Technologies Are Transforming Interior Spaces

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Abstract

As digitalization and immersive technologies continue to rapidly evolve, there is a significant paradigm shift in the realm of interior design where traditional design methods are transformed to technologically advanced techniques that are much more dynamic. AR, VR, AI, and cloud design platforms have become some of the most revolutionary tools that redefine the process of interior design by enabling designers to create immersive designs with an increased degree of interaction and data processing capacity.

This study explores the effects of digitalization and immersive tools on the interior design industry. In particular, it aims to discuss the way digitalization is contributing to improved design efficiency and better experiences for users and stakeholders. The use of contemporary immersive tools will be analyzed through the prism of various cases and surveys. It will be argued that immersion tools allow clients to interact with the design concept within realistic simulations that help to avoid misunderstandings and errors. AI helps to optimize the design and personalize it through the prediction of users' needs and preferences.

In spite of all these benefits, the research has highlighted some serious drawbacks as well. These include high cost of implementation, lack of accessibility for everyone, lack of technical skills needed to implement new solutions, and reluctance to use new technology due to inertia. Some ethical issues are also mentioned, particularly excessive automation that might rob human creativity. The results obtained by the research clearly show that the future of interior design will be characterized by a symbiosis between human creativity and technology.

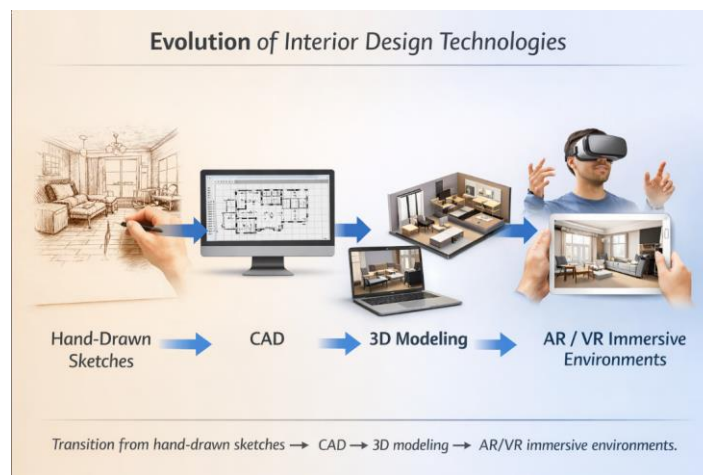
As it can be seen from above, digitalization and the use of immersive technologies have great potential for rethinking spatial design in terms of innovation, sustainability, and personalization. Thus, it can be concluded that the adoption of these approaches is vital to transform the future of spatial design in a way that will allow leveraging all benefits associated with their application.

1. Introduction

The practice of interior design has traditionally developed from the point where artistry, functionality, and materials come together. Based on the manual sketching of designs, physical construction of models, and experiential evaluation of results, the practice of interior design has been revolutionized by digital technologies. In recent times, the integration of digital technology and immersive technology has led to a paradigm shift, not only in the methods used for interior design but also in its essence. The incorporation

of technology such as AR, VR, AI, and cloud-based collaboration platforms is transforming the way that visualization, customization, communication, and execution occur in interior design projects.

The digitization process in interior design is more than simply the use of computer-aided design (CAD) software. It entails the complete change of the whole design process. Modern technology gives designers the opportunity to make accurate 3D modeling and even simulate different lighting effects and materials, as well as make changes in real time depending on user actions. In addition to that, modern immersive technologies like AR and VR help achieve even higher immersion into a digital space that allows the user to see how the final product will look and interact with it even before any actual design takes place.



(fig 1.1)

One of the most important aspects of immersion technologies includes their effectiveness in reducing the difference between conception and perception. Virtual reality allows the client and the designer to "walk through" the simulation, which creates a sense of proportions and ambience. The interactive aspect improves communications among the stakeholders, reducing the chance of design inconsistencies when implementing the project. Augmented reality is another technology that helps users view objects in their current location. It creates a virtual picture of furniture and textures within a real space. These tools increase client participation and decision-making abilities, resulting in higher satisfaction levels and lower costs.

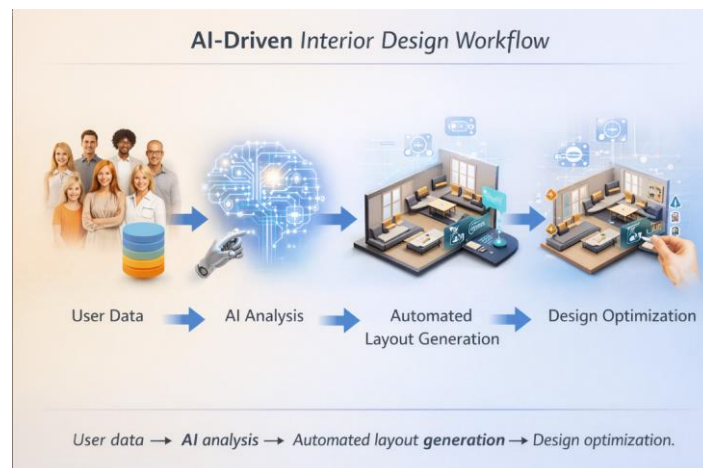
Yet another revolutionizing element has appeared in the field of interior design through artificial intelligence. AI applications incorporate the use of machine learning algorithms to assess individual tastes, forecast trends in interior design, and suggest optimal arrangements of space. Such applications can take care of routine tasks like arranging furniture, selecting a suitable color palette and materials, allowing designers to concentrate on more complex issues related to their job. Moreover, thanks to generative design techniques based on artificial intelligence, many design options can be considered according to certain conditions set up for them, and thus novel design solutions can be found.

Digitalization does not only foster creativity and visualization in the field of interior design but also makes processes faster and more scalable. Cloud solutions allow for efficient collaboration of all involved parties including the designer, architect, contractor, and client, irrespective of their physical locations. Such collaboration is ensured through real-time version control, project management, and communication tools. Besides that, the introduction of BIM allows for a comprehensive centralized storage of all relevant information, which could be accessed and managed by all involved stakeholders. This means that any

conflict could be easily detected and resolved at the earlier stages, helping avoid any delays or unnecessary costs during construction.

While these advantages make technologies an important component of the modern interior designing process, their application is hindered by certain factors. The first one is related to significant investments that are needed for the procurement and operation of such systems. This implies that small studios and individual designers might lack the resources necessary for such an implementation. Moreover, such technologies require certain technical skills from designers. Lastly, there might be resistance from traditional practitioners towards change.

The other important aspect relates to the use of AI technology alongside human creativity. Although artificial intelligence and design tools bring in efficiency and creativity, there exists controversy over their capacity to make designs monotonous and rob them of the unique human element. Interior design is, after all, an art form that includes elements of emotion, culture, and context, which may not be effectively accounted for through algorithms. It is crucial that AI be viewed as supplementary tools that assist but do not replace human designers.



(fig 1.2)

Usability issues and user experience problems still remain important aspects that have to be considered, especially in regard to less computer literate clients. Making an intuitive and user-friendly platform is crucial to achieve maximum accessibility. Ethical questions related to data protection and issues with ownership of the intellectual property created by the AI technology should also be discussed and examined.

The current research represents a part of the digitalization trend, aiming at analyzing the influence of digital technologies on the interior design industry and its development. The study seeks to focus on the role of digitalization and immersive technologies in creating more efficient and creative interior design solutions and to identify problems and barriers that can arise from the use of digital tools and technology. With the help of qualitative analysis of the literature and quantitative analysis of the survey results, it is possible to make a critical evaluation of the opportunities and limitations of the digital technologies for interior designers.

Importantly, the research can play an essential role in overcoming the disconnection between theory and practice in the use of innovative technologies. Although existing research has provided extensive information on technologies such as augmented reality, virtual reality, and artificial intelligence, an urgent

need exists for comprehensive studies assessing the collective effects of all these innovations in the context of design practices. Additionally, ongoing advancements in digitalization require regular assessments to make sure that modern design practices are up-to-date and effective.

To conclude, digitalization and immersion are two technologies that can revolutionize interior design by improving collaboration, communication, and other factors essential for creating functional and aesthetically pleasing spaces. Nonetheless, the success of using digitalization and immersive technologies in interior design depends on overcoming the associated challenges related to the financial aspect, accessibility, skills, and ethics. In order to ensure positive developments in the future, a balanced approach is required.

2. Literature Review

Digital Renaissance in Interior Designing: An Insight into Immersive Technology and Digitization

A revolution of sorts is being witnessed in the field of interior designing owing to the fast-paced advances made in the domain of digital technologies. This revolution is not only about the adoption of newer technologies; it is more of a paradigm shift in terms of the entire design process and how customers can experience interior designs. Technologies like Virtual Reality (VR), Augmented Reality (AR), Artificial Intelligence (AI), BIM, and IoT have ushered in a new era of interior design.

1. The Immersive Revolution: Going Beyond Visualization

Virtual Reality (VR): An Experiential Tool

Virtual Reality is an innovative design tool that does more than simply visualize a space or concept. It allows for immersive interaction with the design and helps one to understand the space through experiencing it. Studies have found that VR technology enhances communication in the design process by enabling immediate feedbacks and modifications in a cost-effective manner, thus eliminating the need for any post-construction alterations. With features like spatial audio and haptic feedback, advanced VR is a valuable tool not only in professional design but also in interior design education.

Augmented Reality (AR) – Contextual and Personalized Design

Augmented Reality involves the projection of digital components into the physical world, thus creating an opportunity for a designer to visualize design features such as furniture, materials, and lighting in their actual context. AR programs employ spatial mapping and object recognition to create an accurate and interactive representation of indoor spaces. Such technologies make it possible to create a more personalized experience when designing, since a user can try out different options without limitations. Moreover, using AR, a designer can achieve high precision in measurements.

3D Scanning and Photogrammetry

Technologies such as 3D scanning and photogrammetry help designers to develop exact digital models of the current space. They come in handy in restoration and renovation, as it is crucial to measure the existing space accurately to integrate a new design element.

2. Digital Workflows and Collaborative Ecosystems

Building Information Modeling (BIM) – Integrated Design Systems

The Building Information Modeling (BIM) system is an innovative solution in the field of digital design that integrates various types of data related to geometry, space, and functionality into one model. This technology allows architects, designers, and engineers to collaborate more efficiently by providing a common platform for exchanging data in real time. Moreover, it helps detect clashes, manage lifecycles, and perform sustainability assessments, which significantly increases the effectiveness of work and reduces mistakes.

Artificial Intelligence (AI) – Automation and Personalization

Artificial intelligence plays a significant role in modern interior design since it provides an opportunity for data-driven decision-making and automation. AI-powered technologies allow designing interiors based on user preferences, generating different options, and optimizing space allocation according to predefined criteria. Generative design systems take this idea even further by creating numerous design solutions simultaneously. Furthermore, AI-driven assistants simplify administrative work, including scheduling and budgeting, helping interior designers focus on creativity.

Cloud-Based Collaboration Platforms

Thanks to cloud technologies, collaboration among various parties involved in a project becomes more effective due to their capabilities of organizing communication and managing projects. Cloud technologies help to manage design projects in real time and ensure efficient collaboration between all participants through the process of exchanging and storing data.

3. Internet of Things (IoT): Dynamic and Reactive Environments

Smart Home Application

The application of IoT devices in interior designing makes it possible to design intelligent and reactive spaces that change according to the users' needs. The application of smart systems makes it easier to manage light, heat, and security. These technologies play a significant role in designing adaptive spaces that change according to the user's habits.

Big Data Application

The application of IoT devices in interior designing helps in collecting data about the environment and user interactions. This information assists designers in making efficient decisions concerning space usage and performance.

4. Future Trends and Emerging Technologies

The future of interior design lies in constant technological development. Among the trends that emerge as part of this process, one can mention such innovations as:

- **Generative Design** : Artificial intelligence-based systems that automatically generate design solutions according to certain conditions.
- **3D Printing**: Making it possible to produce customized furniture and other design components.
- **Interactive Surfaces**: Combination of digital interface elements with physical environment.

- **Digital Twins:** Digital copies of physical environments used for monitoring and simulation purposes
- **Sustainable Design:** Implementation of digital solutions in order to make more efficient use of materials and lessen environmental impact.

It becomes evident from the review of literature that digital transformation is reshaping the very nature of interior design rather than enhancing its already existing principles and methods. However, there still exist numerous obstacles in terms of cost, access, technical skills, and ethics that need to be overcome. Thus, further studies should be directed toward addressing these issues.

3. Research Methodology

Research Design

For this study, a mixed-methods research design will be utilized to gain insights on the influence of technologies such as AR, VR, AI, and cloud-based platforms on the interior design industry. In other words, a combined approach that integrates both qualitative and quantitative methods is appropriate for this particular case since it facilitates an all-rounded understanding of the topic at hand through statistical analysis and interpretation. The current research project falls under the category of descriptive and analytical as its main goal is to evaluate the effects of various technological advancements on the productivity and creativity of interior design practitioners.

Research Objectives

The overall goal of the proposed study is to determine the influence of digital innovations in interior design. More specifically, the following objectives will guide the process:

- Examine the influence of AR and VR technologies on interior design and personalization.
- Identify the influence of artificial intelligence in automating the design process.
- Investigate the contribution of cloud-based technologies to interior design.
- Highlight the challenges associated with adopting the digital technologies in question.

Methods of Data Collection

The following is how the data was collected in a two-staged process in order to ensure the reliability and thoroughness of results achieved during the research:

1. Data Collection from Primary Sources

The primary source data collection included the use of a digital survey conducted with various respondents, such as students and professionals, who had experience in using technological tools within interior design processes. The survey contained quantitative (closed) as well as qualitative (open) questions that allowed to gain insights into the following aspects:

- Level of awareness and use of technologies for design
- Efficacy of AR, VR, and AI technologies
- Personal preferences and experience
- Difficulties encountered during implementation of innovations

2. Data Collection from Secondary Sources

For secondary data collection, a review of the literature was conducted. It included analysis of academic articles and professional publications related to the digital transformation of interior design.

Methods of Data Analysis

The gathered data were subjected to descriptive statistical analysis along with interpretation:

- The quantitative data obtained through surveys were subjected to analysis based on percentage distribution and comparison.
- The qualitative data were also subjected to analysis based on recurring themes and patterns associated with perceptions and difficulties of users.

Findings Based on Survey Analysis

- About 40% of the total participants have perceptions that AI is capable of replacing some designer roles, while about 30% were unsure about this matter.
- About 70% of the participants preferred digital means due to convenience, yet appreciated traditional means for creativity and sensory purposes.
- The majority of about 60% agreed that AI increases accuracy and efficiency; however, it requires human intervention to operate well.

Challenges Hindering AI Integration

Notwithstanding its immense transformational impact, artificial intelligence suffers from some factors that hinder its domination in the field of interior design. These include the following:

1. Human-oriented Factors

One of the challenges facing the use of artificial intelligence technologies is the inadequate knowledge of most designers concerning how to effectively use such tools. In addition, human supervision is needed for their best performance.

2. Lack of Creativity

Some designers stated that designs created using artificial intelligence technology can be uncreative and not unique. For instance, unlike human designers, it lacks cultural elements and emotions.

3. Issues of Ethics and Practicalities

Excessive use of AI is believed to cause the deterioration of design skills due to its dependency. On the other hand, it poses questions about the originality of AI-created designs.

4. Expensiveness

Approximately 35% of the total number of respondents pointed out cost of implementation as an obstacle to its use.

Future Prospects: Collaboration over Replacement

Based on the results obtained, it can be stated that the future of interior design should be built on collaboration and integration instead of substitution with technology:

- 75% of respondents see the digitalization and artificial intelligence technologies entering into common use within a short period.
- 80% of participants consider AI a helpful tool for stimulating creativity instead of substituting designers.
- “Human-centric AI” is mentioned by many participants as the key feature of AI in interior design.

This methodological approach chosen for the current research allows creating a comprehensive perspective for the analysis of the complex impact of digitalization on the domain under discussion. Through the combination of qualitative and quantitative methodologies, it is possible to provide reliable, valid, and relevant data concerning the future prospects of interior design.

4. Research Gap (2025–2026 Comparative Analysis)

Although there is an extensive amount of academic research on the topic of using digitalization and immersion in interior design, critical analysis has shown a number of issues that need to be resolved by comparing current scientific knowledge (until 2025) and new phenomena that occurred in 2026. Despite the fact that previous studies mainly covered the use of technologies like Artificial Intelligence (AI), Augmented Reality (AR), and Virtual Reality (VR) in interior design, there is no comprehensive empirical research dedicated to their application in real life, interactions with users, and impacts on the industry in the long term. This section highlights some of the important research gaps.

1. Inadequate Attention to Real-Time AI in Interior Design Workflows

Previous studies concentrated mostly on AI as a means to generate suggestions and automate post-production processes. Nonetheless, the latest discoveries (2026) indicate the introduction of real-time AI-supported interior design software solutions, which can dynamically create layouts, perform live rendering, and integrate feedback.

Research Gap:

Insufficient data exists on the influence of real-time AI on:

- The pace of decision-making
- Efficiency of iterative design
- Collaboration among designers and clients

2. Lack of Focus on User Experience (UX) in Immersive Technologies

While AR and VR technologies have been recognized for their improvements in visualization, most existing literature focuses on the technical features of such innovations without paying attention to user-centric metrics.

Research Gap:

The literature lacks research related to:

- The cognitive and physical effects of long-time exposure to AR and VR technologies
- The usability aspects for both experienced professionals and unskilled clients
- The issues of accessibility of such technologies for all potential users

It is necessary to conduct a thorough investigation of the user experience to guarantee sustainable adoption and effective interaction with immersive technologies.

3. Lack of Longitudinal Research on Technology Adoption

Most of the existing literature uses cross-sectional designs that collect data at one point in time, thus limiting our understanding of how digitalization develops in the course of time.

Research Gap:

There is a lack of longitudinal research about:

- Skill development and the learning process among designers
- Productivity benefits from using AR and VR technologies in the long term
- The dynamics of technology adoption and resistance

4. Understudied Issue of the Generative AI and Creative Autonomy

Though AI solutions for interior designs have been mentioned in the literature, the quick advances in these tools in 2026, especially in prompt-based and generative design, have exceeded the scope of scholarly studies.

Research Gap:

Not enough attention is paid to:

- Balance of automation and creativity;
- Dangers of homogeneity and lack of originality in design;
- Possible ethical issues related to creation of intellectual property by AI.

The emergence of this gap indicates the necessity for frameworks, describing the limits of AI's creative autonomy.

5. Absence of Cost-Benefit and ROI Evaluation of Digital Tools

Though the cost of technologies is often named as an obstacle for technology implementation, there is still a lack of quantitative studies measuring returns on investments into immersive technologies.

Research Gap:

Scholarly literature does not sufficiently cover:

- Comparative effectiveness of analog and digital workflows;
- Scalability for SMEs;
- Long-term economic gains from using new technologies.

A thorough economic analysis is crucial for informed policy-making and decision-making.

6. Understudied IoT Integration into Practical Application of Interiors' Design

The Internet of Things may be widely discussed in conceptual terms in relation to interior design, but its actual application in interior design processes requires further investigation.

Research Gap:

There is insufficient research concerning:

- Usage of IoT data for adaptation of interior design in real time;
- Integration of smart houses technologies in design;
- Possibility for IoT-based personalization of interiors.

Addressing this gap may lead to creating responsive and adaptive living space.

7. Lack of Studies on Human–AI Collaboration Models

While it is widely agreed upon in the literature that AI must support the work of a human designer rather than replace him/her, there still is no clear picture on the way AI should collaborate with humans.

Research Gap:

Further research is necessary in order to understand:

- Division of labor between artificial intelligence and designer.
- Hierarchies and processes of decision-making in hybrid teams.
- Effective use of AI, not reducing to zero human's creativity.

Development of these aspects would make it possible to achieve maximum efficiency and quality of design.

8. Absence of Research on Mobile-Based Design Solutions

As mobile technologies become popular in emerging economies like India, more and more design tools become available on mobile devices. But still, the literature does not contain any sufficient amount of studies in this direction.

Research Gap:

Insufficient attention is paid to:

- Design apps on mobile AR/VR technologies;
- Affordability of such services for freelancers and independent designers;
- Constraints of mobile platforms.

9. Inadequate Connection Between Sustainability and Digitalization

Even if sustainability is often highlighted as one of the principles of designing, its direct relation to digital technology has not been properly analyzed yet.

The Research Gap:

It is evident that there are very few papers addressing the following topics:

- Application of artificial intelligence in the choice of materials that are eco-friendly
- Using digital simulation in order to decrease the impact on the environment
- Implementation of sustainability criteria within the digitalized process of designing

Thus, solving this problem is critical for the future development of the industry as such.

According to the analysis, even though digital technology and virtual reality have revolutionized the industry of interior design, research is currently too scattered and lacks focus. It is critical to conduct systematic, empirical, and forward-looking studies concerning real-time implementation of technologies,

their cost, and other issues. By filling those research gaps, it will be possible not only to provide better academic understanding of the topic but also develop frameworks that would be implemented in practice.

5. Future Scope

Moreover, there is an abundance of possibilities that the further research and implementation of new ideas might uncover with regards to technology integration into interior design. The continuous advancement of technologies suggests the possibility of even greater innovations with regard to interior design in the future.

In particular, one of the fields with tremendous future potential in terms of further investigation and development of technology use for interior design purposes is the introduction of real-time AI-driven design generation systems that will allow users to create their own designs based on user inputs. Thus, the designer-clients interaction might be significantly enhanced with the help of such solutions.

Furthermore, one of the critical issues to explore regarding the use of immersive technologies is enhancing the UX through improving usability, minimizing the load on users' mental capacities, and ensuring accessibility of the technology. Therefore, in order to foster wide-scale adoption of immersive technologies, there should be a considerable effort in improving interfaces and applications.

Another promising area of future development in relation to the use of technology for interior design tasks is the use of generative AI and machine learning. With their aid, it would be possible to come up with more customized and personal designs by analyzing user behavior and other relevant information. However, the issue of the loss of human creativity in such cases should also be considered.

Finally, another direction for the further research into the ways to incorporate technology in interior design is the IoT integration into interior design processes. Thus, in the future, the environment can become completely adapted to user preferences through real-time data collection via IoT devices.

With the increasing use of mobile design technology, future researchers will have to explore new opportunities, especially those in emerging markets. It is important for scientists to develop new methods for enhancing the work of freelance designers and small studios. Specifically, they will have to optimize their work in relation to using AR/VR technology on mobile devices.

Another area in which future scientific inquiry should focus is the economic and sustainability aspects of digital transformation. In particular, further research must consider the ROI connected with the implementation of innovative tools for designers. Additionally, it is necessary to evaluate whether these innovations can help with sustainable design by saving materials and reducing wastage.

Finally, researchers will have to create frameworks that would facilitate effective human-AI collaboration in design projects. The goal will be to establish an optimal division of labor in order for technologies to become an instrument for designers rather than substitutes for their creative work.

In summary, the future of interior design will depend on the effective application of innovative technologies to the work of designers. Further research in this domain will allow for creating an environment of collaboration between people and technologies in order to improve interior design practice.

6. Conclusion

This research paper has offered an extensive look at how the advent of digital technology has helped bring a transformational change to the interior design industry. It can be seen from the findings that the adoption of sophisticated technological tools such as AR, VR, AI, and cloud-based platforms has led to a revolution

in how interior spaces are designed and experienced. Gone are the days when design professionals relied on manual techniques including drafting drawings and building models to conceptualize designs, along with interpreting clients' expectations. In the current scenario, the process of designing interiors is increasingly driven by the use of immersive visualizations.

One of the most important results obtained from this study is the increased efficiency, flexibility, and accuracy achieved through the adoption of digital technology in interior designing. The application of immersive technologies such as AR and VR has enabled designers to create a whole new experience for users, who get the opportunity to interact with the designed space as in reality. This has greatly improved communication with the clients and resulted in reduced ambiguity. Through simulations in real-time environments, designers can now offer more accurate designs, while making it easier for the clients to understand and In addition to these developments, the use of artificial intelligence in interior design practices has been noted as another significant step towards automation and personalization. Artificial intelligence algorithms can process information about user preferences, identify design trends, and come up with optimal designs within specific parameters. Such programs can automate routine procedures, thereby allowing interior designers to concentrate on other crucial tasks related to the job. On the other hand, cloud computing technologies have played a transformative role in collaboration between different parties involved in interior design projects, irrespective of geographic barriers. Cloud technology has provided a connected digital environment that has made interior design projects more efficient and transparent.

However, while there are many benefits associated with digital transformation in interior design, the research study shows that interior designers should not overlook the role of humans in the industry. As stated earlier, interior design is an intrinsically human-oriented domain that involves emotions, culture, and experience factors, which cannot be captured by any computer program. Therefore, the study indicates a strong preference for the adoption of a blended approach to interior design, wherein digital technologies are used as facilitators rather than substitutes. Human creativity, intuition, and sensitivity to context are However, there are several obstacles that might prevent widespread use and application of modern digital innovations. First, high costs of their implementation could be an obstacle that will make it hard for small entrepreneurs and new entrants in the industry to adopt the new approaches. In addition, the need for special technical skills implies the need for ongoing learning and improvement of skills, which will not be available for many designers. Finally, the resistance to changes in the industry shows an intrinsic conflict that is characteristic of the development process within the sector. Moreover, the issue of homogenization of products, loss of originality, and ethical questions about authorship and copyright should also be considered.

One more critical point mentioned in the research concerns some major research gaps identified in the field, which makes further studies necessary in order to fill them. These gaps include such aspects as a lack of longitudinal studies regarding the adoption of new technologies and their influence, low number of research dedicated to real-time AI application, and a lack of studies focused on users' experience in virtual reality. Finally, there are few studies addressing the economic feasibility of using digital technologies.

However, in an even wider perspective, one might also predict that the interaction between the process of digitalization and other new technology trends, such as IoT and generative AI, will allow for an even greater expansion of the possibilities of interior design. The evolution of adaptive systems, which would be able to react dynamically to user needs and environmental changes, can be seen as one of the steps

towards creating an intelligent environment. In turn, these innovations also carry important benefits from the perspective of sustainable design practice.

In general, it becomes evident that the development of interior design cannot be imagined without an efficient combination of technological innovation and human creativity as well as critical thinking skills. In fact, designers should change their perception of their work as specialists working within particular disciplines; they have to become multifunctional experts who can operate in digital ecosystems but still remember about the importance of considering the needs of users and maintaining cultural traditions and aesthetic standards. Moreover, the development of a holistic approach to the use of new technologies will help prevent any negative consequences for design and guarantee that it will remain a creative process aimed at solving people's needs. Finally, the increasing digitalization of life will provide new opportunities for creating environments which can be characterized as immersive, personalized, sustainable, and even intelligent.

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