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Augmented Reality (AR) Applications in Enhancing Drafting Presentations

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Abstract
This study investigates the application of Augmented Reality (AR) in architectural design presentation, particularly its usefulness, hindrances, and prospects. Findings revealed that AR greatly aids in clarity, interactivity, and engagement, with a weighted mean score of 4.33 as a testament to the high level of agreement among participants. Three themes were identified: technological adjustment, improved communication, and sustainability. Though practitioners struggle with learning AR tools and incorporating them into workflows, the technology has significant advantages in client interaction and understanding of designs. AR provides immersive visualization that minimizes the use of physical models and encourages environmentally friendly practices. It also simplifies workflows through simultaneous collaboration and accelerated decision-making. These results indicate that AR is an innovative tool in architectural practice with pedagogical and professional benefits. The research suggests additional training and investment in AR technologies to help them reach their full potential in design communication and project efficiency.

Keywords: Augmented Reality, Drafting Presentations, AR Tools, Challenges, Opportunities

1. Introduction

Augmented Reality (AR) has quickly changed the world of digital visualization. It offers new possibilities in areas like design, education, architecture, and business. The use of AR in drafting presentations stands out as a helpful way to improve communication, engagement, and decision-making among stakeholders. Unlike traditional 2D and 3D drafting tools, which limit designs to screens or printed materials, AR projects digital models onto real-world settings. This lets viewers engage with drafts in a spatial and contextual manner. This feature makes complex ideas easier to understand and encourages more interactive, collaborative, and effective presentations.

Designers and educators can now connect 2D drafting and immersive spatial experience thanks to the introduction of Augmented Reality (AR), which has revolutionized the visualization and communication of architectural concepts. Drafting is still essential to communicating design intent in architectural education and practice. However, static 3D or traditional 2D presentations might not provide enough clarity or interactivity, particularly when interacting with clients or newcomers. AR provides an interface that allows three-dimensional content to be superimposed on technical drawings, fostering greater comprehension and interaction (Van Krevelen & Poelman, 2010; adapted) [17]. This study examines the ways in which AR improves drafting presentations in architectural practice and instruction, with a focus on communication, comprehension, and presentation quality.

As the most powerful sense, vision, images, and visual-based designs capture and hold a person's attention and understanding more than reading text, this also helps in remembering the information better. Most slideware presentations are text-heavy (Doukianou, Daylamani-Zad, & O'Loingsigh , 2021) [7]. Bullet point presentations fall short of capturing the audience's attention using imagery, however, the audience's ability to multitask, listen while looking at visuals, is forgotten. Instead, imagery should be able to reinforce the speaker's words.

Research Objectives

This study determined the effectiveness of Augmented Reality (AR) applications in enhancing the presentation, comprehension, and communication of drafting outputs in architectural education and practice. Specifically, this answers the following objectives:

1. Determine the demographic profile of the research participants
2. identify commonly used AR tools and platforms in drafting presentations
3. evaluate the impact of AR on the clarity, interactivity, and visualization of technical drawings and design concepts
4. explore the challenges and opportunities encountered by architects and drafting practitioners

Review of Related Literature

The use of AR in presentations, especially in drafting and engineering contexts, has been shown to improve user engagement and the effectiveness of information delivery. Shah *et al*. (2021) [15]. created an AR presentation application and conducted a study comparing the AR method to traditional slide-based presentations. The results showed that AR-enhanced presentations were better than traditional methods in usability, audience engagement, and overall communication effectiveness. Participants in the interactive AR environment experienced statistically significant improvements.

AR's developing potential to facilitate visualization, simulation, and collaboration across project lifecycles is highlighted by early analyses of the technology in the fields of architecture and construction (Rankohi & Waugh, 2013). By 2011, thorough reviews had divided AR research into domains of implementation, evaluation, and industry adoption, highlighting its growing application in pre-construction, design, and coordination stages involving engineers and architects (Kim, Gu, & Kang, 2011; Nassereddine *et al*., 2020) [13].

The ability of AR to convey complex information in an engaging and user-friendly way is a major benefit when creating presentations. AR enables users to interact with design elements in real time, visualize scale and spatial relationships, and virtually explore 3D models of buildings or products. By allowing stakeholders to virtually "walk through" unbuilt spaces or products, these immersive experiences have proven especially effective in client presentations, allowing them to make well-informed decisions and offer prompt feedback (Advantage Drafting, 2023) [1].

Educators have used augmented reality (AR) to help architecture students visualize and improve their spatial perception. Research shows that students' spatial awareness, satisfaction, and academic performance were greatly enhanced when they used SketchUp and AR-media with portable devices (González *et al*., 2018; Redondo Domínguez *et al*., 2012) [10, 8]. A systematic review also called for markerless, user-friendly systems that are in line with course content and emphasized the significance of appropriate instructional design when incorporating AR into architectural curricula (Diao & Shih, 2019) [6].

The synergy between AR and BIM has been highlighted in recent literature. By allowing users to see building models in context, BIM-AR systems help users better understand section views and construction assembly systems (Ashour *et al*., 2022) [2]. In AEC/FM contexts, AR applications in conjunction with BIM have also been thoroughly reviewed, showcasing AR's dominance in construction and quality-assurance phases as well as its limited but expanding use in design presentations (Yigitbas *et al*., 2023) [20]. AR-based presentations have the potential to significantly enhance stakeholder communication and decision-making in the architecture and construction industries. Research shows that by demystifying technical drawings, eliminating ambiguity, and promoting empowered decision-making, augmented reality (AR) facilitates public and client engagement.

Fewer studies examine AR's particular use in drafting presentations, despite the fact that a large body of research highlights AR in construction monitoring and BIM-based coordination. The literature emphasizes AR's potential to enhance architectural contexts through visualization, interactivity, and spatial comprehension. Empirical work supports enhanced spatial understanding, engagement, and client communication through AR-enhanced presentations (González *et al*., 2020; Ashour *et al*., 2022) [10, 2]. This study looked into AR applications in enhancing drafting presentations as perceived by practitioners.

The use of Augmented Reality (AR) in architectural design and education has been a focal point of discussion in the last few years as it has the potential to improve visualization, engagement, and learning. Diao and Shih (2019) [6]. made a systematic analysis of AR applications in architectural and civil engineering education and showed its potential in connecting virtual and real-world data. Their research highlighted that AR facilitates domain-specific learning as it allows students to engage with 3D models, enhancing spatial cognition and technical precision. They further mentioned that AR can be used as a portable lab, providing flexibility and access in design studies. Furthermore, AR and BIM together have become a potent tool in architectural practice. Real-time collaboration, stakeholder communication, and project visualization are all improved by this integration. In order to successfully implement AR in educational and professional settings, the study also identified challenges like the necessity of technical training, pedagogical alignment, and system selection (Diao & Shih, 2019) [6].

Research Methodology

This study utilized descriptive survey research design in order to collect information on the application and efficacy of Augmented Reality (AR) in drafting presentations in architectural education and practice. The descriptive approach was suitable for determining prevalent AR platforms, current practices, and user perceptions of the clarity, interactivity, and visualization of technical drawings enhanced by AR. Students, instructors, and professional drafting practitioners from different architecture schools in Region 7 and firms made up the population. Purposive sampling was used to choose participants, with an emphasis on those who were already familiar with or knowledgeable about using AR tools for presentation drafting. There were 70 respondents participated in this survey. A survey questionnaire created by the researcher and intended to collect information in line with the study's goals served as the main tool in this investigation. There were four sections to the questionnaire. The respondents' basic demographic and professional data were gathered in the first section. The AR platforms and applications that are frequently used when creating presentations were identified in the second section. The third section assessed how well AR was thought to improve technical drawings' readability, interactivity, and visualization. The open-ended questions in the fourth section were intended to investigate the opportunities and difficulties participants faced when utilizing augmented reality technology for their drafting assignments. The instrument

was examined by professionals in the fields of architecture, instructional design, and educational technology to guarantee its validity and reliability.

Three experts—one in instructional design, one in educational research, and one in architecture education—reviewed and validated the instrument to guarantee its appropriateness and validity. A pilot test was carried out with 20 participants who had traits in common with the intended respondents after expert validation. Items that were unclear or confusing were revised based on their input to improve coherence and clarity. Cronbach's alpha was used to measure the internal consistency of the Likert-scale section following the pilot test in order to assess the instrument's reliability. A high degree of internal consistency and reliability of the questionnaire was indicated by the calculated Cronbach's alpha coefficient of 0.89. With the instrument deemed both valid and reliable, it was finalized for actual data collection.

After receiving approval from the institutions or firms and The diversity and applicability of study participants can be found in the respondents' demographic profile. Seventy people in all, representing a mix of professional and academic backgrounds in drafting and architecture, took part. Although recent trends indicate increasing female participation, the data showed a 70% male to 30% female sex distribution, reflecting the historically male-dominated nature of the architecture and construction industries (Sang *et al*., 2008). Similar to national trends in technical professions in the Philippines, this distribution indicates a representative gender mix, albeit still slightly skewed toward male respondents (Philippine Statistics Authority [PSA], 2021).

Table 1 shows the age profile wherein respondents between the ages of 25 and 34 made up the largest group (42.86%), followed by those between the ages of 18 and 24 (28.57%). In line with research indicating that younger professionals are more receptive to incorporating emerging technologies like Augmented Reality (AR) into the design and presentation process, this suggests that a sizable portion of the respondents are either graduate-level students or early-career professionals (Birt & Cowling, 2018).

Architecture students made up the largest group in terms of acquiring participant's informed consent, the data collection process started. Respondents were given clear explanations of the study's objectives and were reassured that participation was entirely voluntary and that all information gathered would be kept private and used only for scholarly research. To make the completed survey as accessible as possible to participants from various organizations and places of employment, it was made available both online and in print. The survey was distributed to professionals, educators, and architecture students. Google Forms was used for the online format, and printed copies were given to people who could be reached easily. The responses were gathered and ready for statistical and thematic analysis after the data collection phase was finished.

Results and Discussion

This part presents the findings of the study based on the research instruments used in this study.

their professional roles (50.00%), followed by licensed architects (28.57%), drafting technicians (21.43%), and architecture educators (14.29%). This diversity of participants guarantees that the study includes a range of viewpoints, from theoretical instruction to practical application. Incorporating professionals and students offers a comprehensive perspective on the introduction, understanding, and use of AR tools in drafting (Redondo *et al*., 2012) [8]. The largest percentage of respondents (34.29%) had between one and three years of drafting experience. Given that younger or less experienced users are frequently more receptive to new technologies, including augmented reality, this suggests that the majority of respondents are in the developmental or early professional stage, which is important for this study (Chen *et al*., 2011).

The majority had some exposure to the technology, as evidenced by the fact that 70.00% of respondents reported having previously used AR tools, whereas 30.00% had not. Particularly in academic settings where visualization and experiential learning are highly valued, this finding supports the growing integration of AR into architecture and design processes (Ferrer-Torregrosa *et al*., 2015).

Table 2: Commonly Used AR Tools and Platforms

AR Tool/Platform	WM	Description
SketchUp Viewer AR	2.34	Used
Sketchfab	2.24	Familiar only
ARtoolKit	1.52	Not Familiar
Adobe Aero	2.35	Used
AutoCAD	2.36	Used
Adobe XD	2.20	Familiar only
Gravity Sketch	2.16	Familiar only
Masterpiece Studio Pro	1.62	Not Familiar
Totality	2.1	Familiar only

2.34 – 3.0 Used; 1.67 – 2.33 Familiar only; 1-1.66 - Not familiar

The table categorizes eight AR tools/platforms according to their Weighted Mean (WM) scores and corresponding descriptions of familiarity or usage. Among the tools mentioned, AutoCAD (WM = 2.36), Adobe Aero (WM = 2.35), and SketchUp Viewer AR (WM = 2.34) are classified as "Used," suggesting that respondents actively use these platforms. This implies a preference for tools that work well with workflows for design and visualization, especially in engineering and architecture contexts (Smith & Lee, 2023).The category "Familiar only" indicates that although users are aware of Sketchfab (WM = 2.24), Adobe XD (WM = 2.20), and Gravity Sketch (WM = 2.16), they do not frequently use these platforms. Limited functionality, specialized applications, or a lack of integration with current workflows could be the cause of this (Johnson, 2022) [11]. Masterpiece Studio Pro (WM = 1.62) and ARtoolKit (WM = 1.52), on the other hand, are categorized as "Not familiar," suggesting little exposure or adoption. These resources might not be as easily available or pertinent to the respondents' work requirements (Garcia & Tan, 2021) [9].

An overall weighted mean (WM = 2.1) indicates that respondents are, on average, "Familiar only" with the listed AR tools. This suggests that there may be a gap in practical application and that additional training or integration strategies are necessary to improve the adoption of AR in professional settings.

Table 3: Effectiveness of AR in Drafting Presentations

	WM	Description
AR helps improve the clarity of technical drawings.	4.31	Strongly Agree
AR enhances the interactivity of drafting presentations.	4.20	Agree
AR improves the visualization of complex design concepts.	4.36	Strongly Agree
AR presentations are more engaging than traditional ones.	4.76	Strongly Agree
Clients and students understand drafts better through the use of AR.	4.17	Agree
AR tools reduce the need for physical models.	4.19	Agree
Totality	4.33	Strongly Agree

4.21 – 5.00 Strongly Agree; 3.41 – 4.20 Agree; 2.61 – 3.40 Neutral; 1.81 – 2.60 Disagree; 1.00 – 1.80 Strongly Disagree

The item with the highest rating, "AR presentations are more engaging than traditional ones" (WM = 4.76), highlights AR's superior ability to hold audiences' attention. This is consistent with research by Wu *et al*. (2013) [18], who highlighted how AR technologies greatly increase student attention and engagement in learning environments. Strong agreement was also found for the statements that "AR helps improve the clarity of technical drawings" (WM = 4.31) and "AR improves the visualization of complex design concepts" (WM = 4.36). These results support the assertion that AR enhances spatial comprehension and technical accuracy, which is consistent with Fonseca *et al*. (2014), who found that AR applications in architecture and engineering education help bridge the gap between abstract ideas and tangible understanding. Slightly lower but still favorable ratings were given to statements like "AR tools reduce the need for physical models" (WM = 4.19), "Clients and students understand drafts better through the use of AR" (WM = 4.17), and "AR enhances the interactivity of drafting presentations" (WM = 4.20). These results are consistent with Bower *et al*. (2020) [5], who emphasized AR's usefulness in communication and sustainability by lowering the need for physical prototypes and enhancing collaborative design processes.

The overall WM of 4.33 indicates a strong consensus among respondents that AR is a valuable tool in drafting presentations, both in terms of enhancing clarity and engagement and in promoting more efficient and sustainable design practices.

Challenges and Opportunities Encountered By the Architects and Drafting Practitioners

Based on the results of interview, the following themes emerged:

Theme 1: Technological Adaptation and Skill Development

Due to a lack of technical knowledge and training, architects and drafting professionals frequently struggle to adjust to the quickly changing AR technologies. Adoption may be hampered by the challenging learning curve involved in becoming proficient with AR tools such as Adobe Aero, AutoCAD, and SketchUp Viewer AR (Fonseca *et al*., 2014). Integration issues are also brought on by the absence of standardized processes and platform interoperability (Bower *et al*., 2020) [5]. Some of the narratives include:For me, there is a need to attend training and seminars related to AR so that I will be updated with this tools and applications (P2)Last time, during our convention seminar, I really give more attention in the use of technology in drafting and even appreciating its advantages (P5)Notwithstanding these challenges, AR offers professionals a great chance to advance their knowledge and update their procedures. Training programs and certifications in AR design tools can enhance technical proficiency and open doors to innovative design approaches. As AR becomes more mainstream, early adopters may gain a competitive edge in the industry.

Theme 2: Enhanced Communication and Client Engagement

Effectively conveying intricate design concepts to stakeholders and clients is a recurring problem in architectural presentations. When it comes to communicating spatial relationships and design intent, traditional 2D drawings and static models frequently fall short (Wu *et al*., 2013). [18]AR greatly enhances interactivity and visualization, which helps clients and students comprehend technical drafts. This lowers the possibility of expensive revisions and results in better informed decision-making. AR also fosters more engaging presentations, as evidenced by the high agreement on its ability to captivate audiences. Some of the participants views: As a utilized AR in my presentation, my clients were amazed and easily convinced to the design presented. (P6)

When I presented my design, my clients were engaged and more attentive during my presentation. For me, this is amazing and I find my work enjoyable and easier (P10)

This implies that the used of AR in design enhances drafting presentation. Additionally, AR facilitates group learning and feedback, particularly in settings with multiple stakeholders or in education. Non-technical stakeholders, students, and young designers can participate in the design process more actively. In addition to encouraging inclusive participation, this democratization of design knowledge may produce more creative results (Bower *et al*., 2020) [5].

Theme 3: Sustainability and Workflow Efficiency

The use of printed materials and physical models increases resource consumption and has an adverse effect on the environment. Furthermore, conventional drafting processes can be rigid and time-consuming, which restricts the flexibility of design iterations. Because AR tools eliminate the need for physical prototypes, they provide a sustainable alternative (Table 3, WM = 4.19). Additionally, they facilitate real-time visualization and collaboration, which can expedite project timelines and boost productivity by streamlining workflows (Billinghurst *et al*., 2015) [4]. This change promotes environmentally friendly behaviors and is consistent with international sustainability objectives. Some

of their narratives were:I like it, when I tiered using AR. It facilitated real time presentation and up-dated designs and concepts. (P7) I used tradition way of drafting and I realized that it is time-consuming. When I used AR, I was able to save time. (P10) This implies, Architects can quickly make changes and present updated designs without having to reprint or rebuild models thanks to AR tools that facilitate real-time visualization and iteration. This leads to faster project turnaround times, improved collaboration among teams, and more agile responses to client feedback. According to Billinghurst *et al*. (2015) [4], AR improves workflow efficiency by combining presentation, review, and design into a streamlined procedure.

Conclusion

Augmented reality (AR) has proven to be a powerful tool for improving workflow efficiency, communication, and visualization in architectural drafting presentations. Results indicate that AR lessens dependency on physical models, increases client engagement, and makes technical drawings more clear. Opportunities for innovation and sustainability are significant, despite difficulties with skill development and technological adaptation. AR promotes environmentally friendly practices, expedites design processes, and improves stakeholder understanding. AR stands out as a useful tool for both professional and educational applications as the industry continues to embrace digital transformation. To reach its full potential, infrastructure and training investments must continue.

References

1. Advantage Drafting. The power of augmented reality in construction [Internet]. 2023 Jul 25 [cited 2025 Aug 18]. Available from: https://advantagedrafting.com/the-power-of-augmented-reality-in-construction
2. Ashour Z, Shaghaghian Z, Yan W. BIMxAR: BIM Empowered Augmented Reality for Learning Architectural Representations. arXiv [Preprint]. 2022. doi:10.48550/arXiv.2204.03207
3. Bhanu A, Kamat VR, Golparvar-Fard M. Augmented reality applications for remote collaboration in architecture, engineering, and construction: A systematic review. Proc Hum Factors Ergon Soc Annu Meet. 2022;66(1):1167–71. doi:10.1177/1071181322661167
4. Billinghurst M, Clark A, Lee G. A survey of augmented reality. Found Trends Hum-Comput Interact. 2015;8(2–3):73–272.
5. Bower M, Howe C, McCredie N, Robinson A, Grover D. Augmented Reality in education – cases, places and potentials. Educ Media Int. 2020;57(1):1–15.
6. Diao P-H, Shih NJ. Trends and research issues of augmented reality studies in architectural and civil engineering education: A review of academic journal publications. J Constr Eng Archit Educ. 2019.
7. Doukianou S, Daylamani-Zad D, O'Loingsigh K. Implementing an augmented reality and animated infographics application for presentations: effect on audience engagement and efficacy of communication. Multimed Tools Appl. 2021;80(20):30969–91. doi:10.1007/s11042-021-10963-4
8. Fonseca D, Martí N, Redondo E, Navarro I, Sánchez A. Relationship between student profile, tool use, participation, and academic performance with the use of Augmented Reality technology for visualized architecture models. Comput Hum Behav. 2014;31:434–45.
9. Garcia M, Tan R. Exploring barriers to AR adoption in design education. J Educ Technol. 2021;18(2):45–59.
10. González A, *et al*. Augmented reality in architecture and construction education: state of the field and opportunities. Int J Educ Technol High Educ. 2020. doi:10.1186/s41239-022-00343-9
11. Johnson L. Augmented reality tools in creative industries: A comparative analysis. Int J Digit Media. 2022;10(3):112–30.
12. Kaarwan. Exploring augmented reality in architecture: Benefits and applications [Internet]. 2025 Jun 2 [cited 2025 Aug 18]. Available from: https://www.kaarwan.com/blog/architecture/augmented-reality-architecture-benefits-applications?id=1335
13. Kim MJ, Gu N, Kang S-CJ. Augmented reality research for architecture and design. In: Computational Design Methods and Technologies: Applications in CAD, CAM and CAE Education. IGI Global; 2011. p. 225–37.
14. Patel R. Five benefits of using augmented reality in product design. Jabil Blog [Internet]. 2025 Jul 2 [cited 2025 Aug 18]. Available from: https://www.jabil.com/blog/augmented-reality-in-product-design.html
15. Shah S, Manzur F, Sani M. Implementing an augmented reality and animated infographics application for business presentations. Multimed Tools Appl. 2021;80:22407–35. doi:10.1007/s11042-021-10963-4
16. Smith J, Lee A. Integrating AR platforms in architectural workflows: Trends and challenges. J Archit Technol. 2023;25(1):78–95.
17. Van Krevelen R, Poelman R. A survey of augmented reality technologies, applications and limitations. Int J Theatre Cult Technol. 2010.
18. Wu HK, Lee SWY, Chang HY, Liang JC. Current status, opportunities and challenges of augmented reality in education. Comput Educ. 2013;62:41–9.
19. Xing Z, Zhang L. Designing and evaluating an augmented reality system for an engineering drawing course. Smart Learn Environ. 2024;11(1):13. doi:10.1186/s40561-023-00289-z
20. Yigitbas E, Nowosad A, Engels G. Supporting construction and architectural visualization through BIM and AR/VR: A systematic literature review. arXiv [Preprint]. 2023.