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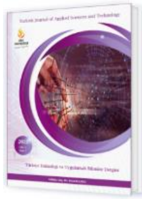

Technology Acceptance in Architecture: Systematic Literature Review of TAM and Related Models (2005-2025)

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Abstract
As digital transformation in architecture accelerates, moving from CAD to BIM, and from parametric design to VR/AR and generative AI, the practical value of these technologies depends on adoption decisions made by users and organizations. Yet technology-acceptance research in the architecture, engineering, and construction context remains fragmented across different technologies, user groups, and theoretical models. This study aims to systematically map how the Technology Acceptance Model (TAM) and related frameworks (TAM2/TAM3, UTAUT) have been applied in architecture, identify dominant themes, patterns of variables, and architecture-specific determinants, and propose an agenda for future research. Following PRISMA principles, a two-stage systematic review was conducted covering 2005-2025. The search spanned Scopus, Web of Science, ScienceDirect, SpringerLink, Taylor & Francis Online, Emerald, and MDPI. For national coverage, TR Dizin and the Council of Higher Education (YÖK) National Thesis Centre were also screened. In the first stage, 350 records were thematically classified at the title and abstract level. In the second stage, 176 studies were coded by technology type, target user group, acceptance model employed, and added external variables, and were synthesised through mixed qualitative and quantitative content analysis. The findings show that the literature concentrates on professional practice and production technologies. At the same time, a rapidly expanding stream foregrounds representation, experience, and stakeholder communication through VR/AR and virtual environments. Although perceived usefulness (PU) and perceived ease of use (PEOU) retain their central role, trust, social influence, and facilitating conditions become more salient for technologies that require collaboration and organisational transformation. In educational settings, self-efficacy and studio-culture-specific social learning dynamics stand out. The study renders core and extended acceptance variables comparatively visible and argues that "usefulness" should be expanded beyond productivity to include design quality and creativity. It therefore outlines a research agenda towards architecture-specific acceptance structures and, in particular, context-sensitive models for generative AI.

Keywords: Technology Acceptance Model (TAM); Architectural Technologies, Building Information Modelling (BIM), Virtual Reality (VR), Systematic Literature Review, Digitalisation

1. Introduction

The discipline of architecture has historically been closely intertwined with technological innovations, and these innovations have driven a range of transformations in both architectural education and professional practice (Manzoor et al., 2021; Köse and Gümüşburun Ayalp, 2024). Architectural design dynamics have been fundamentally reshaped by the transition from traditional drawing boards to CAD systems and later to integrated platforms like BIM, parametric design, and VR/AR. (Picon, 2010; Lee et al., 2020; Özgen et al., 2021; Soulikias et al., 2021). Today, architects are not only concerned with designing aesthetically and functionally sound spaces but also with demanding tasks such as managing complex datasets, collaborating with interdisciplinary teams, and optimising design processes

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in line with multi-layered goals such as sustainability (Manzoor et al., 2021; Elkhayat et al., 2024). In this context, technology has moved beyond being a mere tool and has become a primary actor that shapes design thinking and professional practices (Barosio et al., 2023).

However, for the potential benefits of technological innovations to materialize, these technologies must be accepted by users, and the extent of acceptance is decisive. The technical superiority of a technology does not necessarily mean that it will be accepted by architects, students, or end users (Klein et al., 2022; Okoro et al., 2022). At this point, the concept of technology acceptance offers an important framework for understanding the psychological, social, and contextual factors that influence individuals' and organizations' decisions to adopt or reject a new technology (Alghamdi et al., 2023). In a discipline such as architecture, where creative and rational decision-making processes are tightly interwoven, the dynamics of technology acceptance become considerably more complex. Software that promises efficiency and automation may encounter resistance if it is perceived to constrain the designer's creative freedom, whereas another system with a steep learning curve may be adopted rapidly because of the long-term benefits it offers (Soulikias et al., 2021).

Among the theoretical models developed to make sense of this complexity, the Technology Acceptance Model (TAM), introduced by Davis in 1989, has become one of the most widely used frameworks due to its parsimony and explanatory power. According to TAM, behavioral intention is driven by two primary beliefs: perceived usefulness (PU), defined as the expectation of enhanced performance, and perceived ease of use (PEOU), defined as the expectation of minimal mental effort. According to the model, the more useful and easy to use a technology is perceived to be, the more favorable an individual's attitude towards it and intention to use it will be (Özkaynar, 2024; Heo and Na, 2025).

Over the past three decades, TAM has been tested extensively, adapted to different contexts, and enriched with additional variables such as social influence, trust, and facilitating conditions. As a result, it has evolved into more comprehensive models, including TAM2, TAM3, and the Unified Theory of Acceptance and Use of Technology (UTAUT) (Venkatesh and Davis, 2000; Venkatesh et al., 2003; Venkatesh and Bala, 2008). The field of architecture has likewise applied these theoretical frameworks across a broad range, from students' adoption of new design software to professionals' transition processes towards BIM (Sepasgozar and Ghobadi, 2021). Nevertheless, the dispersed nature of this body of work, together with its focus on different technology types and user groups, makes it difficult to develop a coherent and holistic understanding of the field (Elkhayat et al., 2024).

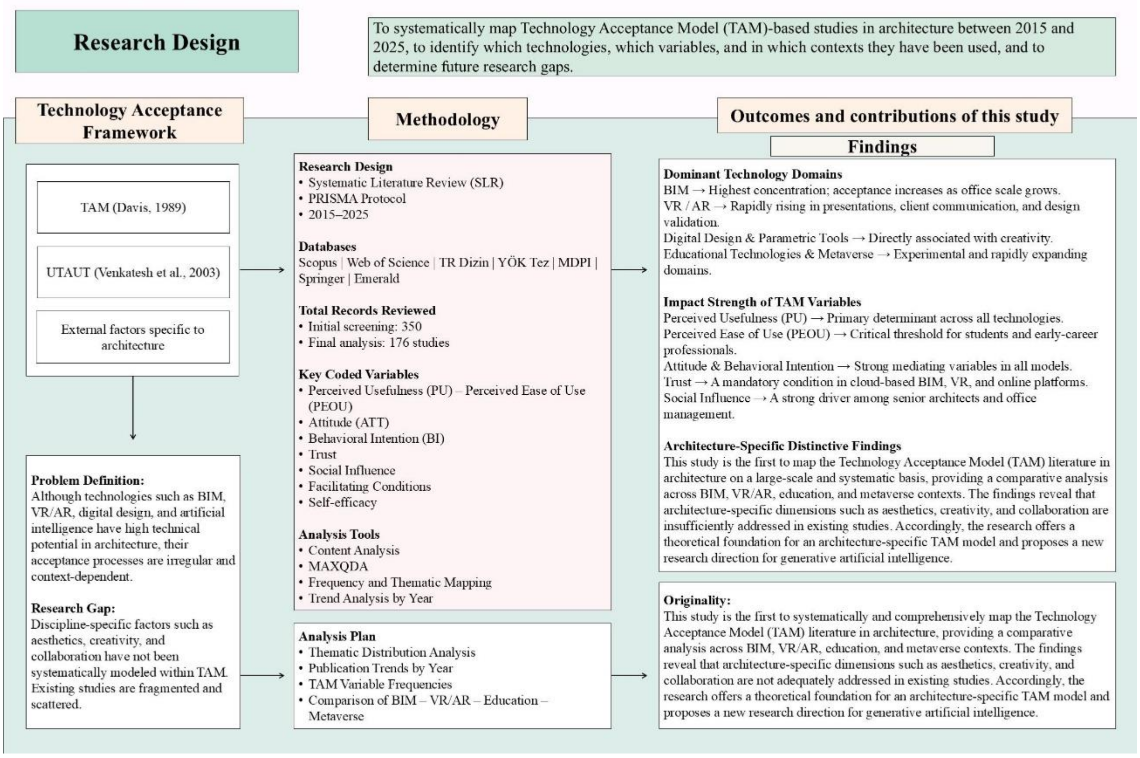
Against this backdrop, the main aim of this article is to systematically map the academic literature at the intersection of architecture and technology acceptance, analyze the current state of research, and offer a roadmap for future studies by identifying key trends, the models employed, and existing research gaps. In line with this overarching aim, the study seeks to answer the following research questions:

RQ1: Which thematic areas (for example, architectural education, professional practice, and specific technologies) and application contexts are most prominent in Technology Acceptance Model studies in architecture?

RQ2: Which TAM variables, both core and extended, are used most frequently in these studies, and which architecture-specific external factors influence technology acceptance?

RQ3: How has the technology-acceptance literature in architecture evolved, and what potential gaps and directions can be identified for future research?

To address these questions, this study adopts a systematic literature review approach in order to evaluate the use of TAM and related frameworks in architecture in an integrative manner. In line with PRISMA principles, searches covering the period 2005-2025 were conducted in Scopus, Web of Science, ScienceDirect, Springer, Taylor and Francis Online, and MDPI. To represent the national literature, TR Dizin and the Council of Higher Education (YÖK) National Thesis Centre were also included. The retrieved records were screened through a multi-stage process based on predefined inclusion and exclusion criteria. Studies included in the final dataset were then coded across dimensions such as technology type, target user group, the acceptance model used, and additional external variables, and were synthesised through mixed qualitative and quantitative content analysis (Manzoor et al., 2021). The research design is presented in Figure 1.



Source: Developed by the authors within the scope of this study

Figure 1. Research design

The systematic framework established by the research design requires, as a first step, a clear articulation of the theoretical foundations underpinning technology-acceptance studies in order to enable meaningful comparisons across findings in the literature (Ullah et al., 2023; Elkhayat et al., 2024). Accordingly, the next section outlines TAM's core assumptions and conceptual components. It then discusses how the model has been extended over time, including TAM2, TAM3, and UTAUT, and examines the external variables with which it has been associated in the architecture, engineering, and construction context (Venkatesh and Davis, 2000; Venkatesh et al., 2003; Venkatesh and Bala, 2008; Sepasgozar and Ghobadi, 2021). This theoretical background provides an analytical basis for interpreting the findings presented in the following sections and for justifying the research gaps identified in the field.

2. Theoretical Background

2.1. TAM and extended versions

The Technology Acceptance Model (TAM) was developed by Davis (1989) within the information systems literature to explain user behavior, and, due to its parsimonious structure, it has become one of the most frequently cited theoretical frameworks (Sepasgozar and Ghobadi, 2021; Santos and Soares, 2023). The model is theoretically grounded in Fishbein and Ajzen's (1975) Theory of Reasoned Action (TRA). According to TAM, behavioral intention to use a technology is shaped primarily by two cognitive beliefs, perceived usefulness (PU) and perceived ease of use (PEOU). These beliefs influence attitudes towards the technology, and attitudes and/or the cognitive beliefs directly influence behavioral intention, which in turn has a significant effect on actual use (Cui et al., 2021; Sepasgozar, 2022).

A key strength of TAM lies in its applicability across different types of technologies and in the relatively transparent way in which relationships among variables can be modeled. However, critics argue that TAM is overly reductive in complex contexts, as it fails to fully account for the external conditions governing acceptance in multi-actor, collaboration-intensive environments like BIM (Ahmed and Kassem, 2018; Klein et al., 2022). In applications that require organizational transformation, such as BIM, determinants such as interoperability, training and infrastructure, organizational readiness, and process alignment play a critical role in shaping acceptance dynamics. For this reason, explanations relying solely on PU and PEOU may remain insufficient (Chen et al., 2023; Adeniyi and Thurairajah, 2024).

In response to these critiques, TAM has been extended over time. For example, TAM2 sought to explain technology-use intention not only through individual perceptions but also through mechanisms of social influence, and it introduced job-context variables such as task relevance and output quality into the discussion (Venkatesh and Davis, 2000; Mata and Ancheta, 2024).

The need for a more integrated account has also brought forward the Unified Theory of Acceptance and Use of Technology (UTAUT), developed through the synthesis of multiple acceptance models. UTAUT addresses technology acceptance through four core constructs: performance expectancy, effort expectancy, social influence, and facilitating conditions, thereby making the context-dependent nature of acceptance more explicit (Venkatesh et al., 2003; Lin and Huang, 2023).

From this perspective, extended approaches such as UTAUT provide a more suitable analytical basis for explaining acceptance dynamics in technologies that require organisational transformation, such as BIM, or in digital platforms that reshape coordination among stakeholders (Ullah et al., 2023; Elkhayat et al., 2024). Indeed, within the architecture, engineering, and construction field, studies examining the acceptance of technologies that entail multi-stakeholder workflows and organisational restructuring have increasingly drawn on such extended models (Ahmed and Kassem, 2018; Deshapriya et al., 2025). Similarly, in the diffusion of integrated technologies such as digital twins, external barriers, including integration, interoperability, and training and organisational capacity, are reported to have a marked influence on acceptance (Alonso et al., 2024; Ibrahim and Okanlawon, 2024).

This study adopts TAM and its derivatives as a theoretical foundation, reflecting the continued dominance of PU and PEOU constructs in architectural acceptance research. While incorporating external determinants such as social influence, trust, organisational support and facilitating conditions into model structures in different ways (Zhang et al., 2022; Algassim et al., 2023; Heo and Na, 2025). This diversity makes it necessary to map the literature systematically and to foreground architecture-specific acceptance dynamics more clearly (Manzoor et al., 2021; Elkhayat et al., 2024).

2.2. Technology use and its evolution in architecture

Architecture is the practice of transforming thought first into design and then into physical space, and the tools and modes of representation that support this practice have evolved in tandem with technological possibilities in every period (Köse and Gümüşburun Ayalp, 2024). In the digitalisation era, this evolution in architectural practice should be understood not merely as an automation process that increases production speed, but as a socio-technical transformation in which design decisions are generated, knowledge is organised, and interaction among actors is established (Soulikias et al., 2021; Elkhayat et al., 2024). For this reason, technology acceptance in architecture cannot be reduced to software use within the design process alone. Rather, it is a multi-layered phenomenon intertwined with information management, workflows, role distribution, and organisational capacity (Murguia et al., 2021; Chen et al., 2023).

In the early stages of this transformation, CAD tools transferred drawing production into digital environments and accelerated representational processes, yet for a long time, they largely retained the logic of two-dimensional drafting (Köse and Gümüşburun Ayalp, 2024). The more substantive shift became apparent with BIM. Unlike geometric representation based on lines, BIM offers a three-dimensional modelling logic built around intelligent objects, such as walls, slabs, and windows, supported by a rich database (Ahmed and Kassem, 2018; Ullah et al., 2023). This model does not simply generate drawing sets. It functions as a platform through which different stakeholders can share information and establish coordination across the design, construction, and operation life cycle (Olanrewaju et al., 2022). Accordingly, BIM adoption often requires organizational transformation beyond a mere software change, where workflows and roles are redefined (Murguia et al., 2021; Chen et al., 2023).

In parallel with BIM, parametric and algorithmic design tools (Grasshopper, Dynamo) have enabled architects to construct design production around a system of rules and relationships rather than drawing, thereby facilitating the generation of complex geometries and performance-driven variations (Purup and Petersen, 2020). Because this approach enables the exploration of context-sensitive and optimisable design options rather than standardized solutions, it has contributed to the reorganization of architectural creativity on a different plane (Alghamdi et al., 2023).

More recently, VR and AR technologies have transformed the representation and experience dimensions of architecture, making it possible to discuss design decisions with stakeholders through shared experience (Lee et al., 2020; Liu and Konduri, 2024). VR enables holistic immersion in the scale, atmosphere, and material effects of a space that has not yet been built, whereas AR overlays digital information onto the physical environment, creating a broad range of applications from construction-site practices to client communication (Zhang et al., 2022). These tools have the potential to reduce communication gaps between designers, clients, and contractors and to improve decision-making processes (Özgen et al., 2021).

Nevertheless, the diffusion of these technologies in architecture is closely related to adoption conditions rather than technical capacity alone. Factors such as limited training and technical knowledge, learning costs, and a lack of in-house competence and experience may constrain adoption. External environmental factors, including uncertainty in market demand, the absence of an enabling policy and legal framework, and the relatively conservative structure of the sector, may also shape acceptance decisions (Alghamdi et al., 2023; Wang et al., 2024). Moreover, because digital technologies in the architectural services sector can be perceived as interventions that transform established workflows, it is not realistic to assume that new tools will be adopted automatically (Soulikias et al., 2021; Klein et al., 2022).

This suggests that explanations based solely on PU and PEOU may often be inadequate in the architectural context and that organizational and sectoral determinants need to be incorporated to understand acceptance more fully (Ahmed and Kassem, 2018; Chen et al., 2023). Indeed, some studies highlight that general acceptance models are not directly optimized for architecture and that organizational factors specific to architectural practice have not yet been fully clarified (Elkhayat et al., 2024).

Against this backdrop, the importance of technology-acceptance research in architecture is twofold. On the one hand, the effects of digital tools on design production, coordination, and representation are diversifying rapidly. On the other hand, the adoption of these tools is strongly shaped by educational processes, professional culture, organizational capacity, and external environmental conditions (Manzoor et al., 2021; Chen et al., 2023; Deshapriya et al., 2025). Accordingly, the following sections systematically examine which technology types and user groups have been studied using TAM and extended models and how architecture-specific external variables, such as organizational support, training, standards, and market pressure, have been incorporated into acceptance mechanisms (Ullah et al., 2023).

3. Methodology

This study was designed as a Systematic Literature Review (SLR) to map, in a systematic manner, the use of the Technology Acceptance Model (TAM) and related theoretical frameworks, including TAM2, TAM3, and UTAUT, within the field of architecture. An SLR aims to identify, appraise and synthesise the available evidence addressing specific research questions through a transparent and replicable procedure that minimises bias (Kitchenham and Charters, 2007). Within this framework, the study was conducted with reference to the core principles of the PRISMA statement for the reporting and selection stages (Moher and Liberati, 2009).

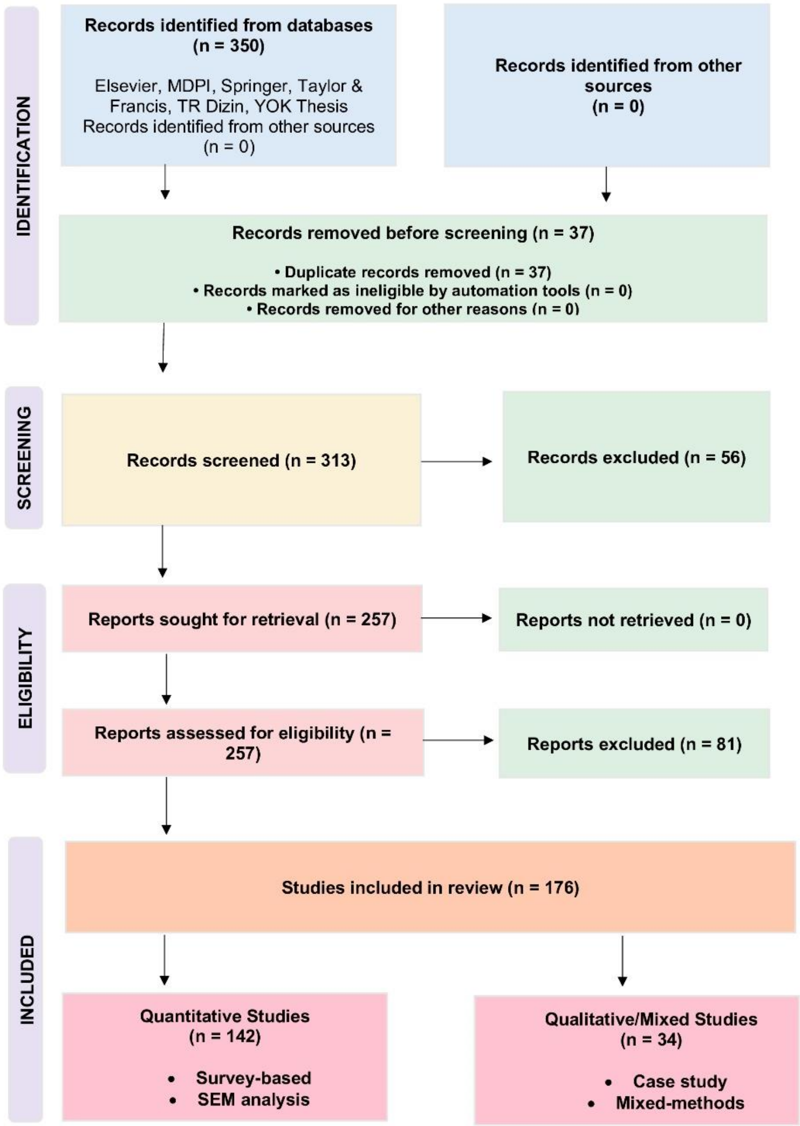
3.1. Data collection and study selection

The systematic search was finalized on May 14, 2025, ensuring the inclusion of the most recent academic contributions. The international search strategy was structured around two primary conceptual axes. The first axis focused on technology acceptance theories, utilizing terms such as 'Technology Acceptance Model (TAM)', 'Unified Theory of Acceptance and Use of Technology (UTAUT)', and their core constructs, including 'Perceived Usefulness' and 'Perceived Ease of Use'. The second axis targeted the specific context of architecture and its digital transformation, employing keywords such as 'Architectural Practice', 'Technology Adoption in Architecture', 'Digital Transformation in Architecture', and 'Digital Technology in Architecture'. Furthermore, to capture studies on specific technological advancements, terms including 'Building Information Modeling (BIM) Adoption', 'BIM in Architecture', 'Computational Design', and 'Artificial Intelligence in Architecture' were integrated into the search strings.

For the national databases, specifically TR Dizin and the Council of Higher Education (YÖK) National Thesis Center, the search strategy was adapted to include Turkish equivalents to ensure a comprehensive capture of local literature. These included terms such as 'Teknoloji Kabul Modeli', 'TAM', 'Yapı Bilgi Modelleme', and 'Mimarlıkta Teknoloji Benimseme'. These keywords were combined using Boolean operators (AND/OR) to maximize the relevance of the retrieved records, maintaining the same logical structure across field restrictions and filters. In addition, minor formatting adaptations were applied based on database interfaces to ensure consistency between the international and national search results.

Studies were assessed against predefined criteria. The inclusion criteria were as follows: (i) the study employs TAM, its extended versions (TAM2 or TAM3), or a related acceptance model such as UTAUT as its theoretical framework; (ii) it is situated within an architecture or AEC context (including education, design practice, coordination, or implementation); (iii) it includes empirical evidence or a robust theoretical discussion; and (iv) the full text, or an abstract detailed enough to support screening decisions, is accessible. The exclusion criteria were: (i) studies with no theoretical linkage to TAM, UTAUT, or related models; (ii) studies focusing on sectors outside architecture or AEC; (iii) publication types with limited scholarly contribution, such as letters to the editor or book reviews; and (iv) texts that do not provide analyzable data in terms of method or findings.

The selection process was conducted in four stages in accordance with the PRISMA logic: identification of records, screening, eligibility, and inclusion. The initial search yielded 350 records from the databases. After removing duplicate records (n = 37), the titles and abstracts of the remaining 313 studies were screened according to inclusion and exclusion criteria, and 56 studies were excluded at this stage. Following full-text review, 81 more studies were excluded. As a result, a total of 176 publications were included in this review. Of these studies, 142 were quantitative (survey-based, SEM analysis), and 34 were qualitative/mixed methods (case study, mixed methods). The entire selection process was reported using the PRISMA flow diagram presented in Figure 2. To enhance the traceability and replicability of the findings, a comprehensive bibliographic list and the core coding attributes of the final 176 included studies are provided as Supplementary Material (Appendix A). This dataset includes the authors, publication years, specific technology types, and the theoretical frameworks (TAM, UTAUT, etc.) identified during the systematic review process.



Source: Developed by the authors within the scope of this study

Figure 2. PRISMA Flow Chart

The final dataset generated through this screening process (n = 176) provides a coherent body of evidence that is not only well aligned with the scope of the review but also sufficiently comparable to support systematic analysis and to address the study's research questions. However, the reliability of a systematic review depends not only on the selection of appropriate studies but also on how the included studies are examined, including the variables used and the analytical scheme applied. Accordingly, in the next stage, a standardized data-extraction form was applied to each publication in the final dataset. This approach brought the studies' theoretical frameworks, methodological characteristics, the technology types examined, and the reported findings together within a shared analytical language. The following section details how data extraction and coding were conducted and explains the analytical logic through which the findings were synthesized.

3.2. Data extraction, coding, and analysis

The aim of analyzing the final dataset is not merely to report numerical distributions but to bring together, on a comparable basis, the theoretical approaches, methodological choices, and empirical patterns used to explain technology acceptance in the architectural context. The analysis, therefore began with a standardized data-extraction and coding step, followed by thematic classification and comparative synthesis based on the coded data. This approach seeks to generate systematic answers to the research questions by making both commonalities and divergences visible across studies focusing on different technologies and user groups.

3.2.1. Data extraction and coding scheme

Studies included in the final dataset were examined systematically using a predefined data-extraction form and coding scheme. The coding scheme aimed to extract the following information from each study:

Bibliographic information: author(s), year, publication type (article, conference paper, thesis), and country or context.

Research context: the technology examined (BIM, VR and AR, mobile applications, parametric tools, and related technologies) and the focal domain (education, professional practice, implementation and coordination, and related domains).

Theoretical framework: the model used (TAM, TAM2, or TAM3, UTAUT, and related models) and external variables added to the model (for example, social influence, trust, facilitating conditions, and organizational support).

Methodological characteristics: research design (survey, case study, experiment, mixed methods), sample size, and data-analysis technique (for example, structural equation modelling, SEM, regression, and related techniques).

Findings: supported or rejected relationships, key determinants influencing acceptance, and interpretations specific to the architectural context.

For each publication, the relevant information was recorded through the predefined data-extraction form, and coding decisions were aligned with a shared scheme. Table 1 summarizes which variables were extracted from the dataset and how these variables were standardized through the coding logic. In this way, the entire content, from bibliographic information to theoretical constructs, methodological preferences, and findings, was structured to enable consistent comparisons across studies.

By applying the data-extraction form and coding scheme, each study could be represented within a shared data structure in terms of technology type, target user group, acceptance model used, and reported relationships. This structure made it possible, on the one hand, to describe the overall profile of the literature, including which models were preferred for which technologies, and, on the other hand, to trace analytically how TAM variables and architecture-specific external determinants were considered together. The next section details the analytical approach applied to the coded data and explains the logic through which the findings were synthesized.

Table 1. Data-extraction form and coding scheme

Dimension	Fields	Coding approach
Bibliographic	Author, year, title, publication type, outlet, country or region, DOI or URL	Publication type coded as article, conference paper, or thesis (optional: book chapter). Country coded as the country where the sample or context is located.
Research context	Context (education, professional practice, construction site and assembly, client, mixed), technology type (BIM, VR and AR, parametric, and related types), target user group	Each study coded with one primary technology, plus a sub-technology where relevant (for example, BIM 4D, VR head-mounted display).
Theoretical framework	Model (TAM, TAM2, TAM3, UTAUT, UTAUT2, hybrid), core variables (PU, PEOU, ATT, BI, USE), extended constructs (SI, FC, TR, and related constructs)	Core variables coded as present or absent. Additional constructs recorded as a list.
Method	Data collection (survey, interview, experiment, mixed), design (quantitative, qualitative, mixed), sample (n), analysis (SEM, PLS-SEM, regression, thematic analysis, and related techniques)	Analysis technique recorded using standard labels where possible (SEM versus PLS-SEM).
Findings	Number of hypotheses, supported relationships (for example, PU → BI), key findings	Supported relationships recorded in arrow notation. Findings summarised in two to three sentences.
Architecture-specific external variables	Organisational support, training and self-efficacy, standards, project pressure, collaboration intensity, perceived creative autonomy, cost, and related variables	Variables recorded using their original labels, with synonyms in parentheses (for example, top management support, senior management support).

Source: Developed by the authors within the scope of this study

3.2.2. Analytical approach and synthesis

Data analysis was conducted using a combined qualitative and quantitative content analysis approach. In the first stage, studies were classified by technology type, user group, and application context to develop a thematic map of the literature. In the second stage, the frequency of TAM and UTAUT variables was examined, including which variables were preferred in which technological contexts, as well as the patterns through which external variables, such as organizational support, training and self-efficacy, standards, and collaboration requirements, were incorporated into the models. In the final stage, studies addressing similar contexts were clustered, and their findings were assessed comparatively. Based on convergent results and points of divergence, the study identified research gaps and future directions in the field.

The coding and analysis process was carried out using MAXQDA software. To assess coding reliability, a randomly selected subsample from the final dataset, approximately 70 percent of the included studies, was coded independently by two coders using the same initial codebook. Inter-coder agreement was calculated using Cohen’s kappa (κ) for binary (present or absent) variables, for example, PU, PEOU, and the presence of external-variable families, and also using Cohen’s kappa for multi-category nominal variables, for example, technology type. Across variables, κ values ranged from 0.68 to 0.91, and the overall level of agreement, calculated as the arithmetic mean across variables, was $\kappa = 0.79$.

For codes with relatively lower agreement, code definitions and decision rules were reviewed based on the kappa results and the coders’ notes, and the codebook was revised accordingly. Discrepancies between coders were then resolved through discussion and consensus using the revised codebook as the reference. Following these refinements, the remaining portion of the dataset was coded in line with the revised codebook, and the resulting codes were used in the thematic classification and comparative synthesis stages.

3.2.3. Ethical Statement:

As this study is a systematic literature review based on the analysis of previously published secondary data and does not involve human participants, animal subjects, or sensitive personal information, ethical committee approval was not required.

4. Result

The following sections present the synthesized results of the systematic review. The detailed coding scheme and the full list of analyzed studies (n=176) can be found in the Supplementary Material accompanying this article.

4.1. Response to RQ1: Prominent Thematic Areas and Application Contexts

The thematic classification reveals that the primary focus is on Architecture and Design (56.6%, n=198), followed by Metaverse and Virtual Reality (26.3%, n=92) and Educational Technologies (9.4%, n=33), as detailed in Table 2. Within professional practice, BIM remains the dominant technology examined (Elkhayat et al., 2024). VR and AR follow as a significant cluster, particularly for design communication and stakeholder interaction (Özgen et al., 2021; Liu and Konduri, 2024). In educational settings, the focus is on students' adoption of parametric tools and e-learning platforms (Wu and Zhao, 2022).

4.2. Response to RQ2: Frequency of TAM Variables and External Factors

Content analysis of the final dataset (N = 176) shows that Perceived Usefulness (PU) and Perceived Ease of Use (PEOU) are the most frequently used core variables. Behavioral Intention (BI) is the primary dependent variable, while Attitude (ATT) often serves as a mediator (Heo and Na, 2025).

Architecture-specific external factors identified in the data include:

Social factors: Social influence and subjective norms are prominent in team-based projects and hierarchical office structures (Murguia et al., 2021; Wei et al., 2025).

Organisational factors: Facilitating conditions, including management support and technical infrastructure, are critical for complex technologies like BIM (Olanrewaju et al., 2022; Chen et al., 2023).

Individual factors: Self-efficacy and prior experience are key personal determinants in educational contexts (Wu and Zhao, 2022; Heo and Na, 2025).

Trust: A significant determinant in scenarios involving cloud-based collaboration and data sharing (Ahmed and Kassem, 2018; Avsar et al., 2022).

4.3. Response to RQ3: Evolution of Literature and Identified Gaps

The literature indicates a trajectory from individual software adoption toward complex, multi-actor digital ecosystems. Key gaps identified include:

•Lack of systematic measurement for creative flow, aesthetic value, and design autonomy.

•Limited research on the acceptance of Generative AI and its impact on professional roles.

•A shortage of longitudinal designs tracking the transition from initial intention to routinized use.

4.4. Detailed Data Distribution (N = 350 and N = 176)

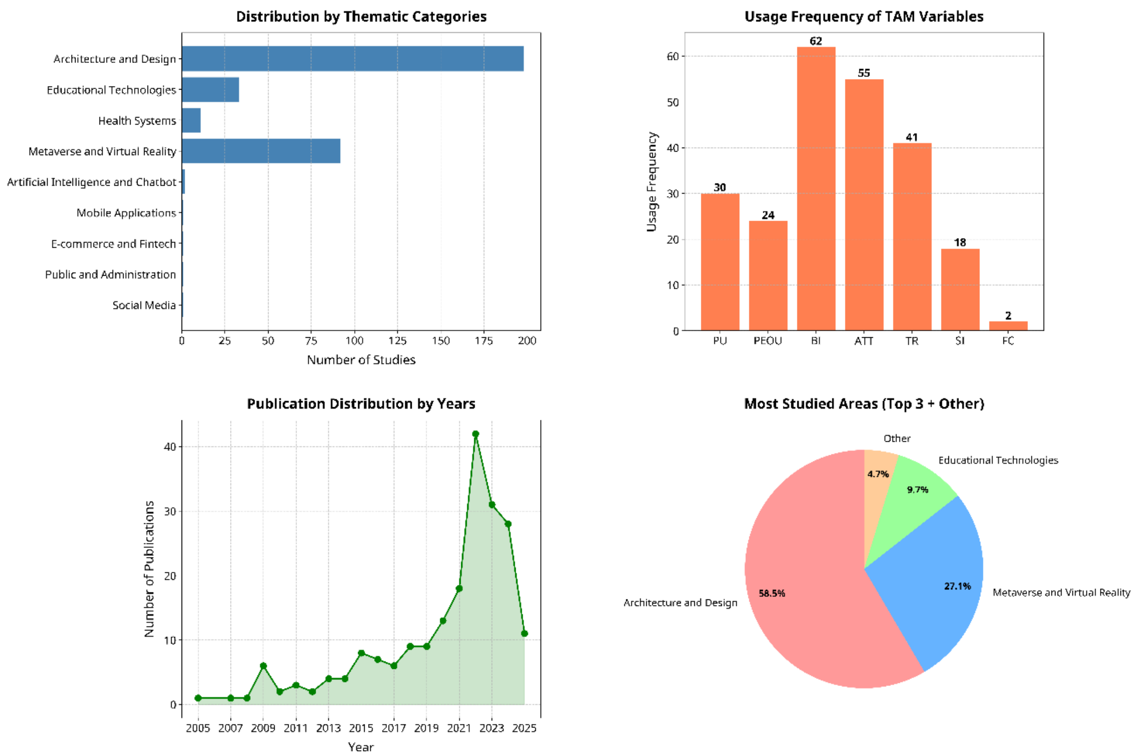
The thematic classification conducted at the title and abstract level (N = 350) is summarized in Table 2.

Table 2. Distribution of the reviewed studies by thematic category

Thematic category	Number of studies	Share (%)
Architecture and Design	198	56.6
Metaverse and Virtual Reality	92	26.3
Educational Technologies	33	9.4
Health Systems	11	3.1
AI and Chatbots	2	0.6
Mobile Applications	1	0.3
E-commerce and Fintech	1	0.3
Public Administration and Governance	1	0.3
Other (Uncategorised)	11	3.1

Source: Compiled from the relevant literature by the authors

Figure 3 provides an integrated visualization of the thematic areas, variable distributions, and chronological evolution of the literature. This visual overview serves as the empirical foundation for addressing the study's research questions. Based on the systematic review of the final dataset (n=176) and the patterns illustrated in Figure 3, the following synthesis provides direct answers to the research questions (RQ1-RQ3).



Source: Compiled from the relevant literature by the authors

Figure 3. Visualization of the literature-analysis findings (thematic distribution, variable use, number of publications by year, and most popular domains)

4.5. Synthesis of Research Findings: Bridging Visual Data and Research Questions

The analysis of the thematic map and variable distributions in Figure 3 reveals that technology acceptance in architecture is transitioning from a focus on individual tools toward collaborative, multi-actor digital ecosystems. In direct response to RQ1, the findings show a clear concentration in professional practice (BIM), representation (VR/AR), and architectural education. This thematic distribution indicates that adoption research is no longer limited to technical performance but increasingly addresses communication and stakeholder interaction.

Regarding RQ2, while the core constructs of Perceived Usefulness (PU) and Perceived Ease of Use (PEOU) remain dominant, the variable patterns in Figure 3 underscore the growing importance of social influence, trust, and facilitating conditions. These results suggest that architecture-specific adoption is a multi-level socio-technical process that depends heavily on organizational readiness and the management of uncertainty in collaborative environments.

Finally, addressing RQ3, the chronological evolution of the literature highlights a significant shift from simple software adoption studies toward complex integration scenarios. However, visible gaps remain, particularly concerning the systematic measurement of creative autonomy and the development of ethical frameworks for Generative AI. The synthesis of these findings demonstrates that technology acceptance in architecture is not merely a technical decision but a multi-layered phenomenon intertwined with professional culture, organizational capacity, and educational studio dynamics. This integrated perspective provides a solid foundation for the theoretical and practical discussions presented in the following section.

5. Discussion

The findings indicate that technology-acceptance research in architecture has shown a marked expansion in volume and topical diversity (Manzoor et al., 2021; Elkhayat et al., 2024). This section interprets the findings in relation to the research questions and broader literature.

5.1. Theoretical Contribution: Continuity of the TAM Core and the Need for Extensions

One of the most consistent findings is that PU and PEOU continue to provide a strong basis for explaining intention to adopt (Cui et al., 2021; Mata and Ancheta, 2024). However, the classic TAM struggles to capture the complexity of architectural practices on its own and tends to be extended with external variables (Chen et al., 2023). The increasing prevalence of such extensions indicates a shift from individual user perceptions towards multi-level determinants, including organizational capacity, social interaction, and trust (Klein et al., 2022).

The greater visibility of UTAUT-based constructs like social influence and facilitating conditions, alongside risk-sensitive variables such as trust, is closely related to the production logic of the AEC sector (Avsar et al., 2022). Acceptance, therefore, needs to be conceptualized as a process that begins with individual intention and extends to routinized use within the organization (Olanrewaju et al., 2022).

5.2. Contextual Dynamics: Professional Practice, VR/AR, and Education

The concentration on BIM in professional practice highlights that adoption is a matter of organisational readiness and change management (Klein et al., 2022; Elkhayat et al., 2024). Conversely, VR and AR adoption is justified by communication effectiveness and experience quality (Özgen et al., 2021; Liu and Konduri, 2024). In these contexts, PU expands to encompass communication-based benefits, such as enabling clients to understand space and detecting early-stage design errors (Lee et al., 2020).

In architectural education, acceptance dynamics are sensitive to user profiles. The prominence of learning support and ease of use among students relates to the nature of the learning process (2). Studio culture turns technology acceptance into a social learning process, where peer learning and instructor role-modelling reinforce technology legitimacy (Sepasgozar and Ghobadi, 2021).

5.3. Architecture-Specific Gaps: Creative Process, Aesthetic Value, and Design Autonomy

A pronounced gap in the literature concerns the lack of systematic definition for constructs critical to architecture, such as creative flow, aesthetic value, and design autonomy (Algassim et al., 2023). While studies on AI-enabled robotic architects offer some frameworks (Lin and Xu, 2022), these dimensions often remain implicit or are absorbed indirectly within standard variables (Davis, 1989; Venkatesh and Bala, 2008). In architecture, usefulness is not limited to productivity; it also involves the quality of aesthetic outcomes and the designer's decision space (Picon, 2010; Soulikias et al., 2021).

5.4. Practical Implications

For architectural practices, technology integration is a transformation requiring training and change management (Soulikias et al., 2021). For schools of architecture, curricula should move beyond software instruction to help students understand technology's role in industry (Davis, 1989). For software developers, interface intuitiveness and workflow integration are as important as technical performance (Lee et al., 2020; Liu and Konduri, 2024).

5.5. Future Research Agenda: Generative AI and Longitudinal Designs

The next phase of the literature is likely to be shaped by AI-based design supports and their impact on professional roles (Soulikias et al., 2021; Elkhayat et al., 2024). Generative AI raises new questions regarding creativity, ethics, and copyright (Barosio et al., 2023). Additionally, increasing longitudinal and qualitative studies is critical for understanding how acceptance evolves from initial intention to routinized organizational use (Murguia et al., 2021; Chen et al., 2023).

5.6. Limitations and Directions for Future Research

This study has three main limitations. First, the search was limited to specific databases and keywords. Second, thematic mapping relied on titles and abstracts, which may miss nuanced contributions. Third, it does not include a meta-analysis evaluating effect sizes.

Priority directions for future research include: (i) scale-development studies for architecture-specific dimensions like perceived aesthetic contribution; (ii) context-sensitive models for generative AI addressing creativity and professional shifts; and (iii) longitudinal designs to explain how acceptance becomes routinized within organizations across different cultural contexts and firm sizes.

6. Conclusion

This systematic review comprehensively addresses its initial research questions, illuminating the multifaceted landscape of technology acceptance in architecture.

6.1. Synthesis of Answers to Research Questions

Technology acceptance research in architecture predominantly focuses on professional practice (BIM) and architectural education. While core TAM constructs (PU and PEOU) remain fundamental, their power is augmented by architecture-specific factors like design quality and creativity. The literature reveals a trajectory toward complex digital ecosystems, highlighting a need for context-sensitive models for Generative AI and Digital Twins. These findings emphasize that technology acceptance in architecture is a multi-level socio-technical process encompassing collaboration and organisational capacity.

6.2. Summary of Limitations and Future Directions

In summary, while this study provides a comprehensive map of the field, it is limited by its database selection and the qualitative nature of thematic mapping. Future research should prioritize the development of architecture-specific scales, focusing on creativity and aesthetic value, and investigate the adoption of emerging technologies like Generative AI through longitudinal and comparative designs.

Ethics Statement
The authors declare that ethical approval was not required for this research.

Author Contribution Statement
The authors declare that they contributed equally to the article and that they have seen/read and approved the final version of the manuscript for publication.

Conflict of Interest Statement
All authors declare that there is no conflict of interest for this study.

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