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Revisiting the Technology Acceptance Model in the Digital Technology Era: A Theoretical Review

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Abstract

Purpose: This paper re-examines the Technology Acceptance Model (TAM) in the digital technology era. It posits that the rapid emergence of intelligent and immersive systems, such as artificial intelligence (AI) and the Internet of Things (IoT), has challenged the original rational and individualistic assumptions of the TAM. The study aims to clarify why revisiting TAM is necessary today and to propose an updated framework that reflects the social, emotional, and institutional dynamics of digital transformation. **Design/methodology/approach:** Adopting a theoretical review approach, this study synthesizes three decades of TAM-related literature, integrating key extensions such as TAM2, TAM3, and UTAUT with insights from the Theory of Planned Behavior and Trust Theory. **Findings:** The review reveals that while TAM remains a robust model, it must evolve to address digital-era factors such as trust, transparency, digital identity, and ethical governance. Technology acceptance is no longer purely cognitive but relational, affective, and socially embedded. **Research limitations/implications:** This study is conceptual and calls for empirical validation of the proposed digital-era TAM framework through longitudinal and multi-level research designs. **Practical implications:** The findings guide organizations and policymakers to promote responsible digital transformation by building trust, fostering digital readiness, and embedding ethical governance in technology adoption strategies. **Originality/value:** This study advances TAM by reframing it as a dynamic, socio-technical, and ethically grounded model, offering new theoretical and practical insights into human–technology interaction in the digital age.

Keywords: Technology Acceptance Model (TAM), Digital Transformation, Artificial Intelligence, Trust, Organizational Behavior

Introduction

Background

The rapid advancement of digital technologies has profoundly transformed how organisations operate, communicate, and create value. From artificial intelligence (AI) and data analytics to collaborative platforms and remote work systems, digitalization has become an inseparable component of modern organizational life. Understanding why and how individuals accept, adopt, and use new technologies remains a central question in management and information systems research. Among the various theoretical frameworks developed to address this question, the Technology Acceptance Model (TAM) originally proposed by Davis has emerged as one of the most influential and enduring models in this field (Davis, 1989).

Since its inception, TAM has offered a parsimonious yet powerful framework for explaining technology-adoption behaviour through its two core constructs: Perceived Usefulness (PU) and Perceived Ease of Use (PEOU). Empirical studies across organisational information systems, consumer technologies, e-commerce, and healthcare applications have consistently supported the explanatory value of these constructs (Davis, 1989; King & He, 2006). Over the past three decades, researchers extended TAM to account for new determinants and contextual factors, giving rise to models such as TAM2 (Venkatesh & Davis, 2000) and the unified acceptance models UTAUT (Venkatesh et al., 2003) and UTAUT2 (Venkatesh et al., 2012).

However, the ongoing digital transformation reshaping workplaces and societies challenges some of TAM's traditional assumptions. Contemporary technologies, including AI-based decision tools, algorithmic management systems, and virtual collaboration platforms, are not merely functional instruments; rather, they are socially embedded and affectively charged artefacts. They shape users' trust, digital identity, and sense of control in ways that the original TAM did not fully anticipate. Furthermore, the rise of remote and hybrid work is blurring the boundaries between organisational and personal technology use, suggesting that purely cognitive models of acceptance may no longer suffice.

In light of these developments, revisiting the TAM in the context of digital transformation is both timely and essential. This theoretical review has three key objectives. Firstly, the historical evolution of TAM is traced, from its original formulation to its major extensions and integrations. Secondly, it synthesises key streams of empirical research applying TAM across diverse contexts, highlighting how the model has adapted to digital-era technologies and organisational environments. Thirdly, it identifies significant theoretical lacunae and puts forward future research directions with an emphasis on the integration of social, emotional, and organisational dimensions into frameworks of technology acceptance.

By offering a comprehensive and critical review of TAM's development and applications, this paper contributes to a more nuanced understanding of technology acceptance in the era of digital transformation. By providing a comprehensive and critical review of TAM's development and applications, this paper contributes to a more nuanced understanding of technology acceptance in the era of digital transformation. Future models must move beyond

cognitive evaluations of usefulness and ease of use, incorporating instead the affective, relational, and institutional dynamics that increasingly characterize technology use in the present day.

Problem Statement and Motivation

Although the Technology Acceptance Model (TAM) has demonstrated enduring explanatory power, its foundational assumptions were developed in an era when technology was largely instrumental, static, and human-controlled. The digital transformation of the past decade has given rise to a plethora of technologies that are autonomous, adaptive, and socially interactive. These technologies encompass a wide range of applications, including artificial intelligence (AI), the Internet of Things (IoT), blockchain, and the Metaverse. These systems are not merely tools for efficiency; they are agents that influence users' perceptions of trust, transparency, and identity (Logg et al., 2019). Consequently, the traditional TAM constructs of Perceived Usefulness and Perceived Ease of Use alone are insufficient to capture the affective, ethical, and relational dimensions of user acceptance in digital ecosystems.

Theoretically, TAM's limitations stem from its rational-cognitive orientation and individual-level focus. Research has demonstrated that emotional attachment, perceived fairness, and algorithmic trust have a substantial impact on user engagement with digital technologies. These factors are not addressed by TAM's original formulation (Gefen et al., 2003; Vrontis et al., 2021). Furthermore, the concept of digital transformation has the effect of rendering the boundaries between personal and organisational technology use indistinct. This development, in turn, gives rise to a multi-level socio-technical process of technology acceptance, which is influenced by a variety of factors, including culture, leadership, and ethics (Cascio & Montealegre, 2016). These developments challenge TAM's static and individualistic perspective, calling for its reconceptualization as a dynamic framework sensitive to social and institutional contexts.

Therefore, revisiting TAM in the digital technology era is both theoretically necessary and practically urgent. Theoretical renewal is required to incorporate constructs such as digital trust, transparency, and emotional engagement into models of acceptance. Practically, organisations need frameworks that can explain and guide adoption in trust-dependent, ethically sensitive, and continuously evolving technological environments. Addressing these gaps positions TAM not as a legacy model, but as a renewable foundation for understanding technology acceptance in the age of intelligent and interconnected systems.

Research Objectives

Building upon the preceding discussion, this study seeks to re-examine the Technology Acceptance Model (TAM) through the lens of contemporary digital transformation. The overarching objective of this study is to evaluate the validity of TAM's core theoretical assumptions in a technology environment that is increasingly characterised by technology. The present review has three specific aims: firstly, to trace the historical evolution of TAM and its major extensions, TAM2, TAM3, and the Unified Theory of Acceptance and Use of Technology (UTAUT); secondly, to critically assess how these frameworks have been applied to emerging digital contexts; and thirdly, to identify theoretical and empirical gaps, proposing directions for developing an updated, socio-technical, and trust-based framework for technology acceptance.

To achieve these aims, the paper adopts a theoretical review methodology, synthesising over three decades of literature across information systems, organisational behaviour, and digital innovation research (Venkatesh et al., 2012). By integrating insights from the Theory of Planned Behaviour (Ajzen, 1991) and Trust Theory (Mayer et al., 1995), the review expands TAM's analytical scope beyond individual cognition to encompass emotional, ethical, and institutional dimensions of acceptance.

The Evolution of the Technology Acceptance Model

The Technology Acceptance Model (TAM) has evolved over more than three decades to become one of the most enduring theoretical frameworks in information systems research. Since its original formulation by Davis (1989), TAM has undergone several major refinements and integrations that expanded its explanatory power and contextual applicability. This section reviews the historical development of TAM, focusing on four key milestones: the original TAM, its major extensions TAM2 and TAM3, and the unified models UTAUT and UTAUT2. Together, these developments illustrate the model's theoretical evolution from a parsimonious cognitive framework to a more complex, context-sensitive approach to understanding technology adoption.

The Original TAM

The Technology Acceptance Model (TAM), developed by Davis (1989), was grounded in the Theory of Reasoned Action (TRA) proposed by Ajzen and Fishbein (1975). TRA posits that individual behaviour is determined by behavioural intention, which in turn is influenced by attitudes and subjective norms. While TRA provides a broad social-psychological framework, it was not entirely suited to the domain of technology use, where attitudes toward specific systems often depend on perceived functionality and usability. Davis refined TRA for the information systems context, proposing TAM as a parsimonious yet powerful model to explain users' acceptance of technology.

TAM introduced two core constructs, Perceived Usefulness (PU) and Perceived Ease of Use (PEOU), which were posited as direct determinants of behavioural intention (BI) to use a system. It was subsequently predicted that this intention would predict actual usage. Figure 2.1 illustrates the original structure of TAM, depicting the causal links among perceived usefulness, perceived ease of use, and behavioral intention. PU refers to the degree to which an individual believes that using a technology enhances job performance, while PEOU reflects the extent to which the system is perceived as free of effort. Empirical validation across early workplace applications, such as word processors, email, and decision-support tools, demonstrated the strong predictive capability of these constructs (Davis, 1989). Notably, PU often emerged as the stronger predictor of behavioural intention, though PEOU remained significant, underscoring that both utility and usability shape technology acceptance (King & He, 2006).

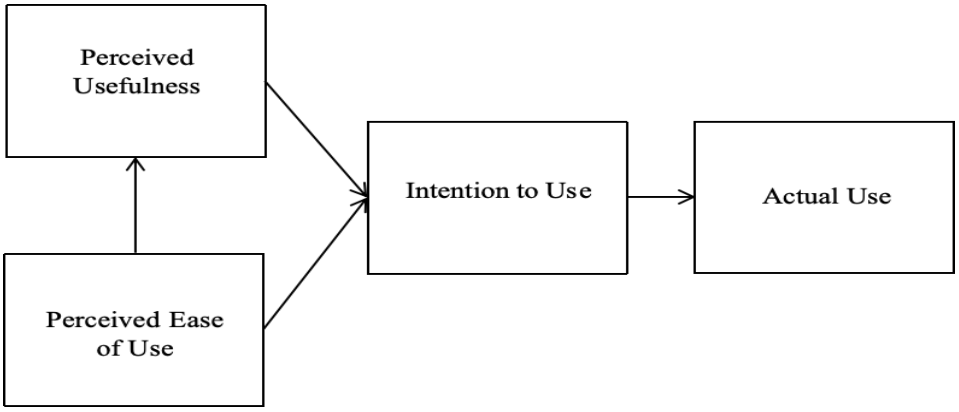

Figure 2.1: Technology Acceptance Model 1

A key innovation of TAM was the removal of the "attitude toward behaviour" construct present in TRA. Davis (1989) demonstrated that including attitude did not substantially improve predictive power and instead proposed a more direct causal path from beliefs to behavioural intention. This simplification enhanced the model's applicability, especially in organisational contexts where efficiency and clarity of adoption mechanisms are critical.
Despite its empirical strength, the original TAM has been criticised for its narrow cognitive orientation and lack of contextual depth. Scholars argue that it assumes individuals make rational and deliberate adoption decisions, neglecting affective, social, and cultural influences that often shape technology behaviour in practice (Bagozzi, 2007). Moreover, its individual-level focus limits explanatory power in organisational settings where collective norms, leadership, and institutional trust play central roles.

TAM2: Incorporating Social Influence and Cognitive Processes
Recognising the theoretical and contextual limitations of the original Technology Acceptance Model, Venkatesh and Davis (2000) extended it by developing TAM2, which integrates Subjective Norms and Cognitive Instrumental Processes into the model. Subjective norms are defined as the perceived social pressures to behave or not behave, typically arising from significant referents such as supervisors, peers, or organisational culture. In contrast, cognitive instrumental processes, encompassing job relevance, output quality and demonstrable outcomes, are indicative of users' rational evaluation of the extent to which a technology facilitates their work tasks and enhances performance. These additions aimed to expand TAM's explanatory scope beyond individual cognition to include social and contextual determinants of technology use (Venkatesh & Davis, 2000). Figure 2.2 presents the TAM2 framework, showing how social influence and cognitive processes shape technology adoption.

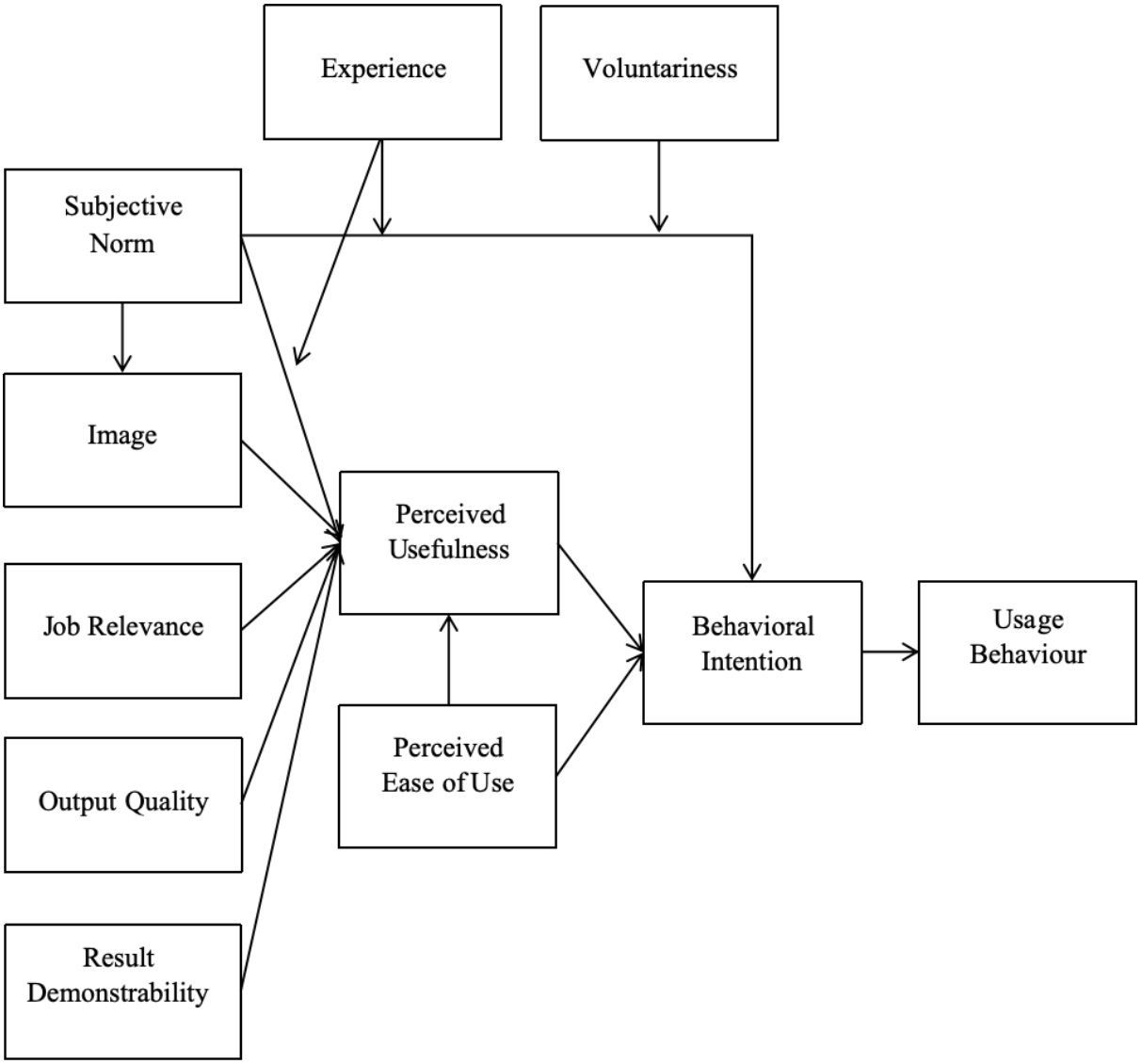

Figure 2.2: Technology Acceptance Mode 2

A major contribution of TAM2 lies in its recognition of social influence as a central antecedent of PU and behavioural intention. Empirical evidence demonstrated that in mandatory environments, subjective norms significantly shape early-stage adoption, as individuals comply with perceived organisational expectations rather than intrinsic motivation. Over time, as users get used to it and have more experience, the impact of social pressure gets weaker, and PU becomes the main thing that predicts continued use. This dynamic interplay between external influence and internal cognition illustrates TAM2's sensitivity to temporal adoption processes and contextual diversity.

Furthermore, the inclusion of Perceived External Control and Job Relevance introduced a stronger organisational perspective into the model. Perceived External Control reflects users' belief that adequate resources and institutional support exist to facilitate system use, while Job Relevance assesses the alignment between the technology and one's professional responsibilities. Together, these constructs enhance the model's ability to explain technology adoption across both voluntary and mandatory contexts, bridging individual perceptions with organisational realities (Agarwal & Prasad, 1999; Venkatesh & Davis, 2000).

Despite its contributions, TAM2 remains bound by a cognitivist and utilitarian paradigm. Critics argue that while it acknowledges social norms, it continues to treat users as rational actors responding to quantifiable stimuli, overlooking emotional, trust-based, and cultural dimensions that increasingly shape digital technology use (Bagozzi, 2007; Benbasat & Barki, 2007). In addition, TAM2's reliance on linear causal assumptions limits its ability to capture the reciprocal and evolving relationship between users, organisations, and technology systems. These theoretical constraints motivated further extensions, such as TAM3, which sought to integrate emotional and individual-difference factors into the acceptance process.

TAM3: Integrating Experience and Individual Differences

As technology use became increasingly personalised, immersive, and emotionally engaging, the limitations of TAM2 in addressing individual psychological factors and experiential dynamics became apparent. To overcome these shortcomings, Venkatesh and Bala (2008) introduced TAM3, which integrates individual differences, experience, and affective responses into the established TAM framework. This model reflects a shift from a purely rational-cognitive view of technology adoption to one that recognises the interplay of cognitive, emotional, and experiential influences on user behaviour.

TAM3 incorporates several new constructs, it's acknowledged that users' acceptance decisions are shaped not only by functional evaluations of technology, such as usefulness and ease of use, but also by emotional confidence, anxiety, and enjoyment (Venkatesh & Bala, 2008). These variables capture the psychological and emotional dimensions of technology use. For instance, users with higher self-efficacy exhibit greater confidence and persistence in learning new systems, whereas computer anxiety can inhibit exploration and reduce adoption likelihood. Likewise, perceived enjoyment enhances intrinsic motivation, encouraging voluntary and sustained engagement with digital systems (Lai, 2017). Figure 2.3 displays TAM3, highlighting the integration of affective and individual difference factors into the model.

One of TAM3's major theoretical contributions lies in identifying six key antecedents that influence PEOU. These include users' confidence in handling computers (computer self-efficacy), their sense of external support and control, levels of technology-related anxiety, the degree of playfulness in computer interaction, enjoyment derived from usage, and objective system usability (Venkatesh & Bala, 2008). Furthermore, TAM3 introduced two critical moderators: The experience of the subject is of significance, as is the voluntariness of the act. The effects of anxiety and playfulness are moderated by experience; anxiety decreases as familiarity grows, and PEOU becomes less salient over time. Voluntariness determines whether external social influence or internal motivation drives adoption: in mandatory contexts, subjective norms dominate, while in voluntary contexts, enjoyment and self-efficacy become stronger predictors of behavioural intention.

Empirical studies demonstrated TAM3's ability to explain technology adoption across both organisational and consumer contexts, highlighting the dynamic relationship between PEOU and PU. Initially, ease of use enhances perceptions of usefulness by lowering cognitive effort; however, as users gain experience, usefulness becomes the dominant determinant of sustained engagement. Despite its advances, TAM3 remains grounded in a cognitive-behavioural paradigm, focusing primarily on internal psychological processes while

underrepresenting the social, cultural, and ethical dimensions that influence technology use in contemporary digital environments (Benbasat & Barki, 2007). Moreover, although TAM3 acknowledges emotional and experiential factors, it conceptualises them as individual-level antecedents rather than as socially embedded dynamics, limiting its capacity to explain collective technology adoption and trust-based interactions. Nevertheless, TAM3 offers valuable insights for designing user-centred digital systems and tailoring adoption strategies to users' experience levels and motivational profiles.

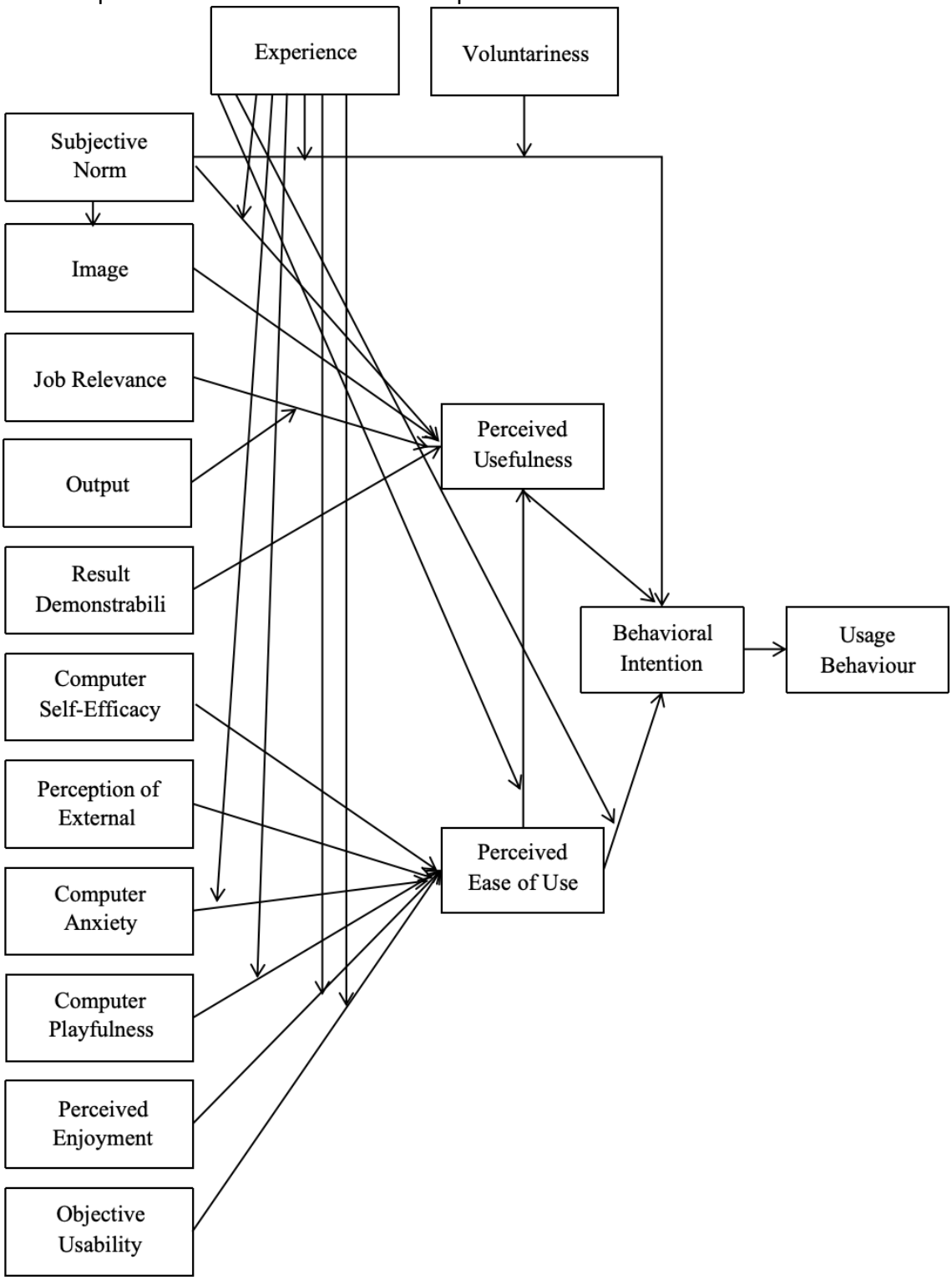

Figure 2.3: Technology Acceptance Mode 3

UTAUT and UTAUT2: Toward an Integrated Model of Technology Acceptance

As research on technology adoption evolved beyond TAM and its later extensions, scholars recognized the need for a broader, integrative framework that could unify fragmented theories of individual acceptance. In response, Venkatesh et al. (2003) introduced the UTAUT, which synthesizes insights from eight major theoretical perspectives, including the Theory of Reasoned Action, Theory of Planned Behavior, Technology Acceptance Model, Innovation Diffusion Theory, and Social Cognitive Theory, among others.

UTAUT aims to explain how users form intentions and subsequently engage with technologies in both organizational and voluntary settings by integrating cognitive, social, and contextual determinants within a single model. The framework identifies four key predictors of behavioral intention and technology use: Performance Expectancy, Effort Expectancy, Social Influence, and Facilitating Conditions. These relationships are further shaped by individual differences such as gender, age, experience, and voluntariness of use.

Specifically, Performance Expectancy denotes the perceived benefits or productivity gains from technology use, conceptually similar to Perceived Usefulness in TAM. Effort Expectancy reflects users' perceptions of how easy or intuitive a system is to operate, paralleling Perceived Ease of Use. Social Influence describes the extent to which users' adoption decisions are shaped by opinions or expectations of important others, such as supervisors or peers. Finally, Facilitating Conditions capture users' perceptions that the necessary organizational and technical resources are available to support technology use.

Theoretical Contributions of UTAUT

Firstly, it was able to integrate the fragmented body of acceptance theories into a cohesive framework, thus enabling researchers to compare previously isolated constructs and models within a unified structure. This consolidation advanced the theoretical maturity of the field, allowing for more consistent empirical testing across contexts (Venkatesh et al., 2003).

Secondly, UTAUT introduced a dynamic and contextual perspective to technology acceptance. The incorporation of moderators such as age, gender, and voluntariness into the model is indicative of an acknowledgement that acceptance is not uniform but varies across demographic groups and usage conditions. For instance, younger users might prioritise ease of use, while older employees might place more emphasis on performance gains and institutional support (Im et al., 2011).

Thirdly, the UTAUT model accentuated the social and environmental embeddedness of technology adoption, underscoring that user behaviour is influenced by both subjective norms and the perceived support of organisational infrastructure. This expansion signified a discernible transition from the individualist, cognition-centred assumptions of TAM towards a more systemic understanding of technology acceptance.

Empirical tests of the UTAUT framework have shown that it accounts for almost 70% of the differences in users' intentions to adopt technology, much higher than the roughly 40% explained by its predecessor models (Venkatesh et al., 2003). Nevertheless, this strength has also been critiqued as a double-edged sword. It has been posited by scholars that the model's explanatory power may be attributable to the inclusion of numerous moderators and

overlapping constructs. This has given rise to concerns regarding the model's complexity, redundancy, and the possibility of overfitting (Bagozzi, 2007). Furthermore, the deterministic structure of the model posits a rational decision-making process, thus offering limited insight into the emotional, ethical and cultural dynamics that are increasingly present in the use of digital technology.

The Emergence of UTAUT2

Almost ten years later,Venkatesh et al. (2012) broadened the original UTAUT framework to create UTAUT2, tailoring it for consumer-oriented rather than purely organizational contexts. This revised model suggests that individuals' technology adoption choices extend beyond functional considerations and are shaped by emotional engagement, habitual usage patterns, and perceived experiential value.

UTAUT2 adds three key elements: Hedonic Motivation, Price Value, and Habit. Together, these elements explain how users feel, whether the price is worth it, and automatic behavioural tendencies. Specifically, Hedonic Motivation captures the pleasure or enjoyment obtained from interacting with technology, highlighting the growing significance of emotional and experiential factors in digital consumer behavior. Price Value represents the perceived trade-off between benefits and monetary cost, highlighting economic evaluation as a driver of adoption in consumer contexts. Habit denotes the extent to which technology use has become automatic or routine through repeated experience.

Since then, extensive application of UTAUT2 has been observed in studies of mobile commerce, social media, online learning, and smart technologies. It has been demonstrated that emotional satisfaction and habitual behaviours are frequently more effective predictors of technology use than cognitive evaluation alone (Escobar-Rodríguez & Carvajal-Trujillo, 2014). By introducing these constructs, UTAUT2 acknowledged that technology use is embedded in users' lifestyles and routines, reflecting the blurred boundaries between work and personal digital environments.

However, despite its broader scope, UTAUT2 has faced criticism for its continued rationalist foundation. It treats constructs such as Hedonic Motivation as supplementary variables rather than as central psychological processes that fundamentally reshape how users relate to technology (Dwivedi et al., 2019). Furthermore, the model is predicated on stable causal relationships, thus failing to capture dynamic socio-technical feedback loops, such as the influence of algorithmic recommendations, digital identity, or trust formation on long-term use. As digital technologies become increasingly intelligent, autonomous, and relational, models such as UTAUT2 must evolve to accommodate the ethical, affective, and adaptive dimensions of human–technology interaction (Maruping et al., 2017).

Table 2.1 provides a comparative overview of the major theoretical extensions across the entire TAM family. The model demonstrates how each stage of development progressively incorporates new constructs, moving from cognition (TAM) to social context (TAM2), emotional and individual differences (TAM3), and finally the integrative and consumer-oriented perspective of UTAUT and UTAUT2.

Table 2.1
Key Theoretical Extensions of the Technology Acceptance Model

Model	Authors (Year)	Key Additions	Theoretical Contribution
TAM	Davis (1989)	PU, PEOU	Foundational cognitive model for technology adoption.
TAM2	Venkatesh and Davis (2000)	Subjective Norm, Job Relevance	Added social influence and contextual cognition.
TAM3	Venkatesh and Bala (2008)	Self-Efficacy, Anxiety, Enjoyment	Integrated affective and individual-difference factors.
UTAUT / UTAUT2	Venkatesh et al. (2012)	Performance Expectancy, Habit, Hedonic Motivation	Unified multiple theories and extended applicability to consumer contexts.

The transition from TAM to UTAUT2 signifies the field's persistent endeavor to strike a balance between parsimony and explanatory richness. The seminal works of UTAUT and UTAUT2 represent pivotal milestones in this domain, providing comprehensive frameworks that integrate cognitive, emotional, social, and contextual influences on technology utilization. However, as digital ecosystems evolve towards AI-driven, adaptive, and immersive technologies, these models face growing challenges.

Future theoretical developments must move beyond the confines of rational prediction to encompass critical considerations such as trust, ethics, algorithmic agency, and socio-emotional engagement. In this sense, the UTAUT family can be regarded as a transitional stage towards a next-generation theory of technology acceptance. This is a theory that can capture the fluid, relational, and affective nature of human–technology interaction in the digital era.

TAM in the Digital Technology Era

The accelerating convergence of artificial intelligence (AI), immersive media, and decentralized systems has redefined the scope and assumptions of technology acceptance research. In the context of AI-driven and algorithmically managed environments, traditional TAM constructs such as PU and PEOU retain their pertinence. However, they are increasingly influenced by factors such as trust, transparency, and perceived fairness. As decision-making processes become automated and data-driven, users' willingness to rely on technology depends not only on its instrumental utility but also on the perceived ethical and epistemic integrity of algorithms.

Emerging Technological Contexts and Applications

In AI-driven environments, user acceptance is heavily influenced by perceptions of algorithmic transparency, fairness, and accountability. Traditional TAM constructs remain relevant, but they are now deeply intertwined with users' beliefs about whether AI systems are trustworthy and ethically aligned. Zerilli et al. (2022) demonstrated that trust in AI systems is significantly shaped by the degree of algorithmic transparency and explainability. Similarly, Cheong (2024) found that transparent communication of algorithmic intent and human oversight increases both perceived usefulness and trust, particularly in high-stakes decision-making contexts. These findings indicate a shift in TAM's causal structure: trust is no longer a by-product of perceived usefulness but a prerequisite for it. In other words, users must first

believe that an algorithm is fair and accountable before they can perceive it as useful or efficient.

Furthermore, studies suggest that users' willingness to rely on AI advice depends on their confidence in its impartiality and objectivity (Afroogh et al., 2024). This aligns with a growing recognition that trust functions as a foundational mediator linking perceptions of transparency and ethical design to behavioural intention. In contemporary algorithmic management systems, including HR analytics, credit scoring and autonomous decision-support tools, acceptance is contingent upon a relational understanding of trust that integrates both cognitive and moral evaluations.

Beyond the realm of algorithmic systems, the advent of immersive technologies, encompassing the metaverse, virtual reality (VR), and augmented reality (AR), introduces affective and experiential dimensions that extend the traditionally cognitive structure of TAM. In these contexts, immersion, presence, and emotional engagement become central predictors of technology adoption. Kim et al. (2020) found that perceived immersion and hedonic motivation significantly influenced attitudes toward metaverse environments, while social presence and avatar-based interaction enhanced both perceived enjoyment and ease of use.

These findings suggest that users engage with immersive technologies not only for their instrumental utility but also for their emotional and social value. Venkatesh et al. (2012) similarly observed that perceived enjoyment and social presence increase behavioural intention toward virtual collaboration platforms. As such, immersive systems challenge TAM's rational-choice foundation by emphasizing that emotional gratification and identity expression are equally important drivers of acceptance in virtual spaces.

Furthermore, blockchain technologies and cryptocurrencies represent another frontier that challenges TAM's foundational assumptions. Unlike conventional systems, blockchain operates within decentralized architectures where trust in institutions is replaced by trust in protocols. In these settings, perceived risk, security, and institutional legitimacy become central antecedents of adoption. Gefen et al. (2003) demonstrated that perceived institutional trust and transaction transparency significantly shaped PU and behavioural intention in online exchanges. Similarly, Felzmann et al. (2019) showed that perceptions of algorithmic transparency and compliance with ethical standards significantly enhance user confidence in digital infrastructures.

These insights underscore the notion that, within decentralised systems, trust and perceived legitimacy effectively supplant conventional social influence, thereby redefining the social dimension of TAM from interpersonal persuasion to systemic reliability. Acceptance in blockchain ecosystems thus depends on trust in the technology's governance mechanisms rather than in individual actors or organizations.

Across AI, immersive, and blockchain contexts, a unifying theme emerges: the psychological and ethical architecture of technology acceptance is evolving. Where TAM once assumed stable, individual-level cognition, the digital era reveals an intricate interplay of trust,

emotion, and socio-technical context. Users no longer evaluate technology purely in terms of rational efficiency but through relational, affective, and moral frameworks.

Therefore, a re-examination of TAM in the digital age necessitates more than the mere addition of new variables; it demands a fundamental conceptual re-framing. Trust now precedes usefulness; presence and immersion redefine perceived ease of use; and legitimacy replaces traditional notions of social influence. Collectively, these changes illustrate how digital transformation necessitates an updated, integrative model of technology acceptance that reflects the ethical, emotional, and experiential realities of contemporary digital life.

Shifting Psychological Mechanisms of Users

The psychological mechanisms underlying technology acceptance have progressively evolved from rational evaluations to emotionally and socially embedded processes. While the original Technology Acceptance Model (TAM) emphasized cognitive assessments of usefulness and ease of use, modern digital technologies engage users through affect, identity construction, and social belonging.

Firstly, affective motivations have become dominant in digital technology adoption. Vrontis et al. (2021) conducted research that revealed that emotional attachment to social media platforms significantly predicts continued engagement, even in cases where perceived usefulness declines. This shift signifies a transition from instrumental logic, where technology use is goal-driven, to affective logic, where emotional satisfaction and psychological comfort sustain long-term usage.

Secondly, social influence has evolved from a normative construct to one rooted in identity and community. In digital ecosystems, users adopt technologies not merely for functional reasons but because they serve as tools of self-expression and social connection. Studies by Marbach et al. (2016) found that social identity and peer validation are strong predictors of engagement on social networking and short-video platforms. This evolution reflects a transformation of TAM's "subjective norm" into a social identity mechanism, where belonging and recognition drive adoption.

Thirdly, digital trust and platform attachment play a critical role in sustaining usage in both organisational and consumer contexts. Gefen and Straub (2004) demonstrated that users' trust in technology and institutional systems significantly predicts continued use, particularly in remote or virtual collaboration environments. More recently, Mikalsen and Monteiro (2021) emphasised that users evaluate platforms not as isolated tools but as integral components of broader relational ecosystems involving human, technological, and institutional trust. This dual-layer trust dynamic underscores a paradigm shift in which technology acceptance becomes relational rather than individualistic.

In summary, the psychology of technology use has shifted from rational evaluation to affective engagement and relational trust. Contemporary users interact with digital systems that are not merely functional but emotionally resonant, socially meaningful, and institutionally embedded. These evolving mechanisms challenge TAM's cognitive foundations, paving the way for integrative approaches that incorporate emotion, identity, and trust as core components of acceptance theory.

Theoretical Limitations of TAM in the Digital Era

Despite its enduring influence, the Technology Acceptance Model faces several theoretical limitations in explaining technology use within the digital era.

Firstly, the cognitive reductionism of TAM constrains its applicability to immersive and affect-driven technologies. As digital experiences increasingly emphasize interactivity, transparency, and fairness, purely cognitive constructs such as perceived usefulness and ease of use fail to capture the experiential and ethical dimensions of modern technology engagement. Goodhue (2007) emphasised that conventional TAM variables are inadequate in accounting for user responses to design elements such as system transparency and algorithmic fairness, which have now become critical to digital trust.

Secondly, TAM's individual-level focus overlooks the multi-level dynamics that characterise digital technology adoption. The prevailing organisational culture, the leadership style, and the digital policy framework collectively influence user intentions, particularly in hybrid and networked workplaces. Venkatesh et al. (2012) called for multi-level frameworks capable of capturing how individual cognition interacts with institutional and societal factors. Without such integration, TAM risks oversimplifying complex socio-technical environments.

Thirdly, TAM's static causal assumptions limit its ability to model dynamic and evolving perceptions. In the digital era, user evaluations of trust, risk, and utility are fluid and shaped by ongoing experiences. Dwivedi et al. (2019) has demonstrated that perceptions of trust and risk evolve as users become more familiar with AI and data-driven systems. This necessitates the use of process-oriented or longitudinal models that are capable of capturing such temporal variations.

In summary, TAM remains a foundational model, but its constructs require significant adaptation to remain relevant. Integrating constructs such as algorithmic transparency, digital identity, immersion, and institutional trust is essential to address the psychological and contextual realities of digital-era technologies. Theoretical integration with frameworks like the Theory of Planned Behavior (Ajzen, 1991) and Trust Theory (Mayer et al., 1995) could help us create a better model of how people accept technology. This model would include the emotions, ethics, and relationships involved in modern digital systems.

Theoretical Extensions and Integrations of TAM

Building on the preceding discussion, this section examines how scholars have extended the Technology Acceptance Model (TAM) by integrating it with complementary behavioural theories to broaden its explanatory power. Over the past decades, TAM has become a seminal framework shaping our understanding of individual engagement with digital and information technologies. However, as digital systems have grown more complex, socially embedded, and emotionally engaging, the limitations of TAM's predominantly cognitive focus have become increasingly evident.

Researchers have sought to integrate TAM with other theoretical perspectives that encompass the social, volitional, and emotional facets of technology utilisation. These dimensions were not adequately addressed by the model's original rational assumptions. Among the most influential integrations are those with the Theory of Planned Behavior (TPB) and Trust Theory. The combination of TAM and TPB enhances the model's ability to reflect

social influence and perceived behavioural control, whereas the integration of TAM with Trust Theory incorporates affective and institutional trust, expanding the framework to address relational and ethical facets of technology acceptance. Collectively, these developments reframe TAM as a broader socio-technical model capable of explaining behavioural, emotional, and normative mechanisms underlying technology adoption in the digital era.

Integrating TAM and the Theory of Planned Behavior (TPB)

Integrating the Technology Acceptance Model (TAM) and the Theory of Planned Behavior (TPB) marks an important conceptual step toward explaining technology adoption. Both frameworks originate from the Theory of Reasoned Action (Fishbein & Ajzen, 1977) but diverge in emphasis and explanatory focus. TAM focuses on cognitive evaluations of technology PU and PEOU (Davis, 1989), whereas TPB extends the framework by incorporating subjective norms (SN) and perceived behavioural control (PBC), which capture social and volitional influences on behaviour (Ajzen, 1991).

Integrating these models provides a more holistic understanding of technology use by acknowledging that users' decisions are shaped not only by their cognitive assessments but also by their social context and sense of control. The integration first appeared in TAM2 (Venkatesh & Davis, 2000) and evolved into the UTAUT (Venkatesh et al., 2003). These later frameworks emphasised that social expectations and normative pressures influence both users' perceived usefulness of technology and their behavioural intentions. Peer endorsement and managerial support have been found to play a significant role in strengthening technology acceptance within organisational settings.

Perceived behavioural control complements TAM by accounting for users' self-efficacy and access to resources, both of which determine their ability to use technology effectively. Cascio and Montealegre (2016) found that PBC was a strong predictor of technology adoption during remote work transitions, as users assessed not only system usability but also their own capacity to integrate digital tools. Similarly, Waizenegger et al. (2020) identified digital self-efficacy as an essential element sustaining user participation in digital collaboration contexts. Recent research further demonstrates that social norms and perceived control interact dynamically in collective contexts. Wang et al. (2020) showed that employees' willingness to use collaboration platforms depended on both perceived capability and shared organisational expectations. These findings reveal that technology adoption is embedded in social systems where cognition, culture, and capability intersect.

In summary, integrating TAM and TPB enhances explanatory power by combining cognitive, social, and volitional perspectives. However, both models continue to assume rational decision-making, which may not fully capture the emotional or habitual dimensions of technology use in digital environments. Future research should extend this hybrid framework to encompass affective and automated determinants, such as enjoyment, habit, and algorithmic influence, in order to more accurately reflect contemporary digital behaviour.

Integrating TAM and Trust Theory

While TAM and TPB primarily emphasise cognitive and social determinants of behaviour, Trust Theory introduces the emotional and relational dimensions essential to understanding technology acceptance in the digital era. In environments shaped by AI, blockchain, and

autonomous systems, users often lack a complete understanding of system operations, leading them to rely on trust as a heuristic to reduce uncertainty (Gefen et al., 2003). Integrating trust into TAM thus extends the model beyond utilitarian assessments, accounting for emotional, moral, and institutional factors that influence user behaviour.

Trust in digital contexts is typically conceptualised across three interrelated dimensions: cognitive trust, affective trust, and institutional trust. Cognitive trust reflects users' confidence in the system's capability and dependability, whereas affective trust represents users' emotional connection and sense of goodwill. Institutional trust, in turn, derives from confidence in structural safeguards such as governance, regulation, and ethical standards (Mayer et al., 1995). These layers collectively determine whether users perceive technology as safe, fair, and worthy of adoption.

Empirical studies consistently demonstrate that trust enhances TAM's predictive power. In AI-driven environments, users' trust has been shown to mediate the relationship between PU and behavioural intention, reinforcing that usefulness alone is insufficient without perceived transparency and accountability (Zerilli et al., 2022). Similarly, in blockchain and financial technologies, institutional trust significantly moderates the effects of perceived risk on adoption intentions, as users depend on governance mechanisms to ensure security and fairness (Gefen & Straub, 2004). These findings emphasise that trust operates at both the individual and institutional levels, shaping perceptions of utility and legitimacy simultaneously.

Within organisations, the integration of trust and commitment further enriches TAM's explanatory scope. Organisational trust fosters alignment between technological adoption and collective goals, enhancing perceived usefulness and reducing resistance (Mikalsen & Monteiro, 2021). When employees believe that technologies are implemented transparently and ethically, their engagement and willingness to adopt increase correspondingly. Thus, trust acts as a bridge between individual cognition and organisational culture.

The trust-based TAM is particularly relevant in digital ecosystems where transparency, fairness, and ethical design are paramount. When users regard algorithmic systems as fair and accountable, they are more likely to develop trust in AI and demonstrate a stronger intention to adopt it (Cheong, 2024). Integrating trust theory thus allows TAM to capture relational and moral dimensions of acceptance that are increasingly central in algorithmic and data-intensive technologies.

In conclusion, combining TAM with Trust Theory extends the framework from cognition to confidence, emphasising that acceptance is not merely a rational evaluation but a relational and affective commitment. Trust bridges the gap between individual perception and institutional reliability, providing a multi-level perspective that reflects the socio-technical complexity of the digital era.

Summary of Theoretical Integrations

Table 4.1 summarises the theoretical intersections of TAM, TPB, and Trust Theory, outlining their complementary constructs:

Table 4.1
Summarises the theoretical integrations between TAM, TPB, and Trust Theory

Theoretical Dimension	Core Constructs	Key Contribution
TAM	Perceived Usefulness, Ease of Use	Explains individual rational evaluation of technology
Social TPB	Subjective Norms, Perceived Behavioral Control	Incorporates social influence and perceived capability
Affective Trust Theory	Cognitive, Affective, and Institutional Trust	Adds emotional, moral, and institutional legitimacy factors

Together, these extensions transform TAM into a comprehensive socio-technical model, capable of explaining technology acceptance within complex, trust-dependent, and emotionally charged digital environments. Future research should continue exploring how trust, emotion, and social context interact dynamically over time, offering more adaptive and holistic models for technology adoption in the age of digital transformation.

Future Research Directions

Building upon the theoretical integrations discussed above, future research should further extend TAM toward organizational, ethical, and adaptive dimensions.

From Individual Cognition to Organizational Contexts

TAM's original focus on individual perceptions limits its applicability in organizational digital transformation. Future research should expand TAM into a multi-level framework linking individual, team, and organizational factors. Organizational culture has been shown to significantly influence firms' adoption of Industry 4.0 technologies (Wiese et al., 2024). Integrating constructs such as organizational trust, commitment, and innovation orientation could bridge micro-level and macro-level mechanisms. Longitudinal and hierarchical modeling approaches can capture the dynamic interplay between individual beliefs and institutional practices, advancing TAM toward an organizational adoption model.

Trust, Ethics, and Governance in Digital Adoption

As AI and algorithmic systems become pervasive, trust and ethical governance have emerged as essential dimensions of technology acceptance. As Gefen et al. (2003) have previously demonstrated, existing research focuses predominantly on individual trust. However, organisational trust mechanisms, such as transparency, accountability, and fairness, have received comparatively little attention from researchers. For instance, studies on algorithmic systems show that enhanced transparency of system logic and data provenance significantly increases users' trust and reduces perceived risk, which in turn influences perceived usefulness and acceptance intentions (Zerilli et al., 2022). Future studies should examine how organizational fairness and value alignment mediate trust and acceptance. Embedding ethical governance into TAM can ensure its relevance to contemporary issues of corporate responsibility and digital integrity.

Dynamic Change, Learning, and Capability Building

Technology acceptance should be understood as an evolving learning process rather than a one-time decision. Integrating TAM with the dynamic theory can explain how digital readiness, absorptive capacity, and change resilience influence sustained adoption. Empirical

evidence suggests that organizations promoting continuous learning and experimentation exhibit higher acceptance and effective technology utilization (Cascio & Montealegre, 2016). Future research should explore how digital transformation leadership and organizational agility shape adaptive technology behaviors over time, repositioning TAM as part of a broader capability-building and organizational change framework.

In summary, future TAM research should move beyond isolated cognition to a multi-level, ethically grounded, and adaptive framework. The incorporation of organisational context, trust governance, and dynamic learning has the potential to evolve TAM into a comprehensive model that reflects the realities of digital transformation. In this model, technology adoption is shaped by cognition, culture, and continuous change.

Conclusion

Over more than three decades, the Technology Acceptance Model (TAM) has remained one of the most influential frameworks for explaining how individuals adopt and use technology. This review revisited TAM in the context of the digital technology era, arguing that while its core logic remains robust, the growing complexity of digital ecosystems demands theoretical renewal. In an age characterized by artificial intelligence (AI), algorithmic decision-making, and organizational digital transformation, technology acceptance must be understood as a multi-level, socially embedded, and ethically governed process rather than a purely cognitive one.

This paper traced TAM's evolution from its original formulation through TAM2, TAM3, and the UTAUT frameworks, illustrating its enduring value across contexts. Emerging technologies such as AI, blockchain, and immersive systems challenge traditional assumptions about the TAM by introducing new determinants, including trust, transparency, and digital identity. These determinants shape user attitudes in novel ways. Integrating TAM with the TPB and Trust Theory demonstrates how combining cognitive, social, and relational perspectives enriches our understanding of digital technology acceptance.

The study's primary theoretical contribution is a renewed digital-era acceptance framework that positions TAM as a dynamic and multidimensional model. It integrates traditional constructs of perceived usefulness and ease of use with organizational and ethical dimensions, including trust, commitment, culture, and leadership. This extension addresses TAM's historical individualism and establishes a foundation for multi-level theorization of technology adoption within complex, trust-dependent environments.

From a practical standpoint, these insights hold significant implications for managers and policymakers. Recognizing technology acceptance as both an individual and institutional process enables organizations to design interventions that strengthen trust, foster digital readiness, and align adoption with cultural and ethical values. For policymakers, prioritizing transparency, fairness, and accountability can foster responsible digital transformation and public trust.

In sum, revisiting TAM in the digital age not only reaffirms its theoretical importance but also transforms it into a comprehensive socio-technical framework. Future research should integrate perspectives from organizational behavior, ethics, and data science to capture

evolving human–technology interactions, guiding both scholarly inquiry and practical innovation in an era defined by intelligence, interconnectedness, and ethical awareness.

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