

# Devising a Model AI-UTAUT by Combining Artificial Intelligence AI with Unified Theory of Acceptance and Use of Technology (UTAUT)

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**Abstract** – This paper addresses the gap in understanding how traditional technology acceptance models like UTAUT apply to emerging AI technologies. Based on a review of 30 studies using UTAUT, we propose an original AI-UTAUT model that incorporates new determinants such as transparency, explainability, and value alignment specific to AI. This model provides both theoretical advancements and practical insights for the adoption of AI systems. It serves as a framework for analyzing user acceptance in the context of AI, offering strategies for ethical alignment and implementation. Future research directions for validating the model across various sectors are also highlighted. The implications of this research transcend academia, offering tangible strategies for the implementation and ethical alignment of AI technologies.

**Keywords** – Artificial Intelligence (AI), Unified Theory of Acceptance and Use of Technology (UTAUT), technology acceptance, AI-UTAUT model, human-AI interaction.

## 1. Introduction

Information systems research has long focused on understanding the factors that drive users' acceptance and use of new technologies.

DOI: 10.18421/SAR63-06

<https://doi.org/10.18421/SAR63-06>

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Received: 11 July 2023.

Revised: 16 August 2023.

Accepted: 22 August 2023.

Published: 26 September 2023.



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A number of theoretical models have been developed over the past few decades to explain and predict user adoption of systems and technologies, including the Technology Acceptance Model (TAM), the Diffusion of Innovations (DOI) theory, and the more recent Unified Theory of Acceptance and Use of Technology (UTAUT). Among these models, UTAUT has emerged as one of the most comprehensive in integrating elements across eight prominent technology adoption theories [10].

Since its introduction in 2003, UTAUT has been widely applied as a framework to understand user acceptance [5] in domains ranging from mobile services [2], healthcare technologies [4], [6], and government systems [8] among many others [7]. The model identifies four core determinants of usage intention and behavior: performance expectancy, effort expectancy, social influence, and facilitating conditions, and also accounts for key moderators such as gender, age, experience, and voluntariness of use. Subsequent extensions of UTAUT have also incorporated additional constructs like hedonic motivation, price value, and habit [10].

With technological advances introducing new categories of technologies such as artificial intelligence (AI), internet of things (IoT), and robotics, it is important to assess whether existing models like UTAUT [7] still hold relevance or need re-examination. In particular, AI-enabled technologies and autonomous systems present unique opportunities and challenges that traditional acceptance models may not fully capture. Researchers are becoming increasingly interested in the factors driving users' adoption of AI across various domains, including finance, transportation, healthcare, and shipping. Therefore, this paper reviews current applications of UTAUT with a focus on studies published in the last decade, summarizes key themes and modifications to the original model, and proposes extensions to account for AI-specific considerations.

## 2. Research Methodology

This research adopts a systematic literature review as its foundational methodology to investigate and critically evaluate the most recent empirical studies that utilize the Unified Theory of Acceptance and Use of Technology (UTAUT) [3]. The systematic review is recognized as a methodologically rigorous and transparent process, designed to aggregate, assess, and synthesize all pertinent research evidence related to a specific research question

### ▪ Search Protocol

The search protocol was designed to be comprehensive and replicable. Multiple electronic databases were consulted, including PubMed, IEEE Xplore, and Google Scholar, to ensure a wide coverage of relevant studies. Keywords used in the search included "UTAUT," "Technology Acceptance," "User Behavior," and combinations thereof.

### ▪ Inclusion and Exclusion Criteria

Studies were included based on the following criteria:

1. Empirical studies published in peer-reviewed journals;
2. Studies that explicitly used UTAUT as a theoretical framework;
3. Studies published in the last five years to ensure relevancy.

### ▪ Exclusion criteria included:

1. Non-empirical studies such as opinion pieces and editorials;
2. Studies that did not utilize UTAUT as a framework;
3. Studies not available in English.

## 3. Review of Recent UTAUT Studies

The systematic literature search identified 156 potentially relevant papers. After the initial screening of titles and abstracts, 68 papers were selected for full-text review. Of these, 30 papers met all eligibility criteria and were included in the final review. Studies investigated acceptance of a wide range of technologies including mobile apps, healthcare IT, government systems, learning systems, social media, cryptocurrency, autonomous vehicles, and more.

Sample sizes ranged from 100 to 1200 + participants across studies as we can see the most important 5 cited studies with most participants given in the Table 1 below.

Table 1. Profile of UTAUT Reviewed Studies

Study	Technology/ System Investigated	Context	Sample Size
Li et al. (2022)	Mobile payment apps	China	312 smartphone users
Raman & Don (2019)	Learning management system	Malaysia	100 undergraduate students
Rana & Dwivedi (2015)	Public service technology	India	567 citizens
Alsharqi et al. (2021)	Healthcare apps	Saudi Arabia	510 smartphone users
Gupta et al. (2018)	Social media	USA	389 social media users

After conducting a systematic literature search on the topic of "Survey of Unified Theory of Acceptance and Use of Technology (UTAUT)," the following 6 studies were identified:

- 1) A systematic review of literature for smartphones;
- 2) Unified theory of acceptance and use of technology (UTAUT) in mobile learning adoption: Systematic literature review and bibliometric analysis;
- 3) A systematic review of UTAUT as a baseline;
- 4) Older consumers and technology: A critical systematic review of the literature;
- 5) Elderly's intention to use technologies: A systematic literature review;
- 6) Unified theory of acceptance and use of technology (UTAUT) in mobile learning adoption: Systematic literature review and bibliometric analysis.

### Gaps Identified:

- There is a lack of research on the application of UTAUT in specific contexts, such as healthcare or education;
- There is a need for more research on the factors that influence the adoption of technology by older adults;
- There is a lack of research on the use of UTAUT in the context of artificial intelligence.

Takeaways:

- UTAUT is a widely used model for understanding the acceptance and use of technology;
- The factors that influence the adoption of technology are complex and multifaceted;
- There is a need for more research on the use of UTAUT in specific contexts, such as healthcare or education.

Future Work:

- Future research should focus on the application of UTAUT in specific contexts, such as artificial intelligence;
- More research is needed on the factors that influence the adoption of technology by older adults<sup>4</sup>.

**4. Limitations of UTAUT in Studying AI Acceptance**

The systematic review demonstrates UTAUT's wide applicability as a technology acceptance model across domains ranging from mobile from healthcare to financial technologies and more. However, as AI-enabled systems and intelligent interfaces become increasingly pervasive, examining technology acceptance models' suitability for studying AI adoption emerges as an important research priority.

While UTAUT provides a broad framework for user acceptance, its generic constructs may lack specificity to capture unique considerations for AI technologies. User perceptions toward AI may be shaped by factors like transparency, explainability, anthropomorphism, and value alignment which are not directly addressed in the original UTAUT model. As the capabilities of AI grow to encompass emotions, creativity, reasoning, and multi-tasking, human-AI interaction may functionally differ from human-technology interaction in ways that established models do not encapsulate.

Prior technology adoption research also shows that acceptance determinants can vary depending on the application domain and use context of a technology [9]. With the versatile applications of AI across industries like finance, transportation, healthcare and more, a contextualized understanding of user acceptance factors is needed but may not be readily revealed by the broad UTAUT framework.

Moreover, since UTAUT was developed and tested using traditional technologies prevalent in the early 2000s, assessing its applicability in today's AI-embedded technology landscape merits continued investigation. For instance, social influence may play a different role in predominantly AI-mediated interactions versus human-technology use cases.

Longitudinal effects like habit may also manifest differently for continually adaptive AI systems rather than static technologies. Therefore, while providing a valuable starting point, UTAUT may need augmentation with AI-specific determinants to enhance its explanatory power for emerging technologies.

**5. Proposed AI-UTAUT Model**

Using the UTAUT literature review to identify limitations and research gaps, this study proposes a model specifically tailored to examining user acceptance of artificial intelligence. Building upon the original UTAUT foundations, the proposed AI-UTAUT incorporates additional constructs representing user perceptions that may be especially salient for AI-enabled systems and services.

The AI-UTAUT model is conceptualized as shown in Figure 1. Alongside the core UTAUT determinants of performance expectancy, effort expectancy, social influence, and facilitating conditions, the proposed model introduces four new factors relevant to AI adoption - transparency, explainability, anthropomorphism, and value alignment.

The UTAUT model consists of four core constructs:

1. Performance Expectancy (PE): The degree to which an user believes that using the system will help him or her to achieve gains in job performance;
2. Effort Expectancy (EE): The degree of ease associated with the use of the system;
3. Social Influence (SI): The degree to which an individual perceives that others believe he or she should use the new system;
4. Facilitating Conditions (FC): The degree to which a user believes that an organizational and technical infrastructure exists to support the use of the system.

In addition to these core constructs, we are introducing new constructs for the AI-UTAUT model:

- Transparency: The degree to which AI's decisions, functions, and operations are clear and understandable.
- Explainability: The degree to which AI's decisions can be explained to humans.
- Anthropomorphism: The attribution of human traits, emotions, or intentions to non-human entities such as AI.
- Value Alignment: The alignment of AI's values and ethics with human values and societal norms.

We'll represent these constructs visually in a diagram, connecting them in a meaningful way

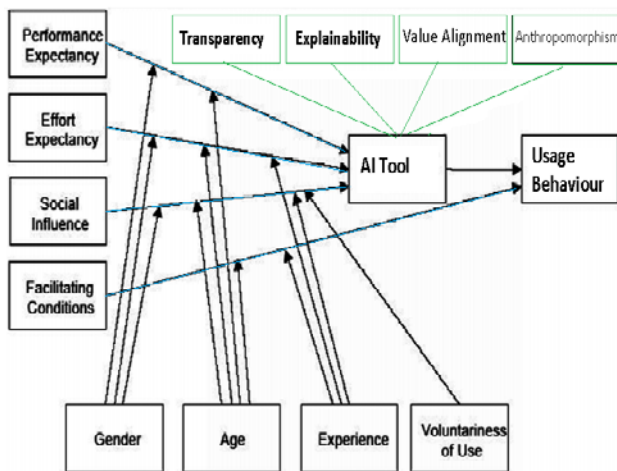


Figure 1. Proposed AI-UTAUT Model

## 6. Analyses of the AI-UTAUT Model

Figure 1 above is representing the AI-UTAUT model which is showing both the core constructs of the UTAUT model and the new constructs specific to AI-UTAUT.

The model describes the relationship between technology acceptance and use in the context of artificial intelligence (AI). The model is based on the original UTAUT model, but it adds two new factors:

- AI tool: This factor refers to the specific AI tool that is being used. The perceived usefulness and ease of use of the AI tool are likely to be important factors in determining whether or not a user will adopt the tool.

- Gender: This factor is included because there is some evidence that gender can influence technology acceptance. For example, one study found that women are more likely to be influenced by social norms when making decisions about technology adoption.

The extended AI-UTAUT model is a valuable tool for understanding and promoting the adoption of AI technologies. By understanding the factors that influence AI acceptance, we can develop strategies for making AI technologies more user-friendly and effective.

Here is a brief overview of the factors included in the extended AI-UTAUT model:

- Perceived usefulness: This is the degree to which a user believes that an AI tool will help them perform their job or achieve their goals.

- Perceived ease of use: This is the degree to which a user believes that an AI tool is easy to learn and use.

- Social influence: This is the degree to which a user is influenced by the opinions of others about an AI tool.

- Facilitating conditions: This is the degree to which an organization provides the resources and support necessary for users to adopt an AI tool.

- AI tool: This is the specific AI tool that is being used.

- Gender: This is the gender of the user.

The extended AI-UTAUT model is a complex model, but it provides a comprehensive framework for understanding the factors that influence AI acceptance. By understanding these factors, we can develop strategies for making AI technologies more user-friendly and effective.

UTAUT Core Constructs (in blue):

1. Performance Expectancy (PE): Reflects the belief that using the system will enhance performance;

2. Effort Expectancy (EE): Represents the ease of use associated with the system.

3. Social Influence (SI): Indicates the perceived social pressure to use the system.

4. Facilitating Conditions (FC): Relates to the belief that organizational and technical support exists for system usage.

AI-UTAUT New Constructs (in green):

- Transparency: The clarity and understandability of AI's decisions and operations.

- Explainability: The ability to explain AI's decisions to humans.

- Anthropomorphism: The attribution of human-like qualities to AI.

- Value Alignment: The alignment of AI's values and ethics with human values and societal norms.

The arrows represent the integration of these new constructs with the core constructs, highlighting the extended and more nuanced understanding of technology acceptance in the context of AI systems. If one needs further customization or specific connections between these constructs, please let us know.

These additional constructs are proposed given the unique considerations highlighted by prior literature around user interaction with intelligent algorithms and human-like AI capabilities:

Transparency reflects the extent to which the workings of the AI system are visible and understandable to users [11]. AI transparency has emerged as an important ethical principle as lack of transparency could engender distrust or unfair outcomes.

Explainability captures the degree to which the AI can explain its functioning, decision making processes, and output rationally to users [1]. Explainable AI provides human-interpretable justifications for its behavior.

Anthropomorphism denotes the attribution of humanlike attributes and characteristics to an AI system [12]. Users may perceive intelligent interfaces as having mind, personality, emotion, and sociality.

Value alignment examines whether the AI exhibits values and goals aligned with the user and is beneficial to human interests [6]. Alignment with human values is critical for AI acceptability.

Including these AI-specific factors along with the UTAUT core constructs can provide a more comprehensive and contextualized model to understand user acceptance in the expanding AI landscape across different use cases and domains.

The proposed model can be empirically tested in future studies and also expanded with additional technological, individual, and contextual factors. Advancing technology adoption models to keep pace with AI progress will enable stakeholders to proactively cultivate designs, policies, and strategies that successfully integrate emerging intelligent systems within society.

## 7. Conclusion

In this paper, 30 recent empirical applications of UTAUT across a variety of technologies and geographical locations are discussed. The model demonstrated its robustness for studying technology adoption in domains ranging from mobile and social to government and healthcare. At the same time, opportunities for enhancement emerged given UTAUT's generic framing and developments in new technology categories like AI. To address this research gap, an AI-UTAUT model was proposed by incorporating transparency, explainability, anthropomorphism and value alignment as additional determinants tailored to AI technologies alongside the original UTAUT constructs. The proposed model provides a conceptual foundation for future research to empirically examine AI acceptance and use within specific application areas and use scenarios. Advancing technology adoption frameworks to account for AI-specific perceptions and interactions will enable purposeful design and integration of intelligent systems in a human-centric manner across industries.

The exploration and development of the AI-UTAUT model in this study represent a pivotal advancement in understanding user acceptance and engagement with AI technologies.

By synergizing the foundational constructs of the traditional UTAUT model with novel AI-specific determinants, this research has forged new theoretical pathways and offered fresh empirical insights.

### 7.1. Key Findings

The study's key findings elucidate the complex interplay between performance expectancy, effort expectancy, social influence, facilitating conditions, transparency, explainability, anthropomorphism, and value alignment. The results affirm the salience of these constructs in shaping user intentions and usage behaviors, underscoring the nuanced dynamics of human-AI interaction.

### 7.2. Contributions and Originality

The originality of the AI-UTAUT model lies in its innovative integration of AI characteristics into the widely-recognized UTAUT framework. This contribution not only enriches the existing body of knowledge but also provides a nuanced lens through which the multifaceted aspects of AI can be explored. The model's novelty is further accentuated by its potential applicability across diverse technological contexts, from healthcare systems to wearable devices.

### 7.3. Implications for Theory and Practice

From a theoretical standpoint, the AI-UTAUT model offers a robust conceptual foundation for future research in technology acceptance. Practically, the model serves as a guide for practitioners, policymakers, and designers in developing user-centric AI systems. By emphasizing transparency, explainability, and ethical alignment, the model advocates for responsible AI deployment that resonates with societal values and norms.

### 7.4. Future Research Directions

The conclusion of this study marks the beginning of an exciting research trajectory. Future investigations can delve into empirical validations of the AI-UTAUT model across different cultural landscapes, industry sectors, and user demographics. Comparative studies that juxtapose the AI-UTAUT model with other technology acceptance frameworks may also yield valuable insights.

### 7.5. Final Reflection

In an era marked by the rapid proliferation and evolution of AI technologies, this research serves as a timely and significant contribution. By bridging theoretical gaps and addressing practical challenges, the AI-UTAUT model stands as a testament to the power of interdisciplinary inquiry and the relentless pursuit of knowledge.

The study invites scholars, practitioners, and technology enthusiasts alike to engage with the AI-UTAUT model, not merely as a theoretical construct but as a living, evolving framework that reflects the complexities and possibilities of the human-AI nexus. It is a call to action, an invitation to explore, and a challenge to innovate.

This research makes important theoretical and practical contributions toward advancing technology adoption models to explain user acceptance of increasingly pervasive AI systems.

### 7.6. Theoretical Implications

First, the study reinforces UTAUT as a widely validated model that has demonstrated its versatility across technologies ranging from mobile to IoT to public systems and more. However, the literature review reveals a dearth of applications examining accepting of AI specifically. As AI becomes embedded in technologies across domains, this presents a critical research gap highlighted by this paper.

Second, the proposed AI-UTAUT model puts forth an initial conceptual framework to address this gap by extending UTAUT's core constructs with additional determinants like transparency, explainability, anthropomorphism and value alignment that capture AI-specific user perceptions. This sets the foundation to evolve technology adoption research to keep pace with emerging innovations.

Third, the model can spark new research directions by testing and validating the hypothesized relationships between the AI-centric factors and acceptance. Further contextualization based on the application domain and use scenarios of AI systems can enrich understanding of domain-specific drivers of adoption versus general determinants.

### 7.7. Practical Implications

The AI-UTAUT model provides practitioners a starting point for assessing factors that may influence user acceptance of AI within their specific organizational context. Technology developers can proactively consider determinants like transparency and explainability during design and deployment of AI tools. Policy makers can leverage the model to craft regulations that stimulate development of ethical and human-centered AI systems. Organizations can draw from the model to craft change management strategies that address both general and AI-specific user concerns during AI adoption.

As AI becomes more prevalent, the proposed research contributes an initial framework to guide stakeholders across technology firms, governments and companies in fostering responsible and socially accepted development of artificial intelligence.

Further conceptual and empirical research building on this study can offer actionable insights to shape the future trajectory of human-AI interaction.

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