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# Factors Impacting the Adoption and Acceptance of ChatGPT in Educational Settings: A Narrative Review of Empirical Studies

**Mousa Al-kfairy**

College of Technological Innovation, Zayed University, Abu Dhabi P.O. Box 144534, United Arab Emirates; mousa.al-kfairy@zu.ac.ae

**Abstract:** This narrative review synthesizes and analyzes empirical studies on the adoption and acceptance of ChatGPT in higher education, addressing the need to understand the key factors influencing its use by students and educators. Anchored in theoretical frameworks such as the Technology Acceptance Model (TAM), Unified Theory of Acceptance and Use of Technology (UTAUT), Diffusion of Innovation (DoI) Theory, Technology–Organization–Environment (TOE) model, and Theory of Planned Behavior, this review highlights the central constructs shaping adoption behavior. The confirmed factors include hedonic motivation, usability, perceived benefits, system responsiveness, and relative advantage, whereas the effects of social influence, facilitating conditions, privacy, and security vary. Conversely, technology readiness and extrinsic motivation remain unconfirmed as consistent predictors. This study employs a qualitative synthesis of 40 peer-reviewed empirical studies, applying thematic analysis to uncover patterns in the factors driving ChatGPT adoption. The findings reveal that, while the traditional technology adoption models offer valuable insights, a deeper exploration of the contextual and psychological factors is necessary. The study's implications inform future research directions and institutional strategies for integrating AI to support educational innovation.

**Keywords:** ChatGPT in education; intention to use; acceptance; narrative review; information systems theories



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## 1. Introduction

The advancement of artificial intelligence (AI) has significantly influenced numerous sectors, including education. Among the various AI technologies, ChatGPT, created by OpenAI, has attracted considerable attention for its sophisticated conversational abilities and its potential to enrich educational experiences. As an AI-driven chatbot, ChatGPT provides personalized, interactive support to students, offering solutions to complex questions, feedback on assignments, and enabling open-ended discussions [1]. Its versatility and usefulness make it a transformative tool in higher education, with the capability to redefine the traditional learning models.

However, the adoption of ChatGPT in higher education is shaped by numerous factors that affect its acceptance and practical use among students and educators [2–5]. Understanding these factors is essential for fully realizing the potential of ChatGPT and ensuring its smooth integration into educational environments. Empirical studies have investigated various aspects of ChatGPT adoption, including technological attributes, user perceptions, institutional policies, and broader educational contexts.

This narrative review seeks to compile the findings from empirical studies regarding the factors affecting the adoption of ChatGPT in education. By concentrating on evidence-based research, the review aims to pinpoint the main factors that either encourage or impede the acceptance and use of ChatGPT among students and educators. The insights from this review will provide crucial guidance for educational institutions, policymakers, and technology developers in enhancing the deployment and utilization of ChatGPT in educational settings.

The review is structured to initially present the theoretical frameworks frequently used in studies on ChatGPT adoption. It will then categorize and discuss the empirical findings under several themes: technological factors (e.g., perceived usefulness and ease of use), personal factors (e.g., attitudes, trust, and self-efficacy), social factors (e.g., social influence and peer usage), and organizational factors (e.g., institutional support and policy frameworks).

This narrative review attempts to answer the following questions:

- Which theoretical frameworks have been utilized in empirical studies examining user acceptance and adoption of ChatGPT in educational settings?
- What technological and personal factors influence the adoption of ChatGPT in higher education?

This narrative review provides a comprehensive overview of these studies, aiming at the nature of ChatGPT adoption and offering actionable insights for fostering its effective integration in higher education.

To achieve this goal, the following sections will be presented: first, an introduction to the narrative review methodology; next, the review results; followed by a discussion of the theoretical and practical implications and future research directions. The final section provides the conclusion.

## 2. Review Methodology

This narrative review aims to synthesize and analyze empirical studies on adopting and accepting ChatGPT in educational settings. The review follows a systematic approach to ensure the comprehensive inclusion of relevant studies, rigorous data extraction, and insightful synthesis of findings.

### *2.1. Research Design*

A narrative review approach offers a qualitative synthesis of empirical studies. This method enables an in-depth examination of the existing literature, helping to identify key themes, patterns, and gaps in research related to ChatGPT adoption and acceptance in educational settings. The following subsection explains the steps used in this research (as highlighted in Figure 1).

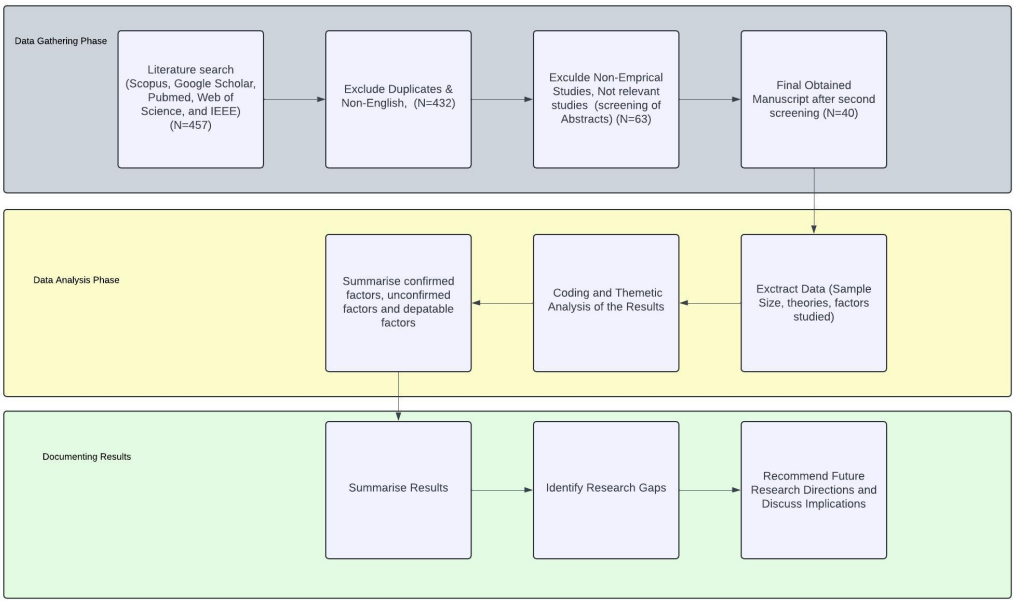


**Figure 1.** Research design process.

Figure 1 presents an overview of the research design process, illustrating the key steps undertaken during data collection, screening, and analysis. This comprehensive process

enabled the identification of factors influencing the use and acceptance of ChatGPT in educational settings. The following subsections provide a detailed breakdown of each stage within the research design. In this study, we employed similar strategy as illustrated in [6,7]

### *2.2. Data Sources and Search Strategy*

A comprehensive literature search was conducted using several electronic databases, including Scopus, Google Scholar, PubMed, Scopus, Web of Science, and IEEE Xplore. These databases were chosen for their extensive coverage of academic publications in technology, education, and social sciences.

### *2.3. Search Strategy*

The search terms used included combinations of the following keywords: "ChatGPT", "higher education", "adoption", "acceptance", "empirical study", "technology acceptance model", "TAM","UTAUT", "UTAUT2", "TOE", "Technology-Organization-Environment", "DoI", "Diffusion of Innovation", "anthropomorphism", "Hedonic Motivation System Adoption Model", "Extended Value-Based Adoption Model", "Theory of Planned Behavior", "Interpretative Phenomenological Analysis", "trust", "design novelty", and "institutional policy". The search was limited to peer-reviewed articles published in English from January 2018 to June 2024 to capture the most recent and relevant studies.

### *2.4. Inclusion/Exclusion Criteria*

Inclusion Criteria:

- Empirical studies investigating the factors influencing the adoption and acceptance of ChatGPT in educational settings.
- Studies utilizing established theoretical frameworks, such as TAM, TOE, DOI, UTAUT, UTAUT2, IPA, HMSAM, VAM, TPB, or their extensions.
- Studies providing quantitative or qualitative data on the determinants of ChatGPT adoption.
- Studies published in peer-reviewed journals or conference proceedings.

Exclusion Criteria:

- Studies not focused on educational settings.
- Studies not empirically investigating the factors influencing ChatGPT adoption.
- Non-peer-reviewed articles, opinion pieces, editorials, and book chapters.
- Studies published in languages other than English.

The initial search yielded 457 articles. After removing duplicates and non-English articles, the number of articles remained at 432. The titles and abstracts of these articles were screened for relevance, resulting in 63 articles selected for full-text review. After thoroughly examining the full texts, 40 articles met the inclusion criteria and were included in the final analysis.

### *2.5. Data Extraction Process*

The data extraction process involved systematically reviewing and gathering relevant information from the selected studies. The extracted information included the following:

- **Study Details**: Author(s), year of publication, and country where the study was conducted.
- **Research Design**: The type of study (e.g., survey, interview, or mixed-methods approach), sample size, and data collection methods employed.
- **Theoretical Framework**: The theoretical models applied in the studies (e.g., TAM, UTAUT, DoI, and ToE), along with any additional constructs explored (e.g., anthropomorphism and trust).
- **Key Findings**: Factors influencing ChatGPT adoption were identified and analyzed using various models (e.g., TAM, UTAUT, ToE, and DoI), with statistical significance assessments where applicable. Additional relevant constructs were incorporated and evaluated.

- **Contextual Information**: The educational discipline or course under evaluation, characteristics of the study population, and consideration of institutional policies.

This approach ensured that comprehensive and consistent data were captured across all studies to facilitate the subsequent analysis.

#### 2.5.1. Mitigating Researcher Bias in Study Selection

Several precautions were taken during the study selection to minimize researcher bias and ensure the objectivity of this narrative review.

First, a systematic search strategy was employed across multiple academic databases, including Scopus, Web of Science, and Google Scholar. This ensured a broad literature search, reducing the chance of selective inclusion of studies. The search terms were predefined and closely aligned with the focus on ChatGPT adoption in higher education. This process helped to ensure that a wide range of relevant studies were considered and minimized the risk of missing significant research [8].

Second, clearly defined inclusion and exclusion criteria were established before the study selection process to prevent subjective judgment. Studies were included if they were empirical, peer-reviewed, and focused on adopting or accepting ChatGPT in educational settings. Theoretical studies that did not relate to higher education or lacked sufficient empirical evidence were excluded. Applying these criteria consistently throughout the review helped to maintain a structured approach and avoided subjective bias during the study selection phase [9].

Third, although this is a one-author study, a reflective approach was taken to reduce potential bias. Throughout the process, the author employed self-reflection and critically re-examined decisions made during study selection. This included reviewing any borderline cases and reassessing inclusion decisions to ensure fairness. To strengthen objectivity, feedback was also sought from colleagues to review the methodology and study the inclusion process [10].

By utilizing these strategies, the study aimed to mitigate subjective bias and maintain the review's integrity. A systematic and transparent approach to study selection ensures that the findings are robust and reflect the broader research landscape on ChatGPT adoption in higher education.

#### 2.5.2. Thematic Analysis

The extracted data were synthesized using a thematic analysis approach, widely recognized for its ability to identify, analyze, and report patterns within qualitative data [11]. Thematic analysis was chosen because it is flexible in exploring complex phenomena like technology adoption. This enables a more detailed understanding of the various factors influencing ChatGPT adoption across different studies. Using this method, we could systematically organize and interpret the data to derive themes that offer meaningful insights into the research findings.

The process involved the following steps:

- **Familiarization**: Reading and re-reading the extracted data to become familiar with the content.
- **Coding**: Generating initial codes for significant aspects related to the adoption of ChatGPT.
- **Generating Themes**: Collating codes into potential themes and sub-themes based on patterns identified in the data.
- **Reviewing Themes**: Refining themes by checking them against the extracted data and ensuring accurate representation.
- **Defining and Naming Themes**: Clearly defining each theme and sub-theme and naming them to reflect the key findings.

## 3. Review Results

Figure 2 shows the reviewed papers per year, highlighting that 16 empirical papers were reviewed from 2023 and 24 from 2024. This indicates a significant increase in publications discussing ChatGPT adoption and acceptance in educational settings. The growing body of literature reflects the rising interest and recognition of ChatGPT's potential impact on education. Researchers are increasingly focusing on understanding how ChatGPT can be integrated into educational practices to enhance learning outcomes and streamline educational processes.

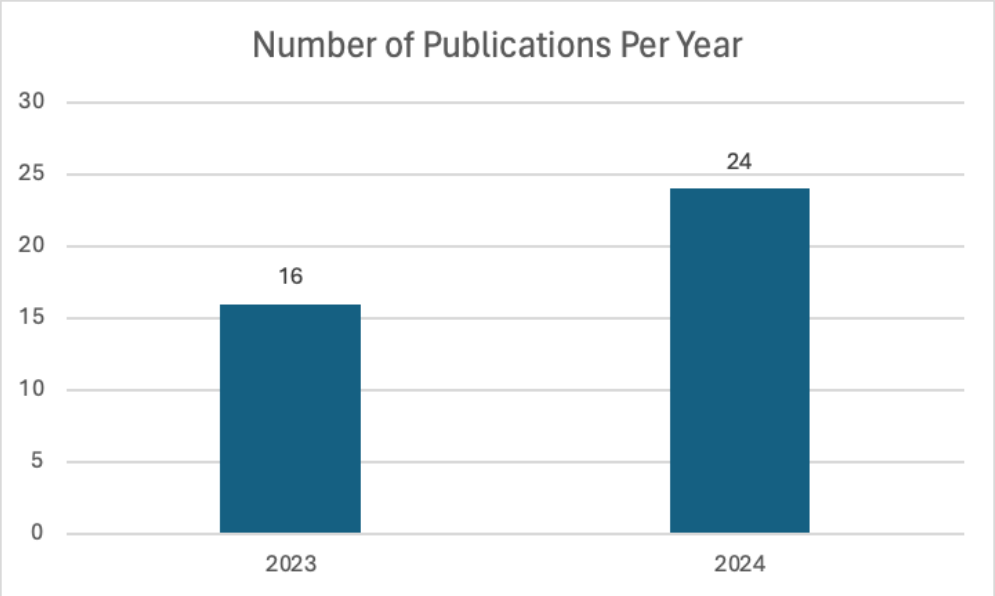


**Figure 2.** Number of publications analyzed per year.

The increase in publications from 2023 to 2024 underscores the urgency and importance placed on exploring the various factors influencing ChatGPT adoption. This trend suggests that educational institutions and researchers are keen to address the challenges and opportunities presented by this advanced AI technology. The reviewed studies span various educational contexts, offering insights into the diverse applications and implications of ChatGPT in higher education. As the technology evolves, the expanding research base will be crucial for developing effective strategies to leverage ChatGPT's capabilities, ensuring its successful integration into educational systems worldwide. This surge in research highlights the academic community's proactive approach to harnessing AI-driven tools for future educational advancements.

Moreover, Table 1 shows the list of confirmed, unconfirmed, and debatable factors influencing the adoption and acceptance of ChatGPT in educational settings. The confirmed factors are consistently found to be significant across empirical studies.

The unconfirmed factors were found to be insignificant across studies. In contrast, the debatable factors have shown mixed results in terms of significance, including trust, extrinsic motivation, privacy and security, technology readiness, reliability, and accuracy concerns. These debatable factors highlight areas where further research is needed to clarify their impact on adopting and accepting ChatGPT in education. The detailed categorization of these factors is presented in Table 1.

The following subsections discuss in detail the theories used in the empirical studies, the factors examined, the methodology applied, and the gaps in the current literature.

**Table 1.** Summary of studied educational ChatGPT adoption and acceptance factors.

| Confirmed Factors | Debatable Factors | Unconfirmed Factors |
|---|---|---|
| Network quality | Social influence | Demographics |
| Accessibility | Perceived ease of use | Extrinsic motivation |
| System responsiveness | Effort expectancy | Anxiety |
| Satisfaction | Facilitating conditions | Technology readiness |
| Organizational culture | Trust | Characteristics of ChatGPT |
| Knowledge application | Privacy and Security | Reliability and accuracy concerns |
| Feedback quality | Cost | Reduced human interaction |
| Assessment quality | Personal Innovativeness | Lack of institutional support |
| Hedonic motivation | Curiosity | Overreliance on ChatGPT |
| Habit | Control | Institutional policy |
| Intrinsic motivation | Perceived usefulness | Perceived technicality |
| Relative advantage | Perceived enjoyment | Personal competency |
| Compatibility | Perceived AI intelligence | |
| Complexity | Subjective norm | |
| Trialability | Self-efficacy | |
| Observability | | |
| Usability | | |
| Perceived benefits | | |
| Disconfirmation of expectations | | |
| Relative risk perception | | |
| Emotional factors | | |
| Knowledge sharing | | |
| Perceived system quality | | |
| Online course design | | |
| Perceived anthropomorphism | | |
| Design novelty | | |
| Metacognitive self-regulation learning | | |
| Perceived credibility | | |

### *3.1. Technology Acceptance Model and Its Extensions*

The Technology Acceptance Model (TAM) is a well-known and widely used theoretical framework for understanding the adoption and acceptance of technology in various fields, including education. Developed by Davis (1989), the TAM posits that two primary factors—perceived ease of use (PEOU) and perceived usefulness (PU)—determine users' attitudes towards a technology, which in turn influence their behavioral intention to use the technology and actual usage behavior [12]. This model has been extensively applied to study the adoption of ChatGPT in higher education, providing valuable insights into the confirmed and unconfirmed factors that influence its acceptance among students and educators [4,13–16].

#### 3.1.1. Discussed Factors

**Perceived Ease of Use (PEOU):**

Multiple empirical studies have confirmed that perceived ease of use (PEOU) significantly predicts users' attitudes toward ChatGPT. When users find ChatGPT easy to use, they are more likely to develop a positive attitude towards its use, thereby increasing their intention to adopt the technology. For instance, students who perceive ChatGPT as user-friendly are more inclined to integrate it into their learning processes, utilizing it for various academic tasks such as writing assistance, research, and interactive learning. The intuitive

design and straightforward functionality of ChatGPT reduce the learning curve, making it accessible even for those with limited technical expertise. This ease of use fosters a supportive learning environment where students can focus more on their educational goals rather than on navigating complex technological interfaces [17–20]. However, a study found that perceived ease of use (PEOU) does not significantly influence users' intention to use ChatGPT in education. This finding prompts a deeper exploration of the construct's relevance, highlighting the need for further discussion and additional empirical evidence to validate its role [14].

**Perceived Usefulness (PU):**

Perceived usefulness (PU) has consistently influenced users' attitudes and behavioral intentions to use ChatGPT positively. Users who believe that ChatGPT enhances their productivity and academic performance are more likely to adopt it. This factor has been particularly significant among educators who view ChatGPT as a valuable tool for facilitating teaching and providing additional student support. Educators recognize that ChatGPT can assist in creating engaging lesson plans, offering personalized feedback, and supporting students with diverse learning needs. By streamlining administrative tasks and enriching the educational experience, ChatGPT enables educators to focus more on interactive and meaningful teaching practices. This perceived benefit of improved efficiency and effectiveness in academic tasks strongly motivates both students and educators to embrace ChatGPT as an integral part of their educational toolkit [4,13,21]. The consistent positive impact of PU across studies highlights the critical role of perceived benefits in driving the acceptance and integration of innovative educational technologies.

**Feedback Quality and Assessment Quality:**

High-quality feedback and assessment provided by ChatGPT positively influence behavioral intentions to use the technology. Students appreciate timely and constructive feedback, which supports their learning process and encourages continuous engagement with ChatGPT. By offering instant personalized responses and detailed evaluations, ChatGPT helps students to understand their strengths and areas for improvement, facilitating a more effective and individualized learning experience. This capability to provide high-quality feedback not only enhances students' academic performance but also builds their confidence and motivation to use the technology regularly. The continuous engagement fostered by such feedback mechanisms ensures that students remain actively involved in their learning, leveraging ChatGPT as a reliable educational companion [4]. The consistent appreciation of high-quality feedback underscores its importance in educational tools, demonstrating that constructive and timely assessments are key to fostering positive user experiences and sustained adoption.

**Trust:**

Trust in ChatGPT significantly impacts users' attitudes and intentions to use the technology. When users trust the system's capabilities and reliability, they are more likely to adopt it. Trust is particularly crucial in educational settings, where the accuracy and dependability of information are crucial. Instructors and students must feel confident that ChatGPT can provide precise, reliable responses to academic queries and support educational activities without errors. This trust is built through consistent performance, transparency in AI processes, and assurances of data security and privacy. When users believe ChatGPT is a dependable tool that upholds academic integrity, they are more willing to integrate it into their learning and teaching processes. The impact of trust on adoption underscores its foundational role in the successful implementation of AI technologies in education, ensuring that users can rely on the system for high-stakes educational tasks [4,22,23]. The significance of trust across multiple studies highlights the necessity for developers and educational institutions to prioritize building and maintaining trust in AI technologies to facilitate widespread acceptance and utilization. Nevertheless, trust did not consistently significantly impact users' adoption of ChatGPT. This inconsistency raises questions regarding how trust is measured across different studies, which may account for

the variation in its influence. It underscores the need for further exploration and a more standardized approach to assessing trust.

**Extrinsic Motivation:**

Contrary to the expectations, extrinsic motivation did not significantly impact the adoption of ChatGPT in some studies. This finding suggests that external rewards or pressures may not be as influential as intrinsic factors such as perceived usefulness and ease of use. Users seem to be more motivated by how ChatGPT directly benefits their productivity and learning experiences rather than by external incentives or obligations. This highlights the importance of designing educational technologies that inherently offer substantial value and ease of use as these intrinsic qualities drive user engagement and adoption more effectively than extrinsic motivators. The diminished role of extrinsic motivation underscores the need to focus on creating user-centric AI tools that align with the users' internal motivations and preferences, ensuring long-term adoption and satisfaction [13]. This insight into the lesser influence of extrinsic motivation encourages educators and developers to prioritize enhancing the intrinsic appeal of educational technologies to foster deeper, more sustained user engagement.

**Perceived Enjoyment:**

Perceived enjoyment, which refers to the fun and pleasure derived from using ChatGPT, was found to have an insignificant effect on attitudes towards using the technology. This result indicates that, while enjoyment might enhance the overall user experience, it is not a critical determinant of adoption in educational contexts. Users in educational settings seem to prioritize practical benefits such as improved productivity, ease of use, and the technology's ability to meet their academic needs over the enjoyment factor. This finding suggests that the primary drivers of adoption are more aligned with functional and performance-related attributes rather than the entertainment value of the technology. Consequently, developers and educators should focus on optimizing the practical utility and reliability of ChatGPT to support educational goals better as these aspects are more influential in encouraging adoption [18]. The minimal impact of perceived enjoyment emphasizes the importance of addressing the core academic requirements and practical applications of AI tools in education to ensure their effective integration and sustained use.

**Privacy and Security Concerns:**

Studies have indicated that privacy and security concerns did not significantly influence perceived ease of use or usefulness. Despite their importance, their impact on the adoption of ChatGPT appears to be minimal. This suggests that users may prioritize the practical benefits and functionalities of ChatGPT over potential privacy and security risks. The perceived advantages, such as enhanced productivity, ease of use, and academic support, seem to outweigh data privacy and security concerns. This finding highlights that, while privacy and security are crucial, they do not significantly deter users from adopting ChatGPT if the technology provides substantial benefits and meets their needs effectively [14,23]. This minimal impact underscores the importance of developers maintaining robust privacy and security measures without compromising the technology's usability and effectiveness, ensuring that users continue to perceive high value in using ChatGPT.

**Anxiety and Technology Readiness:**

Anxiety about using ChatGPT and general technology readiness did not significantly impact adoption. While these factors might be relevant in other contexts, they appear to be less critical in adopting ChatGPT among higher education students and educators. This suggests that users in educational settings may have sufficient familiarity and comfort with technology, reducing the influence of anxiety and readiness on their decision to adopt ChatGPT. Instead, these users might focus more on the technology's tangible benefits and ease of use. This finding indicates that concerns about technological anxiety and readiness may not be major barriers to adoption in educational environments where the users are generally accustomed to integrating new technologies into their workflows [24]. The minimal impact of these factors highlights the importance of emphasizing the practical

advantages and straightforward usability of ChatGPT to encourage its widespread adoption among students and educators.

#### 3.1.2. Extended TAM with System Characteristics and Individual Factors

Some studies have incorporated system characteristics such as perceived system quality and online course design into the Technology Acceptance Model (TAM). These factors positively impact perceived usefulness and ease of use, enhancing users' attitudes and behavioral intentions towards ChatGPT. High system quality, characterized by reliability, efficiency, and user-friendliness, ensures that users have a seamless and productive experience with ChatGPT. Similarly, well-designed online courses that effectively integrate ChatGPT can significantly improve the perceived value and usability of the technology. By addressing these system characteristics, educators and developers can foster a more positive attitude towards ChatGPT, encouraging greater adoption and sustained use in educational settings [25]. Including system quality and course design aspects highlights the importance of a robust and user-centric technological infrastructure in driving the acceptance and effectiveness of educational technologies.

#### 3.1.3. Extended TAM with Trust and Perceived Risk

Trust has been added as an essential construct in the extended Technology Acceptance Model (TAM) to account for the reliability and security concerns associated with using ChatGPT. This extension highlights the critical role of trust in shaping users' attitudes and intentions. When users trust that ChatGPT is reliable and secure, they are more likely to develop positive attitudes toward its adoption and use. Although perceived risk is sometimes considered to be insignificant, it still plays a role in understanding users' apprehensions about adopting new technologies. By incorporating trust into the extended TAM, researchers and developers can better address the concerns users may have regarding the dependability and safety of ChatGPT, thereby fostering greater acceptance and utilization of the technology in educational settings [24]. This approach underscores the importance of building and maintaining user trust to ensure the successful integration of AI tools in education.

The Technology Acceptance Model (TAM) and its extensions provide a robust framework for understanding the adoption of ChatGPT in higher education. Confirmed factors such as perceived ease of use, perceived usefulness, attitude, feedback quality, trust, and personal innovativeness play significant roles in influencing adoption. However, unconfirmed factors like extrinsic motivation, perceived enjoyment, technicality, cost, privacy concerns, anxiety, and technology readiness highlight the complexity and variability among the technology adoption processes. By incorporating additional constructs and extending the original TAM, researchers can capture a more comprehensive picture of the determinants that facilitate or hinder the adoption of ChatGPT in educational settings. Future research should continue to explore these extensions and validate their relevance in diverse educational contexts.

### *3.2. Unified Theory of Acceptance and Use of Technology (UTAUT) and Extensions*

The Unified Theory of Acceptance and Use of Technology (UTAUT) is a comprehensive model Venkatesh et al. (2003) developed to explain user intentions to adopt information technology and subsequent usage behavior. The UTAUT consolidates eight previous models of technology acceptance and identifies four fundamental constructs: performance expectancy (PE), effort expectancy (EE), social influence (SI), and facilitating conditions (FCs). Various moderating factors, including age, gender, experience, and voluntariness of use, influence these constructs. The UTAUT and its extensions have been extensively applied to study the adoption of ChatGPT in higher education, providing valuable insights into the confirmed and unconfirmed factors that influence its acceptance among students and educators [26].

3.2.1. Discussed Factors

**Performance Expectancy (PE):**

Performance expectancy is the degree to which users believe that using ChatGPT will help them to achieve gains in job performance or learning outcomes. Empirical studies have consistently confirmed that performance expectancy (PE) significantly predicts behavioral intention to use ChatGPT. Students and educators who perceive ChatGPT as beneficial for improving academic performance and productivity are more likely to adopt the technology. The belief that ChatGPT can enhance their efficiency and effectiveness in academic tasks motivates users to integrate it into their daily routines. Several studies have confirmed the crucial role that PE plays in the integration of ChatGPT in educational settings, highlighting the importance of this factor in driving adoption. This consistent finding underscores the need for educational technologies to clearly demonstrate their practical benefits to encourage widespread use among students and educators [5,27–30]. The significant influence of PE emphasizes that showcasing tangible improvements in academic outcomes is key to fostering positive attitudes and increased adoption of ChatGPT.

**Effort Expectancy (EE):**

Effort expectancy refers to the ease of use associated with ChatGPT. Studies have shown that effort expectancy (EE) positively correlates with behavioral intention and actual use of ChatGPT. When users find ChatGPT easy to use, they are more likely to develop a positive attitude towards its adoption. This factor is particularly important in educational settings, where ease of use can facilitate seamless integration into learning and teaching processes. EE has been confirmed as an important factor impacting users' adoption of ChatGPT in educational settings, highlighting the necessity for user-friendly interfaces and intuitive designs to encourage widespread use [31–34]. However, some studies have found that EE did not significantly influence behavioral intention or use behavior, suggesting that its impact may differ based on specific contexts or user groups [30,35,36]. This variability indicates that, while EE is generally important, its role in adoption may be influenced by other factors or specific educational environments.

**Social Influence (SI):**

Social influence is the degree to which users perceive that important others believe they should use ChatGPT. Research has confirmed that social influence (SI) significantly affects behavioral intention to adopt ChatGPT. The impact of peers, instructors, and societal norms is crucial in shaping users' attitudes towards ChatGPT. This influence is especially significant in collaborative learning environments where peer usage can encourage wider adoption. For instance, when students see their classmates and teachers effectively using ChatGPT, they are likelier to adopt the technology. This peer-driven adoption can create a positive feedback loop, further embedding ChatGPT into the educational process [5,27,37]. However, while SI is generally a significant predictor, some studies have reported that it did not consistently influence adoption intentions. This discrepancy may be due to varying levels of peer and instructor influence across different educational settings, suggesting that the impact of social influence can depend on specific contextual factors [36,38]. This variability highlights the need for a nuanced understanding of how social dynamics affect technology adoption in different educational environments.

**Facilitating Conditions (FCs):**

Facilitating conditions refer to the availability of resources and support necessary for using ChatGPT. Empirical studies have validated that facilitating conditions (FCs) positively influence effort expectancy and behavioral intention. Users with access to adequate technical support and infrastructure are more likely to adopt and use ChatGPT effectively. This factor underscores the importance of institutional support in promoting the adoption of new technologies in education. Access to reliable internet, functional devices, and prompt technical assistance ensures that users can utilize ChatGPT without significant barriers, enhancing their overall experience and likelihood of adoption [27,28]. However, some studies have found that FCs did not significantly influence behavioral intention or use behavior, indicating that the impact may vary based on specific contexts or user

groups [30,35,36]. This variability suggests that, while facilitating conditions are generally important, their role in adoption may depend on the particular educational environment and the existing technological infrastructure.

**Demographic Factors (Age, Gender, etc.):**

Demographic factors such as age and gender were found to have an insignificant effect on the intention to adopt ChatGPT in some studies. This finding indicates that the adoption of ChatGPT may be more influenced by individual attitudes and external factors rather than demographic characteristics [30,36].

#### 3.2.2. UTAUT2

The UTAUT2, an extension of the Unified Theory of Acceptance and Use of Technology (UTAUT), incorporates additional constructs such as hedonic motivation, price value, and habit. These factors are designed to provide a deeper understanding of consumer use and have been applied to explore ChatGPT adoption in educational settings. For instance, hedonic motivation, which refers to the enjoyment or pleasure derived from using ChatGPT, has positively influenced users' behavioral intention to adopt the technology [30]. This suggests that, when users find ChatGPT engaging and enjoyable, they are likelier to develop a positive attitude toward its use. However, some studies have reported that hedonic motivation did not significantly impact adoption, indicating variability in its influence based on different user contexts [39]. This variability highlights the need to consider how individual preferences and contexts may affect the role of hedonic motivation in the adoption process, reflecting the complex interplay of the factors influencing technology use in educational settings.

#### 3.2.3. UTAUT with Personal Innovativeness

Personal innovativeness in technology has been added to the Unified Theory of Acceptance and Use of Technology (UTAUT) to account for individual differences in technology adoption. Personal innovativeness positively influences users' willingness to try and adopt new technologies like ChatGPT. Individuals with high personal innovativeness are likelier to experiment with and embrace new technological tools, demonstrating a proactive attitude towards innovation. This extension of the UTAUT helps to understand the role of individual traits in the adoption process, highlighting that users who are inherently more open to new experiences are crucial drivers of technology adoption [30]. By acknowledging personal innovativeness, researchers and educators can better tailor their strategies to encourage adoption among different user groups, ensuring that technological innovations like ChatGPT are effectively integrated into educational settings.

#### 3.2.4. Extended UTAUT with Trust and Perceived Risk

Incorporating trust and perceived risk into the Unified Theory of Acceptance and Use of Technology (UTAUT) provides insights into the security and reliability concerns associated with ChatGPT. Trust significantly impacts users' attitudes and intentions, indicating that, when users trust ChatGPT's reliability and security, they are more likely to adopt and use it. On the other hand, perceived risk, although sometimes insignificant, highlights users' apprehensions regarding adopting new technologies. This dual consideration helps to understand the balance between confidence in the technology and concerns about potential risks. By addressing these factors, developers and educators can create a more secure and trustworthy environment, encouraging broader acceptance and integration of ChatGPT in educational settings [29,34]. This approach underscores the importance of building user trust and mitigating perceived risks to facilitate the adoption of AI technologies.

#### 3.2.5. Extended Meta-UTAUT

The meta-UTAUT model includes anthropomorphism, trust, design novelty, and institutional policy. These extensions provide a broader perspective on the external and contextual factors affecting ChatGPT adoption. For example, perceived anthropo-

morphism, or the degree to which users attribute human-like characteristics to ChatGPT, positively influences attitude and behavioral intention. When users perceive ChatGPT as more human-like, they are more likely to engage with it positively and intend to use it more frequently. This suggests that making AI interfaces more relatable and personable can enhance user acceptance and interaction. Factors like trust, design novelty, and supportive institutional policies also significantly shape user attitudes and intentions, highlighting the complex interplay of various external and contextual elements in the adoption process [31,32]. These insights emphasize the need to consider various influences when developing and implementing AI technologies in educational settings.

The Unified Theory of Acceptance and Use of Technology (UTAUT) and its extensions offer a robust framework for understanding the adoption of ChatGPT in higher education. Confirmed factors such as performance expectancy, effort expectancy, social influence, facilitating conditions, behavioral intention, and trust play significant roles in influencing adoption. However, unconfirmed factors like effort expectancy, facilitating conditions, social influence, demographic factors, and institutional policy highlight the complexity and variability regarding the technology adoption processes. By incorporating additional constructs and extending the original UTAUT, researchers can capture a more comprehensive picture of the determinants that facilitate or hinder the adoption of ChatGPT in educational settings. Future research should continue to explore these extensions and validate their relevance in diverse educational contexts.

### *3.3. Technology–Organization–Environment (TOE) Framework and ChatGPT Adoption in Higher Education*

The Technology–Organization–Environment (TOE) framework, developed by Tornatzky and Fleischer (1990) [40], provides a comprehensive model for understanding the factors that influence the adoption and implementation of technological innovations within organizations. The framework categorizes these factors into three contexts: Technology, Organization, and Environment. In the context of ChatGPT adoption in higher education, the TOE framework has been extended by integrating the concept of knowledge application, offering a perspective on the various determinants that impact the acceptance and use of this technology among students and educators [40]. The following paragraphs provide an in-depth discussion of the factors highlighted in previous research.

**Network Quality and System Responsiveness:**

Network quality, accessibility, and system responsiveness are crucial technological factors influencing user satisfaction with ChatGPT. Users are more likely to adopt ChatGPT when the technological infrastructure supports seamless and efficient use. High network quality ensures that users can access ChatGPT without interruptions, while accessibility guarantees that the platform is easy to reach for all users. System responsiveness, the ability of ChatGPT to quickly and accurately respond to user inputs, further enhances the overall user experience. These factors collectively ensure that the system is reliable and responsive, significantly boosting user satisfaction. Several studies have confirmed the importance of these technological factors in fostering the adoption of ChatGPT [2]. This highlights the need for a robust infrastructure to support the effective implementation and use of AI technologies in educational settings.

**System Quality:**

Perceived system quality, including reliability, efficiency, and user-friendliness, positively impacts both perceived usefulness and ease of use. High system quality ensures that ChatGPT functions reliably and efficiently, providing users a smooth and effective experience. When users perceive the system as user-friendly and dependable, they are more likely to find it useful and easy to use. This encourages them to integrate ChatGPT into their academic activities, enhancing their productivity and learning outcomes. The positive impact of high system quality on user perceptions highlights its importance in driving the adoption of ChatGPT in educational settings [2]. Ensuring that ChatGPT is reliable,

efficient, and user-friendly is crucial for its successful integration and widespread use among students and educators.

**Knowledge Application:**

Integrating the concept of knowledge application within the Technology–Organization–Environment (TOE) framework highlights the importance of applying and utilizing the knowledge gained from ChatGPT. The ability to effectively apply ChatGPT-generated insights in educational contexts positively influences adoption intentions. This factor underscores the need for institutions to foster an environment where knowledge application is encouraged and supported. By promoting the practical use of ChatGPT's capabilities, institutions can enhance the educational experience and drive broader technology adoption. Ensuring that users can translate the information and insights provided by ChatGPT into meaningful academic and practical outcomes is crucial for its successful integration. This factor has been confirmed by several studies, emphasizing its role in influencing the adoption of ChatGPT in educational settings [2].

**Market and Competitive Pressure:**

Environmental factors such as market trends and competitive pressure can influence the adoption of ChatGPT. Institutions may adopt ChatGPT to stay competitive and meet the evolving expectations of students and stakeholders. The need to innovate and remain relevant in a dynamic educational landscape can drive the adoption of new technologies. By incorporating ChatGPT, institutions can enhance their offerings, attract more students, and maintain a competitive edge. This external pressure to adopt advanced technologies ensures that educational institutions keep pace with the market demands and leverage AI tools to improve their educational outcomes and institutional performance. This insight emphasizes the role of environmental factors in driving technological adoption within educational settings [2].

The Technology–Organization–Environment (TOE) framework provides a comprehensive model for understanding the adoption of ChatGPT in higher education. The confirmed factors within the Technology context include network quality, system responsiveness, perceived usefulness, perceived ease of use, and system quality. In the organizational context, factors such as organizational culture, knowledge application, and facilitating conditions play significant roles. Environmental factors such as social influence, regulatory and policy environment, and market pressure also impact adoption. However, unconfirmed factors like anxiety, technology readiness, cost considerations, and privacy concerns highlight the complexity and variability among the technology adoption processes.

By incorporating the TOE framework and extending it with additional constructs such as knowledge application, researchers can capture a more holistic view of the determinants that facilitate or hinder the adoption of ChatGPT in educational settings. Future research should continue exploring these factors and validating their relevance in diverse educational contexts, ensuring that institutions can effectively leverage ChatGPT to enhance learning outcomes and support educational innovation.

### *3.4. Diffusion of Innovation Theory and ChatGPT Adoption in Higher Education*

The Diffusion of Innovation (DoI) Theory, developed by Everett Rogers (1962), and the Technology Adoption Theory provide comprehensive frameworks for understanding how new technologies spread and are adopted within a population. These theories are particularly relevant in ChatGPT adoption in higher education as they offer insights into the various factors and stages that influence the uptake of innovative technologies among students and educators. This section reviews the confirmed and unconfirmed factors identified in empirical studies that apply these theories to adopting ChatGPT [41,42]. The following paragraphs provide an in-depth discussion of the factors highlighted in previous research.

**Relative Advantage:**

Relative advantage refers to the degree to which ChatGPT is perceived as better than its predecessors or current alternatives. Studies have consistently shown that users are

more likely to adopt the technology when they perceive a significant relative advantage in using ChatGPT, such as improved learning outcomes or efficiency in completing tasks. This factor highlights the importance of demonstrating clear benefits of ChatGPT to potential users. Educators and developers can drive the adoption rates by showcasing how ChatGPT can enhance academic performance, streamline processes, and provide superior support compared to the existing tools. The perceived superiority of ChatGPT in delivering tangible benefits plays a crucial role in its acceptance and integration in educational settings [43]. This underscores the need to communicate ChatGPT's advantages to encourage widespread use effectively.

**Compatibility:**

Compatibility is the extent to which ChatGPT aligns with the existing values, past experiences, and needs of potential adopters. Empirical research has confirmed that higher compatibility with users' educational practices and goals positively influences the adoption of ChatGPT. When ChatGPT is perceived as fitting well within the current educational framework and meeting user expectations, its adoption is facilitated. The more seamlessly ChatGPT integrates into the established teaching and learning processes, the more likely educators and students are to embrace it. Ensuring that ChatGPT aligns with the curriculum, pedagogical methods, and institutional goals can significantly enhance its acceptance and usage in educational settings [21,43]. The perceived alignment with the existing practices underscores the importance of designing and promoting ChatGPT to complement and enhance the current educational systems.

**Complexity:**

Complexity refers to the degree of difficulty in understanding and using ChatGPT. Studies have found that lower perceived complexity (i.e., higher ease of use) significantly enhances the likelihood of adoption. Users are more inclined to adopt ChatGPT if they find it easy to understand and integrate into their daily academic activities. Simplifying the interface and functionality of ChatGPT can make it more accessible and user-friendly, encouraging wider acceptance among students and educators. By reducing its complexity, developers can ensure that users can quickly grasp how to use ChatGPT effectively, promoting more frequent and confident use of the technology in educational settings [43]. This emphasizes the critical role of user-friendly designs in driving the adoption of innovative educational tools.

**Trialability:**

Trialability is the extent to which ChatGPT can be experimented with on a limited basis before fully committing. Empirical evidence suggests that allowing users to try ChatGPT on a trial basis positively impacts their adoption decisions. This factor underscores the importance of providing opportunities for users to test and familiarize themselves with the technology [43].

**Observability:**

Observability is the degree to which the results of using ChatGPT are visible to others. Studies have confirmed that higher observability encourages adoption, where others easily see the benefits and positive outcomes of using ChatGPT. When students and educators observe their peers successfully using ChatGPT and achieving positive results, they are likelier to adopt it. This visibility of the benefits creates a social proof effect, where the perceived success of others influences individual decisions to embrace the technology. Ensuring that the advantages and successful applications of ChatGPT are prominently showcased can significantly boost its adoption in educational settings [43]. Highlighting real-world examples and success stories can demonstrate the tangible benefits of ChatGPT, thereby motivating more users to integrate it into their academic activities.

The Diffusion of Innovation Theory and Technology Adoption Theory provide robust frameworks for understanding the adoption of ChatGPT in higher education. Confirmed factors such as relative advantage, compatibility, complexity, trialability, observability, social influence, and effective communication channels play significant roles in influencing adoption. However, unconfirmed factors like social influence, facilitating conditions, per-

ceived risk, demographic characteristics, and technology readiness highlight the complexity and variability among the technology adoption processes.

### 3.5. Interpretative Phenomenological Analysis (IPA) and ChatGPT Adoption in Higher Education

Interpretative Phenomenological Analysis (IPA) is a qualitative research approach that aims to understand how individuals make sense of their personal and social experiences. It focuses on individuals' subjective experiences and meanings regarding phenomena [44]. In the context of ChatGPT adoption in higher education, IPA provides rich insights into students' and educators' lived experiences, attitudes, and perceptions as they interact with this technology. This section reviews the confirmed and unconfirmed factors identified in empirical studies that apply IPA to adopting ChatGPT [45,46]. The following paragraphs provide an in-depth discussion of the factors highlighted in the previous research.

**Personal Competency:**

Studies using Importance–Performance Analysis (IPA) have demonstrated that personal competency is crucial in shaping attitudes toward using ChatGPT. When individuals feel competent and confident in their ability to use ChatGPT, their likelihood of adopting the technology increases significantly. This finding highlights the importance of equipping users with the necessary skills and knowledge to use ChatGPT effectively. Ensuring that users are well trained and comfortable with the technology can enhance their adoption rates and overall satisfaction. Thus, personal competency emerges as a key factor in promoting the successful integration of ChatGPT in various settings [46].

**Trust:**

Trust in ChatGPT's reliability and accuracy significantly impacts users' attitudes and intentions toward its use. Importance–Performance Analysis (IPA) studies reveal that users who have confidence in the capabilities of ChatGPT are more inclined to integrate it into their academic routines. Trust is especially crucial in educational settings, where the credibility and reliability of information are of utmost importance. Ensuring that ChatGPT consistently provides accurate and reliable responses can foster user trust, thereby encouraging its adoption and regular use in academic contexts [45].

**Emotional Response:**

Emotional responses, such as enthusiasm, curiosity, and satisfaction, are important determinants of ChatGPT adoption. Positive emotional experiences with ChatGPT significantly enhance users' willingness to use the technology. Importance–Performance Analysis (IPA) studies emphasize the crucial role of emotional engagement in fostering a positive attitude toward ChatGPT. When users experience positive emotions while interacting with ChatGPT, their overall perception and acceptance of the technology improve, leading to higher adoption rates and continued use [47].

Interpretative Phenomenological Analysis (IPA) provides a deep qualitative understanding of the factors influencing the adoption of ChatGPT in higher education. Confirmed factors such as personal competency, perceived usefulness, trust, social influence, emotional response, and facilitating conditions play significant roles in influencing adoption. However, unconfirmed factors like anxiety, perceived risk, technology readiness, cost considerations, and external motivations highlight the complexity and variability regarding the technology adoption processes.

By leveraging IPA, researchers can capture users' nuanced and subjective experiences, providing a comprehensive picture of the determinants that facilitate or hinder the adoption of ChatGPT in educational settings. Future research should continue exploring these factors and validating their relevance in diverse educational contexts, ensuring that institutions can effectively leverage ChatGPT to enhance learning outcomes and support educational innovation.

### 3.6. Hedonic Motivation System Adoption Model (HMSAM) and ChatGPT Adoption in Higher Education

The Hedonic Motivation System Adoption Model (HMSAM) emphasizes the role of intrinsic motivations, such as enjoyment and pleasure, in adopting information systems [48]. Developed to complement the traditional utilitarian perspectives, the HMSAM provides insights into how hedonic factors influence users' attitudes and intentions toward technology adoption [48]. In the context of ChatGPT adoption in higher education, the HMSAM highlights the importance of emotional and psychological factors that drive the use of this technology among students and educators. This section reviews the confirmed and unconfirmed factors identified in empirical studies that apply the HMSAM to adopting ChatGPT [17]. The following paragraphs explore the factors examined in the previous studies.

**Perceived Enjoyment:**

Perceived enjoyment is a core component of the Hedonic Motivation System Adoption Model (HMSAM), referring to the fun and pleasure derived from ChatGPT. Empirical studies have confirmed that perceived enjoyment significantly influences users' attitudes towards ChatGPT. When students and educators find interactions with ChatGPT enjoyable, they are more likely to adopt and use the technology. This finding underscores the importance of designing engaging and enjoyable user experiences to promote the adoption and sustained use of ChatGPT in educational and other settings [17].

**Focused Immersion:**

Focused immersion, defined as the degree to which users become fully absorbed in their interaction with ChatGPT, has been identified as a significant factor in studies utilizing the Hedonic Motivation System Adoption Model (HMSAM). When users experience a deep level of immersion, characterized by losing track of time and becoming engrossed in the interaction, they are more likely to develop positive attitudes toward ChatGPT. This intense engagement fosters a stronger intention to use the technology regularly. Empirical evidence suggests that creating highly immersive and engaging user experiences can significantly enhance the likelihood of ChatGPT adoption. This finding underscores the importance of designing interfaces and interactions that captivate users' attention and provide a seamless, engaging experience, thereby promoting sustained use and integration of ChatGPT in various contexts, especially in educational and professional settings [17].

The Hedonic Motivation System Adoption Model (HMSAM) provides a valuable framework for understanding the adoption of ChatGPT in higher education, emphasizing the role of intrinsic motivations and enjoyment. Confirmed factors such as perceived enjoyment, focused immersion, perceived usefulness, perceived ease of use, and social influence play significant roles in influencing adoption. However, unconfirmed factors like external motivations, perceived risk, technology readiness, cost considerations, and effort expectancy highlight the complexity and variability regarding the technology adoption processes.

By incorporating the HMSAM, researchers can capture the emotional and psychological drivers that facilitate or hinder the adoption of ChatGPT in educational settings. Future research should continue exploring these factors and validating their relevance in diverse educational contexts, ensuring that institutions can effectively leverage ChatGPT to enhance learning outcomes and support educational innovation.

### 3.7. Extended Value-Based Adoption Model (VAM) and ChatGPT Adoption in Higher Education

The Extended Value-Based Adoption Model (VAM) integrates multiple constructs from various adoption models to provide a comprehensive framework for understanding technology adoption [49]. The VAM emphasizes the perceived value derived from using technology, which encompasses both benefits and sacrifices associated with the technology. In the context of ChatGPT adoption in higher education, the extended VAM provides insights into how perceived value and other factors influence students' and educators'

attitudes and intentions to use ChatGPT. The following paragraphs explore the key factors identified in previous studies.

**Perceived Enjoyment:**

Perceived enjoyment, which refers to the pleasure and fun derived from using ChatGPT, has positively affected users' attitudes and intentions to use the technology. When users find the interaction with ChatGPT enjoyable, they are likelier to develop a favorable attitude towards it and show a higher intention to continue using it. This factor highlights the importance of incorporating enjoyable features into ChatGPT to enhance user engagement and promote adoption. By ensuring that the user experience is enjoyable and engaging, developers can significantly boost the acceptance and sustained use of ChatGPT in various applications [50].

**Perceived Cost:**

Perceived cost, or the financial sacrifice associated with using ChatGPT, has negatively impacted users' intention to adopt the technology. When users perceive the cost of using ChatGPT as high, they are less likely to use it regardless of its potential benefits. Conversely, when the cost is perceived as reasonable or minimal, users are more inclined to adopt and integrate ChatGPT into their routines. This dynamic highlights the critical importance of affordability in promoting the widespread use of ChatGPT. For educational institutions and students, budget constraints can be a significant barrier; therefore, ensuring that ChatGPT is priced accessibly can enhance its adoption rate. By minimizing the financial barriers, developers and policymakers can make ChatGPT more accessible and appealing, thereby fostering broader acceptance and utilization in various educational and professional settings [50].

While perceived cost is a confirmed factor influencing the adoption of ChatGPT, its significance varies across different studies. In some cases, users may prioritize the educational benefits of ChatGPT over the financial constraints, suggesting that the impact of cost considerations on adoption intentions is not uniform. For some users, the value and advantages offered by ChatGPT in enhancing their learning experience can outweigh the associated financial costs. This variability indicates that, while affordability is important, other factors, like the perceived educational benefits, can also play a crucial role in the decision to adopt ChatGPT. Understanding this balance can help developers and policymakers to tailor their strategies to address both cost concerns and highlight the value proposition of ChatGPT to different user groups [50].

**Perceived Credibility:**

Perceived credibility, encompassing trust in the reliability and accuracy of ChatGPT, plays a critical role in shaping users' attitudes toward the technology. When users have confidence in the information provided by ChatGPT, believing it to be reliable and accurate, they are significantly more likely to adopt and utilize the technology. This trust fosters a positive attitude and enhances the likelihood of using ChatGPT continuously. The importance of perceived credibility underscores the necessity of ensuring that ChatGPT delivers consistently accurate and trustworthy responses. By prioritizing the quality and reliability of information, developers can build and maintain user trust, thereby promoting the broader adoption and sustained use of ChatGPT across various domains, particularly in educational and professional settings where the credibility of information is paramount [50].

**Extrinsic Motivation:**

Contrary to the expectations, extrinsic motivation, such as external rewards or pressures, did not significantly impact the adoption of ChatGPT in some studies. This finding suggests that intrinsic factors, like perceived usefulness and enjoyment, are more critical in driving adoption. Users are more likely to adopt ChatGPT when they find it genuinely beneficial and enjoyable rather than being motivated by external incentives such as rewards, grades, or mandates.

This insight highlights the importance of enhancing ChatGPT's intrinsic value. Developers and educators should prioritize making ChatGPT more useful, efficient, and enjoyable for users. By improving its functionality, ensuring it meets users' needs, and creating an

engaging and enjoyable user experience, ChatGPT can become a valuable tool that users are intrinsically motivated to adopt and continue using.

This approach aligns with the idea that users are more committed and satisfied when addressing their internal motivations. Therefore, emphasizing intrinsic motivators like perceived usefulness and enjoyment can lead to higher adoption rates and sustained engagement with ChatGPT, ensuring its effective integration into educational and professional settings [50].

The Extended Value-Based Adoption Model (VAM) provides a comprehensive framework for understanding the adoption of ChatGPT in higher education, emphasizing the perceived value derived from using the technology. Confirmed factors such as perceived usefulness, perceived enjoyment, perceived cost, perceived credibility, social influence, self-efficacy, and attitude play significant roles in influencing adoption. However, unconfirmed factors like extrinsic motivation, perceived risk, technology readiness, facilitating conditions, and cost considerations highlight the complexity and variability regarding the technology adoption processes.

By incorporating the extended VAM, researchers can capture the multifaceted nature of the value perceptions that facilitate or hinder the adoption of ChatGPT in educational settings. Future research should continue exploring these factors and validating their relevance in diverse educational contexts, ensuring that institutions can effectively leverage ChatGPT to enhance learning outcomes and support educational innovation.

### *3.8. Theory of Planned Behavior*

The Theory of Planned Behavior (TPB) is a widely used theoretical framework to explain and predict human behavior across various domains, including technology adoption. Developed by Ajzen [51], the TPB posits that an individual's intention to engage in a behavior is the most immediate predictor of actual behavior. The TPB identifies three key constructs that influence behavioral intention (BI):

- Attitudes (ATs): These refer to the positive or negative evaluations of performing the behavior. In the context of ChatGPT adoption, attitudes represent the degree to which students believe that using ChatGPT will benefit their academic work.
- Subjective Norms (SNs): This construct represents the perceived social pressure to perform or not perform the behavior. It captures how peers, instructors, or significant others influence the individual's adoption of ChatGPT. If students believe that others expect them to use ChatGPT, they are more likely to have stronger behavioral intentions to adopt it.
- Perceived Behavioral Control (PBC): PBC reflects the individual's perception of the behavior's ease or difficulty. It is shaped by access to resources, skills, and external support. In the case of ChatGPT, students who feel confident in their ability to use the technology or believe they have the necessary resources are more likely to adopt it.

The TPB framework suggests that these constructs—attitudes, subjective norms, and perceived behavioral control—jointly predict the intention to adopt a technology like ChatGPT, which in turn influences the actual usage behavior. The following sections will explore the findings from three studies on ChatGPT adoption, analyzing the influence of these constructs, along with the confirmed and unconfirmed factors, in the educational settings studied.

#### 3.8.1. Discussed Factors

The studies on ChatGPT adoption across various educational contexts highlight several key factors influencing students' behavioral intentions to use the technology.

**Attitudes (ATs)**:

Across the three studies, attitudes consistently emerge as a significant factor influencing students' intention to adopt ChatGPT for academic and language learning purposes. In the Malaysian study, attitudes were one of the strongest predictors of behavioral intention, with positive perceptions of ChatGPT's utility driving adoption intentions for general

academic purposes [28]. Similarly, in Taiwan and Vietnam, positive attitudes toward ChatGPT, particularly its usefulness in learning English as a second language (ESL), significantly predicted behavioral intention [20,33]. This finding suggests that, when students perceive ChatGPT as beneficial for academic success, they are more likely to integrate it into their learning routines.

**Perceived Behavioral Control (PBC)**:

Perceived behavioral control is another critical factor that strongly predicts behavioral intention in these studies. In Malaysia, PBC was the strongest predictor, indicating that those students who felt confident in their ability to use ChatGPT—having the necessary resources, skills, and access—were more likely to adopt it [28]. Similarly, in the ESL-focused studies, control beliefs played a crucial role in determining students' confidence and willingness to use the technology [20,33].

**Subjective Norms (SNs)**:

The role of subjective norms (social influence) varied across the studies. In Malaysia, subjective norms had a significant impact, with peer and instructor influence shaping students' intentions to use ChatGPT [28]. However, subjective norms were found to be less impactful in Taiwan and Vietnam, suggesting that social pressure is limited in influencing adoption in some cultural contexts [20,33]. This variability may point to cultural attitudes toward peer and instructor influence in educational settings.

#### 3.8.2. Extended TPB with Perceived Usefulness and Perceived Behavioral Control

One significant extension observed in these studies is the integration of perceived usefulness (PU) into the TPB framework. By focusing on perceived usefulness, researchers have extended the model to highlight the perceived academic benefits of ChatGPT as a key motivator for adoption. In the ESL studies, perceived usefulness was essential in shaping attitudes towards ChatGPT, reinforcing that the tool's perceived academic benefits are central to adoption [20]. Perceived behavioral control (PBC) was extended to highlight students' perceived ease of accessing and using the technology, emphasizing that adequate resources and support are necessary for adoption [28].

#### 3.8.3. Extended TPB with Subjective Norms and Social Influence

In the Malaysian study, subjective norms played a crucial role, highlighting the influence of peers and instructors on students' intentions to adopt ChatGPT [28]. This suggests that social pressures significantly drive adoption in collaborative or instructor-led educational settings. However, the ESL studies showed that subjective norms were less influential, indicating that peer and instructor influence may be more context-dependent in terms of technology adoption [33].

#### 3.8.4. Extended TPB with Facilitating Conditions and Control Beliefs

In addition to the importance of control beliefs, some studies incorporated facilitating conditions as an extension of the TPB. Facilitating conditions refer to the availability of the resources and support necessary for using ChatGPT effectively. This extension highlights the importance of institutional support, including reliable internet access and technical assistance, in promoting adoption [28,33].

### *3.9. Note on the Methodologies Applied in the Studies*

The studies on adopting ChatGPT in higher education have employed a variety of methodological approaches to gather and analyze data. This section outlines the standard methodologies used across these studies, highlighting the research design, data collection methods, and analytical techniques.

#### 3.9.1. Research Design

**Cross-sectional Research Design:**

Many studies have adopted a cross-sectional research design, which involves collecting data at a single time point from a sample representing the population. This design enables researchers to analyze the relationships between variables and understand the factors influencing the adoption of ChatGPT among students and educators. By examining the data collected in this manner, researchers can identify trends, correlations, and potential causal links between various factors, such as perceived usefulness, ease of use, trust, and cost, and their impact on the adoption of ChatGPT [2,19,22,24].

One of the key benefits of a cross-sectional research design is its efficiency and simplicity. Cross-sectional studies are typically quicker and more straightforward than longitudinal studies. Since the data are collected at a single point in time, it reduces the time and resources required for data collection. Additionally, this design provides a snapshot of the current state of adoption and usage patterns of ChatGPT among students and educators. It helps in terms of understanding the prevailing attitudes, behaviors, and factors influencing adoption at a specific time.

Furthermore, cross-sectional studies effectively identify and analyze the relationships between different variables. Researchers can explore how various factors like perceived usefulness, enjoyment, and cost interact and influence the adoption of ChatGPT. The design's versatility enables it to be applied to diverse populations and settings, making it suitable for studying different user groups and contexts.

However, there are also notable disadvantages associated with cross-sectional research designs. One significant limitation is the inability to establish causality. While cross-sectional studies can identify correlations between variables, they cannot determine whether one variable directly influences another or if underlying factors are at play. Additionally, since the data are collected at a single point in time, cross-sectional studies do not account for changes over time. They cannot track how attitudes, behaviors, or external factors influencing adoption may evolve, limiting the understanding of long-term trends and impacts.

In summary, while a cross-sectional research design offers efficiency, simplicity, and valuable insights into the current trends and relationships between variables, it also has limitations in establishing causality and understanding the changes over time. These benefits and disadvantages highlight the importance of carefully considering the research design when studying the adoption of ChatGPT among students and educators.

**Quantitative Research Approach:**

Many studies have utilized a quantitative research approach, employing structured surveys to collect numerical data that can be statistically analyzed [4,5,27]. This approach is effective in identifying patterns, testing hypotheses, and making generalizations regarding the adoption of ChatGPT in higher education. Using quantitative methods, researchers can systematically measure variables and quantify the relationships between them, providing robust and objective insights into the factors influencing the adoption of ChatGPT.

One of the primary benefits of a quantitative research approach is its ability to identify patterns and trends across large samples. By collecting data from a wide range of participants, researchers can discern commonalities and variations in how different groups perceive and use ChatGPT. This method is also highly effective for testing hypotheses. Researchers can formulate specific testable predictions pertaining to the factors influencing ChatGPT adoption and use statistical techniques to determine whether the data support these hypotheses.

Furthermore, the quantitative approach enables generalizations about the broader population. Since the data are often collected from a representative sample, the findings can be extrapolated to a larger group, providing insights that are broadly applicable to higher education settings. This capability is particularly valuable for policymakers and educational institutions looking to implement or promote ChatGPT.

However, the quantitative research approach also has disadvantages. One notable limitation is that it can sometimes overlook the depth and nuance of individual experiences. While numerical data can provide a broad overview, they may not capture the complexity

of users' interactions with ChatGPT or the contextual factors influencing their adoption decisions. Additionally, the reliance on structured surveys means that the insights are limited to the questions asked, potentially missing unanticipated variables or emerging themes that might be uncovered through more exploratory qualitative methods.

In summary, while the quantitative research approach offers significant advantages in identifying patterns, testing hypotheses, and making generalizations, it may not fully capture the richness of individual experiences and contextual influences. Balancing quantitative methods with qualitative insights can provide a more comprehensive understanding of ChatGPT adoption in higher education.

**Mixed-Methods Approach:**

Some studies have used a mixed-methods approach, combining quantitative and qualitative methods to understand the adoption phenomena comprehensively. This approach allows researchers to explore the depth and breadth of user experiences and attitudes towards ChatGPT [15,21]. By integrating both types of data, researchers can benefit from the strengths of each method, offering a more holistic view of the factors influencing ChatGPT adoption.

The mixed-methods approach has several advantages. Firstly, it enables a more thorough exploration of the research problem. Quantitative data can identify broad trends and patterns, while qualitative data can provide detailed insights into individual experiences and contextual factors. This combination enables researchers to validate and enrich their findings, ensuring that the results are both statistically robust and deeply contextualized.

Secondly, mixed-methods research can address the limitations of using only one method. For example, while quantitative surveys can measure the prevalence of certain attitudes or behaviors, qualitative interviews or focus groups can explain why these attitudes or behaviors exist. This dual perspective can uncover nuances and complexities that might be missed by a single-method approach, leading to a more comprehensive understanding of the adoption process.

However, the mixed-methods approach also has some disadvantages. One significant challenge involves the increased complexity and resource requirements. Quantitative and qualitative research simultaneously demand more time, effort, and expertise. Researchers need to be skilled in both types of methods and integrate and interpret the data cohesively. Additionally, the analysis and interpretation process can be more complicated, requiring careful consideration to ensure that the findings from both methods complement and enhance each other.

In summary, the mixed-methods approach offers significant benefits by providing a comprehensive understanding of ChatGPT adoption, combining the statistical power of quantitative data with the depth and richness of qualitative insights. Despite its challenges, this approach can yield more nuanced and actionable insights into user experiences and attitudes toward ChatGPT, making it a valuable method for studying complex phenomena in higher education.

#### 3.9.2. Data Collection Methods

**Survey-Based and Online Questionnaire Data Collection:**

The primary method for data collection in these studies has been survey-based, using structured questionnaires to gather data from participants. These surveys are often distributed online and include a range of closed-ended questions measured on Likert scales, providing quantifiable data for analysis.

Online questionnaire surveys are a common tool, enabling researchers to reach a broad audience and collect data efficiently. Typically, these surveys include items on a seven-point Likert scale to capture respondents' attitudes and intentions regarding ChatGPT adoption [4,5,27].

**In-Depth Interviews:**

Qualitative studies and mixed-methods approaches often involve in-depth interviews. These semi-structured interviews provide rich, detailed insights into individual experiences, perceptions, and the contextual factors influencing the adoption of ChatGPT [15,21].

#### 3.9.3. Analytical Techniques

**Partial Least Squares Structural Equation Modeling (PLS-SEM):**

Structural Equation Modeling (SEM) is a widely used analytical technique in these studies. SEM allows researchers to test complex relationships between observed and latent variables, providing a robust framework for understanding the factors influencing ChatGPT adoption. Various software tools like AMOS and SmartPLS are commonly employed for SEM analysis.

PLS-SEM is frequently used in the analysis of survey data, particularly when the research focuses on predicting key target constructs and developing theoretical models. This technique is well suited for handling complex models with multiple constructs and indicators [4,5,27].

**Thematic Analysis:**

In qualitative studies, thematic analysis is often used to identify and analyze patterns or themes within interview data. This method involves coding the data and organizing them into meaningful categories that reflect the key factors influencing the adoption of ChatGPT [15,21].

**Artificial Neural Network (ANN) and Deep Neural Network (DNN):**

In some innovative studies, hybrid approaches using an ANN, DNN, and classification algorithms have been used alongside PLS to enhance the predictive accuracy and robustness of the models. These advanced techniques provide deeper insights into the complex relationships between variables.

The methodologies employed in studies on ChatGPT adoption in higher education are diverse, encompassing cross-sectional and longitudinal designs, quantitative and qualitative approaches, and a range of data collection and analytical techniques. The predominant use of survey-based data collection and SEM/PLS-SEM for analysis reflects the focus on identifying the key predictors and understanding the structural relationships influencing adoption. The integration of mixed-methods approaches and advanced analytical techniques like ANN and DNN highlights the evolving nature of the research in this field, aimed at providing comprehensive and nuanced insights into the adoption dynamics of ChatGPT in educational settings [50].

### *3.10. Sample Size and Discipline in ChatGPT Adoption Studies*

#### 3.10.1. Sample Sizes

The sample sizes used in studies on adopting ChatGPT in higher education vary widely, reflecting the diversity of the research contexts and objectives. Here are the sample sizes reported across different studies:

- **Small Sample Sizes (up to 150):** Several studies, particularly those with a qualitative focus or pilot studies, feature small sample sizes. For example, [35] has a sample size of 70, [36] analyzed 138 responses, and [19] collected data from 114 respondents. Qualitative interviews often have even smaller sample sizes, such as [46], which interviewed 34 educators.
- **Medium Sample Sizes (151 to 400):** Studies with medium sample sizes appear to be more common, capturing a broader yet focused group of respondents. For instance, [14] involved 400 respondents, [43] had 383 participants, and [47] gathered 222 responses.
- **Large Sample Sizes (401 to 700):** Large-scale surveys are particularly common in quantitative research, offering a more robust analysis of adoption patterns. Studies like [4] involved 458 responses, while [27] received 503 responses.

- **Very Large Sample Sizes (above 700):** A few studies, primarily those conducted at a broader scale, report very large sample sizes. For example, [33] had a sample size of 1389, and [34] gathered responses from 1004 participants.

Overall, these studies' most commonly used sample sizes tend to fall within the medium to large range (151 to 700 respondents). This suggests a preference for balancing depth and breadth in the analysis. However, smaller sample sizes are still prevalent in more exploratory or qualitative studies, while very large ones are typically employed in extensive quantitative surveys. These varying sample sizes reflect the complexity and scale of research into ChatGPT adoption, from small-scale pilots to expansive cross-sectional surveys, helping to form a comprehensive understanding of the factors influencing its adoption in higher education.

#### 3.10.2. Disciplines

The disciplines targeted in these studies cover a broad spectrum of academic fields, reflecting the diverse applicability of ChatGPT in higher education. The following are the disciplines identified:

- General Higher Education: Studies often do not specify the discipline directly but focus on university students across various academic levels and fields.
- Business and Management: Specific studies targeting students in business and management disciplines.
- Education: Including pre-service teacher education, English Language Teaching (ELT) for EFL teachers, and writing for academic success.
- Specific Academic Settings: PhD, Master's, Bachelor's degree, high school, and professional degree programs.
- Language Studies: English language learning for Chinese international students in British universities and English Writing.
- Various Disciplines: Including health, scientific, humanities, social sciences, engineering, and applied sciences.

These disciplines highlight the widespread interest and relevance of ChatGPT across different academic fields, indicating its potential to support various educational needs and contexts.

### *3.11. Gaps in Current Empirical Studies*

The impact of demographic factors such as age, gender, education, and income on the intention to adopt ChatGPT has shown inconsistent results across empirical studies. While some research has suggested that these demographic characteristics play a significant role, other studies have found them to be insignificant, indicating that individual attitudes, intrinsic motivations, and external factors may exert a stronger influence on adoption behavior than demographic attributes. This suggests that demographic variables may not be consistent predictors of adoption, highlighting the need for more targeted research to better understand when and how they impact ChatGPT use.

Trust in ChatGPT also presents mixed findings. While some studies suggest that trust strongly correlates with perceived usefulness and behavioral intention, others show no significant relationship. This inconsistency points to a gap in understanding how trust interacts with other adoption factors, such as perceived ease of use, user satisfaction, and system reliability. Further research is needed to explore trust's nuanced role, particularly in contexts involving high-stakes academic decisions.

Similarly, privacy and security concerns, although important, did not consistently influence perceived usefulness or ease of use. This suggests that, while users acknowledge the importance of privacy and security, they may prioritize the functional benefits of ChatGPT over these concerns. This gap indicates a need for future research to investigate how institutions can address privacy and security concerns without compromising the user experience or discouraging adoption.

Extrinsic motivation, including external rewards or institutional mandates, has been found to have a limited impact on ChatGPT adoption. Instead, intrinsic factors like perceived usefulness, personal enjoyment, and engagement with the tool seem to play more critical roles in driving adoption. This highlights a gap in understanding how extrinsic motivations can be effectively integrated into adoption strategies. More research is needed to explore the balance between extrinsic incentives and intrinsic motivations in educational settings.

Inconsistent findings also arise regarding effort expectancy and facilitating conditions. While some studies found these factors to be strong predictors of adoption, others did not. This variability suggests that contextual factors, such as the specific academic environment or the availability of technical support, may significantly influence how effort expectancy and facilitating conditions impact user behavior. To clarify this, the future research should focus on contextualized studies across different educational settings.

Cost and financial considerations similarly showed inconsistent effects on adoption intentions. While financial concerns may play a role in some cases, many users prioritize the educational benefits of ChatGPT over financial constraints, indicating that perceived value and utility can outweigh cost concerns. This underscores the need for further research to understand the conditions under which cost becomes a barrier to adoption and how financial considerations interact with perceived benefits.

Additionally, the limited significance of external motivations, such as institutional mandates, underscores a gap in understanding how to leverage these motivations to enhance the adoption rates effectively. The current research suggests that personal attitudes and intrinsic motivations are more decisive factors. The future research should explore ways to align external incentives with intrinsic motivations to encourage broader adoption.

Another important gap in the literature concerns the variation in sample sizes and methodological approaches. The studies range from small pilot studies to large-scale surveys, making it difficult to generalize the findings. The predominance of cross-sectional research designs and quantitative surveys also limits the depth of analysis. The future research would benefit from employing mixed-methods approaches and longitudinal studies to better capture the evolving nature of ChatGPT adoption over time.

Lastly, the generalizability of the current findings is limited by the geographic concentration. Much research has been conducted in North America, Asia, and Europe, leaving other regions underrepresented. This geographical bias may overlook important cultural and contextual factors that influence adoption in other parts of the world. Additionally, there is a need for more discipline-specific studies to better understand the adoption patterns in fields such as business, management, education, and language studies. By addressing these gaps, the future research can provide a more comprehensive understanding of the ChatGPT adoption dynamics across various contexts.

By tackling these gaps, the future research can offer a more holistic view of the factors influencing ChatGPT adoption in higher education.

## 4. Discussion

### *4.1. Theoretical Implications*

The findings from this review have several theoretical implications for understanding the adoption of ChatGPT in higher education.

First, the inconsistent impact of demographic factors, such as age and gender, suggests that traditional models like the Technology Acceptance Model (TAM) and the Unified Theory of Acceptance and Use of Technology (UTAUT), which often incorporate these variables as moderators, may require refinement. Specifically, out of the ten studies that examined demographic factors, only two found them to have any significant effect on adoption behavior (e.g., [52]). In comparison, the majority (eight studies) found them to be insignificant, such as in [27,36]. This suggests that demographic factors may play a limited role in explaining ChatGPT adoption and may not fully capture the complexity of user behavior. Instead, a broader range of psychological factors (e.g., intrinsic motivation and

individual attitudes) and contextual factors (e.g., institutional policies and cultural norms) should be considered to offer a more comprehensive understanding of why and how users adopt ChatGPT.

Additionally, a crucial finding is the confirmed significance of intrinsic motivations—such as perceived usefulness and ease of use—over extrinsic motivations (e.g., external rewards or social pressure). Out of the eleven studies that explored perceived usefulness, ten studies confirmed it as a significant factor (e.g., [13,20]), while only one study found it to be insignificant. Similarly, perceived ease of use was found to be significant in seven studies, while one study found it to be insignificant. This emphasizes integrating Self-Determination Theory (SDT) into the existing frameworks. Theories such as SDT focus on intrinsic motivation, competence, and relatedness, which could explain why users are more likely to adopt ChatGPT for academic purposes when they perceive it to be useful and easy to use.

Moreover, the variability in the influence of constructs such as trust, privacy, and security suggests that these elements might interact in complex ways with other constructs in the adoption models. For example, six studies found trust to be a significant factor influencing adoption (e.g., [22]), while two studies found it to be insignificant, including [4]. This variability suggests that privacy and security concerns may mediate or moderate the impact of trust on adoption. Future theoretical models should explore these interactions using a systems thinking approach to understand the interconnected nature of technology adoption better, recognizing that users' decisions are influenced by a network of factors rather than isolated variables.

Lastly, the observed differences in the significance of the facilitating conditions and effort expectancy across studies highlight the importance of context-specific adaptations of theoretical models. The facilitating conditions were found to be significant in six studies, including [53] and [27], while three studies found them to be insignificant (e.g., [39]). Similarly, effort expectancy was found to be significant in six studies, but three studies reported it as insignificant, such as [32]. These inconsistencies suggest that the availability of technical resources and the complexity of the educational tasks might impact the perceived ease of use of ChatGPT differently across contexts. Researchers should account for these contextual factors when applying and adapting models like the TAM and UTAUT in different educational environments, ensuring that the models remain relevant to the specific conditions and needs of the user population.

By addressing these theoretical implications, future research can develop more robust and context-sensitive models that provide a deeper understanding of the adoption of ChatGPT in higher education.

### *4.2. Practical and Managerial Implications*

From a practical perspective, those educational institutions aiming to adopt ChatGPT must address several key areas to facilitate its successful integration.

First, building trust in the technology by ensuring its reliability, accuracy, and security is crucial. Trust was confirmed as a significant adoption factor in six studies, including [22], significantly impacting user engagement. However, two studies found trust to be insignificant, including [4], suggesting that trust might be more relevant in some contexts than others. To address this, institutions should prioritize transparent communication regarding data handling practices and implement robust data protection measures to alleviate user concerns as security and privacy issues were frequently mentioned as barriers to adoption in studies like [43].

Institutions should also leverage social influence to encourage broader adoption of ChatGPT. Seven studies found social influence to be a significant driver of adoption, such as in [32,53]. However, four studies found social influence to be insignificant, including [36,37]. This suggests that social influence may vary depending on the academic setting or cultural context. Encouraging early adopters to share their positive experiences and create

communities of practice around ChatGPT could foster greater adoption across diverse user groups.

Ensuring the necessary technical infrastructure and support is another critical aspect. The facilitating conditions were confirmed as significant in six studies (e.g., [27,53]) but found to be insignificant in three studies (e.g., [32,39]). This suggests that, while technical resources such as internet access and reliable hardware are critical in some educational settings, their impact on adoption might be less pronounced in environments where these resources are already well established. Institutions should provide continuous technical support through help desks, online services, and dedicated personnel to assist users with any issues. Integrating ChatGPT into existing educational platforms and learning management systems can also enhance its usability and acceptance, making it a more seamless part of the educational experience.

Finally, offering incentives for faculty and students to engage with ChatGPT can also increase adoption. Such incentives could include recognition awards, professional development credits, or other forms of acknowledgment for the innovative use of technology in education. This would encourage more users to experiment with ChatGPT and integrate it into their academic work, further driving adoption.

By addressing these practical and managerial implications, educational institutions can create a conducive environment for the successful adoption of ChatGPT.

### *4.3. Future Research Directions*

Future research should address the identified gaps and build on the existing body of knowledge to provide a more comprehensive understanding of ChatGPT adoption in higher education.

First, longitudinal studies are crucial to examine how the adoption behaviors and perceptions of ChatGPT evolve over time. Unlike cross-sectional studies, which provide a snapshot at one point, longitudinal research can track changes in attitudes, usage patterns, and the sustainability of ChatGPT integration in educational settings over extended periods. This approach can help to identify whether the initial enthusiasm for the technology is sustained, how continued exposure influences user satisfaction and trust, and how evolving technological advancements or policy changes affect adoption. It will also shed light on the long-term impacts, such as how ChatGPT contributes to academic performance, critical thinking, and knowledge retention.

Second, the future research should adopt mixed-methods approaches to combine both quantitative and qualitative data, enabling a more holistic understanding of ChatGPT adoption. Quantitative surveys can offer broad insights into patterns and correlations, such as which factors (e.g., ease of use and performance expectancy) significantly influence adoption decisions. Meanwhile, qualitative methods, such as interviews and focus groups, can provide in-depth insights into users' experiences, challenges, and expectations. Mixed-methods research can also illuminate how different factors—such as trust, privacy concerns, and institutional support—interact and contribute to the decision-making process in ways that purely quantitative studies may overlook. Understanding these complexities is vital for tailoring solutions to the diverse needs of educational institutions.

Third, expanding the geographic scope of the research is essential to capture a more global and culturally diverse perspective on ChatGPT adoption. Many existing studies are concentrated in North America, Europe, and Asia. Including underrepresented regions, such as Africa and South America, is crucial because the factors influencing technology adoption, such as infrastructure, educational policy, and cultural attitudes toward AI, can vary widely across regions. Comparative studies could reveal how local conditions—such as limited access to technology, different pedagogical practices, or varying levels of trust in AI—affect adoption, providing a richer understanding of how to implement ChatGPT in diverse educational contexts successfully.

Fourth, discipline-specific studies are needed to understand how ChatGPT adoption varies across academic fields. Different disciplines may have unique needs and challenges

when integrating AI technologies. For instance, students in STEM fields may use ChatGPT for technical problem-solving, while those in the humanities might rely on it for creative writing or analytical tasks. Tailored research into how ChatGPT can best serve each academic discipline would facilitate more customized strategies that align with the specific learning outcomes of each field. Additionally, identifying discipline-specific barriers—such as resistance from educators in particular fields—could help to refine strategies for broader acceptance and integration.

Lastly, the future research should explore the potential for integrating ChatGPT with other emerging technologies, such as virtual reality (VR), augmented reality (AR), and immersive learning platforms. Investigating how these technologies can complement ChatGPT to create more interactive, engaging, and immersive learning experiences would open new avenues for educational innovation. For example, combining ChatGPT's natural language capabilities with VR could allow students to engage in virtual simulations where AI guides them through complex scenarios, such as medical procedures or historical reenactments. This line of research would not only push the boundaries of AI in education but also offer practical solutions to enhance student engagement and learning outcomes.

By addressing these areas, the future research can provide actionable insights that help educational institutions to effectively utilize ChatGPT to enhance learning outcomes, foster student engagement, and support continuous educational innovation.

## 5. Conclusions

The adoption of ChatGPT in higher education holds significant potential for transforming teaching and learning processes. This narrative review has synthesized the findings from various empirical studies, highlighting the key factors influencing the acceptance and utilization of ChatGPT among students and educators. The review identifies several confirmed factors, such as perceived usefulness, perceived ease of use, trust, social influence, and facilitating conditions, which play crucial roles in driving the adoption of ChatGPT. Conversely, it also points out unconfirmed factors like demographic characteristics, extrinsic motivation, and technology readiness, which exhibit inconsistent impacts across different studies.

From a theoretical perspective, the review underscores the need for refining the existing technology acceptance models to incorporate a broader range of psychological and contextual factors. Integrating intrinsic motivation and self-determination theories can provide a more comprehensive understanding of the motivational drivers behind ChatGPT adoption. Adopting a systems thinking approach can help to capture the complex interactions between trust, privacy, security, and other constructs in the adoption process.

Practically, educational institutions should focus on enhancing the perceived usefulness and ease of use of ChatGPT through comprehensive training and robust technical support. Building trust by addressing privacy concerns and ensuring the reliability of the technology is essential. Leveraging social influence and providing a supportive environment for peer usage can further drive adoption. Ensuring the necessary technical infrastructure and integrating ChatGPT into existing educational platforms are critical steps for facilitating seamless adoption.

While this narrative review provides valuable insights into the factors influencing ChatGPT adoption in higher education, several limitations should be acknowledged. First, the narrative review methodology, which relies on synthesizing findings from existing studies, may introduce a selection bias. The review depends on the availability and accessibility of published research, which may exclude relevant studies that were not accessible or published in other languages.

Second, the review's reliance on published empirical studies is constrained by their quality and scope. Variations in the research design, sample sizes, and methodological approaches across different studies can affect the consistency and generalizability of the findings synthesized in this review.

Third, this review primarily focused on studies published in English, which may overlook valuable insights from research conducted in other languages. This language bias could limit the comprehensiveness of the review and its applicability to non-English-speaking educational contexts.

Fourth, the narrative synthesis approach does not allow for meta-analytic techniques that could provide more precise estimates of effect sizes and the strength of the relationships between variables. Future reviews could benefit from employing meta-analytic methods to quantify these relationships rigorously.

The findings from this review provide important insights that may guide the integration of ChatGPT in educational settings. However, further research is required to determine its impact on learning outcomes and educational innovation.

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