Journal of Information Systems Engineering and Management
2026, 11(3s)
e-ISSN: 2468-4376
https://www.jisem-journal.com/

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Unveiling AI Adoption in SMEs: A Systematic Review of Perceived Advantages and Barriers Through an Extended TAM Framework

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ARTICLE INFO

Received: 26 Dec 2024

Revised: 14 Feb 2025

Accepted: 22 Feb 2025

ABSTRACT

Introduction: This systematic literature review examines the advantages and disadvantages SMEs see in adopting AI.

Objectives: The objectives of the study were to categorize the benefits (perceived usefulness and performance expectancy) and barriers (perceived ease of use, effort expectancy, facilitating conditions, and price value) of AI adoption among SMEs, and to develop a theoretical framework that illustrates their relationships.

Methods: The study used a TAM that was extended by adding components from TAM2, UTAUT, and UTAUT2. In accordance with the PRISMA guidelines, our analysis included 87 studies identified in the Scopus database from 2015 through 2024.

Results: The results indicated 14 primary benefits of adopting AI and 7 primary barriers, most of which were internal or external. Co-occurrence analysis identified several ways to address barriers to AI adoption, including reducing the cost of AI solutions to alleviate financial burdens on SMEs, improving operational performance, and addressing funding issues that affect SMEs. A conceptual model has been developed that links the various dimensions to the intention to adopt AI, with moderators that affect the likelihood of an SME adopting AI. In addition, the findings demonstrate that SMEs' flexibility enables them to adapt to the rapid changes in digital transformation.

Conclusions: The findings indicate that researchers should design studies to evaluate the long-term effects of adopting AI. Overall, this study brings together fragmented prior research, thereby enabling SMEs to leverage AI to enhance innovation, operational effectiveness, and competitive advantage during times of economic uncertainty.

Keywords: AI, SMEs, TAM, UTAUT, Perceived Advantages, Perceived Barriers, PRISMA Methodology.

INTRODUCTION

Human cognition is being mimicked at a high level by machines using artificial intelligence (AI). The capabilities that are being emulated include learning, problem-solving, decision-making, and reasoning (Russell et al., 2010). There are two fundamental ways in which AI has evolved since the development of Alan Turing's foundational work: AI systems that have been engineered to be capable of replicating intelligence by repeatedly processing vast amounts of data, and AI systems that have advanced cognitive capabilities embedded into them from the outset (Haenlein & Kaplan, 2019). Since the middle of the last century, AI has advanced significantly due to rapidly improving computing power, increased data availability, and the continued refinement of AI algorithms (Rajaraman, 2014). In many modern technologies, AI is now a key component of both contemporary technology and related disciplines, including

Journal of Information Systems Engineering and Management
2026, 11(3s)
e-ISSN: 2468-4376
https://www.jisem-journal.com/

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but not limited to machine learning (ML), deep learning (DL), natural language processing (NLP), robotics, and the Internet of Things (IoT) (Enholm et al., 2022; Jagatheesaperumal et al., 2022). From an economic perspective, AI is viewed as a general-purpose technology (GPT); a GPT is capable of creating changes in the efficiency of many sectors of industry and can prompt similar improvements in employee training and the use of equipment and business processes (Bresnahan & Trajtenberg, 1995; Brynjolfsson et al., 2017). As a result, the patterns of diffusion of innovation are also followed when adopting AI. This includes organizational differences and their capacity to adopt new ideas, as well as environmental factors that influence the speed of adoption (Rogers, 2003; Acemoglu & Restrepo, 2019).

AI has moved beyond being a tool for improved business processes and can significantly enhance operational efficiency and strategic decision-making across multiple industries, such as marketing, manufacturing, and customer service (Chatterjee et al., 2021; K.J. Somaiya Institute of Management Studies & Research et al., 2019). For example, ML models provide powerful predictive analytics capabilities that enable organizations to optimize supply chain operations, and NLP provides the foundation for developing advanced chatbot applications that deliver highly customized customer experiences (Chishti et al., 2020; Um et al., 2020). Furthermore, the IoT and AI work together by providing continuous streams of real-time data to the robotic systems used in manufacturing facilities, allowing organizations to develop and utilize intelligent environments that can respond rapidly to changes in the environment or processes (Angelopoulos et al., 2019; Hansen & Bøgh, 2021). However, the path to widespread adoption is not easy, and most organizations will face challenges related to preparation for deployment, the complexity of the technology itself, the integration of multiple data sets, and an increasing number of ethics issues (Baryannis et al., 2019; Chatterjee & Chaudhuri, 2022; Radanliev et al., 2020). Despite the challenges associated with implementing AI-based automation, it is estimated that the use of AI-based automation could potentially result in a 40 percent increase in total organizational productivity by the year 2035, and therefore should be a top-level strategic priority for any organization looking to remain competitive in a completely digital economy (Makridakis, 2017; Oclarino, 2021).

As key engines of job creation, innovation, and overall economic growth, small and medium-sized enterprises (SMEs) play a significant role in driving the economy forward (Ayyagari et al., 2007; Polas et al., 2022). With the rapid emergence of AI, many changes are occurring in how businesses operate day to day, with long-term implications for the overall economy (Lu et al., 2022). SMEs are uniquely positioned to respond quickly to changing customer needs, but they often face limited financial resources, a lack of structure, and competitive pressures from larger companies (Iqbal & Suzianti, 2021; Masood & Sonntag, 2020; Oliveira et al., 2018). Using AI technology alongside other cutting-edge smart technologies enables SMEs to make better decisions and develop new ways to innovate their operations (Davenport & Ronanki, 2018; Ghobakhloo, 2020; Krafft et al., 2020).

Concrete examples demonstrate that AI can significantly improve the user experience for SMEs. It improves day-to-day efficiency by automating tasks such as accounting and supply chain operations. It saves money through predictive maintenance and improves cybersecurity through anomaly detection (Basri, 2020; Drydakis, 2022; Hansen et al., 2020; Jagatheesaperumal et al., 2022; Watney & Auer, 2021). AI-based marketing leverages customer behavior data to enhance personalization and improve campaign effectiveness (Canhoto & Clear, 2020; V. Kumar et al., 2021; Verma et al., 2021). Hiring procedures receive a boost from AI-assisted candidate screening, and moves toward sustainability are aided by more intelligent resource allocation (Black & Van Esch, 2020; Skare et al., 2023). The benefits are even greater when AI is coupled with technologies such as IoT for autonomous data tracking or robotics to simplify production, enabling smaller firms to compete effectively with larger corporations (Bettoni et al., 2021).

Although there is a potential for AI to be used within SMEs, there remain many obstacles to its use, including cost constraints, lack of expertise/knowledge, privacy issues, and perceptions of complexity (Ghobakhloo & Ching, 2019; Iftikhar & Nordbjerg, 2021; Maroufkhani et al., 2023; Schönberger, 2023). As technology continues to evolve at an alarming rate and due to the pressures of competition in digital economies, these are compounded (Duan et al., 2019; Dwivedi et al., 2021). Finally, it is the ROI that adds to this resistance, because SMEs will have to weigh the high costs of AI implementation against the uncertain returns from using it (Davenport & Ronanki, 2018; Linde et al., 2021).

Although numerous studies have examined the influence of AI on SMEs, the current literature is vast but lacks cohesion, leading to disparate views on AI's positive and negative effects (Borges et al., 2021; Enholm et al., 2022).

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e-ISSN: 2468-4376
https://www.jisem-journal.com/

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Therefore, to create an overall picture of the central aspects, a comprehensive meta-analysis integrating data from all prior studies is required. To fill this void, the present study conducts a systematic review of 87 research papers, using the Technology Acceptance Model (Davis, 1989) as a basis for organizing the data, while modifying it to be more applicable to smart technology and SMEs.

Ajzen and Fishbein created the Theory of Reasoned Action (TRA) in 1975. The TRA was the basis for the TAM developed by Davis in 1989. The TAM states that an individual's decision to use technology is based primarily on two types of beliefs about the technology: perceived usefulness (PU) and perceived ease of use (PEOU). PU refers to an individual's perception of how efficiently a technology will improve their productivity. PEOU refers to an individual's perception of how difficult or easy it is to operate a technology (Davis, 1989; Thomas & James, 2017). TAM has been updated over the years to address its limitations. TAM2 added social influence to the original model and included additional cognitive variables, such as job relevance, output quality, and result demonstrability, to provide further insight into how external factors affect the perceived usefulness of technology (Venkatesh & Davis, 2000). The Unified Theory of Acceptance and Use of Technology (UTAUT) combines TAM with four new constructs: performance expectancy, effort expectancy, social influence, and facilitating conditions (Venkatesh et al., 2003). UTAUT2 provides a refinement of UTAUT for consumer contexts, adding constructs of hedonic motivation, price value, and habit (Venkatesh et al., 2012).

The applications of each extension are most meaningful for integrating AI and intelligent technology into SMEs. This is true because of the potential for peer networks to influence individual perception of the utility of AI and other smart technology tools through increased social influence, and due to the impact that the availability of infrastructure has on how easily one may use AI and other smart technology tools (Alkhwaldi, 2024; Alkhwaldi et al., 2025). Cost is also an important factor in perceived value, as high costs may deter the adoption of AI and other smart technologies even when positive benefits exist (Alkhwaldi & Abdulmuhsin, 2022). Studies conducted within the health care sector in SMEs have shown that trust acts as a moderating factor in AI acceptance. Specifically, trust connects an individual's concern about AI safety with their general view of AI's utility (Abdulmuhsin et al., 2025). Similarly, studies of SMEs in the infrastructure sector indicate that factors supporting the acceptance of AI include employee training programs, which increase employees' expectations of the amount of work required to operate AI systems, including those that combine IoT (Alkhwaldi & Abdulmuhsin, 2022; Ghobakhloo, 2020).

In the context of applying the TAM to SMEs, distinct patterns emerge. The primary focus of PU is on cost savings and increased competitive advantage in the marketplace, as many of these organizations have limited financial resources (Baabdullah et al., 2021; Herzallah et al., 2021). Conversely, the focus of PEOU often faces challenges related to skill deficits among workers and system integration issues. Restricted funding creates additional challenges for PEOU by fostering a perception of the effort required to adopt technology and creating distrust in the security of their data, both factors that affect perceptions of PU and social influence (Hubert et al., 2019). This study uses an extended version of TAM to examine the perceived benefits (correlating with PU and performance expectancy) in addition to the perceived barriers (related to PEOU, facilitating conditions, and price value); therefore, this study provides a structured method for guiding SME decision-making processes for adopting technology.

OBJECTIVES

Three specific objectives have been established for this study. First, the research is designed to identify and categorize the most important advantages organizations derive from AI, including better operations, cost reduction, improved innovation, and increased market competition (Bai et al., 2021; A. Kumar & Kalse, 2021). Second, the research will investigate the significant obstacles to AI adoption by SMEs, including limited access to resources and a shortage of qualified staff, as well as concerns about data protection (Ghobakhloo & Ching, 2019; Iftikhar & Nordbjerg, 2021). Third, it will develop a unified conceptual model based on the results of this research, including real-world examples of how AI has been used. The systematic literature review, developed using the PRISMA (Preferred Reporting Items for Systematic Reviews and Meta-Analyses) methodology, will provide an open, structured approach for evaluating a large number of publications across multiple disciplines, minimizing potential bias and maximizing completeness (Pahlevan-Sharif et al., 2019). Ultimately, this research will add value to prior work by identifying the challenges faced by SMEs and linking them to academic theories and concepts, thereby promoting the use of AI to drive a digital revolution.

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METHODS

The research will use an exploratory methodology to identify and evaluate the existing knowledge base on integrating AI into SMEs and to examine the advantages and barriers encountered (Reynolds, 1971). Using a qualitative/qualitative descriptive design, the study follows PRISMA guidelines to provide a systematic and transparent way of documenting the methods used to select, evaluate, and synthesize the data (Harrell & Bradley, 2009; Pahlevan-Sharif et al., 2019; Walliman, 2021). The reason PRISMA was selected is that it has been widely adopted globally, is comprehensive, and provides a means to support reproducibility across disciplines, particularly when combining findings from scattered studies on technology adoption (Pahlevan-Sharif et al., 2019). Additionally, using PRISMA with economic topic reviews enhances methodological rigor and facilitates reproducibility, as open science practices increase expectations for transparency during the compilation of evidence (Stanley et al., 2013).

Inclusion and Exclusion Criteria

Inclusion Criteria: Research had to primarily investigate the application of AI in SMEs or related issues. The time frame for this study was limited to publications from 2015 through 2024 to provide an overview of current trends in the rapidly evolving field of AI in SMEs. A wide range of academic disciplines was reviewed using a cross-disciplinary approach, including Business, Social Science, Computer Science, Economics, and Arts & Humanities. Only finished, peer-reviewed articles in the English language were reviewed, including Journal Articles, Conference Proceedings, Full Books, and Individual Book Chapters. Conference Proceedings provided access to emerging innovations, while full books and their individual chapters provided the reviewer with a deeper understanding of the theoretical bases and the broader historical context of the subject matter.

Exclusion Criteria: Research studies were excluded if they did not address the use of AI in SMEs, were outside of the time frame established for the study (2015-2024), were in fields unrelated to the study, were in a language other than English, or were draft works (Pahlevan-Sharif et al., 2019).

Search Strategy and Data Sources

The search included a wide range of academic literature on the subject using the research engine Scopus as a source for our analysis (Pahlevan-Sharif et al., 2019), which is regarded to be an important source of peer reviewed literature; we used AI and SMEs or ("Small and Medium Enterprises" AND "Adoption") OR (Artificial Intelligence" AND "Barriers") OR ("Artificial Intelligence" AND "Advantages") OR ("Technology Acceptance Model" AND "TAM").

Screening and Selection Process

To help limit potential biases and provide a transparent approach to the screening process, it followed PRISMA guidelines. Initially, all studies were reviewed for relevance by five independent reviewers: their titles, keywords, and abstracts. If there was disagreement among reviewers about which studies were potentially relevant, it was resolved through extensive discussion with each reviewer until a final decision on which studies would be eligible for further review at the full-text stage was reached. At the full-text stage, reviewers independently used the predefined inclusion criteria they developed during the protocol development phase to determine whether each study met the inclusion criteria for this systematic review. The use of a team of reviewers helped increase the overall reliability of the screening process (Pahlevan-Sharif et al., 2019).

Data Extraction and Analysis

This study focused on identifying the perceived advantages and disadvantages of expanding TAM's constructs by examining themes from prior research. The researchers used both qualitative and quantitative coding methods in NVivo to assess a group of 87 studies, using binary coding (1=Yes, 0=No) to indicate whether each article contained a particular theme. Next, the researchers categorized the themes by frequency of occurrence into internal and external categories for both advantages and obstacles. Finally, using the frequency of occurrence and the commonality of patterns identified through occurrence rates, common themes were identified, and relationships between themes were analyzed qualitatively to determine whether co-occurring themes occurred. Co-occurring themes were evaluated and ranked by frequency of occurrence, degree of generalization, and prominence across the studies. Utilizing this method yielded a clear, reproducible, and consistent analysis of TAM evolution (Venkatesh et al., 2003, 2012).

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e-ISSN: 2468-4376
https://www.jisem-journal.com/

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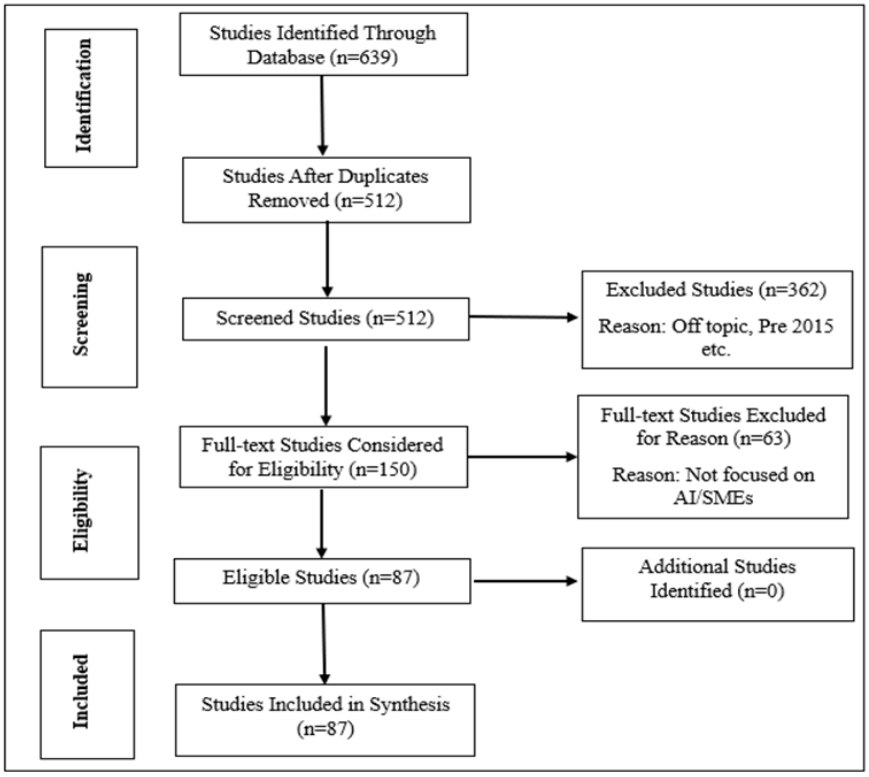

Figure 1: A PRISMA Flowchart for Literature Screening Process

Source: Adapted from (Mohr et al., 2015).

RESULTS AND DISCUSSION

In this evolution, we have drawn on 87 peer-reviewed studies published between 2015 and 2024 that examine AI use in SMEs. The studies were selected for systematic literature review using PRISMA from the Scopus database. The majority of the studies were research journal articles (74), but also included 8 conference papers, 4 book chapters, references, and 1 full book reference. In addition, based upon an expanded version of the TAM as originally outlined by Davis and later elaborated by Venkatesh et al. (Davis, 1989; Venkatesh et al., 2003, 2012), we identified 14 user-perceived advantages and 7 significant barriers. The next section will discuss these results, organize them by internal and external groups, explain how these factors influence each other, illustrate the critical aspects, and outline a new conceptual model to assist with implementing AI in SMEs.

Perceived Advantages: Synthesis and Thematic Organization

In approximately 80.5 percent (70/87) of the data, researchers identified benefits of using AI for businesses that aligned with the PU element of the TAM and the performance expectancy component of the UTAUT. This provides evidence of AI's ability to positively impact SME performance. As shown in Table 1, there are primarily two main types of these advantages: internally, by enhancing SME operations (59.8 percent, or 52 papers), and externally, by improving their market position (34.4 percent, or 30 papers). Internally, the advantages receive substantially more attention than do the externally derived advantages, and include increased productivity and enhanced predictive analysis. Both of these advantages reflect AI's role in creating more efficient business processes and improving resource utilization within an organization (Ghobakhloo & Ching, 2019; Hansen & Bøgh, 2021). Externally, the advantages also include marketing, customer service, and competitive advantage, which together help create long-term growth strategies and better position organizations for success in the marketplace (Canhoto & Clear, 2020; V. Kumar et al., 2021).

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e-ISSN: 2468-4376
https://www.jisem-journal.com/

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Table 1: Perceived Advantages of AI Adoption

TAM/ UTAUT Construct	Theme	Perceived Advantages	f	Citations	%
PU/ Performance Expectancy	Internal Operational Enhancements	Productivity	18	(Basri, 2020; Bender et al., 2022; Bender & Ovtcharova, 2021; C. M. L. Chan et al., 2019; L. Chan et al., 2019; Ghobakhloo & Ching, 2019; Herzallah et al., 2021; Horváth & Szabó, 2019; Iftikhar & Nordbjerg, 2021; Krafft et al., 2020; A. Kumar & Kalse, 2021; Masood & Sonntag, 2020; Müller et al., 2018; Onu & Mbohwa, 2021; Schönberger, 2023; Singh et al., 2023; Ulas, 2019; Uygun & Aydin, 2021)	20.68%
		Predictive analysis	12	(Angelopoulos et al., 2019; Behera & Nain, 2020; Bettoni et al., 2021; Canhoto & Clear, 2020; Chishti et al., 2020; Ciampi et al., 2021; Drydakis, 2022; Jain et al., 2020; Kellner et al., 2021; Omri et al., 2021; Welte et al., 2020; Zhang et al., 2021)	13.79%
		Operational efficiency	11	(Bai et al., 2021; Bender et al., 2022; Bender & Ovtcharova, 2021; L. Chan et al., 2019; Drydakis, 2022; Gao & Han, 2021; Iftikhar et al., 2020; Iftikhar & Nordbjerg, 2021; Kaplan & Haenlein, 2019; Lingxian et al., 2019; Schönberger, 2023)	12.64%
		Automation	9	(Angelopoulos et al., 2019; Borah et al., 2022; Borges et al., 2021; Canhoto & Clear, 2020; Chaudhuri et al., 2022; Hansen et al., 2020; Hansen & Bøgh, 2021; Jagatheesaperumal et al., 2022; Sariyer et al., 2021)	10.34%
		Supply Chain/cybersecurity	8	(Ciampi et al., 2021; Dey et al., 2024; Hamal & Senvar, 2021;	9.19%

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e-ISSN: 2468-4376
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				Jain et al., 2020; Kim et al., 2022; Panigrahi et al., 2023; Radanliev et al., 2020; Rawindaran et al., 2021)	
		Process improvement	6	(Angelopoulos et al., 2019; Dwivedi et al., 2021; Ghobakhloo & Ching, 2019; Iftikhar & Nordbjerg, 2021; Lu et al., 2022; Um et al., 2020)	6.89%
		Decision-making	5	(Borges et al., 2021; L. Chan et al., 2019; Chishti et al., 2020; Krafft et al., 2020; Schönberger, 2023)	5.74%
		Cost reduction	4	(Canhoto & Clear, 2020; Lingxian et al., 2019; Ulas, 2019; Velmurugan et al., 2022)	4.59%
	External Market Performance	Marketing/customer support	9	(Akpan et al., 2021; Borges et al., 2021; Campbell et al., 2020; Canhoto & Clear, 2020; Chishti et al., 2020; A. Kumar & Kalse, 2021; Li, 2019; Lu et al., 2022; Perez et al., 2019)	10.34%
		Business strategy	7	(Akpan et al., 2021; Bai et al., 2021; Black & Van Esch, 2020; Duan et al., 2019; Gebauer et al., 2020; Kohtamäki et al., 2019; Paiola & Gebauer, 2020)	8.04%
		Business competitiveness	7	(Baabdullah et al., 2021; Borah et al., 2022; C. M. L. Chan et al., 2019; Iftikhar & Nordbjerg, 2021; A. Kumar & Kalse, 2021; Polas et al., 2022; Skare et al., 2023)	8.04%
		Innovation	5	(Borges et al., 2021; Lu et al., 2022; Polas et al., 2022; Ulas, 2019; Wan et al., 2021)	5.74%
		Sustainability	4	(Bunte et al., 2021; A. Kumar & Kalse, 2021; Skare et al., 2023; Türkeş et al., 2019)	4.59%
		Revenue Growth	3	(Baabdullah et al., 2021; Iftikhar & Nordbjerg, 2021; Onu & Mbohwa, 2021)	3.44%

Source: Author's analysis based on 87 studies

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2026, 11(3s)
e-ISSN: 2468-4376
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Most research (59.8 % of research) highlights internet benefits, which are related to SME's focus on improving operations to overcome the resource constraints associated with their size and operation within a high level of uncertainty and/or unpredictability that exists in many markets (Drydakis, 2022). Even though fewer studies have highlighted external benefits for competitive advantage, these are generally the most important long-term benefits for the company's sustainability and may be influenced by social factors, as illustrated by the UTAUT model (Alraja et al., 2022).

Perceived Barriers: Synthesis and Thematic Organization

Among the studies we analyzed, 43 papers (49.4 %) reported perceived barriers to technology adoption similar to the TAM PEOU, along with facilitating conditions and price-value considerations. As seen in Table 2, these barriers can be grouped into two major categories: Internal barriers, which were cited by 39 research (44.8%), and External barriers, which were mentioned by 16 research (18.4 %). Most research identified barriers that stemmed from internal factors, including financial constraints and insufficient knowledge/expertise. These barriers increase the perceived effort required and decrease an individual's motivation to use new technologies (Kaiser et al., 2023; Moeuf et al., 2020). Conversely, external barriers such as regulatory/environmental hurdles and concerns about security/privacy tend to reduce an individual's ability to build trust (Dwivedi et al., 2021).

Table 2: Perceived Barriers to AI Adoption

TAM/UTAUT Construct	Theme	Perceived Barriers	f	Citations	%
PEOU/Effort Expectancy & Facilitating Conditions/price value	Internal	Financial barriers	23	(Ardito et al., 2021; Borah et al., 2022; Brunswicker & Vanhaverbeke, 2015; Bunte et al., 2021; Chen et al., 2021; Duan et al., 2019; Ghobakhloo & Ching, 2019; Iancu et al., 2022; Iftikhar & Nordbjerg, 2021; Kaiser et al., 2023; Linde et al., 2021; Matt & Rauch, 2020; Moeuf et al., 2020; Onu & Mbohwa, 2021; Orzes et al., 2018; Pfister & Lehmann, 2023; Sjödin et al., 2020; Skare et al., 2023; Sun & Medaglia, 2019; Türkeş et al., 2019; Ulas, 2019; Ulrich et al., 2021; Welte et al., 2020)	26.43 %
		Knowledge/ expertise barriers	22	(Bai et al., 2021; Bettoni et al., 2021; Borges et al., 2021; Brunswicker & Vanhaverbeke, 2015; Bunte et al., 2021; Chen et al., 2021; Goerzig & Bauernhansl, 2018; Hansen & Bøgh, 2021;	25.28%

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e-ISSN: 2468-4376
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				Iftikhar & Nordbjerg, 2021; Kaiser et al., 2023; Krafft et al., 2020; Priyono et al., 2020; Rauch et al., 2019; Rawindaran et al., 2021; Schönberger, 2023; Sjödin et al., 2020; Sun & Medaglia, 2019; Türkeş et al., 2019; Ulas, 2019; Ulrich et al., 2021; Welte et al., 2020; Xie et al., 2021)	
		Technological/ integration barriers	7	(Chaudhuri et al., 2022; Chen et al., 2021; Dwivedi et al., 2021; Lu et al., 2022; Moeuf et al., 2020; Orzes et al., 2018; Rakshit et al., 2021)	8.04%
		Organizational/cultural barriers	8	(Bai et al., 2021; Bettoni et al., 2021; Chaudhuri et al., 2022; Da Silva et al., 2020; Iftikhar & Nordbjerg, 2021; Lu et al., 2022; Moeuf et al., 2020; Orzes et al., 2018)	9.19%
	External	Regulatory/ environmental barriers	9	(Duan et al., 2019; Kamalaldin et al., 2020; Kohtamäki et al., 2019; Linde et al., 2021; Lu et al., 2022; Onu & Mbohwa, 2021; Orzes et al., 2018; Sjödin et al., 2020; Skare et al., 2023)	10.34%
		Security/ privacy barriers	7	(L. Chan et al., 2019; Duan et al., 2019; Iftikhar & Nordbjerg, 2021; Rauch et al., 2019; Rawindaran et al., 2021; Schönberger, 2023; Ulas, 2019)	8.04%
		Market/ competition barriers	2	(Bai et al., 2021; Skare et al., 2023)	2.29%

Source: Author's analysis based on 87 studies

Internal resource limitations are the primary impediments to technology adoption by SME, whereas although fewer external barriers exist, they reduce SME's confidence and have a direct impact on the social influence aspect of the UTAUT model (Dwivedi et al., 2021).

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Interconnections, Nuances, and Prioritization

According to Table 3, co-occurrence analysis was used to examine the relationship between the advantages and disadvantages of technology adoption in 23 (26.4 %) of the studies reviewed. This example illustrates how an advantage (cost savings) can help remove an obstacle (financial challenges), thereby increasing price value (Venkatesh et al., 2012). In addition, a benefit such as improved operational efficiency will help reduce an obstacle to integrating technology into operations, thereby increasing PEOU (Alraja et al., 2022). Innovation can address knowledge gaps through targeted training programs and positive social influence; however, when ROI is ambiguous, it can reinforce pre-existing barriers and reduce willingness to adapt (Schönberger, 2023).

Table 3: Interconnections and Prioritization of Perceived Advantages and Barriers

Perceived Advantage	Interconnected Barrier	Mitigation Mechanism	Prioritization (Frequency/Emphasis)
Cost reduction (External)	Financial barriers (Internal)	Reduces perceived costs, improving price value	High (26.4 % barrier; critical for SMEs)
Operational efficiency (Internal)	Technological/integration (Internal)	Streamlines adoption, enhancing PEOU	High (12.6% advantage; 30 + citations)
Innovation (External)	Knowledge/expertise (Internal)	Fosters skills via training/social influence	Medium-High (5.7 % advantage; innovation focus)
Sustainability (External)	Regulatory/environmental (External)	Aligns with policies, building trust	Medium (4.6 % advantage; emerging in green AI)

Source: Author's analysis based on 87 studies

Researchers have placed greater emphasis on operational efficiency and financial barriers to adoption due to their prevalence in the research literature (Tables 1-2) and the specific attention they received during the COVID-19 Pandemic recovery (Bai et al., 2021). The SME's perception of the potential advantages is often viewed as both attractive and somewhat unrealistic, due to perceived enjoyment of the technology being utilized and their reliance on pre-existing routines, as outlined in the UTAUT 2 model (Venkatesh et al., 2012). In other words, if the impediments are not addressed, they will be trapped in an ongoing cycle of adverse reinforcement (Ghobakhloo, 2020).

Conceptual Framework

Figure 2 provides a conceptual model that integrates relevant research by identifying how different potential advantages and barriers relate to the intention to implement AI technology within an organization. Advantages within the organization, e.g., increased production efficiency, have their greatest impact on AI adoption mainly through the PU, and conversely, internal barriers, e.g., insufficient funding, can increase PEOU and the level of effort required. External advantages, including but not limited to competitive advantage, promote organizational development, while external barriers, such as regulatory requirements, necessitate efforts to build and demonstrate trust. In addition, moderators from the UTAUT model, e.g., social influence, price-value, and trust, will have a significant effect on an individual's perceptions of usefulness and ease of use and, therefore, support the overall decision to implement AI technology.

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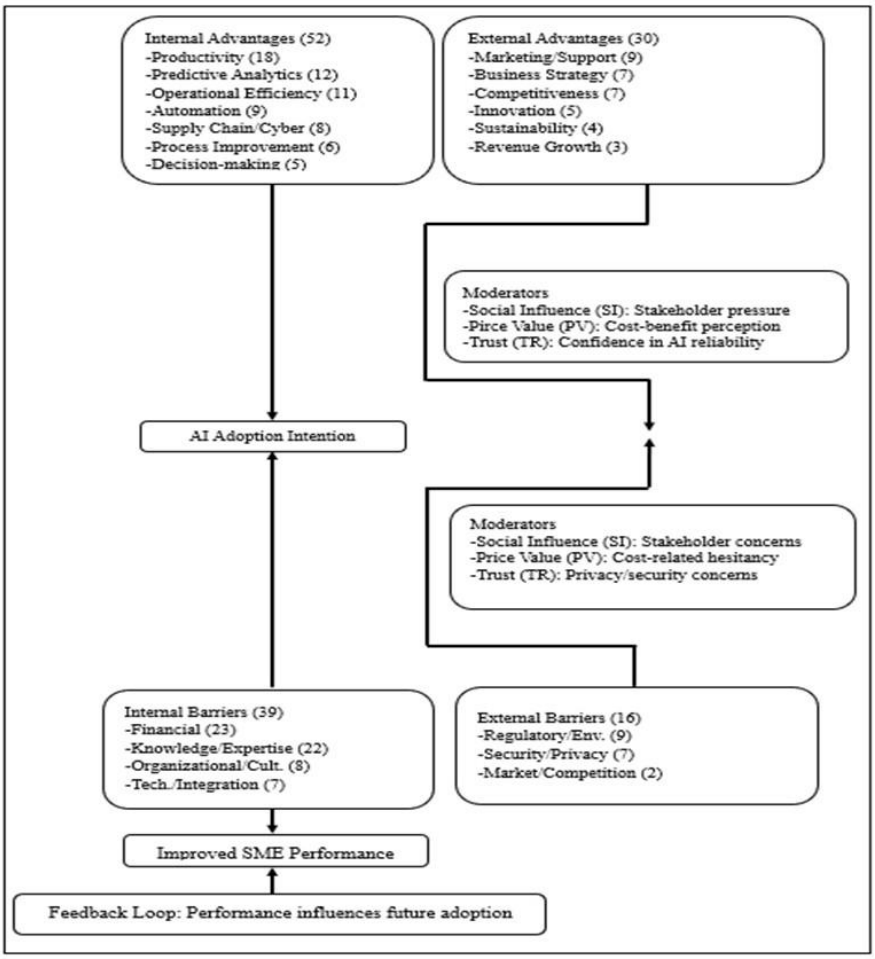

Figure 2: Conceptual Framework for AI Adoption to Improve SMEs' Performance

Practical Implications

For Businesses: The first step is for organizations to test affordable AI solutions, particularly those focused on automation, to demonstrate how quickly they can be implemented and deliver quick returns on investment. Then, investing in employee training programs can create opportunities to improve employees' ability to effectively utilize new technologies, thereby improving PEOU (Alkhwaldi & Abdulmuhsin, 2022).

For Policymakers: Governments in developing economies could encourage the adoption of AI by creating economic incentives for AI use, fostering collaboration among stakeholders to support research and development, and providing funding for worker training programs to close the technological capabilities gap (OECD, 2022; World Bank, 2023). The government could also enact regulations to protect against data security and privacy risks and promote environmental sustainability, both of which are critical to the successful use of AI (Skare et al., 2023).

For Researchers: There is a need for more research exploring less-studied barriers, particularly those associated with competitive and market forces, and for longer-term studies to solidify the current framework.

Recommendation: Companies should implement AI incrementally, starting with internal uses (i.e., improving operating performance), before expanding to external uses (e.g., customer marketing). This approach maximizes the benefits of AI while minimizing its risks, ultimately boosting competitiveness.

CONCLUSION

This evaluation uses an enhanced TAM that incorporates elements from TAM2, UTAUT, and UTAUT2 to examine 87 peer-reviewed articles on AI implementation among SMEs from 2015 to 2024. Using the PRISMA method, the authors identified 14 primary advantages connected to PU and performance expectancy. In terms of daily operation,

those advantages included increased productivity (20 percent) and advanced predictive analytics (13.3 percent). Those advantages connected to competitive advantage included improved marketing and customer service (11.1 percent). The authors found 7 barriers related to PEOU, effort expectancy, and facilitating conditions. The largest internal barriers were a lack of funds and a lack of skills (25.6 percent), and the largest external barrier was regulatory complexity (10.0 percent). The relationship between the factors was important; for example, reducing costs may reduce the burden of financial limitations, improving efficiency will help alleviate integration challenges, and both are important for adoption decisions made by SMEs with limited resources. However, the application of TAM's individual level concepts to entire organizations may be assisted by concepts from evolutionary economics and institutional theory to explain long-term dependency and learning processes in organizations (Nelson & Winter, 1982; Teece, 2018)

On theoretical grounds, this research extends the TAM and UTAUT frameworks by identifying trust and social influence as key factors in SME adoption decisions. Technologies such as AI, ML, NLP, and IoT improve long-term sustainability and operational durability. Businesses can implement easy-to-access platforms to apply their uses, including Google Cloud AutoML for forecasting needs or TensorFlow for task automation, and realize large savings, potentially up to 40 percent of their supply chain costs (Makridakis, 2017). Training initiatives may help bridge knowledge gaps, and governments in Europe, Asia, and Africa can provide grants and test environments to address cost and data protection issues, ensuring equal technology development opportunities. Additionally, AI supports green practices, for example, by optimizing material use during production, which will aid in meeting worldwide environmental goals (Skare et al., 2023) and strengthen the business performance of SMEs in the marketplace.

Limitations of the research include reliance on Scopus data only, omission of non-English publications, and using a qualitative summary to limit the number of broad numerical conclusions. Future studies can test the proposed model over longer time periods, examine less-discussed barriers such as competition (2.2 percent), and examine differences across regions, e.g., money constraints in developing markets versus compliance issues in Europe. Researchers should also acknowledge potential geographic and linguistic bias within Scopus and WoS databases, as the selected studies may not represent all aspects of global realities (Mongeon & Paul-Hus, 2016).

Author Contributions

Author 1: The author developed the research concepts and methodology based on PRISMA, managed the inclusion of the TAM and UTAUT models, provided overall direction for the paper, and approved the final paper.

Author 2 (Corresponding Author): The author was responsible for reviewing relevant literature, collecting data on user-perceived benefits, and conducting the initial thematic analysis (Table 1) before extending it to a higher level of abstraction.

Author 3: The author analyzed the obstacles identified, extended the TAM/UTAUT models, and contributed to the development of the draft (Tables 2 & 3).

Author 4: The author performed the screening of the literature per PRISMA guidelines, assessed the quality of the studies included, and agreed upon the results among the team members (Section 2.3).

Author 5: The author constructed the proposed framework (Figure 2), provided additional implications for policy, and enhanced readability and global applicability of the manuscript.

Conflicts of Interest

There were no conflicts of interest reported by the authors related to this study.

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