European Journal of Economic and Financial Research
ISSN: 2501-9430
ISSN-L: 2501-9430
Available on-line at: http://www.oapub.org/soc

DOI: 10.46827/ejefr.v8i6.1858 Volume 8 | Issue 6 | 2024

PROPOSAL OF A TECHNOLOGY ACCEPTANCE MODEL: ADOPTION OF ARTIFICIAL INTELLIGENCE IN MOROCCAN SMES

Salma Erraoui[1],
Abderrahmane Amine[2i]
[1]Doctoral Student,
Management Sciences ENCG Tangier,
Marrocco
[2]Research Professor at ENCG Tangier,
Morocco

Abstract:
This article proposes a new model based on the Technology Acceptance Model (TAM) to study the adoption of artificial intelligence (AI) in Moroccan small and medium-sized enterprises (SMEs). It aims to identify and analyze the key factors influencing this adoption, taking into account the specific features and challenges of Moroccan SMEs. By integrating elements such as technological understanding, ease of use, and perceived usefulness, this model offers an in-depth perspective on how Moroccan SMEs can effectively integrate AI into their strategies and operations.

JEL: O33, L86, L26, L53

Keywords: artificial intelligence, small and medium enterprises, technology acceptance model, technology adoption, adoption barriers

1. Introduction

In the digital age, Artificial Intelligence (AI) has ceased to be a futuristic vision to become a tangible reality shaping industries. This article examines the adoption of AI in Small and Medium Enterprises (SMEs) in Morocco from an innovative angle: that of marketing. We propose a Structural Equation Modeling (SEM) model based on the Technology Acceptance Model (TAM). SMEs in Morocco, faced with dynamic market demands and technological advances, need to understand and integrate AI. Our SEM model, extending the principles of TAM, aims to unveil perceived usefulness, ease of use, technological understanding and barriers influencing AI adoption in SMEs. In this way, we aspire to offer an in-depth understanding of the exploitation of AI in marketing for SMEs,

[i] Correspondence: email serraoui@uae.ac.ma, amineabderrahmane@uae.ac.ma

enriching the debate on technological acceptance and digital transformation in small businesses.

This timely and crucial exploration fills a gap in existing literature, often focused on large corporations. By focusing on SMEs, we highlight the potential of AI to transform operations and decision-making processes on a smaller scale, equipping SMEs to navigate the digital age with greater efficiency and strategic insight.

2. Literature Review

The integration of artificial intelligence (AI) in industry, and particularly in small and medium-sized enterprises (SMEs), represents a rapidly expanding field of research. Recent studies, such as those by Zhang *et al.* (2022) and Szedlak *et al.* (2020), highlight the growing importance of AI in industrial production, process optimization and machine failure prediction. This is part of the broader framework of Industry 4.0, where AI is seen as an essential element for efficiently handling large volumes of data. However, the majority of AI research and applications are focused on large companies, leaving a gap when it comes to SMEs.

Studies such as that by Ulrich and Frank (2021) show that SMEs are beginning to recognize the opportunities offered by AI, although their adoption remains limited by specific challenges related to their resources and skills. Differences include more limited financial capabilities, reduced data availability, or lower desired complexity of AI applications (Agerri *et al.*, 2014; Jain *et al.*, 2021). This systematic review highlights the growing importance of AI in various business activities while also highlighting specific challenges for SMEs, such as lack of knowledge, costs, and inadequate infrastructure. Overcoming these obstacles is essential for SMEs to effectively integrate AI into their marketing strategies, taking into account benefits such as improved decision-making and optimized operations. Research shows a gap in studies focused specifically on SMEs, highlighting the need for greater attention to their unique needs and challenges in adopting AI (Oldemeyer *et al.*, 2024).

In addition, further systematic studies are recommended to cover various business functions that could benefit from AI techniques, such as accounting, quality management and human resources management (Cubric, 2020; Bauer *et al.*, 2020). The adaptation of the Technology Acceptance Model (TAM) for AI integration in SMEs focuses on adjusting traditional TAM variables to meet the particularities of SMEs.

This model extends the concepts of perceived usefulness and perceived ease of use to include AI-specific considerations, such as technological understanding and barriers to adoption (Dupont, 2023). This personalized approach enables a better understanding of the factors influencing AI adoption by SMEs, taking into account their limited resources and specific needs (Marino-Romero *et al.*, 2024).

3. Research Approach

This study adopts a qualitative approach to examine AI adoption in SMEs using the TAM model, inspired by the integrative method of literature synthesis and theoretical model building (Snyder, 2019; Jaakkola, 2020). The literature search was conducted on several databases, including Web of Science, Scopus, and Google Scholar, following a methodology similar to that of Venkatesh *et al.* (2003) for article selection.

1) **Search Period:** The search extends without the restriction of publication date to include a wide range of studies, following the example of Dishaw & Strong (1999), who emphasize the importance of longitudinal analysis.
2) **Inclusion and Exclusion Criteria:** Inclusion and exclusion criteria are based on principles established in the technology adoption literature (Teo & van Schaik, 2012), favoring articles in English and focused on technology adoption in SMEs.
3) **Text Analysis:** The analysis draws on analytic techniques to examine the relationship between concepts related to technological adoption, drawing on the methods of Delbridge & Fiss (2013) and Jaakkola (2020) for textual analysis.
4) **Model Development:** The aim is to develop a specific model of AI adoption in SMEs, taking into account the work of Venkatesh & Davis (1996) on the TAM model and adapting it to the SME context.

By referencing these authors and works, the study's methodology gains credibility and is part of a rigorous scientific approach, in line with previous research on technological adoption and the TAM model.

4. Applying the Research Approach

4.1 Search Period

The systematic literature search for this study spanned an unrestricted period to cover a wide range of previous and current work. This approach makes it possible to include pioneering studies on AI in SMEs, as well as recent research that highlights current developments and trends in the field. Drawing on studies such as those by Zhang *et al.* (2022), Szedlak *et al.* (2020), and other researchers who have explored AI in various industrial and business contexts, this research aims to capture a comprehensive range of relevant information and analysis. It is crucial to understand fully how SMEs approach AI adoption, taking into account their unique challenges and opportunities. By adopting a longitudinal perspective, in line with the recommendations of Dishaw & Strong (1999), the research embraces both historical and contemporary perspectives, providing a comprehensive overview of the evolution of AI adoption in SMEs.

4.2 Inclusion and Exclusion Criteria

For this study, we established specific inclusion and exclusion criteria in order to target the most relevant and high-quality research.

a. Inclusion Criteria:

1) **Articles in English:** Prioritize articles written in English to ensure coherent understanding and analysis.
2) **Peer-reviewed Literature:** Include only studies published in peer-reviewed journals to guarantee scientific rigor.
3) Thematic relevance: Select articles focusing on technology adoption, more specifically AI, in SMEs.

b. Exclusion Criteria

1) **Off-topic Articles:** Exclude studies that do not focus on technology adoption or AI in SMEs.
2) **Non-academic Literature:** Avoid non-academic sources such as blogs, press articles and documents not validated by experts.
3) **Duplicates:** Eliminate redundant items to avoid repetition in the analysis.

These criteria ensure an in-depth, targeted analysis focused on the most crucial aspects of AI adoption in SMEs.

4.3 Text Analysis

In this phase, we will use analytical methods to examine in depth the relationships between concepts relating to AI adoption in SMEs. This involves:

1) **Thematic Analysis:** Identify and classify the main themes that emerge from the texts, such as the benefits of AI, the challenges specific to SMEs, and the impact of environmental factors on AI adoption.
2) **Integrative Synthesis:** Combining the results of different studies to create a coherent overview. This approach makes it possible to integrate different perspectives and identify common trends or patterns.
3) **Relevance Assessment:** Evaluate each source in terms of its relevance to our research question, focusing on studies that offer insights directly applicable to the SME context.
4) **Source Criticism:** Critically analyze the methodology, results and conclusions of the selected studies to ensure the rigor and validity of our synthesis.

This analytical approach aims to provide a rich and nuanced understanding of the complex dynamics of AI adoption in SMEs based on a comprehensive review of existing literature.

4.4 Model Development

This model builds on the classic Technology Acceptance Model (TAM) and adapts it specifically to AI adoption in SMEs. It incorporates key factors such as technological understanding, perceived ease of use, and perceived usefulness, as well as contextual elements such as barriers to adoption, perceived benefits, and environmental factors. The aim is to assess how these factors influence SMEs' intention to adopt AI. This model offers

a holistic view, integrating the specificities of SMEs, to better understand and facilitate the adoption of AI in this crucial segment of the economy.

4.4.1 The Role of Technological Understanding in SMEs' Perceived Ease of Use of AI

The first hypothesis (H1) examines the relationship between technological understanding and perceived ease of use of AI in SMEs. This hypothesis is based on the premise that the deeper the understanding of AI among SME managers and employees, the more likely they are to find AI easy to use. Various research studies in the field of technology adoption have supported this link. For example, Zhang *et al.* (2022) discussed the growing importance of AI in industry, suggesting that familiarity with these technologies can facilitate their integration and use. Kumar *et al.* (2016) explore the impact of company-generated content on social media on consumer behavior. This study is relevant to understanding how technological understanding, particularly of AI and social media, can influence the adoption of new technologies in digital marketing. A lack of technical knowledge often hampers the adoption of AI by SMEs, but when this barrier is overcome, AI becomes more accessible and its usefulness more obvious. Therefore, this hypothesis suggests that an effective strategy for promoting AI adoption among SMEs could be to invest in training and technology education to improve the general understanding of AI and reduce the perception of its complexity.

H1: Technological understanding → Perceived ease of use

4.4.2 Impact of Technological Understanding on Perceived Usefulness of AI in SMEs

Hypothesis 2 (H2) focuses on the relationship between SMEs' technological understanding and their perception of AI's usefulness. This hypothesis assumes that the more SMEs understand the technical aspects of AI, the more likely they are to perceive this technology as useful for their business. This relationship is supported by existing research highlighting the importance of technical knowledge in evaluating and adopting new technologies. To illustrate this hypothesis, studies such as those by Zhang *et al.* (2022) and Barton *et al.* (2022) can be cited. Zhang *et al.* (2022) point out that the adoption of AI in industry has grown in importance in recent years, not least because of its benefits, such as improved production control and optimization. This observation suggests that understanding these benefits is crucial to perceiving the usefulness of AI. Barton *et al.* (2022) reinforce this idea by stating that AI is seen as an essential part of Industry 4.0. They argue that AI is the only way to use large volumes of newly acquired data effectively. This assertion implies that understanding the applications and capabilities of AI is fundamental to recognizing its usefulness in the business context.

H2: Technological Understanding → Perception of Utility

4.4.3 Perceived Usefulness of AI in SMEs: Influence of Perceived Benefits

Hypothesis 3 (H3) explores the relationship between the perceived benefits of artificial intelligence (AI) and SMEs' perceived usefulness. This hypothesis suggests that when SMEs perceive tangible benefits from AI, such as improved efficiency, productivity and

the ability to analyze data in depth, their perception of AI's usefulness increases significantly. This relationship is supported by studies showing that recognition of AI's potential benefits is a key factor in the positive evaluation of its usefulness. Work such as that by Szedlak *et al.* (2020) emphasizes that AI is essential for effectively harnessing large volumes of data, which directly reflects its benefits in terms of analytical capabilities. Similarly, Barton *et al.* (2022) highlight the role of AI as a central element of Industry 4.0, indicating that its ability to manage and analyze large amounts of data is perceived as highly beneficial. As such, H3 stresses the importance of effectively communicating the practical benefits of AI to SMEs to improve their perception of its usefulness. A clear understanding of the benefits, such as improved decision-making processes and optimized operations, can encourage SMEs to adopt AI in their business practices further.
H3: Perceived Benefits → Perceived Usefulness

4.4.4 Influence of Adoption Barriers on Ease and Perceived Usefulness of AI in SMEs

Hypotheses 4 and 5 (H4 and H5) focus on how barriers to AI adoption affect perceived ease of use and perceived usefulness in SMEs. These hypotheses propose that barriers such as financial challenges, resource constraints, perceived complexity and skill requirements diminish not only AI's perceived ease of use but also its perceived usefulness. Studies such as those by Mittal *et al.* (2018) and Teerasoponpong & Sopadang (2021) indicate that SMEs often face specific challenges in adopting AI, particularly in terms of financial resources and technical skills. Wedel & Kannan (2016) discuss the use of marketing analytics in data-rich environments. Their etude highlights the importance of data analytics in improving marketing decision-making, which is critical to understanding how the perceived benefits of AI can influence its perceived usefulness in SMEs. These challenges can make AI less accessible and, therefore, less valuable in the eyes of SMEs. In addition, the lack of infrastructure and technical knowledge specific to AI can make its use and understanding more complex, negatively influencing the perception of its usefulness and ease of use.

These hypotheses underline the importance of AI developers and solution providers taking into account the specific constraints of SMEs and working to reduce these barriers to facilitate broader and more effective adoption of AI in this sector.
H4 and H5: Barriers to adoption → Ease of use and perceived usefulness

4.4.5 The Role of Environmental Factors in AI Adoption by SMEs

Hypothesis 6 (H6) examines how environmental factors influence SMEs' intention to adopt AI. This hypothesis suggests that elements such as market pressures, institutional support, and public policies play a crucial role in an SME's decision on whether or not to adopt AI. Research by Ulrich and Frank (2021) shows that SMEs are increasingly aware of the potential of AI, but that their adoption is highly dependent on the environment in which they operate. Ransbotham *et al.* (2017) examine how AI is transforming businesses. This type of study is particularly useful for discussing the barriers to AI adoption, such as cost, complexity and skills required, and their impact on the perceived usefulness and

perceived ease of use of AI. For example, a competitive market or a sector heavily influenced by technological innovations may encourage SMEs to adopt AI to remain competitive. Similarly, public policies favorable to innovation and technological support may encourage SMEs to explore and integrate AI into their operations. This hypothesis highlights the importance of an innovation-friendly environment in encouraging the adoption of AI by SMEs, underlining the key role that governments and institutions can play in facilitating this transition.

H6: Environmental factors → Intention to adopt AI

4.4.6 Impact of Ethical and Safety Concerns on AI Adoption by SMEs

Hypothesis 7 (H7) explores how ethical and security considerations influence SMEs' attitudes towards the use of AI. This hypothesis suggests that data privacy and security concerns have a significant impact on SMEs' decision to adopt AI. Iacovou *et al.* (1995) explored the adoption of electronic data interchange by small organizations. They provided a framework for understanding how environmental factors, such as market pressure and institutional support, can influence the intention to adopt innovative technologies in SMEs. Studies in this area, such as those conducted by Bhuvaneshwari and Mishrikoti (2019), show that data security and ethical issues are major concerns for SMEs when considering integrating AI into their operations.

These concerns may stem from fear of losing sensitive data, misuse of AI, or non-compliance with data protection regulations. This hypothesis highlights the importance of AI solution providers considering these concerns and offering guarantees in terms of security and ethical compliance. It is essential that SMEs feel confident about the security and ethics of AI solutions to facilitate their adoption and integration into business practices.

H7: Ethical and Safety Considerations → Attitude to Use

4.4.7 Impact of Ease of Use and Perceived Usefulness

Hypotheses 8 and 9 (H8 and H9) focus on the impact of perceived ease of use and perceived usefulness of AI on SMEs' intention to adopt it. According to Davis' (1989) Technology Acceptance Model (TAM), perceived ease of use (H8) and perceived usefulness (H9) are key predictors of technology adoption. Martin (2019) discusses algorithms' ethical implications and accountability in the business world. This study is relevant to our model as it provides insight into how ethical and security considerations, including data privacy and security, can influence SMEs' attitudes towards the use of AI. Venkatesh and Bala (2008) also explored these relationships in their TAM3 model. These studies suggest that when SMEs see AI as easy to use and valuable, they are more likely to integrate it into their business practices. These hypotheses underline the importance of developing AI solutions that are accessible and relevant to the needs of SMEs, highlighting effective communications about their practical benefits.

H8 and H9: Perceived Ease of Use and Perceived Usefulness → Intention to Adopt AI

4.4.8 Ease of Use and Perceived Usefulness of AI in SMEs

The relationship between perceived ease of use and perceived usefulness, as proposed in Hypothesis H10, is firmly rooted in Davis' (1989) work on the Technology Acceptance Model (TAM). Davis argues that when users perceive a technology as easy to use, their perception of its usefulness increases. This dynamic is particularly relevant in the context of AI in SMEs, where ease of use can significantly influence how technologies are perceived and, consequently, adopted. This hypothesis highlights the importance of designing AI solutions that are intuitive and accessible for SMEs, thereby facilitating their adoption and integration into business processes.

H10: Perceived Ease of Use → Perceived Usefulness

4.4.9 Influence of Perceived Usefulness on Attitude Towards AI Use in SMEs

Hypothesis H11, based on the work of Venkatesh and Davis (2000), explores how perceived usefulness positively influences attitudes towards the use of AI in SMEs. This key relationship is a pillar of the extended technology acceptance model (TAM2), which postulates that users' perception of the usefulness of a technology (in this case, AI) improves their willingness to use it. In the SME context, this perspective is particularly relevant, as a clear understanding of the practical benefits of AI can lead to a more favorable attitude and increased adoption of these technologies.

H11: Perception of Usefulness → Attitude to Use

4.4.10 Link between Attitude and Intent to Adopt AI in SMEs

Hypothesis H12 aligns with Ajzen's (1991) theory of planned behavior, which states that a positive attitude towards a specific behavior increases the intention to adopt that behavior. In the context of SMEs and AI adoption, this relationship is crucial. Studies such as those by Venkatesh *et al.* (2003) and Fishbein & Ajzen (1975) confirm that attitude towards technology is a significant predictor of adoption intention. This research suggests that cultivating a positive attitude towards these technologies is essential to fostering AI adoption in SMEs.

H12: Attitude towards Use → Intention to Adopt AI

This model, based on the TAM (Technology Acceptance Model), has been adapted to reflect the specificities of SMEs better. The aim is to provide a holistic framework for understanding how these different factors interact and influence SMEs' intention to adopt AI. This discussion also assesses the relevance of the modifications made to the classic TAM model, highlighting how they enable a better understanding of SMEs' unique needs and challenges when faced with AI adoption.

Table 1: Summary of Hypotheses Developed as Part of This Study

Hypothesis		Description	Reference
H1	Technological understanding → Perceived ease of use	Better technological understanding increases the perceived ease of use of AI.	Zhang *et al.* (2022); Kumar *et al.* (2016)
H2	Technological Understanding → Perception of Utility	A better understanding of technology increases the perception of AI's usefulness.	Zhang *et al.* (2022); Barton *et al.* (2022)
H3	Perceived Benefits → Perceived Usefulness	The perception that AI improves efficiency, productivity, and provides in-depth data analysis increases the perception of its usefulness.	Szedlak *et al.* (2020); Barton *et al.* (2022)
H4	Barriers to Adoption → Perceived Ease of Use	Financial and resource challenges, as well as the perceived complexity and skills required, diminish the perceived ease of use of AI.	Mittal *et al.* (2018); Teerasoponpong and Sopadang (2021)
H5	Barriers to Adoption → Perception of Usefulness	The same barriers also diminish the perceived usefulness of AI.	Mittal *et al.* (2018); Teerasoponpong and Sopadang (2021)
H6	Environmental factors → Intention to adopt AI	Market pressures and institutional support and public policies positively influence the intention to adopt AI.	Ulrich and Frank (2021); Ransbotham *et al.* (2017)
H7	Ethical and Safety Considerations → Attitude to Use	Concerns about data privacy and security influence SMEs' attitudes towards the use of AI.	Iacovou *et al.* (1995); Bhuvaneshwari and Mishrikoti (2019)
H8	Perceived Ease of Use → Attitude to Use	Perceived ease of use of AI increases Attitude towards use	Davis (1989); Martin (2019)
H9	Perception of Usefulness → Intention to Adopt AI	A greater perception of the usefulness of AI also increases SMEs' intention to adopt it.	Davis (1989); Venkatesh and Bala (2008)
H10	Perceived Ease of Use → Perceived Usefulness	Greater perceived ease of use of AI impacts perceived usefulness.	Davis (1989)
H11	Perception of Utility → Attitude to Use	The perceived usefulness of AI increases the attitude towards its use.	Venkatesh & Davis (2000)
H12	Attitude towards Use → Intention to Adopt AI	A positive attitude towards the use of AI increases the intention to adopt it.	Ajzen (1991)

Figure 1: Proposed Research Model Applied to Moroccan SMEs

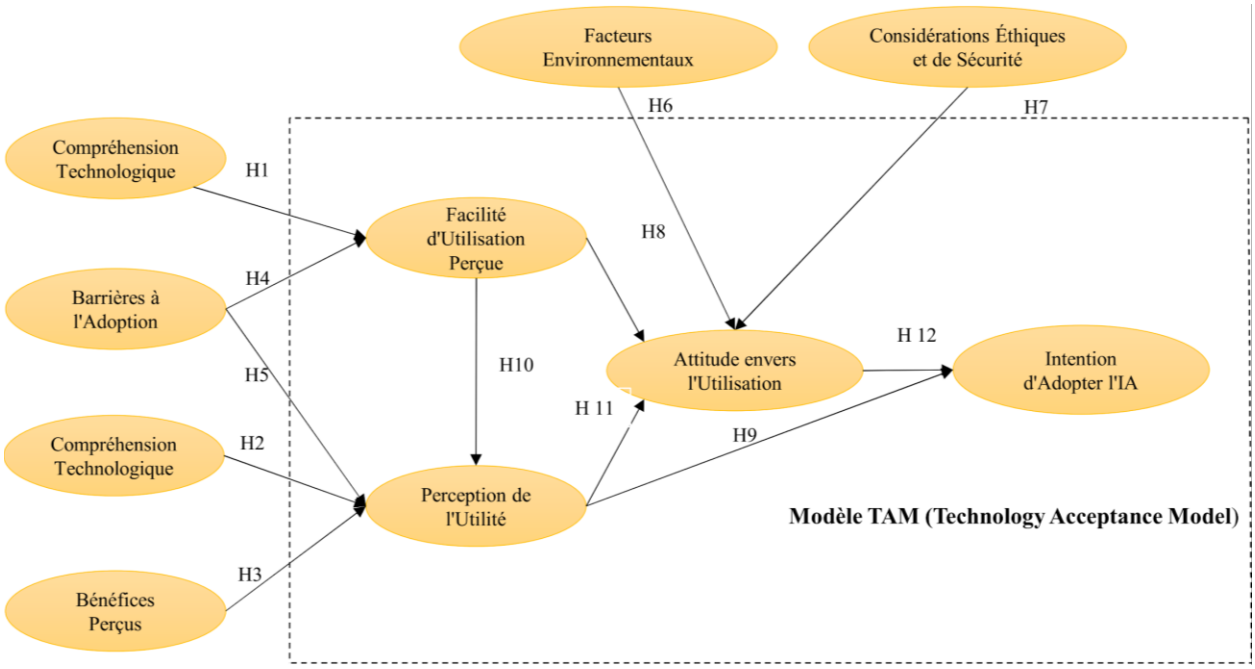

Table 2: Summary of the Work Used in the Proposed Model

Authors	Year	Subject of study	Main conclusions/contributions
Oldemeyer *et al.*	2024	Need for greater attention to SME needs in AI adoption	Highlights the gap in studies focused on SMEs and the need to tailor AI solutions to their specific needs.
Marino-Romero *et al.*	2024	Factors influencing AI adoption by SMEs	Highlights key factors such as technological understanding and perceived benefits to facilitate AI adoption by SMEs.
Dupont	2023	Tailoring the approach to AI adoption by SMEs	Emphasizes the importance of considering barriers to adoption and developing AI solutions that are accessible and relevant to SMEs.
Zhang *et al.*	2022	Importance of AI in industrial production and failure prediction	Highlights the growing importance of AI in Industry 4.0, particularly for large companies, and mentions familiarity with AI.
Barton *et al.*	2022	AI as an essential part of Industry 4.0	Argues that AI makes efficient use of large volumes of data, highlighting its usefulness in the SME business context.
Ulrich and Frank	2021	AI adoption by SMEs	Shows the growing interest of SMEs in AI despite challenges related to resources and skills, highlighting the importance of institutional support and public policies.
Teerasoponpong and Sopadang	2021	Barriers to AI adoption in SMEs	Highlights the impact of financial and skills challenges on the perceived usefulness and ease of use of AI.
Jain *et al.*	2021	Complexity of AI applications for SMEs	Discusses the desired lower complexity of AI applications in SMEs due to their limited resources.
Szedlak *et al.*	2020	AI for process optimization	Highlights the benefits of AI in harnessing large volumes of data and analytical capabilities, especially for process optimization.
Cubric	2020	AI in various sales functions	Further systematic studies are recommended to explore the integration of AI in functions such as accounting and human resources management.

Bauer *et al.*	2020	Adapting the technology acceptance model for SMEs	Suggests adjusting TAM variables to the specific needs of SMEs, emphasizing the importance of technological understanding.
Bhuvaneshwari and Mishrikoti	2019	Data security and ethical issues in the adoption of AI by SMEs	Shows that security and ethical concerns are major for SMEs considering AI, underlining the importance of secure solutions.
Martin	2019	Ethical implications and responsibility of algorithms	This is relevant to the model in discussing the influence of ethical and safety considerations on SMEs' attitudes towards the use of AI.
Mittal *et al.*	2018	Challenges to AI adoption by SMEs	This indicates that financial and technical constraints are major obstacles to SMEs' adoption of AI.
Ransbotham *et al.*	2017	Business transformation through AI	Useful for discussing barriers to AI adoption and their impact on perceived usefulness and perceived ease of use of AI.
Kumar *et al.*	2016	Impact of company-generated content on social media	Relevant for understanding the influence of technological understanding on AI adoption in SMB digital marketing.
Wedel & Kannan	2016	Using marketing analytics in data-rich environments	It highlights the importance of data analysis for marketing decision-making and is relevant to understanding the perceived benefits of AI.
Agerri *et al.*	2014	Challenges specific to AI adoption by SMEs	Identifies obstacles such as limited financial capacity and reduced data availability for SMEs in adopting AI.
Venkatesh and Bala	2008	TAM3 model and technology adoption	Explores the impact of perceived ease of use and perceived usefulness on intention to adopt technologies applicable to SMEs and AI.
Venkatesh *et al.*	2003	Predictors of technology adoption intent	It confirms that attitude towards technology is a significant predictor of adoption intention.
Venkatesh and Davis	2000	Extended Technology Acceptance Model (TAM2)	Suggests that perceived usefulness positively influences attitudes towards technology use.
Iacovou *et al.*	1995	Adoption of electronic data exchange by small organizations	Provides a framework for understanding the influence of environmental factors on the adoption of innovative technologies in SMEs.
Ajzen	1991	Theory of planned behavior	Asserts that a positive attitude towards a specific behavior increases the intention to adopt that behavior.
Davis	1989	Technology Acceptance Model (TAM)	Proposes that perceived ease of use and perceived usefulness are key predictors of technology adoption.
Fishbein and Ajzen	1975	Belief-attitude-intention model	Maintains that attitudes towards technologies influence the intention to adopt them.

The application of the SEM model proposed in the study of AI adoption by SMEs offers several significant practical implications. Firstly, it provides SME decision-makers with a framework for assessing and improving their AI adoption process, by identifying the key factors influencing this adoption. This enables a more strategic and targeted implementation of AI, taking into account the specificities of the company. In addition, the model helps to identify training and development needs to strengthen technological understanding within SMEs, which is crucial for the effective use of AI. Finally, the results of the study can guide AI developers and solution providers to design products more tailored to the needs and capabilities of SMEs, with an emphasis on ease of use and practical utility. There are some limitations to this study. First, the focus on SMEs may not fully capture the diversity of companies and industries, limiting the generalizability of the results. Secondly, the use of a TAM-based SEM model, while robust, may not

include all relevant variables specific to each SME context. In addition, the qualitative nature of the study may introduce subjective biases into the interpretation of the data. Finally, reliance on sources published in English and French limits the study's international and cross-cultural perspective. These limitations suggest the need for further research to refine and extend the results obtained.

For future research, it would be beneficial to extend the study to a broader range of SMEs in various sectors and geographical regions to improve the generalizability of the results. Combining qualitative and quantitative methods, a mixed-methods approach could provide a richer understanding of AI adoption in SMEs. It is also recommended to explore alternative theoretical models or develop AI-specific models to better understand its unique impacts. Finally, longitudinal studies could offer insights into the evolution of AI adoption over time in SMEs.

5. Conclusion

This research has enriched our understanding of the integration of artificial intelligence (AI) within small and medium-sized enterprises (SMEs), by developing an innovative model based on the Technology Acceptance Model (TAM). It highlights the crucial role of ease of use, perceived usefulness, and environmental influences in AI adoption. Nevertheless, the study also highlights the particular barriers SMEs face, including financial and resource limitations. These findings provide essential insights for Moroccan SME leaders and AI solution developers while also indicating the importance of further research to foster a broader and tailored integration of AI within Moroccan SMEs.

Conflict of Interest Statement

I certify that I have NO affiliation or involvement with any organization or entity having a financial interest (such as honoraria, educational grants, participation in speakers bureaus, membership, employment, consulting, stock ownership or other ownership interests, and expert testimony or patent licensing agreements), or a non-financial interest (such as personal or professional relationships, affiliations, knowledge or beliefs) in the subject matter or materials discussed in this manuscript.

About the Authors

Salma Erraoui is a doctoral student in Management Sciences at Abdelmalek Essaâdi University, specifically at the National School of Commerce and Management (ENCG) in Tangier. Her research specializes in adopting emerging technologies, focusing on artificial intelligence integration within Moroccan small and medium-sized enterprises (SMEs). Through her doctoral studies, she aims to deepen the understanding of key factors influencing technology acceptance and digital transformation in SMEs, thereby contributing valuable insights into how these businesses can leverage AI for enhanced competitiveness and innovation.

Professor Abderrahmane Amine is a Moroccan academic specializing in management sciences. He is Professor of Higher Education at the École Nationale de Commerce et de Gestion de Tanger (ENCGT), where he is also Deputy Director in charge of Pedagogical Affairs. His research focuses on management practices in Moroccan small and medium-sized enterprises (SMEs), a subject on which he wrote his doctoral thesis in 1998. As an active member of the ENCGT Scientific Committee, he contributes to the academic development and promotion of research within the institution.

References

Agerri R., Bermudez J., Rigau G. (2014). Multilingual, efficient and easy NLP processing with IXA Pipeline. In: Proceedings of the demonstrations at the 14th Conference of the European Chapter of the Association for Computational Linguistics 5-8. Retrieved from http://ixa.si.ehu.es/sites/default/files/dokumentuak/3287/eacl2014-ixa-pipes.pdf

Ajzen, I. (1991). The Theory of Planned Behavior. *Organizational Behavior and Human Decision Processes, 50*(2), 179-211. http://dx.doi.org/10.1016/0749-5978(91)90020-T

Barton M., Budjac R., Tanuska P., Gaspar G., Schreiber P. (2022). Identification overview of Industry 4.0 essential attributes and resource-limited embedded artificial-intelligence-of-things devices for small and medium-sized enterprises. *Appl Sci 12*:5672. https://doi.org/10.3390/app12115672

Bauer M., Dinther C., Kiefer D. (2020). Machine learning in SME: an empirical study on enablers and success factors. In: AMCIS 2020 Proceedings 1-10. Retrieved from https://www.researchgate.net/publication/344651203_Machine_Learning_in_SME_An_Empirical_Study_on_Enablers_and_Success_Factors

Bhuvaneshwari A. S. K. M., Mishrikoti A. H. (2019). Lean practices in SMEs towards improvement in production performance: A research. *Int J Recent Technol Eng 8*(2S3): 959-965. Retrieved from https://www.ijrte.org/wp-content/uploads/papers/v8i2S3/B11800782S319.pdf

Cubric M. (2020). Drivers, barriers and social considerations for AI adoption in business and management: a tertiary study. *Technol Soc. 62*. http://dx.doi.org/10.1016/j.techsoc.2020.101257

Davis, F. D. (1989). Perceived Usefulness, Perceived Ease of Use, and User Acceptance of Information Technology. MIS Quarterly, 13(3), 319-340. https://doi.org/10.2307/249008

Delbridge, R., & Fiss, P. C. (Eds.). (2013). Editors' comments: Styles of theorizing and the social organization of knowledge. *Academy of Management Review, 38*(3), 325-331. Retrieved from https://www.jstor.org/stable/43700493

Dishaw, M. T., & Strong, D. M. (1999). Extending the technology acceptance model with task-technology fit constructs. *Information & Management, 36*(1), 9-21. https://doi.org/10.1016/S0378-7206(98)00101-3

Dupont, B., Shearing, C., Bernier, M., & Leukfeldt, R. (2023). The tensions of cyber-resilience: From sensemaking to practice. *Computers & Security, 132*, 103372. https://doi.org/10.1016/j.cose.2023.103372

Fishbein, M., & Ajzen, I. (1977). *Belief, attitude, intention, and behavior: An introduction to theory and research.* Reading, MA: Addison-Wesley. Retrieved from https://www.researchgate.net/publication/233897090_Belief_attitude_intention_and_behaviour_An_introduction_to_theory_and_research

Iacovou, C. L., Benbasat, I., & Dexter, A. S. (1995). Electronic data interchange and small organizations: Adoption and impact of technology. *MIS Quarterly*, 19(4). 465-485. https://doi.org/10.2307/249629

Jaakkola, E. (2020). Designing conceptual articles: Four approaches. *AMS Review, 10*, 18-26. http://dx.doi.org/10.1007/s13162-020-00161-0

Jain V., Tewary T., Gopalakrishnan B. N. (2021). Unlocking technology adoption for a robust food supply chain: evidence from Indian food processing sector. *HSE Econ J 25*(1):147-164. http://dx.doi.org/10.17323/1813-8691-2021-25-1-147-164

Kumar, A., Bezawada, R., Rishika, R., Janakiraman, R., & Kannan, P. K. (2016). From social to sale: The effects of firm-generated content in social media on customer behavior. *Journal of Marketing, 80*(1), 7-25. Retrieved from https://www.jstor.org/stable/43785256

Marino-Romero, J. A., Palos-Sánchez, P. R., & Velicia-Martín, F. (2024). Evolution of digital transformation in SMEs management through a bibliometric analysis. *Technological Forecasting and Social Change, 199*, 123014. Retrieved from https://doi.org/10.1016/j.techfore.2023.123014

Martin, K. (2019). Ethical Implications and Accountability of Algorithms. *Journal of Business Ethics 160*(1) Retrieved from https://link.springer.com/article/10.1007%2Fs10551-018-3921-3

Mittal S., Khan M. A., Romero D., Wuest T. (2018). A critical review of smart manufacturing & Industry 4.0 maturity models: Implications for small and medium-sized enterprises (SMEs). *J Manuf Syst 49*:194-214. https://doi.org/10.1016/j.jmsy.2018.10.005

Oldemeyer, L., Jede, A., & Teuteberg, F. (2024). Investigation of artificial intelligence in SMEs: a systematic review of the state of the art and the main implementation challenges. *Management Review Quarterly*, 1-43. http://dx.doi.org/10.1007/s11301-024-00405-4

Ransbotham, S., Kiron, D., Gerbert, P., & Reeves, M. (2017). Reshaping business with artificial intelligence: Closing the gap between ambition and action. *MIT Sloan Management Review, 59*(1). Retrieved from https://sloanreview.mit.edu/projects/reshaping-business-with-artificial-intelligence/

Snyder, H. (2019). Literature review as a research methodology: An overview and guidelines. *Journal of Business Research, 104*, 333-339. https://doi.org/10.1016/j.jbusres.2019.07.039

Szedlak C, Poetters P., Leyendecker B. (2020). Application of artificial intelligence in small and medium-sized enterprises. In: Proceedings of the international conference on industrial engineering and operations management. Retrieved from http://www.ieomsociety.org/detroit2020/papers/367.pdf

Teerasoponpong S., Sopadang A. (2021). A simulation-optimization approach for adaptive manufacturing capacity planning in small and medium-sized enterprises. *Expert Syst Appl 168*:114451.

Teo, T., & van Schaik, P. (2012). Understanding the intention to use technology by pre-service teachers: An empirical test of competing theoretical models. *International Journal of Human-Computer Interaction, 28*(3), 178-188. Retrieved from https://doi.org/10.1080/10447318.2011.581892

Ulrich P., Frank V. (2021). Relevance and adoption of AI technologies in German SMEs-results from survey-based research. *Proced Comput Sci 192*:2152-2159. https://doi.org/10.1016/j.procs.2021.08.228

Venkatesh, V., & Bala, H. (2008). Technology acceptance model 3 and a research agenda on interventions. *Decision sciences, 39*(2), 273-315. Retrieved from http://dx.doi.org/10.1111/j.1540-5915.2008.00192.x

Venkatesh, V., & Davis, F. D. (1996). A model of the antecedents of perceived ease of use: Development and test. *Decision Sciences, 27*(3), 451-481. Retrieved from http://dx.doi.org/10.1111/j.1540-5915.1996.tb00860.x

Venkatesh, V., & Davis, F. D. (2000). A Theoretical Extension of the Technology Acceptance Model: Four Longitudinal Field Studies. *Management Science, 46*(2), 186-204. http://dx.doi.org/10.1287/mnsc.46.2.186.11926

Venkatesh, V., Morris, M. G., Davis, G. B., & Davis, F. D. (2003). User acceptance of information technology: Toward a unified view. *MIS Quarterly, 27*(3), 425-478. Retrieved from https://doi.org/10.2307/30036540

Wedel, M., & Kannan, P. K. (2016). Marketing analytics for data-rich environments. *Journal of Marketing*, *80*(6), 97-121. Retrieved from https://doi.org/10.1509/jm.15.0413

Zhang D., Maslej N., Brynjolfsson E. (2022). The AI index 2022 annual report. Stanford Institute for Human-Centered AI, Stanford University, AI Index Steering Committee. Retrieved from https://aiindex.stanford.edu/ai-index-report-2022/