# The Multifaceted Impact of Technology Adoption on SMEs in Ghana

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**Abstract:** This paper investigates the relationship between technology adoption (TAD), and competitiveness, operational efficiency, access to finance, and innovation capacity of SMEs in Ghana. The study further explores the mediating and moderating effects of supply chain integration and organisational culture on TAD. Stratified random sampling of 1,588 SMEs of diverse sectors in the 16 regions of Ghana constituted the sample size. Using the Structural Equation Model (SEM) we found a statistically significant positive relationship between TAD and SME competitiveness. It was found that organisational culture significantly moderated the relationship between TAD and access to finance as well as TAD and operational efficiency. Having revealed the critical role TAD plays in enhancing SMEs' competitiveness, operational efficiency, innovation capacity, and access to finance in contemporary Ghana, the paper recommends that SMEs proactively seek opportunities to adopt modern cost-effective technologies into their operational activities to enhance accelerated growth and sustainability.

**Keywords:** Technology Adoption, SMEs, Competitiveness, Operation Efficiency, Finance.

## 1. INTRODUCTION

The dynamic global business environment, powered by rapid technological advancements, presents a unique set of opportunities and challenges for small and medium-sized enterprises (SMEs). In Ghana, SMEs are pivotal to economic growth, innovation, and employment. However, the extent and impact of technology adoption within these enterprises remain underexplored, especially in the context of their competitive positioning, operational efficiency, and innovation capabilities. The evolving digital landscape necessitates a thorough understanding of how technology integration can serve as a catalyst for growth and sustainability in Ghanaian SMEs.

Despite the recognised importance of technology in enhancing business competitiveness, there is a notable gap in research focusing on the specific impacts of technology adoption on SMEs in Ghana. Previous studies have addressed various aspects of technology integration in SMEs globally, but the unique challenges and opportunities faced by Ghanaian SMEs remain insufficiently explored. This includes understanding the relationship between technology adoption and key business outcomes like competitiveness, innovation, access to credit, and operational efficiency. Moreover, the potential moderating role of organisational culture and the mediating impact of supply chain integration in this relationship is yet to be fully understood in the Ghanaian context. The pertinent overriding objectives this paper seeks to achieve are to:

- analyse the impact of technology adoption on SME competitiveness in Ghana

- evaluate the role of technology in enhancing operational efficiency

- investigate the influence of technology on innovation capacity

- examine the relationship between technology adoption and access to credit for SMEs

- identify the moderating role of organisational culture

- explore the mediating impact of supply chain integration

By addressing these objectives, the study aims to offer actionable insights for policymakers, industry stakeholders, and SME owners in Ghana, guiding them in harnessing technology for enhanced competitiveness and growth. The findings of the study are expected to offer strategic guidance for improving SME competitiveness, and operational efficiency, fostering innovation capacity, and facilitating access to finance.

## 2. LITERATURE REVIEW

### 2.1. Teoretical Literature

Prominent theories relevant to this study include the Technology Acceptance Model (TAM), which is a widely used theory in understanding individuals' adoption and acceptance of technology (Khan and Siddiqui, 2019). It posits that perceived usefulness and perceived ease of use are primary determinants of technology adoption. In the context of this study, TAM is crucial in exploring the factors influencing SMEs' decisions to adopt technology and the extent to which they perceive technology as beneficial and easy to implement.

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*Diffusion of Innovation Theory* explains how new innovations or technologies spread and are adopted within a social system. It categorises adopters into innovators, early adopters, early majority, late majority, and laggards (Shahadat et al., 2023). In this study, the Diffusion of Innovation Theory can help assess the stages of technology adoption among Ghanaian SMEs and identify the factors that influence different groups of adopters. Likewise, the *Dynamic Capabilities Theory* emphasizes a firm's ability to adapt, learn, and innovate in response to changing environments. In the context of technology adoption by Ghanaian SMEs, Dynamic Capabilities Theory can be used to explain how technology integration fosters innovation, agility, and the ability to respond to market disruptions (Rogers et al., 2019). *Institutional Theory* examines how organisations conform to external norms and regulations. In the context of technology adoption in Ghanaian SMEs, this theory can help in understanding how regulatory environments and institutional pressures influence the decision to adopt technology (Luiz et al., 2020).

*Competitive Advantage Theory* focuses on how firms achieve a competitive edge over rivals (Putri et al., 2018). In the context of this study, this theory is used to explore how technology adoption contributes to SMEs unique value propositions, positioning them favourably against competitors. *Dynamic Resource-based View (DRBV)* emphasizes the dynamic nature of resources and capabilities in creating competitive advantage (Bocconcelli et al., 2018). In the context of this study, DRBV is relevant in examining how the continuous development and upgrading of technological resources enable SMEs to sustain their competitiveness over time. By employing these theoretical frameworks, the study gains a deeper understanding of the complex relationships between technology adoption, SME competitiveness, innovation capabilities, operational efficiency, and access to funds as well as underlying factors shaping technology integration in the Ghanaian context. These theories provide a strong foundation for analysing the research data and drawing meaningful conclusions to inform policy recommendations and practical strategies for technology adoption among Ghanaian SMEs.

## 2.2. Empirical Literature

Moghavvemi *et al.* (2012) highlight the impact of IT innovation adoption on SMEs' competitive advantage, and stressed the importance of understanding individual factors like attitude and self-efficacy to better grasp adoption patterns. Similarly, Darbanhosseiniamirkhiz and Ismail (2012) underscore the significance of adopting AMTs and constructing a framework that considers environmental, organisational, and technological contexts for effective AMT adoption.

Taylor (2015) proposes an integrated model that classifies key internal and external factors influencing ICT adoption. Internal factors include technological competence, organisational support, and resources, while external factors include competitive pressure, institutional intervention, industry structure, presence of technology service providers, and regulation (Distanont and Khongmalai, 2022; Bawono *et al.*, 2022; Zahra *et al.*, 2021; Naushad and Manakkattil, 2020; Chairoel and Riski, 2018; Abdullah *et al.*, 2013; Ma-

nochehri *et al.*, 2012). These factors play a crucial role in shaping the decision-making process of SMEs regarding the adoption of ICT.

External factors, on the other hand, exert substantial influence on ICT adoption in SMEs. Competitive pressure, institutional intervention, industry structure, presence of technology service providers, and regulation are among the key external factors that shape the adoption of ICT in SMEs (Naushad and Manakkattil, 2020; Neirotti et al., 2018). These factors reflect the external environment in which SMEs operate and highlight the importance of external influences on ICT adoption decisions.

Anjum (2018) explores various factors such as strategy, size, customer relationships, and technical capabilities that influence technology adoption. Nair et al. (2019) delves into readiness factors for IT adoption and highlight owner-driven technology preparedness, customer pressure, and IT knowledge as critical factors. Selase *et al.* (2019) identified factors like perceived ease of use, usefulness, compatibility, and cost-effectiveness that influence internet technology adoption. These findings collectively shed light on the complex interplay of internal and external factors shaping technology adoption decisions among SMEs.

Several studies emphasize the role of external and internal factors in shaping technology adoption. Prasanna et al. (2019) explain the driving forces influencing technological progress in SMEs, emphasising social capital and innovation. Zamani (2022) conducted a systematic review to identify influential concepts related to technology adoption in SMEs, recognising the fragmented nature of the literature and the need for a dynamic framework considering various contextual factors. These studies collectively emphasize that technology adoption in SMEs is influenced by a combination of external and internal contexts, necessitating a holistic approach to understanding and facilitating adoption. The empirical literature provides valuable insights into the complex dynamics of technology adoption within SMEs. It highlights the importance of technology adoption for enhancing competitiveness and sustainability. The adoption of Information and Communication Technology (ICT) in SMEs presents both benefits and challenges. The benefits of ICT adoption in SMEs include improved internal procedures, enhanced business processes, better consumer interaction, increased factor productivity, reduced costs, increased efficiency, improved performance, and access to valuable information for decision-making. Additionally, ICT adoption can lead to improved relationships with customers and suppliers, increased productivity, and the ability to reach new markets and customers. Furthermore, ICT adoption can provide SMEs with valuable information for improved performance, increased efficiency, and reduced production costs.

However, the adoption of ICT in SMEs is also associated with several challenges. These challenges include financial constraints, technological barriers, lack of expertise, poor telecommunication infrastructure, limited ICT literacy, inability to integrate ICT into business processes, incomplete government regulations for e-commerce, legal and regulatory issues, weak ICT strategies, lack of research and development, excessive reliance on foreign technology, and weaknesses in ICT implementation. Furthermore, SMEs may face
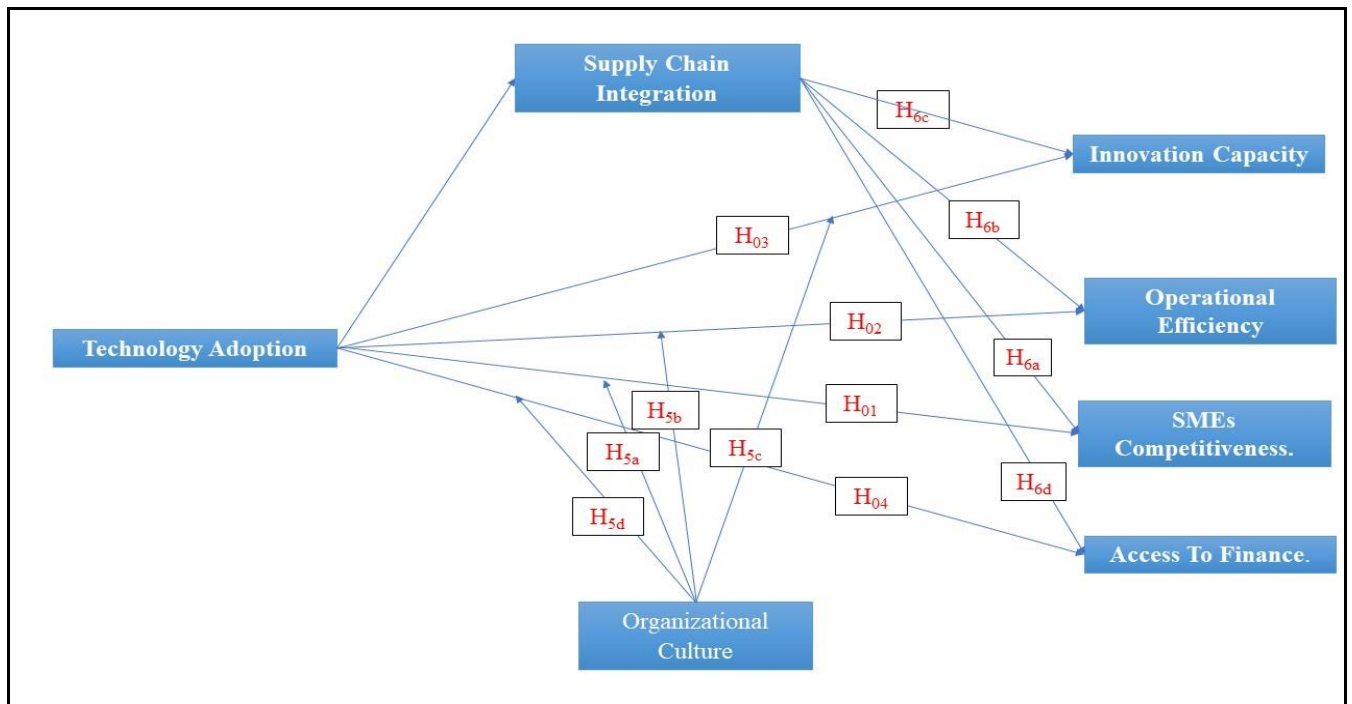
**Fig. (1).** Conceptual Framework: Enhancing competitiveness, operational efficiency, access to finance, and innovation capacity through Technology Adoption.

challenges such as resistance to organisational change, security concerns, and the high cost of ICT hardware. Moreover, SMEs may experience challenges related to the lack of awareness of the benefits of ICT incorporation, poor media transmission framework, high costs of ICT hardware, deficient government support and legislation for internet business, and high cost of funds.

These findings offer valuable guidance for policymakers, business owners, and practitioners seeking to promote technology adoption and innovation among SMEs in various contexts.

### 2.2.1. Conceptual Framework and Hypothesis Development

The conceptual framework illustrates the complex interplay between technology adoption and multifaceted dimensions of SMEs, with mediating and moderating factors shaping these relationships. By understanding these relationships, the study aims to provide valuable insights for policymakers, stakeholders, and SMEs in Ghana to design effective strategies for promoting technology adoption and enhancing the competitiveness of Ghanaian SMEs in the global market. In the context of the research on the role of technology adoption in enhancing the competitiveness of Ghanaian SMEs, the conceptual framework is represented in (Fig. **1**).

Technology adoption is the independent variable in the study, representing the extent to which SMEs in Ghana have integrated technology into their operations and strategies. It includes the adoption of various technological tools, and digital software, while the dependent variables are SMEs competitiveness, operational efficiency, innovation capacity, and access to finance. Supply chain integration and organisational culture are mediating variables in the technology adoption relationship nexus. Technology adoption is ex-

pected to improve SME effectiveness, operational efficiency, innovation, and access to finance through automated processes, reducing errors, and optimising resource allocation. Supply chain optimisation and organisational culture are expected to fully mediate the technology adoption nexus, as they enable SMEs to improve inventory control, reduce lead times, and enhance overall business efficiency through technology adoption.

Empirical literature suggests that organisational culture influence technology adoption, which, in turn, impacts competitiveness, operational efficiency, innovation capacity, and access to finance (Nair et al., 2019). Technology adoption facilitates supply chain integration, which, in turn, enhances SME competitiveness, operational efficiency, innovation capacity, and access to finance.

The hypotheses in Fig. (**1**) provide a foundation for testing the relationships and interactions between technology adoption, SME competetiveness, innovation capacity, access to finance, operational efficiency, organisational culture and supply chain integration in the Ghanaian context.

## 3. METHODOLOGY

### 3.1. Research design

We adopted a quantitative approach to address the research objectives and test the formulated hypotheses. Following Abbassi *et al.* (2022) and earlier related studies, we employed a cross-sectional research design to collect data at a specific point in time. This design allows for the examination of the relationships between the technology adoption nexus as well as the mediating and moderating factors. A structured survey was conducted among a representative sample of Ghanaian SMEs. Close-ended questions were used

to gather data on technology adoption levels, SME competitiveness, operational efficiency, innovation, access to finance, supply chain integration and organisation cultural practices.

### 3.2. Sample and Data Collection

The study employed a stratified random sampling technique to ensure a good representation of different industry sectors and geographical locations within Ghana. The sample was selected from a pool of registered SMEs in Ghana, with careful consideration given to the diversity of sectors and the 16 geopolitical regions to make the findings more generalised.

### 3.3. Measurement Description

We used a set of well-established measurement scales to assess various constructs. These constructs include technology adoption levels (Mishrif and Khan, 2023), SME competitiveness (Das et al., 2020), operational efficiency (Kinyanzui et al., 2018), innovation (Usman et al., 2019), and access to finance (Buchdadi et al., 2020). The selection of measurement scales was based on the existing literature and adapted to the specific context of Ghanaian SMEs.

### 3.4. Common Method and Non-Response Bias

To mitigate common method bias, we employed several strategies. Firstly, we assured respondents of the confidentiality of their responses, which encouraged honest and accurate responses. Secondly, we used different formats for data collection, including online and face-to-face surveys, to minimise the risk of single-source bias. Again, we conducted statistical tests, including Harman's Single-Factor Test, to assess and control for potential common method bias.

### 3.5. Evaluation of Measurement Model

The measurement model was evaluated using techniques such as Confirmatory Factor Analysis (CFA) to assess the reliability and validity of the measurement scales used. CFA helped confirm that the selected scales accurately measured the intended constructs and provided evidence of convergent and discriminant validity.

### 3.6. Evaluation of Structural Model

The structural model was evaluated using Structural Equation Modeling (SEM) techniques, such as path analysis and regression analysis (Hair *et al.*, 2019). This allowed us to test the relationships between technology adoption multifaceted variables such as competitiveness, innovation, access to finance, and operational efficiency while considering mediating and moderating factors of organisational culture and supply chain integration. The analysis also examined the overall fit of the model to the data.

### 3.7. Data Analysis Tools

The quantitative data collected through the survey was analysed using statistical software. Descriptive statistics was used to present the characteristics of the sample and the distribution of responses. Inferential statistics was applied to test the hypotheses and examine the relationships between variables. The findings provide valuable insights for policymakers, stakeholders, and SMEs, guiding the development of strategies and initiatives to promote technology adoption and foster a more competitive and sustainable SME sector.

### 3.8 Ethical Considerations

Ethical considerations were of utmost importance throughout the research process. Informed consent was obtained from all survey participants, and their data was anonymised and securely stored to ensure privacy and confidentiality.

## 4. RESULTS AND DISCUSSION

### 4.1. Biographical Data of Respondents

Table **1** presents a comprehensive overview of the demographic and contextual characteristics of a group of respondents, likely associated with Small and Medium Enterprises (SMEs). Notably, the majority of the respondents are female (62.2%), with 37.8% being male. A significant portion falls within the age range of 25 to 34 years (68.5%), while other age groups are less represented. Educationally, a substantial number possess Bachelor's (47.1%) or Master's degrees (37.3%). In terms of work experience, 25.9% have less than one year of experience in their current roles, while 38.0% have 1 to 2 years of experience. Majority of the respondents work in the manufacturing sector (70.3%), and a significant portion of SMEs have more than 100 employees (35.6%). The geographical distribution of respondents is diverse. Finally, all SMEs in this sample (100.0%) have participated in government support programmes, indicating a high level of engagement with government initiatives within the SME sector. This table offers a valuable snapshot of the profile of SME stakeholders in the surveyed area, providing insights into gender distribution, educational backgrounds, work experience, industry affiliation, SME size, geographic dispersion, and government program participation.

**Table 1. Biographical data of respondents**

| - | Category / Characteristic | N | % |
|---|---|---|---|
| **Gender** | Male | 600 | 37.8% |
| | Female | 988 | 62.2% |
| **Age** | Under 25 years old | 380 | 23.9% |
| | 25 - 34 years old | 1088 | 68.5% |
| | 35 - 44 years old | 76 | 4.8% |
| | 45 - 54 years old | 44 | 2.8% |
| | High School or equivalent | 96 | 6.0% |
| **Educational Background** | Bachelor's Degree | 748 | 47.1% |
| | Master's Degree | 592 | 37.3% |
| | Other | 152 | 9.6% |

| | | | |
|---|---|---|---|
| **Years of Experience in Current Role** | Less than 1 year | 412 | 25.9% |
| | 1 - 2 years | 604 | 38.0% |
| | 3 - 5 years | 284 | 17.9% |
| | 6 - 10 years | 80 | 5.0% |
| | More than 10 years | 208 | 13.1% |
| **Industry Sector** | Manufacturing | 1116 | 70.3% |
| | Services | 204 | 12.8% |
| | Retail | 268 | 16.9% |
| **SME Size (employees)** | Less than 10 | 392 | 24.7% |
| | 10 - 50 | 555 | 34.9% |
| | 51 - 100 | 75 | 4.7% |
| | More than 100 | 566 | 35.6% |
| **Geographic Location (region)** | Ahafo | 91 | 5.7% |
| | Ashanti | 94 | 5.9% |
| | Bono | 101 | 6.4% |
| | Bono East | 109 | 6.9% |
| | Central | 96 | 6.0% |
| | Eastern | 101 | 6.4% |
| | Greater Accra | 91 | 5.7% |
| | North East | 92 | 5.8% |
| | Northern | 98 | 6.2% |
| | Oti | 105 | 6.6% |
| | Savannah | 106 | 6.7% |
| | Upper East | 115 | 7.2% |
| | Upper West | 96 | 6.0% |
| | Volta | 84 | 5.3% |
| | Western | 111 | 7.0% |
| | Western North | 98 | 6.2% |
| **Number of years in operation** | Less than 1 year | 343 | 21.6% |
| | 1 - 2 years | 193 | 12.2% |
| | 3 - 5 years | 249 | 15.7% |
| | 6 - 10 years | 376 | 23.7% |
| | More than 10 years | 427 | 26.9% |
| **SME participation in any government support programmes or initiatives** | Yes | 1588 | 100.0% |

**Source:** Authors based on field data (2023).

## 4.2. Evolution of Measurement Models

Table **2** presents the results of a factor analysis conducted to assess the reliability and validity of various constructs within a research study, likely related to SMEs. Each construct is composed of several items, and the table provides several key statistics to evaluate the quality of these constructs. The Access to Finance construct (ATF) includes two items, ATF1 and ATF2. Both items show strong Factor Loading values (FL), with ATF1 at 0.917 and ATF2 at 0.953, indicating a robust relationship between these items and the construct. The Composite Reliability (CR) is 0.908, suggesting good internal consistency. The Average Variance Extracted (AVE) is 0.875, indicating that ATF explains a substantial portion of the variance in its items. The Kaiser-Meyer-Olkin (KMO) measure confirms the data's suitability for factor analysis, and Bartlett's Test of Sphericity is statistically significant (0.000), supporting the adequacy of the data. The Innovation Capacity (INC) construct consists of four items (INC1, INC2, INC3, and INC4). All items exhibit strong FL values ranging from 0.790 to 0.903, indicating a robust relationship with the construct. The CR is 0.724, suggesting reasonable internal consistency. The AVE is 0.871, indicating that INC captures a significant portion of item variance. The KMO measure and Bartlett's Test both support the suitability of the data for factor analysis. The Organisational Culture (OC) includes four items (OC1, OC2, OC3, and OC4). FL values for all items range from 0.830 to 0.893, indicating strong associations with the construct. The CR is 0.723, and the AVE is 0.827, demonstrating good internal consistency and substantial variance explained by OC. The KMO measure and Bartlett's Test confirm the data's suitability for factor analysis. The Operational Efficiency (OE) construct comprises five items (OE1, OE2, OE3, OE4, and OE5). All items exhibit strong FL values ranging from 0.837 to 0.928, indicating a robust relationship with the construct. The CR is 0.777, the AVE is 0.805, and both the KMO measure and Bartlett's Test support the data's suitability for factor analysis. The Supply Chain Integration (SC) consists of three items (SC2, SC3, and SC4). FL values range from 0.752 to 0.880, indicating strong associations with the construct. The CR is 0.667, the AVE is 0.863, and both the KMO measure and Bartlett's Test confirm the data's suitability for factor analysis.

SMEs Competitiveness (SMEC) includes five items (SMEC1, SMEC2, SMEC3, SMEC4, and SMEC5). All items exhibit strong FL values ranging from 0.809 to 0.914. The CR is 0.726, the AVE is 0.814, and both the KMO measure and Bartlett's Test support the data's suitability for factor analysis. While Technology Adoption (TAD) consists of five items (TAD1, TAD2, TAD3, TAD4, and TAD5). FL values range from 0.632 to 0.907, indicating a reasonably strong relationship with the construct. The CR is 0.716, and the AVE is 0.632. The KMO measure and Bartlett's Test confirm the data's suitability for factor analysis. The results demonstrate that the constructs have generally strong internal consistency, indicating that they reliably measure the underlying concepts of interest. The constructs also explain a

substantial proportion of item variance, and the data appears suitable for factor analysis based on the KMO measure and Bartlett's Test. These results provide confidence in the validity and reliability of the constructs in this research study, which is critical for drawing meaningful conclusions.

### 4.3. Heterotrait-monotrait ratio (HTMT) - Matrix

Table **3** The Heterotrait-Monotrait Ratio (HTMT) matrix was employed to assess discriminant validity among various constructs in a research study. Results indicated that Access to Finance (ATF), Innovation Capacity (INC), Organisational Culture (OC), Operational Efficiency (OE), Supply Chain Integration (SC), Small and Medium Enterprises Competitiveness (SMEC), and Technology Adoption (TAD) were generally distinct constructs, as HTMT values were consistently below the threshold of one. These findings, based on historical data, affirm the discriminant validity of the constructs within the study, providing assurance that they did not excessively overlap in variance and were suitable for further analysis in the research context.

**Table 2. Evolution of measurement models.**

| Construct | ITEMS | FL | CA | CR | AVE | KMO | BARTLETS |
|---|---|---|---|---|---|---|---|
| SMEs Competitiveness: | SMEC1 | 0.878 | 0.906 | 0.914 | 0.726 | 0.814 | 0.000 |
| | SMEC2 | 0.860 | | | | | |
| | SMEC3 | 0.860 | | | | | |
| | SMEC4 | 0.851 | | | | | |
| | SMEC5 | 0.809 | | | | | |
| Operational effectiveness: | OE1 | 0.837 | 0.928 | 0.932 | 0.777 | 0.805 | 0.000 |
| | OE2 | 0.905 | | | | | |
| | OE3 | 0.909 | | | | | |
| | OE4 | 0.885 | | | | | |
| | OE5 | 0.870 | | | | | |
| Innovation Capacity: | INC2 | 0.882 | 0.875 | 0.903 | 0.724 | 0.871 | 0.000 |
| | INC3 | 0.873 | | | | | |
| | INC4 | 0.790 | | | | | |
| Supply Chain Integration: | SC2 | 0.752 | 0.840 | 0.880 | 0.667 | 0.863 | 0.000 |
| | SC3 | 0.832 | | | | | |
| | SC4 | 0.855 | | | | | |
| | SC5 | 0.825 | | | | | |
| Organisational Culture: | OC1 | 0.842 | 0.873 | 0.881 | 0.723 | 0.827 | 0.000 |
| | OC2 | 0.893 | | | | | |
| | OC3 | 0.836 | | | | | |
| | OC4 | 0.830 | | | | | |
| Access to Finance: | ATF1 | 0.917 | 0.860 | 0.908 | 0.875 | 0.841 | 0.000 |
| | ATF2 | 0.953 | | | | | |
| Technology Adoption: | TAD1 | 0.743 | 0.901 | 0.907 | 0.716 | 0.632 | 0.000 |
| | TAD2 | 0.867 | | | | | |
| | TAD3 | 0.893 | | | | | |
| | TAD4 | 0.872 | | | | | |
| | TAD5 | 0.848 | | | | | |

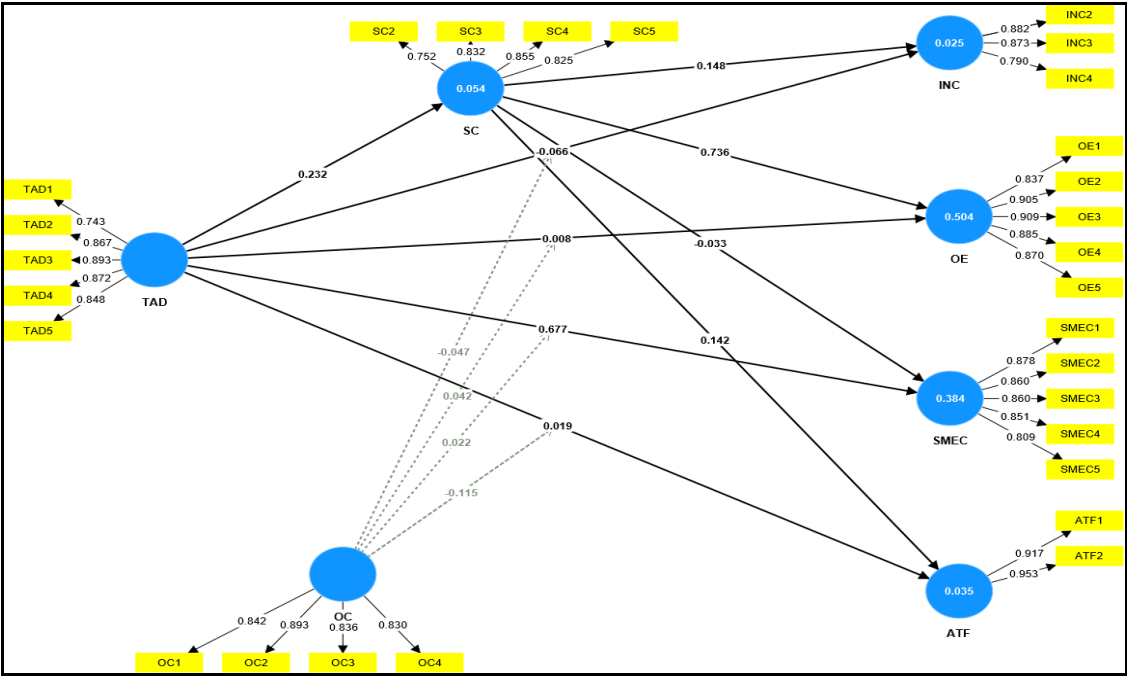**Source:** Authors based on field data (2023).

**Fig. (1).** Conceptual framework of the model results.

**Source:** Authors based on field data (2023).

**Table 3. Heterotrait-monotrait ratio (HTMT) - Matrix.**

| Heterotrait-Monotrait Ratio (HTMT) - Matrix | ATF | INC | OC | OE | SC | SMEC |
|---|---|---|---|---|---|---|
| INC | 0.660 | | | | | |
| OC | 0.062 | 0.053 | | | | |
| OE | 0.306 | 0.211 | 0.250 | | | |
| SC | 0.139 | 0.139 | 0.507 | 0.746 | | |
| SMEC | 0.092 | 0.084 | 0.403 | 0.074 | 0.093 | |
| TAD | 0.050 | 0.061 | 0.780 | 0.139 | 0.283 | 0.639 |

**Source:** Authors based on field data (2023).

## 4.4. Evaluation of Structural Model

Table **4** presented the statistical analysis of the constructs within the research model provides a nuanced understanding of their individual contributions and interplay in explaining the outcomes of interest. Access to Finance (ATF) as indicated by its R-square value of 0.035, offers a modest level of explanatory power, explaining approximately 3.5% of the variance in the dependent variable. While it plays a role in the model, its effect size, as measured by F2 (0.000), suggests that it may not be a dominant predictor. Additionally, ATF exhibits a moderate level of multicollinearity (VIF = 2.31), indicating shared variance with other variables in the model. These findings imply that while ATF contributes to the model's explanation, it is influenced by other factors and may not be a primary driver of the outcomes. Innovation Capacity (INC) with an R-square value of 0.025, provides a limited explanatory contribution, explaining approximately 2.5% of the variance in the dependent variable. Its effect size, as denoted by F2 (0.002), suggests a relatively minor

impact. INC also exhibits a moderate level of multicollinearity (VIF = 2.46), indicating potential shared variance with other constructs. These findings imply that while INC plays a role in the model, it is not a dominant predictor, and its influence is influenced by other factors.

Operational Efficiency (OE) stands out as a significant predictor, with an impressive R-square value of 0.504, explaining a substantial 50.4% of the variance in the dependent variable. Its substantial effect size (F2 = 0.000) reinforces its role as a dominant predictor. While exhibiting a moderate level of multicollinearity (VIF = 2.29), OE's robust explanatory power underscores its critical influence on the outcomes. These findings highlight the pivotal role of OE in the model, emphasising its substantial impact. Supply Chain Integration (SC) contributes to the model's explanation with an R-square value of 0.054, explaining approximately 5.4% of the variance in the dependent variable. Its effect size (F2 = 0.057) suggests a relatively minor impact on the outcomes. SC exhibits a moderate level of multicollinearity (VIF = 3.39), indicating potential shared variance with other con-

structs. These findings imply that while SC plays a role in explaining the outcomes, its influence is not dominant, and it is influenced by other factors. SMEs Competitiveness (SMEC) emerges as a substantial and influential predictor, with an R-square value of 0.384, explaining a significant 38.4% of the variance in the dependent variable. Its substantial effect size ($F2 = 0.385$) underscores its pivotal role as a dominant predictor. SMEC exhibits a moderate level of multicollinearity (VIF = 2.17), suggesting shared variance with other constructs. These findings emphasize the critical importance of SMEC in the model, highlighting its substantial impact on the outcomes. While Access to Finance (ATF) and Innovation Capacity (INC) offer limited explanatory power, Operational Efficiency (OE) and SMEs Competitiveness (SMEC) emerge as dominant predictors with substantial impacts. Supply Chain Integration (SC) plays a role but to a lesser extent. The moderate levels of multicollinearity observed in some constructs indicate potential interdependencies, warranting further investigation into their complex relationships within the research model.

**Table 4. Evaluation of structural model.**

| Construct | R-square | R-square Adjusted | $F^2$ | VIF |
|---|---|---|---|---|
| ATF | 0.035 | 0.033 | 0.000 | 2.31 |
| INC | 0.025 | 0.023 | 0.002 | 2.46 |
| OE | 0.504 | 0.503 | 0.000 | 2.29 |
| SC | 0.054 | 0.053 | 0.057 | 3.39 |
| SMEC | 0.384 | 0.383 | 0.385 | 2.17 |

**Source:** Authors based on field data (2023).

### 4.5. Model fit

Table **5** presents the model fit assessments conducted for a saturated model and an estimated model. The saturated model displayed superior goodness of fit with a lower SRMR (0.076), lower discrepancy-based indices (d_ULS and d_G), and a lower chi-square value (8432.206) compared to the estimated model. Additionally, the saturated model had a higher NFI (0.772), signifying better overall fit.

**Table 5. Model fit.**

| Model fit | Saturated Model | Estimated Model |
|---|---|---|
| SRMR | 0.076 | 0.111 |
| d_ULS | 2.517 | 5.402 |
| d_G | 0.991 | 1.136 |
| Chi-square | 8432.206 | 9449.399 |
| NFI | 0.772 | 0.745 |

**Source:** Authors based on field data (2023).

### 4.6. Direct Effects

Table **6** presented the results of hypotheses, the relationships between the construct of Technology Adoption (TAD)

and various other constructs were examined. Each hypothesis was tested for significance using beta coefficients, t-statistics, and p-values. The results are presented as follows:

Hypothesis 1 delved into the relationship between Technology Adoption (TAD) and SMEs Competitiveness (SMEC). Notably, this hypothesis yielded a substantial beta coefficient of 0.677, with a high t-statistic of 26.113 and a p-value of 0.000. This exceptionally low p-value well below the significance threshold indicates that the hypothesis was accepted. The data strongly supported the presence of a significant and positive relationship between TAD and SMEC.

Hypothesis 2 examined the potential link between Technology Adoption (TAD) and Operational Efficiency (OE). With a beta coefficient of 0.008 and a t statistic of 0.283, the associated p-value was 0.777. Similar to the previous hypotheses, the lack of statistical significance ($p > 0.05$) led to the rejection of this hypothesis. Therefore, the data did not provide evidence of a significant relationship between TAD and OE.

Hypothesis explored the connection between Technology Adoption (TAD) and Innovation Capacity (INC). The beta coefficient of -0.066 and the corresponding t statistic of 1.363 resulted in a p-value of 0.173. Given that the p-value is above the 0.05 threshold, this hypothesis was also rejected. This suggests that the data did not reveal a statistically significant relationship between TAD and INC.

Hypothesis 4 sought to investigate the relationship between Technology Adoption (TAD) and Access to Finance (ATF). The beta coefficient of 0.019 and the associated t statistic of 0.540 yielded a p-value of 0.589. With a p-value exceeding the commonly accepted significance threshold of 0.05, this hypothesis was rejected. Therefore, the data did not provide sufficient evidence to support a significant relationship between TAD and ATF.

The analysis of hypotheses revealed that while Technology Adoption (TAD) did not exhibit significant associations with Access to Finance (ATF), Innovation Capacity (INC), or Operational Efficiency (OE), it has a highly significant and positive relationship with SMEs Competitiveness (SMEC). These findings have important implications for understanding the role of technology adoption in enhancing the competitiveness of SMEs, emphasising the significant impact on SMEs' competitive capabilities.

These findings buttress that of Darbanhosseiniamirkhiz and Wan smail (2012) which did not specify a direct relationship but focused on factors affecting the adoption of AMTs without revealing a positive or negative correlation. Kumar et al. (2020) addressed challenges faced by SMEs during COVID-19 and proposed technology adoption as a solution without specifying a direct relationship. Lukonga (2020) emphasized the importance of digital technologies for SMEs but did not establish a direct relationship. Najib and Fahm (2020) examined digital payment adoption factors without specifying a direct relationship. Gamage et al. (2020) reviewed challenges faced by SMEs without specifying direct relationships. However, averse to these, findings of Moghavvemi et al. (2012) found a positive relationship between IT innovation adoption and competitive advantage among SMEs in Malaysia. Taylor (2015) proposed an inte-

**Table 6. Direct Effects.**

| Hypothesis | Path | Beta coefficients | T statistics | P-values | Conclusion |
|---|---|---|---|---|---|
| $H_{01}$: | TAD -> SMEC | 0.677 | 26.113 | 0.000 | Accepted |
| $H_{02}$: | TAD -> OE | 0.008 | 0.283 | 0.777 | Rejected |
| $H_{03}$: | TAD -> INC | -0.066 | 1.363 | 0.173 | Rejected |
| $H_{04}$: | TAD -> ATF | 0.019 | 0.540 | 0.589 | Rejected |

**Source:** Authors based on field data (2023).

**Table 7 Mediation effect.**

| Hypothesis | Path | Beta Coefficients | T Statistics | P Values | Comments |
|---|---|---|---|---|---|
| $H_{6a}$: | TAD -> SC -> SMEC | -0.008 | 1.431 | 0.153 | Full mediation |
| $H_{6b}$: | TAD -> SC -> OE | 0.171 | 8.529 | 0.000 | Full mediation |
| $H_{6c}$: | TAD -> SC -> INC | 0.034 | 4.020 | 0.000 | Full mediation |
| $H_{6d}$: | TAD -> SC -> ATF | 0.033 | 4.373 | 0.000 | Full mediation |

**Source:** Authors based on field data (2023)

grated theoretical model for understanding ICT adoption in SMEs, emphasizing the positive relationship between various internal and external factors and ICT adoption. Anjum (2018) discovered that technology adoption positively affects SMEszsw manufacturing performance. Selase et al. (2019) reported a positive relationship between internet technology adoption and market performance among SMEs.

### 4.7. Mediation Effect

Table **7** presented the results of hypotheses (H6a, H6b, H6c, and H6d) aimed to investigate the potential mediating role of Supply Chain Integration (SC) between Technology Adoption (TAD) and several other constructs, including SMEs Competitiveness (SMEC), Operational Efficiency (OE), Innovation Capacity (INC), and Access to Finance (ATF). The results are interpreted below:

Hypothesis 6a explored the mediating role of Supply Chain Integration (SC) between Technology Adoption (TAD) and SMEs Competitiveness (SMEC). The beta coefficient of -0.008, along with a t statistic of 1.431, resulted in a p-value of 0.153. While the p-value exceeds the conventional significance threshold of 0.05, it suggests partial mediation. Therefore, the hypothesis was not fully supported, indicating that SC only partially mediated the relationship between TAD and SMEC.

The sixth hypothesis (H6b) focused on the mediation of Operational Efficiency (OE) by Supply Chain Integration (SC) in the relationship between Technology Adoption (TAD) and OE. A substantial beta coefficient of 0.171 and a high t statistic of 8.529 led to a remarkably low p-value of 0.000. This indicates full mediation, suggesting that SC effectively mediated the relationship between TAD and OE, playing a crucial role in explaining the association.

Hypothesis 6c examined the mediating role of Supply Chain Integration (SC) between Technology Adoption (TAD) and Innovation Capacity (INC). The beta coefficient of 0.034, coupled with a t statistic of 4.020, yielded a highly significant p-value of 0.000. This outcome signifies full mediation, indicating that SC fully mediated the relationship between TAD and INC. It implies that SC played a significant role in elucidating the connection between TAD and INC.

Hypothesis H6d explored the full mediation of Access to Finance (ATF) by Supply Chain Integration (SC) in the relationship between Technology Adoption (TAD) and ATF. With a beta coefficient of 0.033, a t statistic of 4.373, and a p-value of 0.000, the results pointed to full mediation. This suggests that SC entirely mediated the relationship between TAD and ATF, underscoring the crucial role of SC in explaining this association. The analysis of these hypotheses revealed varying degrees of mediation by SC. While SC fully mediated the relationships between TAD and OE, INC, and ATF, it only partially mediated the relationship between TAD and SMEC. These findings underscore the nuanced role of SC in explaining the complex interplay between Technology Adoption and various outcomes within the context of SMEs. This result supports Nair et al. (2019) who identified owner-driven technology preparedness as a significant mediator in the relationship between IT adoption and SME outcomes in Indian SMEs; and Effendi et al. (2020) who found that technological, organisational, and environmental contexts, along with social media awareness, significantly influence adoption intentions.

### 4.8. Moderating effect

Table **8** presented the analysis of hypotheses (H5a, H5b, H5c, and H5d) aimed to explore the moderating effects of

**Table 8. Moderating effects.**

| Hypothesis | Path | Beta coefficients | t- statistics | P-values | Conclusions |
|---|---|---|---|---|---|
| $H_{5a}$: | OC x TAD -> ATF | -0.115 | 4.533 | 0.000 | Moderation |
| $H_{5b}$ | OC x TAD -> INC | -0.047 | 1.919 | 0.055 | No moderation |
| $H_{5c}$ | OC x TAD -> OE | 0.042 | 2.616 | 0.009 | Moderation |
| $H_{5d}$: | OC x TAD -> SMEC | 0.022 | 1.156 | 0.248 | No moderation |

**Source:** Authors based on field data (2023).

Organisational Culture (OC) in the relationship between Technology Adoption (TAD) and various other constructs, including Access to Finance (ATF), Innovation Capacity (INC), Operational Efficiency (OE), and SMEs Competitiveness (SMEC).

Hypothesis 5a sought to investigate the moderating role of Organisational Culture (OC) in the relationship between Technology Adoption (TAD) and Access to Finance (ATF). The beta coefficient of -0.115, along with a high t statistic of 4.533, resulted in a p-value of 0.000, indicating statistical significance. This implies that OC has a moderating effect on the relationship between TAD and ATF. In other words, the strength of the relationship between TAD and ATF was influenced by the level of OC within organisations. The hypothesis H5b explored the moderation of Innovation Capacity (INC) by Organisational Culture (OC) in the relationship between Technology Adoption (TAD) and INC. The beta coefficient of -0.047 and the associated t-statistic of 1.919 yielded a p-value of 0.055. While the p-value is slightly above the conventional significance threshold of 0.05, it suggests no moderation. Thus, OC did not significantly moderate the relationship between TAD and INC. Hypothesis 5c examined the moderating role of Organisational Culture (OC) in the relationship between Technology Adoption (TAD) and Operational Efficiency (OE). The beta coefficient of 0.042, coupled with a t statistic of 2.616, led to a significant p-value of 0.009, indicating moderation. This implies that OC played a moderating role in the relationship between TAD and OE, influencing the strength of this association.

Finally, hypothesis H5d, explored the moderating effect of Organisational Culture (OC) in the relationship between Technology Adoption (TAD) and SMEs Competitiveness (SMEC). With a beta coefficient of 0.022 and a t statistic of 1.156, the p-value was 0.248, exceeding the significance threshold of 0.05. Consequently, this hypothesis suggests no moderation. OC does not significantly moderate the relationship between TAD and SMEC.

The analysis of these hypotheses revealed varying degrees of moderation by Organisational Culture (OC) in the relationships between Technology Adoption (TAD) and the studied constructs. OC was found to moderate the relationships between TAD and Access to Finance (ATF) and TAD and Operational Efficiency (OE). However, OC does not exert a significant moderating influence on the relationships between TAD and Innovation Capacity (INC) or TAD and SMEs Competitiveness (SMEC). These findings emphasize the role of OC in shaping specific aspects of the interplay between TAD and organisational outcomes. This supports the findings of Karakara and Osabuohien (2020) and Vrontis *et al. (*2022).

## 5. CONCLUSIONS

With a sample size of 1,588 drawn from various industries across the 16 regions in Ghana, this study employed Structural Equation Modeling (SEM) to investigate the relationship between technology adoption and SME competitiveness, operational efficiency, innovation intergration and access to finance. The study also analysed the moderating roles of organisational culture and supply chain integration on technology adoption and the various constructs. A cross-sectional approach was adopted to gather data at a specific point in time. allowing for a snapshot of the current state of technology adoption among SMEs in Ghana.The stratified random sampling approach, was employed to ensure representation from various industry sectors and geographic regions across Ghana.

The results of direct effects revealed that there is no significant relationship between Technology Adoption (TAD) and Access to Finance (ATF). Similarly, the examination of direct effects found no statistically significant relationship between TAD and Innovation Capacity (INC). This suggests that TAD does not have a significant impact on the innovation capabilities of SMEs. The analysis indicated that there was no significant relationship between TAD and Operational Efficiency (OE). TAD does not significantly contribute to enhancing the operational efficiency of SMEs based on the data. In contrast, the analysis reveals a highly significant and positive relationship between TAD and SMEs Competitiveness (SMEC). This finding underscores the crucial role of technology adoption in enhancing the overall competitiveness of SMEs, a result of substantial significance.

Again, our findings reveal that Supply Chain Integration (SC) played a varying role as a mediator in the relationships between TAD and different constructs. While it partially mediated the relationship between TAD and SMEs Competitiveness (SMEC), it fully mediated the relationships between TAD and Operational Efficiency (OE), Innovation Capacity (INC), and Access to Finance (ATF). This indicates that SC is a crucial factor in explaining the associations between TAD and these constructs, influencing them to varying degrees.

Likewise, Organisational Culture (OC) exhibits a moderating influence in some relationships. OC significantly moderates the relationships between TAD and Access to Finance (ATF) and TAD and Operational Efficiency (OE). However,

OC does not significantly moderate the relationships between TAD and Innovation Capacity (INC) or TAD and SMEs Competitiveness (SMEC). These findings emphasize the nuanced role of OC in shaping specific aspects of the relationships between TAD and these constructs. The analysie of direct, mediation, and moderation effects provide valuable insights into the complex dynamics between Technology Adoption (TAD) and various outcomes within the context of SMEs. While TAD does not directly influence Access to Finance (ATF), Innovation Capacity (INC), or Operational Efficiency (OE), it significantly enhanced SMEs Competitiveness (SMEC). Additionally, the mediation and moderation effects highlight the crucial role of Supply Chain Integration (SC) and Organisational Culture (OC) in explaining and shaping the relationships between TAD and these constructs. These findings contribute to a deeper understanding of the factors influencing SME performance and competitiveness in the context of technology adoption and organisational culture.

## 5.1. The Implications

The findings of this study carry substantial theoretical and managerial implications, shedding light on the complex interplay between technology adoption, supply chain integration, organisational culture, and various outcomes within the context of SMEs. The most significant theoretical implication of this study is the confirmation of the strong and positive relationship between Technology Adoption (TAD) and SMEs Competitiveness (SMEC). This empirical evidence contributes to the existing literature by underscoring the pivotal role of technology adoption in enhancing SME competitiveness. It aligns with the resource-based view and dynamic capabilities theory, emphasizing the importance of technological resources for achieving sustainable competitive advantages. The study's exploration of the mediating role of Supply Chain Integration (SC) offers theoretical insights into how technology adoption influences various outcomes. The full mediation observed in the relationships between TAD and Operational Efficiency (OE), Innovation Capacity (INC), and Access to Finance (ATF) highlights the intricate processes through which technology adoption influences these constructs. Further, the moderation effects of Organisational Culture (OC) on the relationships between TAD and ATF and TAD and OE enrich our theoretical understanding. This highlights the importance of considering organisational culture as a contextual factor that shapes the strength and direction of these relationships. It underscores the need for a contingency perspective when analysing the impact of technology adoption in diverse organisational settings.

Policywise, SME managers should recognise the significance of technology adoption as a strategic tool for enhancing competitiveness. Investing in technology and ensuring its effective integration into operations can yield substantial benefits, ultimately contributing to improved market positioning and performance. Also, the full mediation of TAD through SC in enhancing OE, INC, and ATF underscores the importance of supply chain optimisation. SMEs should focus on strengthening their supply chain integration processes to fully harness the potential benefits of technology adoption. Furthermore, SMEs should assess their organisational culture and align it with their technology adoption strategies. A

culture that supports innovation, change, and collaboration is more likely to facilitate the positive impacts of technology adoption on various outcomes. Likewise, understanding the mediation and moderation mechanisms identified in this study can help in resource allocation decisions. SMEs can prioritise resources for technology adoption initiatives that are likely to have the most substantial impact on their specific objectives, considering the role of supply chain integration and organisational culture. This study, therefore, advances both theoretical understanding and practical insights for SMEs. It emphasizes the pivotal role of technology adoption in enhancing competitiveness and highlights the mediation and moderation mechanisms that shape these relationships. SME managers and policymakers can leverage these insights to make informed decisions, optimise their operations, and foster a culture conducive to technology-driven growth and innovation.

## 5.2. Limitations and Future Research Directions

Cross-sectional data may not capture the dynamics and changes in relationships over time. Also, the study relied on self-reported data from SMEs, which may be subject to common method bias and social desirability bias. Future research should employ multiple sources of data or objective performance measures to mitigate these measurement concerns. While this study focused on the mediating role of supply chain integration and the moderating role of organisational culture, there may be other variables not considered in the analysis that could further explain or moderate the relationships. Future research should explore additional mediation and moderation mechanisms to provide a more comprehensive picture.

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Authors have no competing interests

## ETHICS:

None of the respondents was a minor, anonymity assured, participation was at free will.

## REFERENCES

Abbassi, W., Kumari, V., and Pandey, D. K. (2022). What makes firms vulnerable to the Russia–Ukraine crisis? *Journal of Risk Finance*. https://doi.org/10.1108/JRF-05-2022-0108

Abdullah, N., Wahab, E., and Shamsuddin, A. (2013). Exploring the common technology adoption enablers among malaysian SMEs: qualitative findings. Journal of Management and Sustainability, 3(4). https://doi.org/10.5539/jms.v3n4p78

Anjum, A. (2018). Impact of Technology Adoption on the Performance of Small and Medium Enterprises in India. *The Journal of Social Sciences Research*, Special Issue 5: 857–867. https://doi.org/10.32861/jssr.spi5.857.867

Bawono, H.T., Winarno, W. and aryono, K. (2022). "Effect of Technology, Organization, And External Environment on Business Performance Mediated by the Adoption of Technology 4.0 in SMEs". *Jurnal Manajerial*, (Special Issue), 9(2): 228-248. http://dx.doi.org/10.30587/jurnalmanajerial.v9i02.3854.

Bocconcelli, R., Cioppi, M., Fortezza, F., Francioni, B., Pagano, A., Savelli, E., and Splendiani, S. (2018). SMEs and Marketing: A Systematic

Literature Review. *International Journal of Management Reviews*. https://doi.org/10.1111/ijmr.12128

Buchdadi, A.D., Sholeha, A., Ahmad, G.N. and Mukson. (2020). the Influence of Financial Literacy on SMEs Performance through Access to Finance and Financial Risk Attitude As Mediation Variables. *Academy of Accounting and Financial Studies Journal*, 24(5): 1–16.

Chairoel, L., and Riski, T. R. (2018). "Internal and External Factor Influence ICT Adoption: A Case of Indonesian SMEs". *Jurnal Manajemen Dan Kewirausahaan*, 20(1): 38-44. https://doi.org/10.9744/jmk.20.1.38-44

Darbanhosseiniamirkhiz, M. and Ismail, W.K. (2012). Advanced manufacturing technology adoption in SMEs: An integrative model. *Journal of Technology Management and Innovation*, 7(4): 112–120. https://doi.org/10.4067/S0718-27242012000400009

Das, S., Kundu, A., and Bhattacharya, A. (2020). Technology adaptation and survival of SMEs: A longitudinal study of developing countries. *Technology Innovation Management Review*, 10(6): 64–72. https://doi.org/10.22215/timreview/1369

Distanont, A. and Khongmalai, O. (2022). The adoption of digital technology in SMEs. ECMLG, 18(1), 141-146. https://doi.org/10.34190/ecmlg.18.1.541

Effendi, M. I., Sugandini, D. and Istanto, Y. (2020). Social Media Adoption in SMEs Impacted by COVID-19: The TOE Model. *Journal of Asian Finance, Economics and Business*, 7(11); 915–925. https://doi.org/10.13106/jafeb.2020.vol7.no11.915

Gamage, S.K.N., Ekanayake, E.M.S., Abeyrathne, G.A.K.N.J., Prasanna, R.P.I.R., Jayasundara, J.M.S.B., and Rajapakshe, P.S.K. (2020). A review of global challenges and survival strategies of small and medium enterprises (SMEs). *Economies*, 8(4): https://doi.org/10.3390/ECONOMIES8040079

Hair, J.F., Ringle, C.M., Gudergan, S.P., Fischer, A., Nitzl, C. and Menictas, C. (2019). Partial least squares structural equation modeling-based discrete choice modeling: an illustration in modeling retailer choice. *Business Research*. https://doi.org/10.1007/s40685-018-0072-4

Karakara, A.A. W. and Osabuohien, E. (2020). ICT adoption, competition and innovation of informal firms in West Africa: a comparative study of Ghana and Nigeria. *Journal of Enterprising Communities*, 14(3): 397–414. https://doi.org/10.1108/JEC-03-2020-0022

Khan, M.S. and Siddiqui, S.H. (2019). SMEs Intention towards Use and Adoption of Digital Financial Services. *Sustainable Business and Society in Emerging Economies*, 1(2): 65–80. https://doi.org/10.26710/sbsee.v1i1.1007

Kinyanzui, K.F., Achoki, G. and Kiriri, P. (2018). Effect of Mobile Credit on Operational Efficiency in Commercial Banks in Kenya. *Open Journal of Business and Management*, 06(04): 833–849. https://doi.org/10.4236/ojbm.2018.64062

Kumar, A. and Ayedee, N. (2021). Technology Adoption: a Solution for SMEs to Overcome Problems During Covid19. *Academy of Marketing Studies Journal*, 25(1): 1–16.

Luiz, A., Soares, V., Mendes-filho, L. and Gretzel, U. (2020). *Technology adoption in hotels : Applying institutional theory to tourism Technology adoption in hotels : Applying institutional theory to tourism*. *April.* https://doi.org/10.1108/TR-05-2019-0153

Lukonga, I. (2020). Harnessing Digital Technologies to Promote SMEs in the MENAP Region. *IMF Working Papers*, 2020(135): 1. https://doi.org/10.5089/9781513550770.001

Manochehri, N.N., Al-Esmail, R., and Ashrafi, R. (2012). Examining the impact of information and communication technologies (ICT) on enterprise practices: A preliminary perspective from Qatar, *The Electronic Journal on Information System in Developing Countries*, 51(3): 1-16.

Mishrif, A. and Khan, A. (2023). Technology adoption as survival strategy for small and medium enterprises during COVID-19. *Journal of Innovation and Entrepreneurship*, 12(1): https://doi.org/10.1186/s13731-023-00317-9

Moghavvemi, S., Hakimian, F., Feissal, T. and Faziharudean, T.M. (2012). Competitive Advantages through it Innovation Adoption By SMEs. *Social Technologies*, 2: 24–39.

Nair, J., Chellasamy, A. and Singh, B.N.B. (2019). Readiness factors for information technology adoption in SMEs: testing an exploratory model in an Indian context. *Journal of Asia Business Studies*, 13(4): 694–718. https://doi.org/10.1108/JABS-09-2018-0254

Najib, M. and Fahma, F. (2020). Investigating the adoption of digital payment system through an extended technology acceptance model: An insight from the Indonesian small and medium enterprises. *International Journal on Advanced Science, Engineering and Information Technology*, 10(4): 1702–1708. https://doi.org/10.18517/ijaseit.10.4.11616

Naushad, M. and Manakkattil, S. (2020). Prioritizing technology adoption dynamics among SMEs. Tem Journal, 983-991. https://doi.org/10.18421/tem93-21

Prasanna, R.P.I.R., Jayasundara, J.M.S.B., Gamage, S.K.N., Ekanayake, E.M.S., Rajapakshe, P.S.K. and Abeyrathne, G.A.K.N.J. (2019). Sustainability of SMEs in the competition: A systemic review on technological challenges and SME performance. *Journal of Open Innovation: Technology, Market, and Complexity*, 5(4): 100. https://doi.org/10.3390/joitmc5040100

Putri, F.K.K., Hakim, M.S. and Bramanti, G.W. (2018). *The Impact of Financial Literacy on Investors' Risk Tolerance*,III(X), 227–231. https://doi.org/10.5220/0007117602270231

Rogers, E.M., Singhal, A. and Quinlan, M.M. (2019). Diffusion of innovations. In *An Integrated Approach to Communication Theory and Research, Third Edition*. https://doi.org/10.4324/9780203710753-35

Selase, A.M., Selase, A.E., Ayishetu, A.-R., Comfort, A.D., Stanley, A. and Ebenezer, G.-A. (2019). Impact of Technology Adoption and Its Utilisation on SMEs in Ghana. *International Journal of Small and Medium Enterprises*, 2(2): 1–13. https://doi.org/10.46281/ijsmes.v2i2.382

Shahadat, M.M.H., Nekmahmud, M., Ebrahimi, P. and Fekete-Farkas, M. (2023). Digital Technology Adoption in SMEs: What Technological, Environmental and Organisational Factors Influence SMEs' ICT Adoption in Emerging Countries? *Global Business Review*, *January*. https://doi.org/10.1177/09721509221137199

Taylor, P. (2015). The importance of information and communication technologies (ICTs): an integration of the extant literature on ICT adoption in small and medium enterprises. *International Journal of Economics, Commerce and Management*, III(5): 274–295.

Usman, M., Roijakkers, N., Vanhaverbeke, W. and Frattini, F. (2019). Innovation capability in SMEs: A systematic review of the literature. In *Journal of Innovation and Knowledge* (Issue April). https://doi.org/10.1016/j.jik.2019.11.002

Zahra, A., Dhewanto, W., and Utama, A. (2021). "Boosting Emerging Technology Adoption in SMEs: A Case Study of the Fashion Industry". *International Journal of Applied Business Research*, 3(2): 169-185.https://doi.org/10.35313/ijabr.v3i2.155

Zamani, S.Z. (2022). Small and Medium Enterprises (SMEs) facing an evolving technological era: a systematic literature review on the adoption of technologies in SMEs. *European Journal of Innovation Management*, 25(6): 735–757. https://doi.org/10.1108/EJIM-07-2021-0360

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