International Journal of Global Sustainable Research (IJGSR)
Vol.4, No.3, 2026:237-258

Technology Adoption and Managerial Skills Enhance Business Resilience Through Organizational Agility in Indonesia Cross-Sector Firms

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A R T I C L E I N F O

Keywords: Technology Adoption, Managerial Skills, Organizational Agility, Business Resilience
Jel Classification: M10; M15; D23

Received : 3 January
Revised : 20 February
Accepted: 20 March

A B S T R A C T

This study aims to explore the relationships between Technology Adoption, Managerial Skills, Organizational Agility, and Business Resilience within a dynamic business environment. According to the dynamic capabilities view of the firm, this study suggests that technology adoption and managerial skills can directly and indirectly impact business resilience through organizational agility. A quantitative study was adopted through a survey of firms, where Partial Least Squares Structural Equation Modeling (PLS-SEM) was used to analyze the data obtained. The study found that technology adoption and managerial skills were significant positive antecedents of organizational agility and business resilience. Furthermore, this study found that organizational agility was a significant influencer of business resilience and a partial mediator of the relationships between technology adoption-business resilience and managerial skills-business resilience. The study contributes to the existing body of knowledge by developing a comprehensive framework of how internal capabilities interact to produce business resilience within a dynamic business environment. The study is of great importance to managers as it provides insights on how to increase business sustainability within a dynamic business environment

DOI: https://doi.org/10.59890/ijgsr.v4i3.179
ISSN-E: 3026-4677
https://slamultitechpublisher.my.id/index.php/ijgsr/index

INTRODUCTION

In the modern business environment, organizations are faced with unprecedented levels of uncertainty, volatility, and complexity. Technology, globalization, changes in consumer behavior, and unforeseen disruptions in the business environment, including economic crises and pandemics, have significantly changed the nature of the business environment. For example, the outbreak of the COVID-19 pandemic has revealed the underlying weaknesses in many industries, thus underscoring the need for businesses to enhance their capacity to cope with disruptions in the business environment (Kinyua, 2025; Le, 2023). Therefore, the concept of business resilience has attracted considerable scholarly and managerial interest in the modern business environment. Business resilience can be defined as a business organization's capacity to anticipate, prepare for, respond to, and adapt to changes and disruptions in order to survive and thrive in the business environment. In this context, resilience is not viewed as a reactive concept, but as a strategic imperative embedded in the business environment (Bruce et al., 2022).

One of the main factors affecting organizational resilience is the adoption of technology. The rapid development of digital technologies, including cloud computing, big data analytics, artificial intelligence, and digital platforms, has changed the manner in which organizations operate, interact, and build value (Li et al., 2023). The adoption of technology allows organizations to increase their operational efficiency, improve customer interactions, and build innovative products and services. More importantly, during disruption, digital technologies help organizations operate remotely, increase supply chain management, make decisions in real time, and build strategies based on data (Fassam & Dani, 2017; Kayyali, 2025). Organizations that are able to adopt and integrate digital technologies are better positioned to build resilience and respond to organizational changes. However, the adoption of technology is not just about the technology itself but also about the strategic alignment, availability of resources, and organizational readiness to build outcomes, including organizational resilience (YahiaMarzouk & Jin, 2022).

Apart from the technological infrastructure, the role of managerial skills cannot be overlooked in the development of organizational resilience. Managerial skills refer to the overall competence that managers exhibit, which includes strategic thinking, problem-solving, leadership, communication, and decision-making skills, among others. In the face of a turbulent business environment, the managers ought to be competent enough to take timely and informed decisions despite the lack of sufficient information (Do et al., 2022). On the other hand, good leadership promotes trust, cooperation, and engagement, which are vital for organizational response to crises. In addition, the skills of the managers impact the adoption of technological innovations for the purpose of enhancing competitiveness. Therefore, the human factor, which includes the competence of managers, plays a vital role in the development of business resilience (Li et al., 2023).

Another significant factor that can contribute to business resilience is organizational agility. Organizational agility can be defined as the ability of a business to sense changes in the environment and react to them quickly and effectively (De Matteis et al., 2023). Organizations that are agile are characterized by their flexible structure, decentralized decision-making, collaborative culture, and learning culture, among other characteristics. Organizational agility is significant in highly volatile environments because it can reduce the time gap between identifying a threat or opportunity and reacting to it appropriately (Mohezar et al., 2023; Sutar et al., 2024). Organizational agility can be seen as a complement to technology and managerial skills, as technology can equip a business and managerial skills can direct a business, but organizational agility can mobilize the entire business to react to changes in the environment efficiently (Zhao et al., 2024).

The interrelation between technology adoption, managerial competence, and organizational agility indicates the necessity of a multi-faceted approach to building business resilience. In fact, technology adoption may not be an effective factor in building business resilience if managerial competence is lacking to utilize technology to its full potential. On the other hand, managerial competence may be of no use if technology and organizational agility are not supportive (Kussudyarsana et al., 2023). Therefore, it is essential to understand the interrelation between these variables and their impact on building business resilience, as it is of great importance to both scholars and practitioners. Although there is an increase in the interest of scholars to engage in research on the subject of business resilience, empirical studies on the subject, particularly in emerging economies, are very few.

While there has been significant research on the individual impacts of technology adoption, managerial capabilities, and organizational agility on business performance and sustainability, there is a lack of comprehensive studies that incorporate all these variables within a unified framework to explain business resilience. Today, there are many instances where firms are investing heavily in technology adoption strategies without a thorough understanding of the role played by managerial capabilities and organizational structures in this regard. As a result, there are cases of suboptimal performance, where firms face issues of low adaptability towards technological changes and crisis situations. There is a lack of empirical research regarding the relative impacts of technology adoption strategies, managerial capabilities, and organizational agility on business resilience within the ever-changing business environment. This study aims to examine the role of technology adoption, managerial skills, and organizational agility in shaping business resilience.

LITERATURE REVIEW

Business Resilience

Business resilience has become a major concept in strategic management and business organizations, especially with the rising environmental turbulence. Business resilience can be defined as the ability of a business organization to foresee any potential disruption, absorb the disruption, and then recover to a stable point of operation (Kennedy & Linnenluecke, 2022; Kussudyarsana et al., 2023). Business resilience differs from traditional risk management, which mainly aims at prevention and mitigation. Business resilience combines both forward-thinking and backward-thinking strategies, enabling business organizations not only to weather the storm but also to capitalize on the new business opportunities that come with the storm (Xie et al., 2022).

Business resilience is theoretically viewed as an entity with dimensions of robustness, adaptability, agility, and learning (Aldianto et al., 2021; Rao et al., 2024). Robustness is the ability of an organization to continue with its essential operations despite disturbances, and adaptability is the ability to alter strategies and processes in response to changes. Learning is an additional factor that contributes to business resilience as it allows an organization to learn from past disturbances and thus be better placed to handle future disturbances (Agarwal et al., 2023). Empirical studies have supported the view that resilient business organizations experience improved financial, relational, and competitive advantages during unstable periods (Hanifan & Dhewanto, 2022). However, it is essential to note that business resilience does not just happen; it is an outcome of strategic, organizational, and leadership capabilities.

Technology Adoption

Technology adoption is defined as the process by which an organization discovers, assesses, and executes new technology systems within its business processes (Skare et al., 2023). Technology adoption in the digital age is not limited to information systems alone but encompasses other sophisticated digital technology solutions such as artificial intelligence, cloud computing, data analytics, and integrated technology platforms. The theoretical basis for technology adoption is based on the Technology-Organization-Environment (TOE) theory and innovation diffusion theory, which emphasize the role of organizational preparedness and environmental influences on technology adoption (Rogers et al., 2005).

From a strategic point of view, technology adoption is beneficial as it improves efficiency, minimizes transactional costs, and aids in effective communication and data-informed decision-making (Liébana-cabanillas et al., 2014). Digital technologies, in particular, have enabled real-time monitoring of supply chains, automation of processes, and improved interactions with customers via digital platforms. Such technologies have been instrumental in crisis situations, as they offer timely access to information and flexibility of operations. For instance, digital platforms can be leveraged to operate despite physical limitations (Lee et al., 2015; Patma et al., 2021).

Yet, as the literature emphasizes, technology adoption does not necessarily guarantee improved business performance or resilience on its own. The effectiveness of digital transformation is contingent upon the availability of complementary factors such as human capital, management skills, and organizational culture. Business organizations that are not technology-savvy or are unable to match their technology adoption strategy with their business strategy are likely to experience challenges during the implementation of technology as well as resistance to change (Lee et al., 2015). As such, technology adoption must be aligned with a strategic framework to make a positive impact on business resilience.

H1a: Technology adoption has a positive and significant effect on business resilience.
H1b: Technology adoption has a positive and significant effect on organizational agility.

Managerial Skills

Managerial skills are another important factor which determines the success or failure of an organization. Managerial skills include technical skills, human skills, and conceptual skills. These skills are the same as those originally proposed by classical management theorists (Kim & Yoon, 2023). Technical skills are those skills which are associated with any particular area of knowledge. Human skills are associated with communication and leadership. Conceptual skills are associated with the ability to solve problems. These skills are important in dynamic environments (Ferdinan, 2016; NG'ORA et al., 2022).

According to strategic leadership theory, managers shape organizational outcomes by developing visions, allocating resources, and building supportive cultures within an organization. During crises, the ability of managers depends on how effectively the organization responds to environmental cues, assesses risks, and takes the right actions (Murtianingsih et al., 2023; NG'ORA et al., 2022). Decisive and transparent leadership builds trust among employees, reduces panic, and increases organizational commitment to goals. Managers are instrumental in facilitating technology adoption by providing direction, allocating resources, and motivating employees to adopt technology (Sapiro, 2024). Studies show that companies with high managerial competencies tend to be more innovative and adaptable. Managers who foster an environment of experimentation, learning, and cooperation are key drivers of resilience (Busso et al., 2023; Murtianingsih et al., 2023). On the other hand, poor managers might lead to slow responses and poor coordination, which might hinder resilience. As such, managerial skills act as a catalyst that converts technological and structural resources into resilience outcomes.

H2a: Managerial skills have a positive and significant effect on business resilience.
H2b: Managerial skills have a positive and significant effect on organizational agility.

Organizational Agility

Organizational agility is defined as the firm's capacity to detect changes in the environment and respond accordingly (Satar et al., 2023). Organizational agility has also been defined as having two main components, which are sensing capability and responding capability. Sensing capability is defined as the ability of the firm to detect changes in the environment, including market trends, customer needs, and competitors (Probojakti et al., 2025; Teece et al., 2016). Agile

organizations are marked by flexible structures, decentralized authority, collaborative work styles, and a culture of innovation. These dimensions help firms adjust to changing circumstances without being hindered by excessive bureaucracy. Agility is closely associated with dynamic capability theory, which emphasizes the importance of firms developing internal and external competencies to deal with dynamic environments (Muduli, 2017).

Empirical research has proven the benefits of organizational agility in relation to firm performance, innovation, and customer satisfaction (Muduli, 2017; Xu et al., 2024). During the disruption, organizational agility enables the firm to change its business model, diversify its revenue streams, and change its operational processes. The most important thing about organizational agility is its ability to leverage the benefits of technology adoption and management skills (Ürü et al., 2024). While technology adoption can facilitate rapid communication and data analysis, organizational agility can facilitate the firm's response to the analyzed data. Management skills are also beneficial in enhancing organizational agility (Mahmoud et al., 2025; Pelletier et al., 2025).

H3a: Organizational agility has a positive and significant effect on business resilience.
H3b Organizational agility mediates the relationship between technology adoption and business resilience.
H3c: Organizational agility mediates the relationship between managerial skills and business resilience.

METHODOLOGY

Design of Research

This research is based on the quantitative research approach and the cross-sectional survey design. The use of the quantitative research approach is appropriate for the purpose of this research because the main aim of the research is to test the research hypothesis and determine the relationships between the variables. The use of the cross-sectional survey design is appropriate because the data is collected at one particular time, which is appropriate for the purpose of gathering data on the perceptions of the organizational agility and resilience in the particular business context.

The research model is developed based on the theory of dynamic capability and the resource-based view (RBV) theory, which emphasize the strategic role of organizational resources and capabilities in achieving sustained competitive advantage and long-term survival. The conceptual model specifies technology adoption and managerial skills as exogenous variables, organizational agility as an endogenous and mediating variable, and business resilience as the endogenous variable.

Population and Sample

The target population for this study consists of organizations that operate in dynamic and competitive business environments. On the other hand, the unit of analysis for this study targets the organization, while the unit of observation targets the individuals, who could be the owners, directors, managers, and departmental heads, based on the fact that they have sufficient information regarding the implementation of technology, organizational processes, and the strategies that the organizations employ. The purposeful sampling method is

utilized for data collection with the purpose that the selected respondents should possess specific qualities, which include: (1) they should be in a managerial or supervisory role, (2) they should be a part of the strategic decision-making process, and (3) they should have a minimum experience of two years with the company. The minimum sample size can be computed by applying the "10 times rule" in Partial Least Squares Structural Equation Modeling (PLS-SEM) to ensure that the sample size is at least ten times larger than the maximum number of structural paths aimed at a particular construct in the model. Alternatively, the results can be supplemented by applying a statistical power analysis to ensure sufficient power to detect significant relationships. Increasing the sample size will make the results more robust.

Data Collection Procedure

The collection of the primary data is done using a structured questionnaire, which is either electronically or physically sent to the respondents. For the electronic version, online survey tools can be used to enhance the ease of access to the questionnaire. Before the actual collection of the data, a pilot study is done using a smaller number of respondents to assess the reliability and validity of the questionnaire. To minimize common method bias, respondents are assured of anonymity and confidentiality. This is achieved by informing them that there are no right or wrong answers and by encouraging them to respond honestly. Additionally, the order of the items is arranged to minimize response pattern bias.

Measurement of Variables

All constructs in this study are measured using multi-item scales adapted from established literature to ensure content validity. Responses are assessed using a five-point Likert scale ranging from 1 (strongly disagree) to 5 (strongly agree).

Table 1. Variable Measurement

Variable	Operational Definition	Dimensions	Sample Indicators
Technology Adoption (TA)	The extent to which the firm adopts and integrates digital technologies into its business processes and strategic activities.	- Digital Infrastructure-Technology Integration- Strategic Alignment	- Our company uses digital systems to support daily operations. - We utilize data analytics for decision-making. - Digital technologies are aligned with our business strategy.
Managerial Skills (MS)	The capability of managers to effectively lead, make decisions, solve problems, and manage organizational resources in dynamic environments.	- Conceptual Skills- Human Skills- Technical Skills	- Managers in our company make strategic decisions effectively. - Leaders communicate goals clearly to employees.

			- Managers are capable of solving complex problems.
Organizational Agility (OA)	The firm's ability to sense environmental changes and respond rapidly and effectively through resource reconfiguration and strategic adaptation.	- Sensing Capability- Responding Capability	- Our company quickly detects changes in the market. – We can rapidly adjust strategies when needed. - Resources can be reallocated quickly to address new challenges.
Business Resilience (BR)	The firm's capacity to anticipate, absorb, adapt to, and recover from disruptions while maintaining business continuity.	- Robustness- Adaptability- Recovery Capability	- Our company can maintain operations during crises. - We adapt effectively to unexpected changes. - The company recovers quickly after disruptions.

Data Analysis Technique

The current research uses Partial Least Squares Structural Equation Modeling (PLS-SEM) as the major data analysis strategy to test the proposed hypotheses and investigate the relationships between technology adoption, managerial competency, organizational agility, and business resilience. PLS-SEM is used as the data analysis strategy because this approach is appropriate for predictive and exploratory research studies, particularly while analyzing complex models with multiple latent variables and mediation effects. Additionally, PLS-SEM is an appropriate data analysis strategy for studies that do not impose strict multivariate normality assumptions and are based on moderate-sized samples (Hair et al., 2019). This data analysis strategy is effective while simultaneously analyzing the measurement models and structural relationships within a single framework.

The data analysis procedure consists of two stages: evaluating the measurement model (outer model), and evaluating the structural model (inner model). Data screening is carried out before testing the hypotheses. Data screening is intended to guarantee data quality. It involves examining data for missing values, outliers, and response patterns. Descriptive statistics is carried out to obtain an overall view of the respondents' characteristics and trends.

The first step is the evaluation of the measurement model for reliability and validity. In this case, the reliability of the indicators will be checked, and this will be done by examining the outer loadings, which need to be 0.70 or higher for the indicators to represent the latent construct adequately. In addition, internal consistency reliability will be checked, and this will be done by examining the value of Cronbach's Alpha and Composite Reliability, which needs to be 0.70 or higher for the model to be reliable. Convergent validity will be checked by

examining the Average Variance Extracted, which needs to be 0.50 or higher for the model to be valid, as it would mean that the construct explains more than half of the variance for the indicators. Discriminant validity will be checked by examining the Fornell-Larcker criterion. In this case, the value needs to be lower than 0.90 for the model to be valid, as it would mean that the constructs are empirically distinct from one another.

Once the reliability and validity conditions for the measurement model are met, the second step is concerned with the evaluation of the structural model. In this step, the relationships between the constructs are tested. The degree and direction of the relationships are identified based on the path coefficients. In order to establish the statistical significance, the bootstrapping method with 5,000 resamples is used. In order to establish the significance of the hypotheses, the t-values and the corresponding p-values, with a 5 percent ($p < 0.05$) threshold, are used.

The degree to which the model explains the relationships between the variables is also determined using the coefficient of determination (R^2), which shows the proportion of variance explained by the exogenous variables for the endogenous variables. R^2 values of 0.25, 0.50, and 0.75 represent low, moderate, and high explanatory power, respectively. Effect size (f^2) is also computed to establish the relative contribution of the exogenous constructs to the endogenous construct. Effect sizes of 0.02, 0.15, and 0.35 represent small, medium, and large effect sizes, respectively. Predictive Relevance (Q^2) is also assessed using the blindfolding procedure to evaluate the ability of the model to make predictions. A Q^2 value greater than zero indicates that the model has predictive relevance.

For the evaluation of mediation effects, indirect effects are considered through the bootstrapping method. The significance of indirect effects of technology adoption and management skills on business resilience through organizational agility is checked. If both direct and indirect effects are found significant, partial mediation is considered to occur. If the indirect effect is found significant and the direct effect is not significant, full mediation is said to take place. This method helps to achieve a comprehensive understanding of how organizational agility acts as a mediator between technology adoption/management skills and business resilience.

RESULTS

Characteristics of Respondents

A total of 210 valid questionnaires were collected and analyzed. The demographic characteristics of respondents are presented in Table 2.

Table 2. Respondent Characteristics

Category	Frequency	Percentage (%)
Gender		
Male	126	60.000
Female	84	40.000
Position		
Owner/Director	68	32.381
Senior Manager	74	35.238
Department Head	46	21.905
Supervisor	22	10.476
Work Experience		
2–5 years	54	25.714
6–10 years	83	39.524
>10 years	73	34.762
Industry Type		
Manufacturing	79	37.619
Services	88	41.905
Trade	43	20.476

Source: Primary Data

From Table 2, it is evident that the majority of the population are males, comprising 60.000%, while females constitute 40.000%. This shows an almost equal distribution of males and females, with males being dominant in management positions. From the table, it is also evident that the majority of the population are senior managers, comprising 35.238%, while owners/directors constitute 32.381%, department heads constitute 21.905%, and supervisors constitute 10.476%. This shows that the data is mostly based on strategic level opinions within organizations. From the table, it is evident that the majority of the population have 6-10 years of experience, comprising 39.524%, while those with over 10 years of experience constitute 34.762%, while those with 2-5 years of experience constitute 25.714%. This shows that the population has substantial experience. From the table, it is evident that the majority of the population work in service industries, comprising 41.905%, while those in manufacturing constitute 37.619%, while those in the trade industry constitute 20.476%. This shows that the data is based on opinions from different industries, with the service industry being dominant.

Descriptive Analysis

Descriptive statistics were calculated to examine the central tendency and dispersion of responses for each construct. The results are presented in Table 3.

Table 3. Descriptive Statistics of Constructs

Variable	N	Minimum	Maximum	Mean	Std. Deviation
Technology Adoption	210	2.000	5.000	4.012	0.587
Managerial Skills	210	2.000	5.000	4.143	0.542
Organizational Agility	210	2.000	5.000	4.087	0.561
Business Resilience	210	2.000	5.000	4.176	0.533

Source: Data Processed

Table 3 shows that all variables possess a mean value greater than 4.000 on a five-point Likert scale, which indicates that the respondents generally perceive that the organization exhibits high levels of technology adoption, managerial skills, organizational agility, and business resilience. It is also noticeable that the highest mean value is recorded for Business Resilience at 4.176, followed by Managerial Skills at 4.143, Organizational Agility at 4.087, and Technology Adoption at 4.012. These results indicate that the firms perceive themselves to possess the highest levels of business resilience to withstand disruptions. It is also noticeable that the minimum value recorded across all variables is 2.000, the maximum value recorded across all variables is 5.000, although the low standard deviation values recorded between 0.533 and 0.587 indicate that the responses were moderately concentrated around the mean.

Measurement Model Evaluation

1. Indicator Reliability

Indicator reliability was assessed by examining outer loadings. All indicators demonstrated loadings above the recommended threshold of 0.700, indicating satisfactory reliability.

Table 4. Outer Loadings

Construct	Indicator	Loading
Technology Adoption (TA)	TA1	0.812
	TA2	0.845
	TA3	0.831
	TA4	0.864
	TA5	0.798
Managerial Skills (MS)	MS1	0.821
	MS2	0.856
	MS3	0.833
	MS4	0.847
	MS5	0.809
Organizational Agility (OA)	OA1	0.844
	OA2	0.867

	OA3	0.852
	OA4	0.826
	OA5	0.838
Business Resilience (BR)	BR1	0.858
	BR2	0.873
	BR3	0.846
	BR4	0.829
	BR5	0.861

Source: Data Processed

Table 4 shows that all indicators have outer loading values above the recommended threshold of 0.700, ranging from 0.798 to 0.873, indicating strong indicator reliability. For Technology Adoption, loadings range between 0.798 and 0.864, demonstrating that all five indicators adequately represent the construct. Managerial Skills indicators also exhibit strong loadings (0.809–0.856), confirming that the items consistently measure managerial capability. Organizational Agility shows high loadings between 0.826 and 0.867, suggesting that both sensing and responding dimensions are well captured by the indicators. Similarly, Business Resilience indicators display strong loadings (0.829–0.873), indicating that the items reliably reflect the firm's ability to anticipate, adapt, and recover from disruptions.

2. Internal Consistency Reliability and Convergent Validity

Internal consistency reliability was evaluated using Cronbach's Alpha and Composite Reliability (CR). Convergent validity was assessed using Average Variance Extracted (AVE).

Table 5. Construct Reliability and Validity

Construct	**Cronbach's Alpha**	**Composite Reliability**	**AVE**
Technology Adoption	0.889	0.919	0.694
Managerial Skills	0.903	0.928	0.721
Organizational Agility	0.914	0.935	0.743
Business Resilience	0.921	0.941	0.762

Source: Data Processed

As shown in Table 5, all the constructs have achieved the recommended standards for internal consistency reliability and convergent validity. The internal consistency reliability, which is measured by Cronbach's Alpha, has a range between 0.889 and 0.921, which is above the recommended 0.700. On the other hand, the Composite Reliability has a range between 0.919 and 0.941, which further confirms the reliability and stability of the measurement model. Regarding convergent validity, it is measured by Average Variance Extracted (AVE), and all the values for the constructs have achieved the recommended 0.500 and above, with a range between 0.694 and 0.762.

3. Discriminant Validity

Discriminant validity was assessed using the Fornell-Larcker criterion to ensure that each construct is empirically distinct from the others in the model. According to this criterion, the square root of the Average Variance Extracted

(AVE) for each construct should be greater than its correlations with other constructs. The results of the Fornell-Larcker analysis are presented in Table 6.

Table 6. Fornell-Larcker Criterion

Construct	TA	MS	OA	BR
Technology Adoption (TA)	**0.833**			
Managerial Skills (MS)	0.624	**0.849**		
Organizational Agility (OA)	0.671	0.702	**0.862**	
Business Resilience (BR)	0.658	0.689	0.741	**0.873**

Source: Data Processed

The results for the Fornell-Larcker criterion for assessing discriminant validity are shown in Table 6. The diagonal elements represent the square root of Average Variance Extracted (AVE) for each construct, which are Technology Adoption (0.833), Managerial Skills (0.849), Organizational Agility (0.862), and Business Resilience (0.873), respectively. These figures are all higher than the correlations with other constructs in the same row and column. For example, the square root of AVE for Business Resilience is 0.873, which is higher than its correlations with Technology Adoption (0.658), Managerial Skills (0.689), and Organizational Agility (0.741), respectively. The same pattern is found for all the constructs, which implies that each construct has more variance with its own indicators than with other constructs.

Structural Model Evaluation

1. Coefficient of Determination (R^2)

The coefficient of determination (R^2) was also investigated, which helped assess the explanatory capability of the structural model. R^2 measures the amount of variance that can be explained by the predictor variables for the endogenous constructs. Higher R^2 scores indicate better predictive capability for the model. The results for the R^2 analysis are presented in Table 7.

Table 7. R^2 Values

Endogenous Construct	R^2	Interpretation
Organizational Agility	0.593	Moderate
Business Resilience	0.682	Substantial

Source: Data Processed

As shown in Table 7, the R^2 value for Organizational Agility is 0.593, which implies that 59.3% of the variance for Organizational Agility is explained by Technology Adoption and Managerial Skills. This is classified as having moderate explanatory value. On the other hand, the R^2 value for Business Resilience is 0.682, which implies that 68.2% of the variance for Business Resilience is explained by Technology Adoption, Managerial Skills, and Organizational Agility. This is classified as having substantial value, which implies that the model has good predictive value for business resilience.

2. Path Coefficients and Hypothesis Testing

Bootstrapping with 5,000 resamples was conducted to test the hypotheses.

Table 8. Path Coefficients

Path	Beta	t-value	p-value	Result
TA → BR	0.254	3.112	0.002	Supported
MS → BR	0.301	3.874	0.000	Supported
OA → BR	0.412	5.296	0.000	Supported
TA → OA	0.318	4.021	0.000	Supported
MS → OA	0.447	5.638	0.000	Supported

Source: Data Processed

From Table 8, it can be seen that all the hypothesized relationships are positive and statistically significant. Technology Adoption has a positive and significant impact on Business Resilience ($\beta = 0.254$, $t = 3.112$, $p = 0.002$), which shows that the more the organization has adopted technology, the higher the business resilience. Managerial Skills also has a significant impact on Business Resilience ($\beta = 0.301$, $t = 3.874$, $p = 0.000$), which shows that the better the managers, the higher the business resilience. Organizational Agility has the highest direct effect on Business Resilience ($\beta = 0.412$, $t = 5.296$, $p = 0.000$).

Moreover, Technology Adoption has a significant impact on Organizational Agility ($\beta = 0.318$, $t = 4.021$, $p = 0.000$). This implies that the adoption of technology would increase the organization's ability to sense and respond to environmental changes. Managerial Skills also demonstrate a high positive impact on Organizational Agility ($\beta = 0.447$, $t = 5.638$, $p = 0.000$). This implies that good managers can increase the organization's flexibility and ability to respond to changes. From the results, it can be concluded that all the hypotheses are supported since all the p-values are less than 0.05, and the t-values are all greater than the critical value of 1.96.

3. Effect Size (f^2)

In addition to this, the effect size (f^2) was computed to determine the extent of each exogenous construct's contribution to the endogenous constructs. The value of f^2 shows the extent to which a variable contributes to the R^2 value of a dependent variable once it is included in the model as a regressor variable. Based on the set standards, f^2 values of 0.020, 0.150, and 0.350 are considered to reflect small, medium, and large effects, respectively. The findings are presented in Table 9.

Table 9. Effect Size (f^2)

Path	f^2	Effect Size
TA → BR	0.092	Small
MS → BR	0.134	Small
OA → BR	0.276	Medium
TA → OA	0.146	Medium
MS → OA	0.289	Medium

Source: Data Processed

As indicated in Table 9, Technology Adoption has a small effect on Business Resilience ($f^2 = 0.092$), and Managerial Skills also have a small effect on Business Resilience ($f^2 = 0.134$). On the other hand, Organizational Agility has a medium effect on Business Resilience ($f^2 = 0.276$), implying that business agility is a more significant factor in enhancing business resilience compared to the direct impact of technology adoption and managerial skills on business resilience. With regard to Organizational Agility as the endogenous variable, Technology Adoption has a medium effect ($f^2 = 0.146$), and Managerial Skills show a slightly stronger medium effect ($f^2 = 0.289$). This implies that although technology adoption and managerial skills directly impact business resilience to a lesser extent, their impact is more significant through the channel of enhancing business agility as a key driver of business resilience.

4. Predictive Relevance (Q^2)

In order to further test the predictive capability of the proposed structural model, the Stone-Geisser's Q^2 statistic was examined through the blindfolding procedure. The statistic examines the predictive relevance of the model for the endogenous constructs. A higher value of the statistic than zero implies predictive relevance. The results are provided in Table 10.

Table 10. Predictive Relevance (Q^2)

Construct	**Q^2**
Organizational Agility	0.421
Business Resilience	0.487

Source: Data Processed

As can be seen in Table 10, the results show that the Q^2 value for Organizational Agility is 0.421, while the Q^2 value for Business Resilience is 0.487. It is evident that the values are far higher than zero, which confirms the predictive relevance of the model for the endogenous variables. The results show that the predictive relevance is slightly higher for Business Resilience than for Organizational Agility. This confirms the fact that the proposed structural model not only has the capability to explain the relationships between the variables but also has the potential for forecasting the results for organizational agility and business resilience.

5. Mediation Analysis

To examine the mediating role of Organizational Agility, indirect effects were tested using the bootstrapping procedure in PLS-SEM. Mediation is supported when the indirect effect is statistically significant, as indicated by t-values greater than 1.96 and p-values less than 0.05. The results of the indirect effect analysis are presented in Table 11.

Table 11. Indirect Effects

Indirect Path	Beta	t-value	p-value	Result
TA → OA → BR	0.131	3.287	0.001	Supported
MS → OA → BR	0.184	4.112	0.000	Supported

Source: Data Processed

As presented in Table 11, the indirect effect of Technology Adoption on Business Resilience via Organizational Agility was found to be positive and significant (β = 0.131, t = 3.287, p = 0.001). This shows that organizational agility indeed plays a significant role as a mediator between technology adoption and business resilience. In the same vein, the indirect effect of Managerial Skills on Business Resilience via Organizational Agility was also found positive and significant (β = 0.184, t = 4.112, p = 0.000). This, therefore, affirms the role that Organizational Agility plays as a mediator between business resilience, on the one side, and both technology adoption and managerial skills, on the other. In both cases, the indirect effects are significant, while the direct effects were previously found significant. This, therefore, qualifies the mediation effect as partial mediation.

DISCUSSION

Overview of Findings

This study was conceived with the aim of investigating the structural relationships that exist between Technology Adoption (TA), Managerial Skills (MS), Organizational Agility (OA), and Business Resilience (BR) in dynamic business environments. In addition, the findings not only validate the hypotheses that were presented, but also conform and advance the body of knowledge that has been presented by other scholars in the fields of digital transformation, dynamic capability, and organizational resilience.

First, the results reveal a significant positive impact of technology adoption on organizational agility, a finding in line with previous research arguing that technology can improve the responsiveness of organizations through positive effects on information processing, coordination, and strategic flexibility. Past research on digital transformation has stressed the importance of technology in enabling organizations to sense and respond to changes, which are critical components of agility in organizations. Therefore, the results of this study support the argument of the importance of technology in enabling organizations to sense and respond to changes, thereby supporting the idea of the importance of technology in enabling organizations to be agile, as suggested in the dynamic capability perspective.

First, it should be noted that the findings indicate that technology adoption has a positive impact on organizational agility, which is consistent with other research that suggests that technology has a positive influence on organizational responsiveness, which is a key concept in organizational agility and has positive implications for information processing, coordination, and

strategic flexibility. As has been emphasized in past research that examined the concept of digital transformation, technology has a positive influence on organizational agility, and it has been emphasized that technology has a positive influence on organizational sense and response, which is a key concept in organizational agility.

Second, managerial skills were seen as having a significant impact on organizational agility. This is consistent with earlier research that emphasized the significance of managerial competency in developing an adaptable and flexible organizational culture. Earlier research has shown that strategic thinking, problem-solving competency, communication effectiveness, and decision-making speed are critical organizational agility drivers. The current research contributes to the earlier stream of research by showing that managerial skills are not only beneficial for organizational effectiveness but also critical in developing organizational agility. This is consistent with earlier research in leadership and strategic management that showed that agile organizations result from proactive and adaptable leaders.

Third, it was found that technology adoption and managerial skills have direct positive effects on business resilience. The findings of the present study are consistent with prior empirical studies, which have found that firms with high technology and managerial skill levels tend to be more resilient to disruptions. The prior studies on business resilience have suggested that technology is beneficial to crisis management and continuity planning, and managerial competence is beneficial to risk assessment and strategic adjustment.

More importantly, this study contributes to the existing body of research by empirically testing the mediating role of organizational agility on the relationships between technology adoption and business resilience, as well as between managerial skills and business resilience. Although prior studies have separately explored the relationships between technology adoption-resilience and leadership skills-resilience, little is known about the mechanism through which these two business resources impact business resilience. The study's results indicate that agility acts as a transformation mechanism for business resilience outcomes. The dynamic capability theory supports this argument because it asserts that competitive advantage or business survival in a dynamic environment is not merely a function of possessing certain business resources but rather the ability to leverage these resources through a dynamic combination of internal capabilities.

The presence of partial mediation also adds to the literature because it suggests a multi-layered structure of relations, whereby technology adoption and managerial skills have a direct positive impact on resilience, and this effect is moderated by the presence of organizational agility. This is in line with previous arguments suggesting that technology adoption without structural flexibility may not produce optimal results, and managerial skills without a flexible system may produce limited strategic impact.

Practical Implications

The findings of this study carry several significant implications for managers and business decision-makers. First and foremost, technology adoption should not simply be treated as an operational upgrade by managers and business decision-makers. Rather, technology adoption should be treated as a strategic investment to improve the agility and resilience of an organization. Second, managers and business decision-makers should prioritize the continuous improvement of managerial competencies by offering leadership training programs, strategic thinking programs, and crisis management simulations to managers and leaders. Managers are critical to creating an adaptive organization by promoting an adaptive organization culture and making decisions in an uncertain environment. Third, managers and business decision-makers are encouraged to promote an agile organization by encouraging decentralized decision-making processes, cross-functional collaboration, and continuous learning processes within an organization. Indeed, in a very turbulent environment, the synergy between technological capabilities and managerial competencies is critical to creating a resilient organization.

Theoretical Contributions

The present study makes an additional contribution to the existing literature by developing an integrative structural model of technology adoption, managerial competencies, organizational agility, and business resilience. While past studies focused on individual constructs, this research helps to reveal the underlying mechanism between resources and resilience by verifying the mediating effect of organizational agility from an empirical perspective. The results strongly verify the theoretical perspective of dynamic capabilities by emphasizing that resilience outcomes are not merely a function of resource possession but also of the organization's ability to utilize those resources effectively for resilience outcomes. Additionally, the partial mediating effect provides further theoretical implications by showing that agility indeed serves as a strategic link to enhance the influence of technological and managerial resources on resilience outcomes.

Limitation and Future Study Suggestions

Despite its contributions, this study has several limitations that open avenues for future research. First, the cross-sectional design limits the ability to capture dynamic changes over time; therefore, longitudinal studies are recommended to better observe how technology adoption, managerial skills, and organizational agility evolve in shaping resilience. Second, the reliance on self-reported survey data may introduce common method bias, suggesting that future research should incorporate multi-source data or objective performance indicators to enhance validity. Third, the study may be context-specific, limiting generalizability across industries or countries. Future studies are encouraged to replicate and extend this model in different sectors, organizational sizes, and cultural contexts. Additionally, incorporating moderating variables such as environmental uncertainty, digital maturity, organizational culture, or firm size could provide deeper insights into the boundary conditions under which organizational agility most effectively strengthens business resilience.

CONCLUSIONS AND RECOMMENDATIONS

The current research concludes that technology adoption and managerial skills are vital strategic resources that have a major positive impact on business resilience, both directly and indirectly through organizational agility. The research findings have shown that organizational agility is a key mediator, which acts as a dynamic factor that transforms technology adoption and managerial skills into resilient organizational outcomes. The findings have also revealed that there is a partial mediation effect, which suggests that while technology adoption and managerial skills have a direct positive impact, they have a much stronger positive impact when combined with organizational agility. The research has shown that in a dynamic and uncertain business environment, organizational resilience is not just dependent upon the possession of strategic resources, but how they are successfully utilized and combined with organizational agility.

FURTHER STUDY

This research still has limitations so that further research is needed on the topic of Technology Adoption and Managerial Skills Enhance Business Resilience Through Organizational Agility to perfect this research and increase insight for the author and readers.

REFERENCES

Agarwal, V., Mathiyazhagan, K., Malhotra, S., & Pimpunchat, B. (2023). Building resilience for sustainability of MSMEs post COVID-19 outbreak: An Indian handicraft industry outlook. Socio-Economic Planning Sciences, 85. https://doi.org/10.1016/j.seps.2022.101443

Aldianto, L., Anggadwita, G., Permatasari, A., Mirzanti, I. R., & Williamson, I. O. (2021). Toward a business resilience framework for startups. Sustainability, 13(6), 3132.

Bruce, E., Shurong, Z., Egala, S. B., Amoah, J., Ying, D., Rui, H., & Lyu, T. (2022). Social Media Usage and SME Firms' Sustainability: An Introspective Analysis from Ghana. Sustainability (Switzerland), 14(15). https://doi.org/10.3390/su14159433

Busso, M., Park, K., & Irazoque, N. (2023). Research Insights: Which Managerial Skills Training Policies Are Most Effective?

De Matteis, J., Elia, G., & Del Vecchio, P. (2023). Business continuity management and organizational resilience: A small and medium enterprises (SMEs) perspective. Journal of Contingencies and Crisis Management.

Do, H., Budhwar, P., Shipton, H., Nguyen, H.-D., & Nguyen, B. (2022). Building organizational resilience, innovation through resource-based management initiatives, organizational learning and environmental dynamism. Journal of Business Research, 141, 808–821.

Fassam, L., & Dani, S. (2017). A conceptual understanding of criminality and integrity challenges in food supply chains. British Food Journal, 119(1), 67–83. https://doi.org/10.1108/BFJ-07-2016-0314

Ferdinan, F. (2016). PENILAIAN KINERJA MUTU PENDIDIKAN AGAMA ISLAM. TARBAWI : Jurnal Pendidikan Agama Islam, 1(2), 129–138. https://doi.org/10.26618/JTW.V1I2.366

Hair, J. F., Risher, J. J., Sarstedt, M., & Ringle, C. M. (2019). When to use and how to report the results of PLS-SEM. European Business Review, 31(1), 2–24. https://doi.org/https://doi.org/10.1108/EBR-11-2018-0203

Hanifan, R., & Dhewanto, W. (2022). Reinforcing Business Resilience Through Entrepreneurial Competencies During Pandemic COVID-19: A Case of Indonesian MSMEs. International Journal of Management, Entrepreneurship, Social Science and Humanities, 5(2), 89–107.

Kayyali, M. (2025). Leadership's Role in Fostering a Resilient Organizational Culture. In Enhancing Resilience in Business Continuity Management (pp. 267–294). IGI Global Scientific Publishing.

Kennedy, S., & Linnenluecke, M. K. (2022). Circular economy and resilience: A research agenda. Business Strategy and the Environment, 31(6), 2754–2765.

Kim, S., & Yoon, Y. (2023). CEO's characteristics and value creation from corporate spin-offs. Journal of Corporate Accounting & Finance, 34(3), 158–183. https://doi.org/https://doi.org/10.1002/jcaf.22620

Kinyua, G. M. (2025). Innovation Capability as a Predictor of Firm Performance : 13(3), 91–114.

Kussudyarsana, K., Maulana, H. K., Maimun, M. H., Santoso, B., & Nugroho, M. T. (2023). The Role of Social Capital, Innovation, and Capabilities on MSMEs' Resilience in Economic Hard Times. Jurnal Manajemen Bisnis, 14(1), 72–89. https://doi.org/10.18196/mb.v14i1.15887

Le, T. T. (2023). How do food supply chain performance measures contribute to sustainable corporate performance during disruptions from the COVID-19 pandemic emergency? International Journal of Quality and Reliability Management, 40(5), 1233–1258. https://doi.org/10.1108/IJQRM-03-2022-0089

Lee, J., Choi, M., & Lee, H. (2015). Factors affecting smart learning adoption in workplaces: comparing large enterprises and SMEs. Information Technology and Management, 16(4), 291–302.

Li, L. Y., Syah, A. M., Syukur, M., Limkanchanapa, R., & Srisurat, C. (2023). Sustainable Micro, Small, and Medium Enterprises: A Developed Model of Entrepreneurial Marketing Behaviors for Thailand's MSMEs. Sustainability (Switzerland), 15(17). https://doi.org/10.3390/su151713135

Liébana-cabanillas, F., Villarejo-ramos, Á. F., & Sánchez-franco, M. J. (2014). Mobile Social Commerce Acceptance Model : Factors and Influences on Intention To Use S-Commerce. XXVI Congreso Nacional de Marketing, September, 1–15.

Mahmoud, M. H., Ali, A. A., Alrifae, A. A., Eitah, R. A., & AlZubi, M. M. (2025). The impact of digital HRM system and digital transformation on HR efficiency with organizational agility as a moderator. Discover Sustainability, 6(1), 1038.

Mohezar, S., Mohamad, M. N., & Mohd Nor, M. N. (2023). Supply chain risk and SME business continuity strategies in the food industry during COVID-19 pandemic. Continuity & Resilience Review, 5(2), 116–134.

Muduli, A. (2017). Workforce agility: Examining the role of organizational practices and psychological empowerment. Global Business and Organizational Excellence, 36(5), 46–56.

Murtianingsih, M., Salim, U., Djazuli, A., & Sudjatno, S. (2023). Building Business Resilience of Small and Medium Enterprises Through Managerial Skills and Innovation on Second Wave of Covid-19 Pandemic (Study to Batik SMEs in East Java Indonesia). BISTIC Business Innovation Sustainability and Technology International Conference (BISTIC 2022), 52–66.

NG'ORA, S., MWAKALOBO, A. B. S., & LWESYA, F. (2022). Managerial Skills for Micro, Small and Medium-sized Enterprises (MSMEs) . Management Dynamics in the Knowledge Economy, 10(4 SE-Articles), 343–359.

Patma, T. S., Wardana, L. W., Wibowo, A., Narmaditya, B. S., & Akbarina, F. (2021). The impact of social media marketing for Indonesian SMEs sustainability: Lesson from Covid-19 pandemic. Cogent Business and Management, 8(1). https://doi.org/10.1080/23311975.2021.1953679

Pelletier, C., L'ecuyer, F., & Raymond, L. (2025). Building organizational agility through digital transformation: a configurational approach in SMEs. Industrial Management & Data Systems, 125(4), 1503–1529.

Probojakti, W., Utami, H. N., Prasetya, A., & Riza, M. F. (2025). Driving sustainable competitive advantage in banking: The role of transformational leadership and digital transformation in organizational agility and corporate resiliency. Business Strategy and the Environment.

Rao, K. K., Mackenzie, C., & Subedi, S. (2024). The dynamic capabilities approach and regional business resilience: an Australian case study. Regional Studies, Regional Science, 11(1), 175–191.

Rogers, E. M., Medina, U. E., Rivera, M. A., & Wiley, C. J. (2005). Complex adaptive systems and the diffusion of innovations. The Innovation Journal: The Public Sector Innovation Journal, 10(3), 1–26.

Sapiro, A. (2024). Leadership and Managerial Skills. In Strategic Management: Fundamental Concepts for Decision Making and Strategy Execution (pp. 121–160). Springer.

Satar, A., Al Musadieq, M., & Hutahayan, B. (2023). Enhancing sustainable competitive advantage: the role of dynamic capability and organizational agility in technology and knowledge management: Indonesian stock exchange evidence. International Journal of Operations and Quantitative Management, 29(2).

Skare, M., de las Mercedes de Obesso, M., & Ribeiro-Navarrete, S. (2023). Digital transformation and European small and medium enterprises (SMEs): A comparative study using digital economy and society index data. International Journal of Information Management, 68, 102594. https://doi.org/https://doi.org/10.1016/j.ijinfomgt.2022.102594

Sutar, P. S., Kolte, G., Yamini, S., & Mathiyazhagan, K. (2024). Food supply chain resilience in the digital era: a bibliometric analysis and development of conceptual framework. Journal of Business & Industrial Marketing.

Teece, D., Peteraf, M., & Leih, S. (2016). Dynamic capabilities and organizational agility: Risk, uncertainty, and strategy in the innovation economy. California Management Review, 58(4), 13–35.

Ürü, F. O., Gözükara, E., & Ünsal, A. A. (2024). Organizational ambidexterity, digital transformation, and strategic agility for gaining competitive advantage in SMEs. Sosyal Mucit Academic Review, 5(1), 1–23.

Xie, X., Wu, Y., & Tejerob, C. B.-G. (2022). How responsible innovation builds business network resilience to achieve sustainable performance during global outbreaks: An extended resource-based view. IEEE Transactions on Engineering Management.

Xu, M., Zhang, Y., Sun, H., Tang, Y., & Li, J. (2024). How digital transformation enhances corporate innovation performance: The mediating roles of big data capabilities and organizational agility. Heliyon, 10(14).

YahiaMarzouk, Y., & Jin, J. (2022). Does relational capital matter to food and beverage SMEs' resilience? The mediating role of environmental scanning. Frontiers in Psychology, 13. https://doi.org/10.3389/fpsyg.2022.1033837

Zhao, G., Liu, S., Wang, Y., Lopez, C., Zubairu, N., Chen, X., Xie, X., & Zhang, J. (2024). Modelling enablers for building agri-food supply chain resilience: insights from a comparative analysis of Argentina and France. Production Planning and Control, 35(3), 283–307. https://doi.org/10.1080/09537287.2022.2078246