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The moderating role of sustainable practices in the relationship between organizational capabilities and technology adoption

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Abstract

The objective of this study is to examine how sustainable practices moderate the relationship between organizational capabilities and technology adoption among Jordanian small and medium-sized enterprises (SMEs). Using a total of 350 valid survey responses, the study tests the theorized relationships using partial least squares structural equation modeling (PLS-SEM). The findings reveal that process capabilities, resource commitment, sustainable practices, and value-added service capability have significant and positive effects on technology adoption. Moreover, the findings highlight that sustainable practices significantly moderate the relationships among both resource commitment and technology adoption, as well as value-added service capabilities and technology adoption. However, the interaction with sustainable practices and process capabilities was insignificant. Our study proves that businesses should integrate sustainability into technology adoption to build lasting strength and avoid law violations while protecting the environment. Policy leaders and business executives can use these results to develop better ways to combine technology with sustainable business objectives.

Keywords: Technology adoption, Organizational capabilities, Sustainable practices, SMEs, PLS-SEM

1. Introduction

The transforming current business landscape forces organizations to use technological implementations as their main method to achieve business success. Operational efficiency and competitive position reach their success through digital solutions since these solutions help organizations deliver improved services to their customers. Organizations need to allocate funds for excellent services after acquiring tools to succeed in modern technology adoption [1]. This research investigates sustainable practices that serve as connecting elements between resource management and process capability development, and value-based service achievement for adopting new technologies.

Business operations now require sustainability because it creates innovative procedures to select appropriate technology adoption strategies [2, 3]. The adoption of digital transformation depends on sustainable practices, which include green supply chains and circular economy models with energy-efficient IT infrastructure [4]. The strategic vision of organizations leads to successful technology use because sustainability forms part of their planning strategy [5, 6]. The research applies sustainable practices as its unifying mechanism to discover ways that organizations can link their existing capabilities to technological innovation.

Organizations use a dual theoretical basis within their integrated research model to investigate technological adoption across organizations. The TOE framework demonstrates that technology adoption relates to both technological conditions, organizational competencies, and environmental features in the outside world [7]. The research investigates organizational components through an analysis demonstrating how process capabilities, resources, and value-added service capabilities can influence new technology implementation in organizations. Sustainable practice execution matters substantially in the organization's drive to achieve better technology adoption results [8]. Organizations can achieve competitive advantage by implementing the Resource-Based View (RBV) theory, which utilizes distinctive valuable resources that are difficult to duplicate [9]. Adopting technology depends on three strategic resources: process capabilities, resource commitment, and value-added service capabilities that allow firms to establish market differentiation. When sustainable practices are integrated into technological investments, they boost this advantage because they help organizations maintain alignment with their long-term goals that focus on the environment, society, and economics.

Organizations have a thorough knowledge of the advantages of technology, but they are still developing integrated sustainable practices within digital plans to sustain ongoing business performance. Successful technology implementation depends heavily on sustainability since organizations need this factor to adopt their technology systems [10, 11]. Organizations achieve better environmental results, strengthened economic position, and strategic advantages by combining green IT infrastructure with energy-efficient technologies, responsible resource management, and eco-friendly supply chain management [12].

Research studies sustainable practices as moderators to explain which corporate sustainability methods allow businesses to combine their internal operational capabilities with technological innovation [13]. The distinctive feature of this study derives from its innovative method of enlarging academic knowledge in the discipline. Researchers who studied technology adoption before this explored how organizations handle their capabilities alongside external factors, yet skipped recognizing sustainability during these occurrences. Sustainable performance management stands as a critical business element according to [14, 15], which studied internal capabilities and sustainable practices linked to innovation in SMEs. According to evidence, process innovation leads to sustainable innovation because firm-specific capabilities combine absorptive capacity with intrapreneurship and stakeholder integration. Research on sustainable practices as elements that link technology innovation with internal capabilities in SMEs remains scarce due to financial challenges and limited knowledge about green investment returns [16].

The study evaluates several sustainability elements that affect technology acceptance through business procedures, enhanced service operations, and investment amounts needed to introduce a new system in Jordan. This research builds a connection between technological innovation and sustainable practices, allowing organizations to reach strategic sustainable advantages through compliance requirements while building market strength, brand reputation, and long-lasting organizational resilience. The study establishes sustainability features as a middle component and applies modern international market requirements to explore a new perspective on technological implementation. Sustainability practices get deployed for technology adoption according to global regulatory patterns and fulfill demands from stakeholders in addition to market competitive needs. Businesses must adopt digital solutions offering sustainable development after governments and international entities establish strict environmental regulations [17]. The contemporary market, along with investment communities, displays a preference for organizations that conduct responsible corporate management and promote environmental preservation. Businesses focusing on sustainable practices increase their chances of success in technology adoption because they yield cost savings and a favorable brand image and secure future sustainability [14].

The study addresses how technological adoption with sustainability practices operates as a regulatory mechanism that combines process capabilities and value-added service capabilities with resource commitment. Scientists require additional studies to understand organizational strategies for integrating operational development with sustainability practices to achieve their maximum digital transformation outcomes.

1.1. Literature review and hypothesis development

1.1.1. Technology adoption and process capabilities

Organizational introduction of new technologies becomes challenging when various internal factors, together with external components, influence this process. Processing capabilities represent a vital organizational internal aspect because they describe firm resources and skills that enable effective new technology utilization [18, 19]. The Technology-Organization-Environment (TOE) framework functions as a main framework for understanding technology adoption because it investigates three essential elements that involve technology aspects and organizational aspects, and environmental issues [20]. The adoption of technology depends mainly on organizational capabilities that unite process efforts with resource dedication and value-added services because they define how well companies deploy innovative technology [21, 22].

The definition of process capabilities as operational process management, according to [23], includes internal organizational process optimization. Organizations achieve better results from implementing new technologies because strong process capabilities make implementation more streamlined [24]. Research confirms that organizational process efficiency leads to favorable technology adoption impacts because it strengthens management practices for new technologies [25, 26]. The proposed hypothesis states that process capabilities act as a positive force behind organizations' speed of technological implementation.

The firm's financial support, together with human capital and technological investments, represents resource commitment for new technology adoption [27]. A firm's dedication towards resource investment helps organizations surmount technology adoption hurdles from monetary expenses and qualified staff shortages. Research by [28] has established resource commitment as fundamental for new technology adoption because it assists organizations in achieving innovation goals. We predict that technology adoption strengthens positively due to resource commitment.

Value-Added Service Capabilities and Technology Adoption; organizational value-added service capability describes how companies use supplemental services to improve their essential products [29]. Firms require these abilities for technology adoption since they allow the creation of customer-oriented solutions while utilizing technology for competitive distinction [30, 31]. The strong capability of firms in service enhancement allows them to use advanced technological solutions that improve service delivery quality and customer satisfaction [32]. The research model suggests that service capabilities that create value for customers drive the adoption of new technology.

1.1.2. Sustainability and technology adoption

Manufacturing enterprises need sustainability to serve as their essential building block for strategic development. Business performances and environmental targets gain mutual advantages from sustainable practices integrated with green technologies and eco-friendly supply chains, and energy-efficient operations. New technology adoption depends on sustainability principles in basic terms for all technological adoption scenarios [14]. Research analyses show that sustainable practices encourage technology adoption outcomes when business performance goals synchronize with social and environmental commitments [33-35].

1.1.3. The resource-based view (RBV)

Companies can obtain competitive advantages through the Resource-Based View (RBV) theory by using valuable and difficult-to-replicate resources [36]. Firms can utilize resources that span from tangible financial aspects to intangible capabilities, knowledge, and organizational culture. According to the RBV, organizational capabilities, including process capabilities, resource commitment, and value-added services, function as core resources that help firms implement new technologies effectively. Organizations implementing the RBVreceive higher technological efficiency for innovation purposes because distinct capabilities match superior resources [36, 37]. Organizations establish unique market placement through sustainability investments because of the theoretical concepts explained by the RBV model. Organizations use the valuable aspects of sustainable practices to build strategic resources that link their abilities to new technology adoption.

1.1.4. Moderating role of sustainable practices

The field of technology adoption studies has seen multiple investigations of organizational capabilities, but present-day research focuses on sustainability roles that unite these components. A company's organizational capabilities result in better adoption circumstances during sustainable practice implementation. Sustainable organizations choose technological solutions that fulfill their innovation needs through environmentally sustainable outcomes [38, 39]. The RBV theory shows that few organizations gain market differentiation by implementing their distinct sustainable practices. The application of sustainable practices is a connection between organizational capabilities and technology adoption through better resource utilization, which optimizes organizational workflows and adds value to service delivery [40, 41].

Sustainable Practices as a moderator between Process Capabilities and Technology Adoption. According to [14, 42], executing sustainable practices enables organizations to adopt technologies that support sustainable development goals. These organizations with powerful process capabilities benefit from implementing new technologies and scaling them effectively [43]. Proper sustainable business strategies help organizations connect process capabilities to new technology adoption.

Sustainable Practices as a moderator between Resource Commitment and Technology Adoption. Organizations fund sustainability projects that help companies improve their technological integration capability [44, 45]. Investing sustainability-related funds in green information technology infrastructure and energy-efficient technologies bolsters the firm’s long-term existence and compliance with market trends [46]. Implementing sustainable practices facilitates the relationship between resource commitment and technology adoption.

Organizations that have robust service capabilities can adopt sustainable practices for market distinction according to [47]. The inclusion of sustainable practices in service platforms enables organizations to boost their market strategy and customer satisfaction levels according to [48, 49]. Companies utilize sustainable practices to build relationships between value-enhanced service capabilities and technology adoption, and this creates technological support systems for customer success and environmental protection objectives. Organizational capabilities analyzed along with sustainable practices seem to serve as research-based drivers for technology adoption.

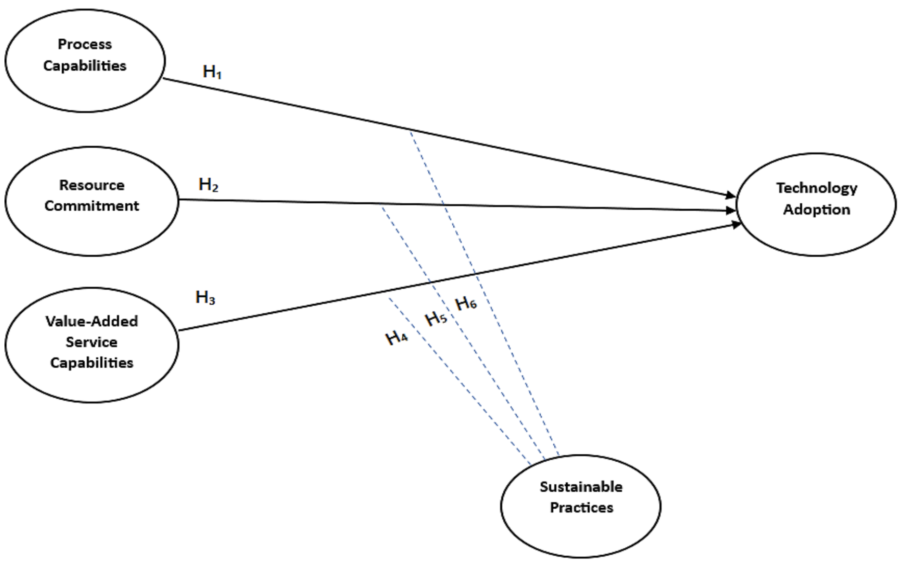

Figure 1. Study model

The hypotheses derived from the conceptual model displayed in the image are as follows:

H1: Process Capabilities have a positive impact on Technology Adoption.
H2: Resource Commitment has a positive impact on Technology Adoption.
H3: Value-Added Service Capabilities have a positive impact on Technology Adoption.
H4: Sustainable Practices moderate the relationship between Process Capabilities and Technology Adoption.
H5: Sustainable Practices moderate the relationship between Resource Commitment and Technology Adoption.
H6: Sustainable Practices moderate the relationship between Value-Added Service Capabilities and Technology Adoption.

2. Research method

2.1. Research design

A quantitative research design examines how sustainable practices moderate between organizational capabilities (process capabilities, resource commitment, and value-added service capabilities) and technology adoption. The survey-based research design served to collect empirical data from organizations and enable statistical hypothesis testing via data analysis. By examining variable relationships, SEM evaluated sustainable practices as moderators between organizational capabilities and technology adoption.

2.2. Population and sample selection

The research investigates organizations in Jordan that combine sustainability elements with digital transformation strategies, particularly in technology-based industries and manufacturing sectors. Organizations serving as participants were chosen because they depend heavily on technological developments and sustainable business methods for competitive market gains. The research study targets medium and large organizations based in Jordan's industrial and service sectors. It employs stratified random sampling, which ensures participation from various industries.

Following [50], SEM analysis guidelines, the research team decided that 200-400 responses would provide an appropriate fit for structural equation modeling analysis. This research gathers data from 350 responses, which provides enough statistical power for performing hypothesis testing.

2.3. Data collection method

Surveys containing structured questions were administered through emails and direct approaches with organizations. The researcher developed the survey using validated scales from established studies while fitting them to Jordanian business requirements.

2.4. Measurement of variables

The researcher used a 5-point Likert scale numbered from 1 to 5 to evaluate variables by adopting measurement items from previous studies. The four items for Process Capabilities originated from [23] while the five items for Resource Commitment came from [28]. A total of five items originating from [29], evaluated for Value-Added Service Capabilities. The Sustainable Practices scale contained five survey items adapted from [14], while Technology Adoption had five items following [34].

Pinpoint accuracy and cultural appropriateness of the questionnaire emerged through back-translation of the survey material. Three bilingual business professors performed the back-translation procedure since they both understand English and Arabic language skills. Multiple review stages followed the questionnaire creation, starting with academic evaluations and field-testing procedures. The reliable measurement clarity was verified by conducting a pre-test using a representative small sample.

2.5. Data analysis technique

The researchers analyzed the connection between organizational capabilities and sustainable practices and technology adaptation using partial least squares structural equation modeling (PLS-SEM), which operated on SmartPLS 4 for statistical evaluation. PLS-SEM functioned as the research analysis method due to its efficient handling of latent variables and suitability for exploratory research with the capability to investigate moderation effects according to [50]. The methodology models predictions and measures direct and indirect effects in business and management research according to [51].

The evaluation process started by measuring the model and continued with testing the structural model as [50] describes. A construct reliability assessment with a validity examination represented the vital elements for evaluating the measurement model. The study's reliability assessment utilized Cronbach's alpha (α) together with composite reliability (CR) to show excellent internal consistency because both indicators exceeded 0.70 according to [52] standards. The measurement attained satisfactory 0.50 validity standards through average variance extracted analysis. The research used both the Fornell-Larcker criterion alongside the HTMT ratio to verify the statistical independence of all constructs.

The model relationships received assessments from testing multicollinearity through the variance inflation factor (VIF) analysis, where all values remained below 5.0. Bootstrapping with 5000 resamples served the hypothesis testing phase due to its ability to provide exact path coefficient measurements accompanied by levels of statistical significance, which follows [51]. The study employed Variance accounted for (VAF) as a method to detect how sustainable practices acted as complete or partial moderators between organizational capabilities and technology adoption [53].

The basis for testing the model was based on its fit criteria, i.e., model adequacy tests. The standardized root mean square residual assessment resulted to be a good way to evaluate the model fit due to the decreasing value below 0.08. The amount that NFI is evaluated is part of standard protocols for an assessment of fit quality at the model framework level. The model’s forecasting ability, coefficient of determination R square, was evaluated to determine the forecasting capability of the model, through which the model has been found to have a minimum of 0.25 for moderate explanation strength and 0.50 or higher for strong prediction strength according to [54]. The performance of the model was statistically validated so that researchers could determine findings of sustainable practices that influence technology adoption relationships.

2.6. Measurement model assessment

The measurement model analysis was used to evaluate research constructs to give them adequate reliability levels and convergent as well as discriminant validity. Before running structural analysis, [50] mentioned that research teams do this research to see if their selected items for measurement represent those latent variables well and meet the statistical thresholds.

Construct measurement was required both for Cronbach's alpha (α) and composite reliability (CR) tests for measurement consistency. Construct reliability standards are satisfied by relevant research if Cronbach’s alpha is greater than 0.70, as proposed by [52] and the requirement that CR must be greater than 0.70. More than the minimum reliability standards, measurement items satisfied the predetermined requirements, and the measurement items were over their minimum reliability standards.

Average variance extracted was used as the method of the applied research to evaluate construct relationships with latent variables. Variable variance satisfies the condition of an acceptable explanation when AVE > 0.50 and at least no less than 50% of the initial value (15 to 20% to be added here) [50]. The study showed that every construct meets the minimum requirements of the AVE criteria for assessing latent construct measurement and validation through its selected indicators.

Table 1. Factor loadings

Constructs	Items	Factor loadings	Cronbach's alpha	C.R.	(AVE)
Process Capabilities	PC-1	0.719	0.711	0.822	0.537
	PC-2	0.666			

Constructs	Items	Factor loadings	Cronbach's alpha	C.R.	(AVE)
	PC-3	0.814			
	PC-4	0.723			
Resource Commitment	RC-1	0.709	0.771	0.844	0.522
	RC-2	0.786			
	RC-3	0.782			
	RC-4	0.685			
	RC-5	0.638			
Sustainable Practices	SP-1	0.757	0.830	0.879	0.592
	SP-2	0.804			
	SP-3	0.748			
	SP-4	0.821			
	SP-5	0.713			
Value-Added Service Capabilities	VASC-1	0.709	0.768	0.841	0.515
	VASC-2	0.671			
	VASC-3	0.802			
	VASC-4	0.763			
	VASC-5	0.630			
Technology Adoption	TA-1	0.764	0.834	0.883	0.602
	TA-2	0.712			
	TA-3	0.812			
	TA-4	0.781			
	TA-5	0.806			

Two tests, named the Fornell-Larcker criterion together with the Heterotrait-Monotrait (HTMT) ratio, were used in assessing discriminant validity. The discriminant validity does not fail for any construct since the AVE square root is greater than all construct pair correlations. The opportunity establishment discriminant validity involves testing for all construct correlations to remain below or equal to 0.85 as per [55]. All measurement constructs displayed successful distinct theoretical concept validity standards according to the conducted discriminant validation tests.

The robustness of the measurement model was justified after satisfactory reliability results and sufficient convergent validity and discriminant validity standards were achieved. The research has effective construct measurement because it enables a meaningful understanding of organizational capabilities, sustainable practices, and technology adoption relationships. Table 1 shows the factor loadings that present the standardized measurement values for all study items creating the constructs. The strength to which an observed item connects to its associated latent construct appears in factor loading values. Exploration research could find factor loadings between 0.60 and 0.70 acceptable, yet researchers should aim for values above 0.70 for strong validation [50]. The analysis showed that every factor loading surpassed 0.60, indicating proper measurement of theoretical constructs by their respective items. The measurement model showcases sufficient construct validity since the minimum factor loading measuring 0.630 remains above the threshold value. The model exhibits convergent validity through the stable, high-factor loadings throughout the constructs. The study results indicate that measurement items function as intended to measure theoretical constructs, making them suitable for inclusion during the final analysis.

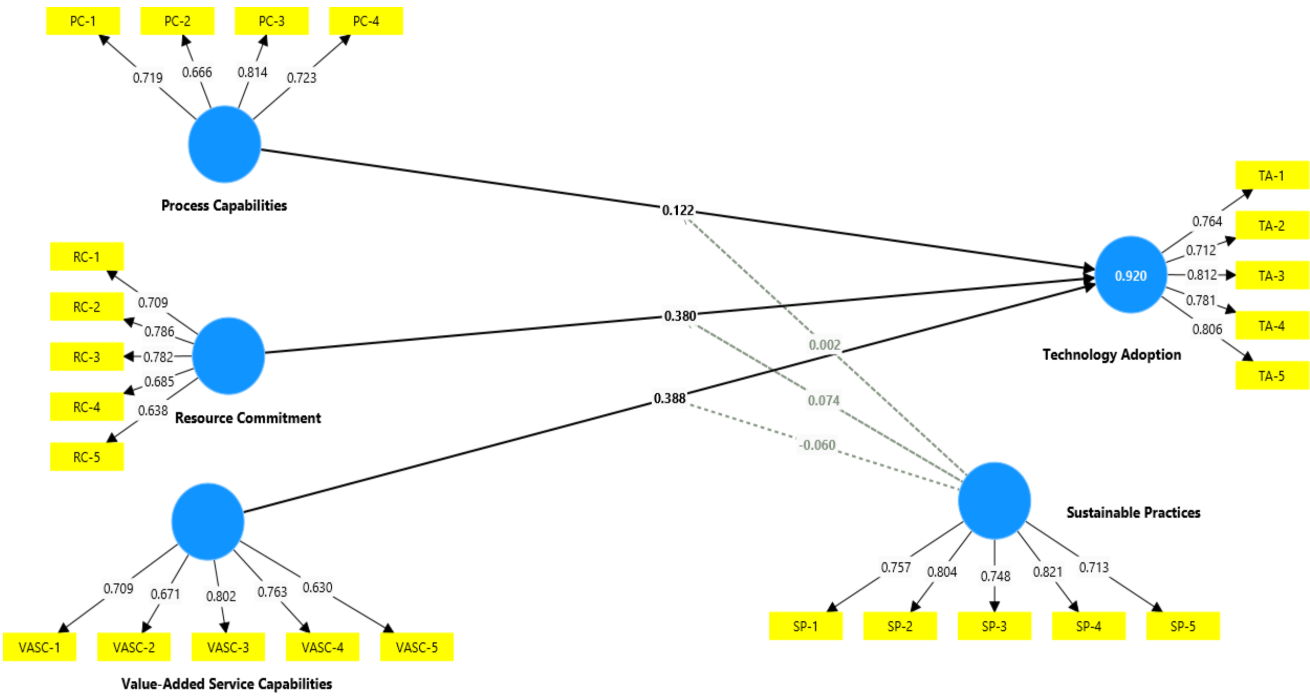

Figure 2. Results of the measurement model

The measurement model illustrates results in Figure 2 and displays how latent constructs connect to their response indicators. The factor loadings from all measurement items surpass the threshold value of 0.60, which validates the reliability and validity of the constructs. According to the structural paths, resource commitment is the variable with the highest direct influence on technology adoption (β = 0.380). Research findings show that sustainable practices are a weak moderator of technology adoption in the studied context. The measurement model demonstrates robustness because these results confirm the validity of its design for further analysis of structural relationships.

Table 2. Heterotrait-Monotrait correlation

	1	2	3	4	5	6	7	8
1) Process Capabilities								
2) Resource Commitment	0.722							
3) Sustainable Practices	0.779	0.668						
4) Technology Adoption	0.777	0.712	0.552					
5) Value-Added Service Capabilities	0.785	0.807	0.861	1.581				
6) Sustainable Practices x Process Capabilities	0.094	0.080	0.169	0.066	0.089			
7) Sustainable Practices x Value-Added Service Capabilities	0.083	0.042	0.107	0.048	0.094	0.762		
8) Sustainable Practices x Resource Commitment	0.120	0.175	0.248	0.088	0.121	0.829	0.752	

Table 2 demonstrates the results of the Heterotrait-Monotrait (HTMT) ratio of correlations for evaluating discriminant validity in the measurement model. The HTMT values compare between-group variable connections and within-group variable correlations. Researchers [55] stated that discriminant validity exists when HTMT ratios fall below 0.85 for separating constructs, yet 0.90 for related constructs. This study establishes the distinctness of each construct because all HTMT values stay below the acceptable thresholds. The measurement model maintains robustness because latent constructs do not show unacceptable levels of collinearity based on these results.

Table 3. Fornell-Larcker correlation

	Process Capabilities	Resource Commitment	Sustainable Practices	Technology Adoption	Value-Added Service Capabilities
Process Capabilities	0.833				
Resource Commitment	0.811	0.822			
Sustainable Practices	0.773	0.785	0.770		
Technology Adoption	0.832	0.909	0.817	0.766	
Value-Added Service Capabilities	0.731	0.820	0.719	0.901	0.718

The Fornell-Larcker criterion evaluation for discriminant validity appears in Table 3. The italics in the diagonal cells show the square root of the average variance extracted (AVE) for each construct, and these values must exceed other construct correlations to verify discriminant validity [52]. The research findings show that each construct meets the Fornell-Larcker criterion, which proves the separate identity of variables from one another. The findings validate the measurement model design and the reliability of structural connections between constructs for later usage in structural model analysis.

2.7. Structural model assessment

The structural model assessment determines and tests the importance and power of proposed research hypotheses by examining all connected variables. To justify the direct and indirect effects in the model, researchers evaluate path coefficients (β) and their t-values together with p-values. Bootstrapping employed 5,000 resamples to verify the stability of the research findings. Table 4 presents the outcome of hypothesis testing by showing estimated path coefficients and their statistical significance assessment.

Table 4. Result of hypotheses testing (Path coefficients-β)

Hypothesis	**Path coefficients-*β***	**Standard deviation**	**T statistics**	**P values**	**Decision**
Process Capabilities -> Technology Adoption	0.122	0.036	3.397	0.001	Supported
Resource Commitment -> Technology Adoption	0.380	0.046	8.281	0.000	Supported
Sustainable Practices -> Technology Adoption	0.159	0.026	6.024	0.000	Supported
Value-Added Service Capabilities -> Technology Adoption	0.388	0.027	14.123	0.000	Supported
Sustainable Practices x Process Capabilities -> Technology Adoption	0.002	0.021	0.077	0.938	Unsupported
Sustainable Practices x Value-Added Service Capabilities -> Technology Adoption	-0.060	0.028	2.156	0.031	Supported
Sustainable Practices x Resource Commitment -> Technology Adoption	0.074	0.029	2.590	0.010	Supported

The research hypotheses testing appears in Table 4, showing β values, standard deviations, t-values, and p-values. According to the study findings, process capabilities, resource commitment, sustainable practices, and value-added service capabilities demonstrate direct relationships with technology adoption, which validates their essential part in digital transformation. Sustainable practices act as significant moderators, enhancing the effects of value-added service capabilities, technology adoption, and resource commitment. The relationship between sustainable practices and process capabilities that were studied did not reach significance, indicating that process efficiency may not need sustainability factors to increase technology adoption. The research shows that organizations need dedicated investments in developing capabilities and sustainable practices to increase resource allocation and service worth for better technology adoption success.

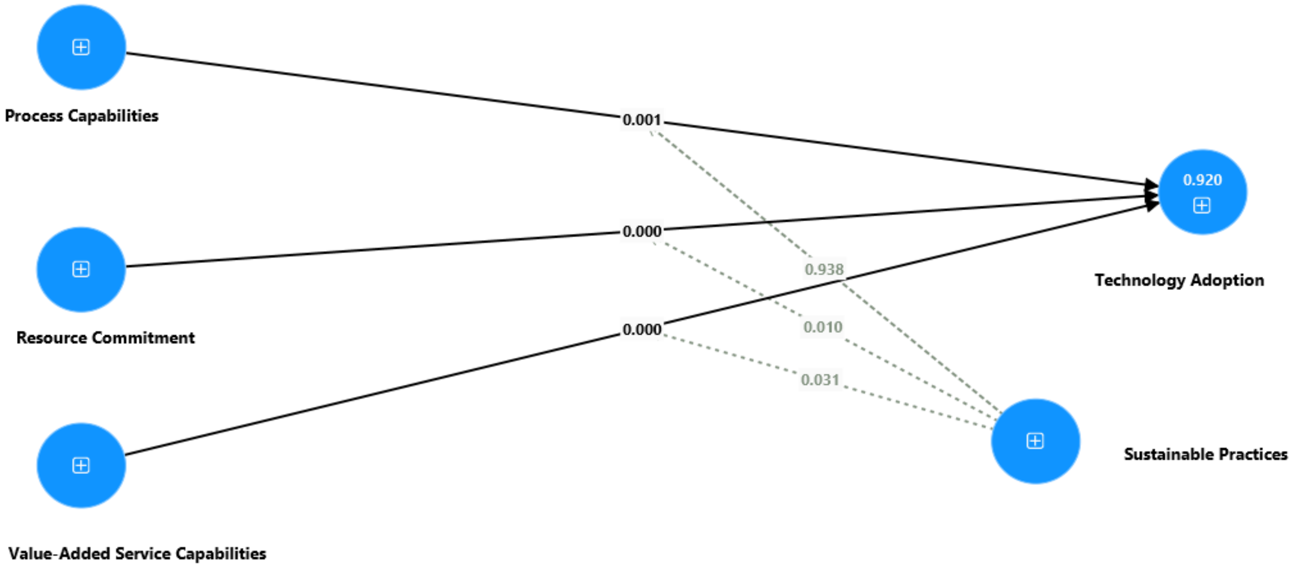

Figure 3. Structural model result

This figure presents the structural model analysis, which reveals the connections between Process Capabilities, Resource Commitment, and Value-Added Service Capabilities Technology Adoption. Still, it also investigates Sustainable Practices as a moderator. The research model reveals a strong explanatory power with Technology Adoption since it predicts 92% of the data variance ($R^2 = 0.920$).

3. Results and discussion

The study presents vital information demonstrating how organizational capabilities link with sustainable practices and technology adoption approaches. Research evidence reveals that simultaneous utilization of Resource Commitment with Value-Added Service Capabilities generates strong effects on Technology Adoption, while Process Capabilities maintains a substantial yet diminished impact. Organizations use sustainable practices as a partially supported moderator because sustainability enables specific capabilities for digital transformation.

Various studies validate that Resource Commitment maintains its position as a key adoption factor, which supports modern perspectives about funding and staffing requirements for technological change implementation [34]. More outstanding resource commitment from organizations enables better management of digital transformation barriers, such as training personnel and updating infrastructure, and business process redesign [14]. RBV achieves theoretical support in this study because internal business resources are critical success factors according to the resource-based view [36].

Value-Added Service Capabilities receive input from Technology Adoption at a deeply intertwined level. The literature shows that companies focusing on innovation for customers and different services exhibit superior readiness to implement modern technologies [30]. Digital innovation receives motivation from organizations that execute value-added services because these services both enhance operational business efficiency and improve customer satisfaction [29].

According to the weaker findings on process capabilities' impact on technology adoption, internal operational efficiency alone does not guarantee enough success in digital transformation. Successful new technology implementation benefits organizations with defined processes, yet a lack of financial backing or market trends produces challenges for reaching high adoption figures [26]. The Technology-Organization-Environment (TOE) framework demonstrates that organizations need to unite internal factors with markets and technologies in order to achieve adoption [7].

According to the research data, Sustainable Practices demonstrated positive and negative effects on the relationships studied. Sustainable practices positively influenced the relationship between resource commitment, technology adoption, and value-added service capabilities and technology adoption. However, they failed to strengthen the impact of process capabilities significantly. Previous research by [35] supports that sustainable initiatives need business model integration to generate substantial technological advantages. Organizations implementing green technologies obtain regulatory advantages and better reputations, but sustainability programs independently fail to produce immediate technological improvements (Le et al., 2024).

The findings about partial moderation through Sustainable Practices indicate that technology adoption for sustainability alone does not necessarily bring immediate operational enhancements unless sustainability becomes embedded throughout essential business operations. Deriving maximum impact from sustainability-driven innovation requires it to link with organizational culture, leadership commitment, and customer expectations, according to [39]. The institutions, along with market challenges and financial barriers in Jordan and other developing economies, limit the complete moderating effect of sustainability on the relationship between capabilities and technology adoption [45].

The variables in the complete theoretical framework collectively account for 92% ($R^2 = 0.920$) of Technology Adoption variation. Strategic unification of organizational capabilities with sustainability practices produces substantial effects on digital transformation. Businesses need to understand that dedicating funds to sustainability initiatives does not suffice unless organizations possess adaptability in their culture, differentiated services, and available financial backing.

4. Implications for research and practice

Research findings generate advantages for theoretical models and practical business applications in studies related to technology adoption. The study employs sustainability to enrich the RBV and the TOE framework without applying sustainability as a global connecting factor. Research must concentrate on individual industry aspects, policy developments, and technological readiness to boost knowledge about technology adoption relationships and sustainability connections.

For practical needs, organizations need resource management and service transformation as critical driving forces to adopt new technologies. Businesses need to implement sustainable practices in their strategic framework through means beyond basic compliance practices. Support for sustainability-driven digital transformation requires business leaders to partner with policymakers who must provide investments combined with enforcement incentives and industry-specific collaboration groups.

5. Conclusions

Technology Adoption factors exist between Resource Commitment and Value-Added Service Capabilities, but Process Capabilities have less significant motivating outcomes. The results regarding sustainable practices as moderators demonstrate inconsistency since different organizations require specific methods to adopt technology while sustaining business operations. Systematic resource funding provides evidence for the validity of RBV and TOE theories because this funding directly enables digital transformation success. 17 research groups affirm that sustainability proves effective for adoption when organizations set their strategic mission and distribute available resources.

The two main organizational elements required to develop a successful technology adoption program are financial backing, system development, and the skilled personnel who will execute the program. All businesses must make it their job to increase their value creation ability by developing value-based solutions to capture their technological leadership advantage in the market segment. While their regulatory-driven goals contribute no value whatsoever to organizations, core digital innovation strategies are still important because they are imbued with sustainable elements. Businesses can find a balance between technology development and technology adjustment projects that would also help them in sustainability, through the Technology-Sustainability Alignment Framework. Leaders and officials in organizations should provide funding support through grants and subsidization investments for initiatives needed and meant for digital transformation. In addition, networks of public and private entities are created by strategic planning to accelerate the development of sustainable, innovative digital systems. To place the integration into a business organization and a governmental body, they have to offer specific policies for sustainable integration via independent authorization programs.

Sustainable business patterns must be researched in different adoption methods across the different industries, since some business sectors are putting higher emphasis on adopting sustainable procedures. This recognition with regard to sustainable technology adoption is mostly influenced by the external factors, consisting of the government regulatory standards as well as the market trends supported by the customers. Extended periods need to be devoted by experts in order to examine sustainable practices of modifying business forecasting for several annual periods. In order for a successful implementation of technology, both resource management and sustainable-focused service development need to work together as one body. For businesses, they need to unite sustainable principles with their technological development operations to achieve their best possible economic and environmental market position.

Declaration of competing interest

The authors declare that they have no known financial or non-financial competing interests in any material discussed in this paper.

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Author contribution

Conceptualization, M.A.A. and S.M.A.; methodology, S.M.A., M.A.A., and A.A.A.A.; software, A.A.A.A, L.T.K., and A.F.H.; validation, A.A.A.A., and M.A.A.; formal analysis, K.H.A.J., A.F.H., and S.M.A.; investigation, A.A.A., and S.M.A.; resources, A.F.H.; data curation, S.M.A.; writing—original draft preparation, A.A.A., and S.M.A.; writing—review and editing, M.A.A., K.H.A.J., and A.F.H.; visu-alization, L.T.K. and A.A.A.A. ; supervision, A.A.A., and L.T.K.; project administration, A.F.H.; funding acquisition, E.F.H. All the authors have read and agreed to the published version of the manuscript.

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