JOURNAL OF TECHNOLOGY MANAGEMENT AND BUSINESS
ISSN: 2289-7224 e-ISSN: 2600-7967

JTMB

Vol.12 No. 1 (2025) 59-72
https://publisher.uthm.edu.my/ojs/index.php/jtmb

Small Business Innovation in Nigeria: A Seamless Technology Integration Approach

Balogun Ebenezer Oluwadamilare[1]

[1] *Department of Business Administration, Faculty of Management Sciences, University of Ilorin, Ilorin, 240003, NIGERIA*

*Corresponding Author: balobendar@gmail.com
DOI: https://doi.org/10.30880/jtmb.2025.12.07.005

Article Info

Received: 11 September 2024
Accepted: 5 March 2025
Available online: 30 June 2025

Keywords

Data consistency, emerging market, organisational innovation, small businesses, technology integration

Abstract

The increasing adoption of digital technologies offers considerable opportunities for small businesses in emerging economies to strengthen their capacity for innovation. However, the effective integration of these technologies into organisational processes remains a critical challenge. This study investigates how seamless technological integration influences organisational innovation within the context of small businesses in Nigeria, an emerging market economy. It focuses on four key dimensions namely process integration, system process integration, system integration, and data consistency. The data were collected using structured questionnaires administered to micro and small entrepreneurs in Kwara State, Nigeria. PLS-SEM was used to analyse the relationships between the identified dimensions of technological integration and organisational innovation. The results show that system integration has a significant positive influence on organisational innovation, followed by data consistency and process integration. These results emphasise the critical role of integrated technological infrastructures in improving innovation outcomes for small businesses operating in resource-constrained environments. In light of these findings, micro and small business owners should prioritise the adoption of integrated technological systems as a central component of their innovation strategies.

1. Introduction

Seamless technology integration is a vital component for driving organisational innovation in small businesses within emerging markets. The rapid emergence of digital technologies, such as Artificial Intelligence (AI), Industry 4.0 (I4.0), and the Internet of Things (IoT), offers significant opportunities for small and medium enterprises (SMEs) to enhance their innovation potential (Shonubi, 2023). In these emerging markets, however, integrating such technologies seamlessly into organisational processes require overcoming unique challenges. The capacity to adapt to rapid technological changes can greatly influence the competitiveness of SMEs, particularly in sectors that rely heavily on IT and technological innovations.

A major challenge faced by SMEs in emerging markets is the need for organisational readiness to adopt and implement advanced digital technologies. Research indicates that while many organisations in emerging economies recognise the potential benefits of technology adoption, they often lack the necessary resources, infrastructure, and technical knowledge to achieve seamless integration (Dana et al., 2022). SMEs also face barriers such as financial constraints and resistance to change among employees. To overcome these challenges, a robust organisational structure that encourages innovation, flexibility, and knowledge sharing is essential.

Collaboration is another key factor in enabling seamless technology integration. The development of collaborative ecosystems between businesses, academic institutions, and regulatory bodies can significantly

enhance the capacity of SMEs to adopt new technologies. Such collaboration helps organisations not only to overcome financial and technical limitations but also to foster innovation by leveraging diverse expertise (Shonubi, 2023). For example, international joint ventures allow SMEs in emerging economies to gain access to advanced technologies and markets, which can enhance their innovation potential (Mahmood & Zheng, 2009).

One of the critical drivers of organisational innovation through technology integration is the entrepreneurial orientation of the leadership. Leaders with a strong focus on innovation and technology adoption can significantly accelerate the process of integration. Studies have shown that companies with innovative CEOs and management teams are more likely to adopt and implement advanced information systems and digital technologies, which are key to staying competitive (Thong, 1999).

Moreover, small businesses that successfully integrate technology tend to rely heavily on continual organisational learning. This is particularly true in IT-based firms, where technological disruption can introduce challenges to business continuity and operational efficiency. Organisational learning helps SMEs remain adaptable and responsive to new technologies, thus enabling smoother transitions and sustained innovation (Badr, 2017). For small businesses, particularly in high-tech sectors, leveraging these networks is crucial for achieving competitive advantage through continuous innovation and technological integration.

Hence, this study examined seamless technological integration in emerging market small businesses for organisational innovation. Specifically, this study assessed process integration and its influence on organisational innovation; system integration and its influence on organisational innovation; and data consistency and its influence on organisational innovation.

2. Literature Review

2.1 Seamless Technological Integration

Seamless technological integration involves merging diverse technological platforms into a unified system to streamline business operations. The integration of advanced digital technologies such as the Internet of Things (IoT), artificial intelligence (AI), and cloud computing enables organisations to improve efficiency, enhance decision-making, and drive innovation. This type of integration connects various devices and systems, allowing for real-time data exchange and monitoring, which is crucial for optimizing processes and achieving operational excellence (Solanki, 2023).

2.2 Dimensions of Seamless Technological Integration

2.2.1 Process Integration

Process integration is critical to achieving seamless technological integration as it unites various business processes across technological platforms to function as one coherent system. By integrating IoT devices with enterprise systems, organisations can create efficient workflows that reduce redundancies and enhance productivity. This integration allows organisations to streamline communication across platforms, resulting in more efficient operations and improved customer satisfaction (Chen, 2023).

2.2.2 System integration

System integration refers to the consolidation of different software and hardware components to allow seamless communication and data sharing across platforms. Emerging technologies such as Industry 4.0 and smart manufacturing rely heavily on system integration to create connected, intelligent production environments that reduce downtime and improve decision-making. Organisations that implement robust system integration strategies can achieve higher productivity and operational efficiency by ensuring that all systems work together smoothly (Solanki, 2023).

2.2.3 Data Consistency Integration

Data consistency integration is vital for maintaining accuracy and reliability across interconnected systems. As companies adopt more advanced digital systems, ensuring that data remains consistent across different platforms is crucial for effective decision-making and operations. Technologies like cloud computing and IoT facilitate real-time data synchronization, enabling businesses to access up-to-date information across all integrated systems and making data consistency a cornerstone of seamless technological integration (Wang et al., 2021).

2.3 Organisational Innovation

Organisational innovation refers to the implementation of new organisational methods, processes, or structures that enhance a company's efficiency, adaptability, and competitiveness. It plays a significant role in improving firm

performance and can drive both technological and product innovations. Research highlights that innovation within organisations enable improved knowledge-sharing, decision-making, and operational efficiency, ultimately leading to increased competitiveness and market responsiveness (Cozzarin, 2017). By fostering a culture of continuous learning and adaptation, organisations can remain competitive in rapidly changing markets and respond effectively to external pressures such as economic shifts and technological advancements (Zahoor & Al-Tabbaa, 2020).

2.4 Seamless Technological Integration and Organisational Innovation

Seamless technological integration is key to driving organisational innovation, particularly in environments where rapid technological advancements are reshaping industries. The integration of digital technologies such as IoT, AI, and cloud computing allows organisations to streamline processes, improve communication, and increase efficiency. Studies have shown that successful integration of technology enhances product competitiveness and enables companies to innovate more effectively (Somohano-Rodríguez et al., 2020). The use of integrated systems fosters a culture of collaboration and innovation, ensuring that organisations can quickly adapt to changes in the market and technological landscapes (Guo et al., 2023).

2.5 Theoretical Review

2.5.1 Resource-Based View Theory

The Resource-Based View (RBV) theory, propounded by Barney in 1991, is one of the most relevant theories when discussing seamless technological integration and organisational innovation. The core tenet of RBV is that organisations gain a competitive advantage by effectively managing and leveraging their internal resources, which include both tangible and intangible assets. This theory posits that when firms possess valuable, rare, inimitable, and non-substitutable (VRIN) resources, they can achieve superior performance. Technological capabilities, knowledge, and organisational culture are considered key resources under this framework, which are critical for fostering innovation (Camisón & Villar-López, 2014).

The implication of the RBV theory for the study of seamless technological integration and organisational innovation is significant. It suggests that firms must invest in building robust technological infrastructure and organisational systems that enable them to integrate new technologies seamlessly. By aligning technological resources with organisational goals, companies can foster innovation that leads to sustained competitive advantage. For instance, organisations that successfully implement Industry 4.0 technologies create a competitive edge through enhanced production efficiency, improved decision-making, and increased innovation capacity (Xu et al., 2018). Therefore, the RBV theory underscores the importance of strategic resource management in enabling technological integration to drive innovation.

2.5.2 Technology-Organisation-Environment (TOE) Framework

The Technology-Organisation-Environment (TOE) framework, established by Tornatzky and Fleischer in 1990, provides a comprehensive analytical lens for examining seamless technology integration within emerging market small businesses (Prakasa & Fauzan, 2024). This framework posits that three distinct contextual domains—technological, organisational, and environmental factors—critically influence an enterprise's capacity to adopt and implement technological innovations. In the technological context, emerging market small businesses must navigate both the available technologies in the marketplace and their compatibility with existing systems. The relative advantage, complexity, and observability of new technologies significantly determine adoption decisions, with firms often balancing the promises of cutting-edge solutions against integration challenges. For instance, cloud computing presents opportunities for resource-constrained small businesses to access sophisticated IT infrastructure without substantial capital investment, yet requires careful consideration of compatibility with legacy systems and local technological ecosystems (Hajoary et al., 2024).

The organisational and environmental contexts further shape technology integration trajectories in emerging market settings. Organisational factors encompass firm size, managerial structure, resource availability, and internal knowledge capacity—all of which present unique considerations for small businesses operating with constrained resources. Leadership orientation toward innovation and the presence of technology champions within the organisation significantly influence adoption outcomes. Concurrently, the environmental context—comprising industry characteristics, market structure, competitive pressures, and regulatory frameworks—creates an external pressure system that can either catalyze or inhibit technology adoption. In emerging markets, institutional voids, regulatory uncertainty, and infrastructure limitations often present additional layers of complexity that small businesses must navigate when integrating new technologies. The TOE framework thus illuminates how successful technology integration requires alignment across these three domains, highlighting

that organisational innovation emerges not merely from technology acquisition but from its strategic assimilation within specific organisational and environmental contexts (Badghish & Soomro, 2024).

2.5.3 Diffusion of Innovation (DOI) Theory

The Diffusion of Innovation (DOI) theory, pioneered by Rogers (1962, 2003), provides a temporal perspective on how technological innovations propagate through social systems, offering critical insights into adoption patterns within emerging market small businesses (Díaz‐Pelaez et al., 2024). According to this theoretical framework, innovation diffusion follows a characteristic S-curve trajectory, with adoption initially proceeding slowly among innovators and early adopters before accelerating through early and late majority segments, and finally tapering among laggards. For small businesses in emerging markets, this diffusion process is moderated by five pivotal innovation attributes: relative advantage (perceived benefits over existing solutions), compatibility (alignment with values, experiences, and needs), complexity (ease of comprehension and implementation), trialability (opportunity for experimentation), and observability (visibility of outcomes). These attributes explain why certain technologiessuch as mobile payment systems in regions with limited banking infrastructure have experienced rapid diffusion across emerging markets, while more complex technologies like enterprise resource planning systems face adoption barriers despite their potential benefits (Branstad & Solem, 2020).

DOI theory further elucidates the communication channels and social dynamics that facilitate technology diffusion within emerging market business ecosystems. The theory highlights the instrumental role of opinion leaders, change agents, and demonstration effects in accelerating adoption processes. In emerging markets, where formal information channels may be less developed, interpersonal networks and local business associations often serve as critical conduits for knowledge dissemination about technological innovations. Small business owners frequently rely on trusted peer recommendations and observable success stories within their networks when making adoption decisions. This phenomenon explains the clustering of technology adoption observed in many emerging market contexts, where geographic proximity and social ties facilitate knowledge spillovers. For organisational innovation to flourish through technology integration, small businesses must, therefore, not only acquire appropriate technologies but also establish connections to knowledge networks that support the assimilation and effective utilisation of these technologies. The DOI theory thus underscores the social embeddedness of technology adoption processes, suggesting that innovation emerges through the dynamic interplay between technological attributes and social system characteristics (Ali et al., 2024).

2.6 Empirical Review

Somohano-Rodríguez et al. (2020) examined the impact of Industry 4.0 digital technologies on innovation in small and medium enterprises (SMEs) in Spain. The study adopted a survey research design, collecting data from 109 SMEs. The analysis employed hierarchical regression techniques to assess the effect of information and communication technologies (IDETs) and advanced robotics (ADETs) on innovation. The findings revealed that IDETs promoted innovation more significantly than ADET technologies, with strategic planning playing a critical role in fostering these technologies. The authors concluded that SMEs should prioritise digital enablers to enhance innovation and organisational performance (Somohano-Rodríguez et al., 2020).

Xu et al. (2021) explored the relationship between seamless technological integration and organisational innovation within the context of Industry 4.0 in China. The study utilised a mixed-methods approach, including surveys and case studies, targeting firms in the manufacturing sector. The sample comprised 150 organisations, and data were analysed using structural equation modeling. The results indicated that technological integration, especially through IoT and cloud computing, significantly enhanced firms' ability to innovate and improve their market competitiveness. The study recommended that firms focus on integrating new technologies with existing systems to drive innovation and long-term growth (Xu et al., 2021).

Valenzuela-Fernández et al. (2021) conducted research on organisational innovation capabilities in Chile, specifically within the business-to-business (B2B) sector. The study used a systematic literature review and surveyed 242 senior executives from different industries, including the mining sector. The data were analysed using regression techniques to identify factors influencing organisational innovation. The findings suggested that innovation strategies, collaborative networks, and market orientation were essential drivers of innovation. The authors recommended that companies should emphasize market orientation and value co-creation to sustain innovation in the competitive B2B environment (Valenzuela-Fernández et al., 2021).

Dana et al. (2022) examined the impact of international markets and new digital technologies on business innovation in emerging markets. The study utilised a descriptive survey research design, collecting data from 300 companies providing business services in Tehran, Iran. The analysis employed the partial least squares structural equation modeling (PLS-SEM) method with Smart PLS-3 software. The findings indicated that both international markets and new digital technologies positively impacted business innovation. Additionally, entrepreneurial orientation was found to mediate the relationship between these factors and innovation. The authors concluded

that companies in emerging markets should prioritise digital technologies and international market engagement to enhance their innovation capabilities and overall performance (Dana et al., 2022).

Liu et al. (2024) investigated the integration of smart city technology (SCT) and business model innovation (BMI) over a 17-year period from 2007 to 2023. The study employed a mixed-methods approach, combining bibliometric analysis and content analysis to explore the current research status and hotspots in this field. The findings revealed that cloud computing, big data, Internet of Things (IoT), and artificial intelligence have significantly enhanced the integration of SCT and BMI in recent years. The study highlighted that the current research primarily focuses on the ideation and design stages of business models, emphasising the use of digital capabilities to refine, formulate, and design corresponding business models while defining strategies through internal and external factors. The authors concluded that Industry 4.0 and digital savviness are key trends in the integration of SCT and BMI, suggesting that companies should leverage these technologies to drive innovation and improve their competitive advantage (Liu et al., 2024).

2.7 Hypotheses Development and Conceptual Model of the Study

2.7.1 Hypotheses Development

Process integration involves the seamless coordination and alignment of various processes within an organisation to enhance efficiency and effectiveness. Recent studies have shown that process integration can lead to improved decision-making through the utilisation of real-time data, enabling better sensing of market conditions. This alignment with dynamic capabilities for adaptability supports the notion that process integration can positively influence organisational innovation. For example, a study by Yang and Hsu (2019) found that structural and strategic alignments positively affect adaptability culture, which in turn facilitates process and product innovations. Hence, the first hypothesis was developed as follows;

H1: *Process integration has significant influence on organisational innovation.*

System integration refers to the consolidation of different systems and technologies within an organisation to create a unified and efficient operating environment. Studies have highlighted that system integration can improve operational efficiency by reducing redundancies and streamlining workflows. This alignment with theories on process efficiency suggests that system integration can enhance organisational innovation. For instance, a study by Cui et al. (2015) discovered that IT integration and depth have a favorable impact on innovation volume, which in turn increases an organisation's productivity in terms of sales growth. Hence, the second hypothesis was developed as follows;

H2: *System integration has significant influence on organisational innovation.*

Data consistency ensures that data across different systems and processes within an organisation is accurate, reliable, and up-to-date. Research indicates that data consistency is crucial for effective decision-making and can enhance organisational performance by providing a single source of truth. This alignment with theories on data-driven decision-making and operational efficiency suggests that data consistency can positively impact organisational innovation. For example, a study by Dubey et al. (2019) pointed out the benefits of process innovation and environmental and financial sustainability through Big Data Analytics (BDA) - powered processes. Hence, the third hypothesis was developed as follows;

H3: *Data consistency has significant influence on organisational innovation.*

2.7.2 Conceptual Model

The path model below was used for the analysis of hypotheses

H1: Process integration has significant influence on organisational innovation;
H2: System integration has significant influence on organisational innovation; and
H3: Data consistency has significant influence on organisational innovation.

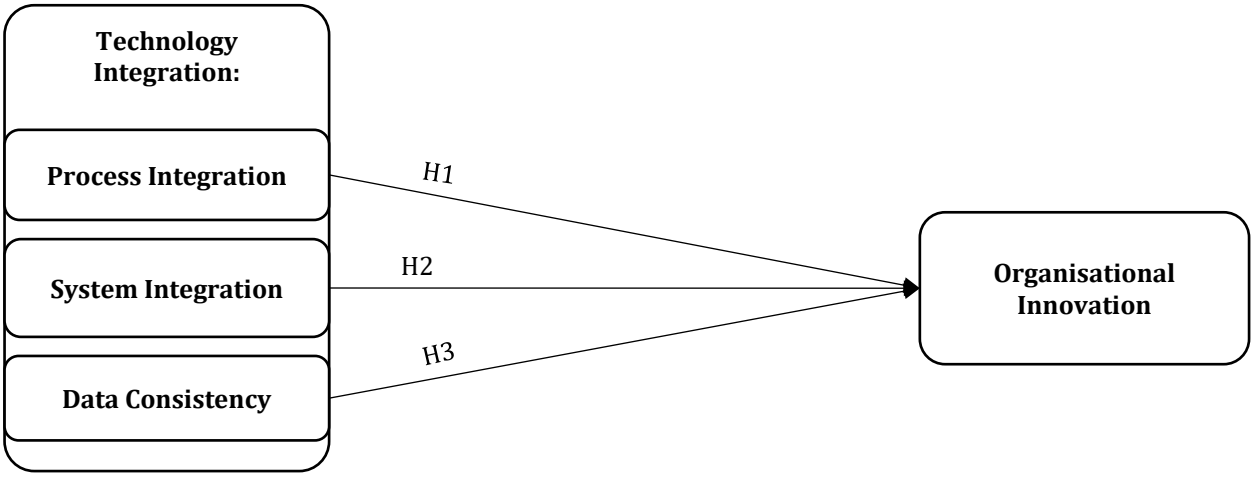

Fig. 1 *Seamless technology integration in emerging market small businesses innovation model*

Fig. 1 depicts a conceptual framework for seamless technology integration which consists of three key elements namely process integration, system integration, and data consistency which are the independent variables and the dependent variable which is organisational innovation. These independent variables are the elements or factors that contribute to the overall seamless technology integration, which is examined against the dependent variable (DV) (organisational innovation). The framework suggests that by addressing these three seamless technology integration aspects, organisations can achieve successful technology integration and drive organisational innovation.

3. Methodology

To achieve the objectives of this study, survey research design was adopted. This is considered the best approach for this study as it helps to collect data from the field and organize such data systematically for better comprehension. It is selected because this could bring the research to an understanding of a complex issue. The population of this study consisted of all 3768 registered micro and small business owners in Kwara state (Nigeria Bureau of Statistics, 2024) consisting of VTU vendors, registered student entrepreneurs, and e-commerce websites. This study utilised the Taro Yamane sample size determination formula, which gave a sample size of 362. However, the actual response rate was 339. This study adopted a simple random sampling technique. The adoption of a simple random sampling technique ensures that each respondent in the population has an equal and unbiased chance of being selected, enhancing the representativeness of the sample. Although this random sample selection process allows for an equal chance of selection among respondents, it has a potential bias in terms of the representation of every kind of MSME. The data for this study was collected using Primary data collection method. Primary data involves information gathered through original personal research efforts. In this study, data collection will involve the use of a structured questionnaire containing standardized items. The questionnaire used in this study is a close-ended questionnaire. The questionnaire was validated by experts in the field of management while it was supported with statistical validation through average variance extracted (AVE) and Funnel Lacker scale to determine the construct's convergent and divergent validity. Cronbach alpha and composite reliability; The reliability of the questionnaire was confirmed using Cronbach alpha and composite reliability, which results are all presented in the result sections. The questionnaire was administered through personal contact and was divided into two (2) parts. Part A comprises of respondent's personal data. Part B contains many research assertions that helped elicit how the adoption of Cloud computing impacts the sustainability of small businesses. Five (5) Likert scale was adopted as the measurement scale.

This study used construct validity for the test of the validity of the questionnaire as it tests the concept in the report as to whether it measures accurately the effect of seamless cloud computing integration on operational efficiency. This was done by using the major concept in the report to structure the questionnaire. The average variance extracted (AVE) was used to determine the convergent and divergent validity of the research instrument which its standard gauge is set at 0.5, that is, if the AVE result is above 0.5 then the instrument is said to be valid. The reliability test for this study adopted Cronbach's alpha (CA) and composite reliability (CR); this was done through SmartPls, version 3.2.9. The standard gauge is set at 0.6; that is, if the CA and CR result is above 0.6, then the instrument is said to be reliable.

Data collected was analysed using partial least square structural equation modeling (PLS-SEM) to analyse between variables. This method was specifically chosen over another method because it can handle complex models with multiple relationships; it works well with smaller sample sizes; it doesn't require normal distribution of data, and it's particularly effective for predictive studies in emerging markets (Hair et al., 2022). All

J. of Technology Management and Business Vol. 12 No. 1 (2025) p. 59-72

computations are done using SmartPLS Version 3.2.9, which is an advanced tool for analyzing complex relationships among several variables.

4. Results

4.1 Descriptive Statistics of the Responses and Normality Test

Table 1 *Descriptive analysis and normality test*

	Mean	Standard Deviation	Excess Kurtosis	Skewness	Number of Observations Used
Data Consistency 1	2.776	1.275	-1.057	0.161	339.000
Data Consistency 2	3.307	1.319	-1.169	-0.239	339.000
Organisational Innovation 1	3.673	1.368	-0.733	-0.740	339.000
Organisational Innovation 2	3.676	1.262	-0.855	-0.581	339.000
Organisational Innovation 3	3.053	1.332	-1.147	-0.083	339.000
Process 1	3.050	1.304	-1.166	-0.262	339.000
Process 2	3.330	1.181	-0.651	-0.480	339.000
System Integration 1	2.903	1.319	-1.171	0.110	339.000
System Integration 2	3.617	1.337	-0.993	-0.567	339.000

Source*: SmartPLS Output, 2024*

Table 1 presents the descriptive analysis and normality test results for the study variables. The mean scores range from 2.776 to 3.676, indicating moderate levels of agreement with the measured constructs. Data Consistency 1 shows the lowest mean (2.776), suggesting that respondents perceive relatively lower levels of data consistency in their organisations. Conversely, Organisational Innovation 1 and 2 have the highest means (3.673 and 3.676 respectively), indicating a more positive perception of organisational innovation among respondents. Standard deviations range from 1.181 to 1.368, demonstrating reasonable variability in responses. Skewness values (-0.740 to 0.161) and excess kurtosis values (-1.171 to -0.651) fall within acceptable ranges for normal distribution, implying that the data is suitable for further parametric analysis. The consistency in the number of observations (339) across all variables indicates a complete dataset, which strengthens the validity of the analysis. These findings suggest that while MSMEs in emerging economies are making strides in organisational innovation, there is room for improvement in areas such as data consistency and system integration. The implications of this data distribution point to the need for targeted interventions to enhance seamless technology integration, particularly in areas where mean scores are lower, to drive organisational innovation in these small businesses.

4.2 Assessment of Measurement Model

To assess the effect of seamless technological integration in emerging market small businesses for organisational innovation, the variables used to measure seamless technological integration are process integration, system integration, and data consistency against organisational innovation.

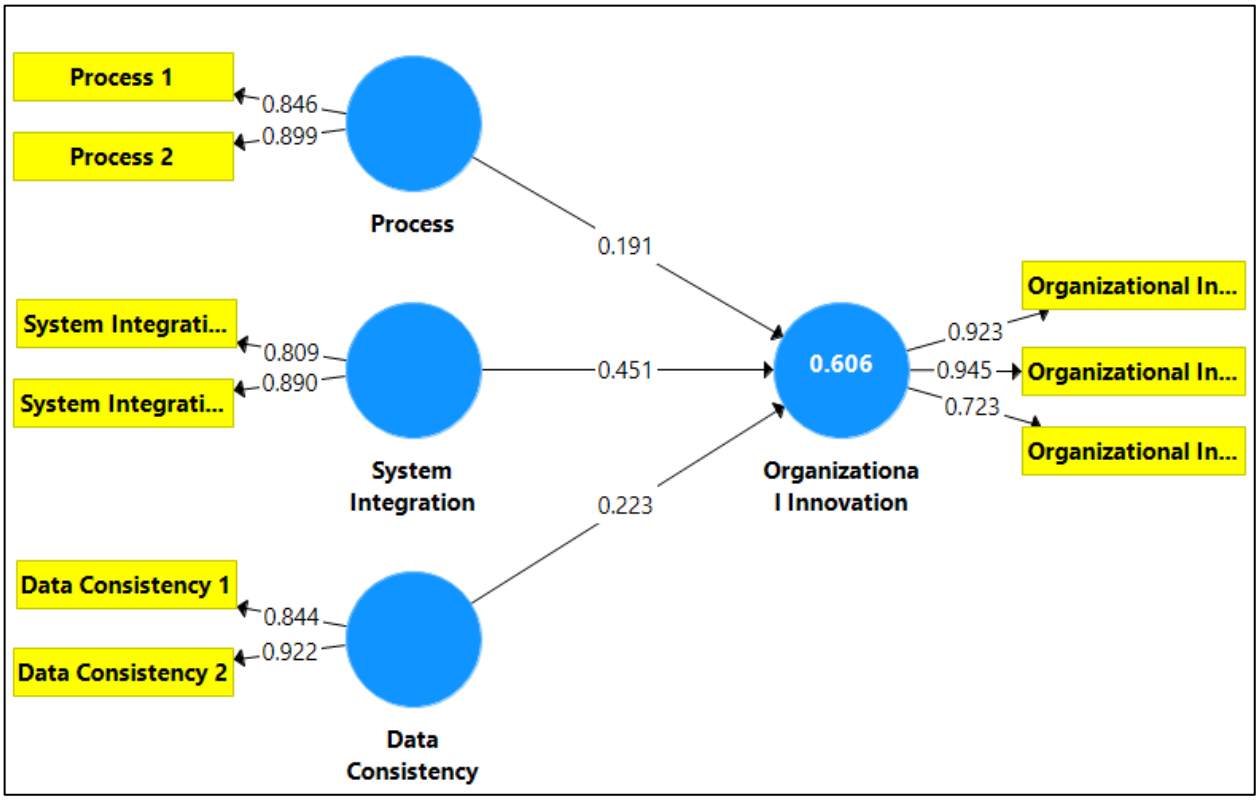

Fig. 2 *A path model of technological integration and organisational innovation*

Source: *SmartPLS Output, 2024*

Fig. 2 illustrates the path model of technological integration and organisational innovation. The model depicts three independent variables (Process Integration, System Integration, and Data Consistency) and their hypothesized relationships with the dependent variable (Organisational Innovation). This visual representation provides a clear framework for understanding the structural relationships between the constructs and guides the interpretation of subsequent statistical analyses. The model suggests that each aspect of seamless technological integration may have a distinct impact on organisational innovation in emerging economy MSMEs. This conceptualization implies that a comprehensive approach to technology integration, addressing processes, systems, and data, may be necessary to foster innovation in these organisations. The model's structure also highlights the potential for synergies between different aspects of technological integration, suggesting that improvements in one area might have cascading effects on others and ultimately on organisational innovation.

Table 2 *Construct reliability and validity*

	Cronbach's Alpha	Composite Reliability	Average Variance Extracted (AVE)
Data Consistency	0.727	0.877	0.781
Organisational Innovation	0.834	0.902	0.756
Process	0.791	0.865	0.762
System Integration	0.723	0.839	0.723

Source: *Authors compilation (SmartPLS 3.2.9 Output) 2024*

Table 2 presents the construct reliability and validity measures. Cronbach's Alpha values range from 0.723 to 0.834, exceeding the recommended threshold of 0.7, indicating good internal consistency reliability for all constructs. Composite Reliability scores (0.839 to 0.902) surpass the 0.7 benchmark, further confirming the reliability of the measures. Average Variance Extracted (AVE) values (0.723 to 0.781) are well above the 0.5 criterion, demonstrating strong convergent validity. These results imply that the measurement items are consistently representing their respective constructs, and a significant portion of the variance is captured by the constructs in relation to the amount due to measurement error. The strong reliability and validity of these measures enhance the credibility of the study's findings and provide a solid foundation for the structural model

analysis. For MSMEs in emerging economies, these results suggest that the constructs of process integration, system integration, data consistency, and organisational innovation are well-defined and measurable. This has important implications for future research and practical applications, as it provides a validated framework for assessing technological integration and its impact on innovation in these organisations.

Table 3 *Discriminant validity*

	Data Consistency	Organisational Innovation	Process	System Integration
Data Consistency	0.884			
Organisational Innovation	0.658	0.870		
Process	0.600	0.643	0.873	
System Integration	0.711	0.745	0.706	0.850

Source: *Authors compilation (SmartPLS 3.2.9 Output) 2024*

Table 3 displays the discriminant validity results using the Fornell-Larcker criterion. The square root of AVE for each construct (bolded diagonal values) is greater than its correlation with other constructs, confirming discriminant validity. This indicates that each construct is distinct and captures phenomena not represented by other constructs in the model. The highest inter-construct correlation is 0.745 between System Integration and Organisational Innovation suggests a strong relationship between these aspects while still maintaining discriminant validity. These results strengthen the overall validity of the measurement model and provide confidence in the uniqueness of each construct's measured phenomenon. For MSMEs in emerging economies, this implies that while the various aspects of technological integration and organisational innovation are related, they represent distinct concepts that can be targeted individually for improvement. The strong correlation between system integration and organisational innovation suggests that focusing on system integration efforts may have a particularly strong impact on innovation outcomes in these organisations.

4.3 Multicollinearity

Table 4 *Inner VIF values*

	Data Consistency	Organisational Innovation	Process	System Integration
Data Consistency		2.107		
Organisational Innovation				
Process		2.075		
System Integration		2.686		

Source: *Authors compilation (SmartPLS 3.2.9 Output) 2024*

Table 4 presents the Inner VIF (Variance Inflation Factor) values, which assess multicollinearity among the predictor variables. All VIF values are below 3 (ranging from 2.075 to 2.686), indicating acceptable levels of collinearity. This suggests that the predictor variables are sufficiently distinct from each other and that the regression results will not be adversely affected by multicollinearity. The absence of problematic multicollinearity enhances the reliability of the path coefficients and allows for a more accurate interpretation of each variable's unique contribution to organisational innovation. For MSMEs in emerging economies, this implies that efforts to improve process integration, system integration, and data consistency can be pursued simultaneously without concerns about redundancy or conflicting effects. Each aspect of technological integration appears to offer a unique contribution to organisational innovation, providing multiple avenues for MSMEs to enhance their innovative capabilities through targeted technological improvements.

4.4 Test of Hypotheses

Table 5 *Coefficient of determination score*

	R Square	R Square Adjusted
Organisational Innovation	0.606	0.602

Source: *Authors compilation (SmartPLS 3.2.9 Output) 2024*

Table 5 shows the coefficient of determination (R Square) for the endogenous construct, Organisational Innovation. The R Square value of 0.606 indicates that 60.6% of the variance in Organisational Innovation is explained by the model. The adjusted R Square of 0.602 accounts for the number of predictors in the model and still shows a substantial explanatory power. This suggests that the three aspects of seamless technological integration collectively have a strong predictive capability for organisational innovation in emerging economy MSMEs. The high R Square value underscores the relevance and importance of technological integration in explaining variations in innovative performance. For small businesses in emerging economies, this implies that investing in comprehensive technological integration initiatives could yield significant returns in terms of enhanced organisational innovation. The model's strong explanatory power also suggests that focusing on these three aspects of technological integration provides a solid foundation for innovation strategies in these organisations.

Table 6 *Assessment of the effect size (f^2)*

	Data Consistency	Organisational Innovation	Process	System Integration
Data Consistency		0.060		
Organisational Innovation				
Process		0.045		
System Integration		0.192		

Source: *Authors compilation (SmartPLS 3.2.9 Output) 2024*

Table 6 assesses the effect size (f^2) of each predictor variable on Organisational Innovation. System Integration shows the largest effect size (0.192), followed by Data Consistency (0.060) and Process Integration (0.045). According to Cohen's guidelines, these represent small to medium effect sizes. This implies that while all three aspects of technological integration contribute to organisational innovation, System Integration has the most substantial impact. For MSMEs in emerging economies, these findings suggest that prioritizing system integration efforts may yield the most significant improvements in organisational innovation. However, the non-negligible effect sizes of data consistency and process integration indicate that a holistic approach to technological integration, addressing all three aspects, is likely to produce the best results. The relative effect sizes provide valuable guidance for resource allocation in technological integration initiatives, allowing MSMEs to balance their efforts across these different areas for optimal innovation outcomes.

Table 7 *Bootstrapping results showing path coefficient for structural model*

	Original Sample (O)	Sample Mean (M)	Standard Deviation (STDEV)	T Statistics (|O/STDEV|)	P Values
Data Consistency -> Organisational Innovation	0.223	0.223	0.057	3.882	0.000
Process -> Organisational Innovation	0.191	0.193	0.063	3.045	0.002
System Integration -> Organisational Innovation	0.451	0.449	0.067	6.739	0.000

Source: *Authors compilation (SmartPLS 3.2.9 Output) 2024*

J. of Technology Management and Business Vol. 12 No. 1 (2025) p. 59-72

Table 7 presents the bootstrapping results showing path coefficients for the structural model. All paths are statistically significant ($p < 0.05$). System Integration has the strongest effect on Organisational Innovation ($\beta = 0.451$, $t = 6.739$, $p < 0.001$), followed by Data Consistency ($\beta = 0.223$, $t = 3.882$, $p < 0.001$), and Process Integration ($\beta = 0.191$, $t = 3.045$, $p = 0.002$). These results confirm that all three aspects of seamless technological integration positively influence organisational innovation, with System Integration having the most substantial impact. The significant positive relationships across all paths underscore the importance of a comprehensive approach to technological integration in enhancing organisational innovation for MSMEs in emerging economies. These findings have important implications for technology adoption and innovation strategies in these organisations. They suggest that while improvements in any aspect of technological integration can drive innovation, focusing on system integration may yield the most significant returns. However, the positive effects of data consistency and process integration highlight the value of a balanced approach that addresses all aspects of technological integration to maximize innovative potential.

4.5 Discussion of Findings

The findings from the bootstrapping results provide strong evidence for the significant positive impact of seamless technological integration on organisational innovation in emerging economy MSMEs. Focusing on the first hypothesis (Ho1), the results show that Process Integration significantly influences organisational innovation ($\beta = 0.191$, $p = 0.002$). This finding aligns with recent research emphasizing the importance of integrated processes in fostering innovation. For instance, Soto-Acosta et al. (2021) found that process integration through digital technologies significantly enhanced innovation capabilities in SMEs. Similarly, Cenamor et al. (2019) demonstrated that integrated business processes facilitated by digital platforms led to improved innovation outcomes in small firms. The positive relationship observed in this study reinforces the critical role of process integration in enabling MSMEs to leverage their technological resources effectively for innovation.

Regarding the second hypothesis (Ho2), the results indicate a strong and significant positive effect of System Integration on organisational innovation ($\beta = 0.451$, $p < 0.001$). This finding is consistent with recent literature on the benefits of integrated technological systems in driving innovation. For example, Nambisan et al. (2019) reported that integrated digital systems led to enhanced innovation performance in small businesses by enabling better information flow and decision-making. Additionally, Zhu et al. (2020) found that system integration facilitated by cloud technologies significantly improved product and process innovation in SMEs. The strong positive relationship observed in this study underscores the crucial role of system integration in maximizing the innovative potential of MSMEs in emerging economies.

The third hypothesis (Ho3) is also rejected, as Data Consistency shows a significant positive effect on organisational innovation ($\beta = 0.223$, $p < 0.001$). This finding is supported by several recent studies in the field. For instance, Ghobakhloo et al. (2021) demonstrated that data consistency and quality were key drivers of digital innovation in manufacturing SMEs. Similarly, Ardito et al. (2022) found that consistent and reliable data management enabled by digital technologies enhanced both incremental and radical innovation in small firms. The significant relationship observed in this study highlights the critical role of data consistency in translating technological capabilities into tangible innovation outcomes for MSMEs in emerging economies.

4.6 Practical Implication

Emerging market business practitioners need to focus on three key elements which ensure technology integration success: process integration through improved department operations and system integration through technological system compatibility and data consistency through standardization. System integration creates the massive influence on organisational innovation among the three key elements. The implementation strategy should emphasize cloud-based system connectivity for better information exchange and must implement common communication standards alongside interdepartmental teams focused on processing alignment. MSMEs facing financial constraints should start their integrating efforts by integrating systems first since this investment provides the most valuable return on investment while working with technology providers with an understanding of local conditions leads to better results.

5. Conclusion and Recommendations

The comprehensive analysis of seamless technological integration and its impact on organisational innovation in emerging economy MSMEs yields several important conclusions. Firstly, the significant positive relationship between process integration and organisational innovation underscores the crucial role of streamlined and interconnected business processes in fostering innovation. This finding suggests that investments in technologies and practices that facilitate process integration can yield substantial returns in terms of innovative performance. By integrating their processes through technology, MSMEs can create a more agile and responsive organisational structure that is conducive to innovation.

Secondly, the strong positive impact of system integration on organisational innovation highlights the transformative potential of integrated technological systems in driving innovation in small businesses. This conclusion emphasizes the need for a coherent and well-integrated technological infrastructure that connects various aspects of the organisation. By integrating their systems, MSMEs can create a more holistic view of their operations, facilitate better decision-making, and unlock new opportunities for innovation. The particularly strong relationship between system integration and innovation suggests that this aspect of technological integration should be a priority for MSMEs seeking to enhance their innovative capabilities.

The significant positive effect of data consistency on organisational innovation underscores the importance of reliable and consistent data management in the innovation process. This conclusion suggests that the value of technological integration for innovation is not just in the systems and processes themselves but in the quality and consistency of the data they handle. By ensuring data consistency across their integrated technological landscape, MSMEs can make more informed decisions, identify new opportunities, and drive innovation more effectively. This finding highlights the need for MSMEs to prioritise data management and quality assurance as part of their broader technological integration efforts. Based on the findings of this study, it is strongly recommended that MSMEs in emerging economies prioritise the implementation of integrated technological systems as a cornerstone of their innovation strategy. This can be achieved by adopting cloud-based enterprise resource planning (ERP) systems that offer comprehensive integration across various business functions. For example, MSMEs should consider platforms like Odoo or ERPNext, which have been successfully implemented by small businesses in developed markets to achieve system integration and drive innovation. MSME owners and IT managers should plan to implement these solutions within the next 12-18 months, starting with core modules and gradually expanding to cover all business areas. Regular training sessions and change management initiatives should be conducted to ensure successful adoption and to maximize the innovation benefits of integrated systems.

To leverage the positive impact of process integration on organisational innovation, it is recommended that MSMEs in emerging economies invest in business process management (BPM) tools and methodologies. This can be achieved by adopting low-code BPM platforms such as Kissflow or Nintex, which have been effectively used by SMEs in developed countries to streamline and integrate their processes. MSME leadership should collaborate with process improvement specialists to identify key processes for integration and redesign them to leverage technological capabilities fully. This initiative should be implemented over a 6-9 month period, focusing on critical business processes that have the most significant impact on innovation, such as product development, customer feedback integration, or supply chain management. Regular process audits and continuous improvement cycles should be established to ensure that process integration efforts continue to drive innovation over time.

To capitalise on the significant role of data consistency in driving organisational innovation, it is recommended that MSMEs in emerging economies implement robust data governance frameworks and data management tools. This can be achieved by adopting data integration and quality management solutions such as Talend Open Studio or Apache NiFi, which have been successfully used by small businesses in developed markets to ensure data consistency across their operations. MSME data managers and IT teams should work closely with business units to establish data standards, implement data cleaning and validation processes, and create a single source of truth for critical business information. This data consistency initiative should be implemented over a 9–12-month period, starting with the most critical data assets and gradually expanding to cover all relevant business data. Regular data quality assessments and continuous improvement of data management practices should be conducted to ensure that data consistency continues to support and drive innovation in these organisations.

Acknowledgement

Completion of this research is made possible through God's assistance.

Conflict of Interest

The author hereby declares that there is no conflict of interests regarding the publication of this paper.

Author Contribution

The author confirms sole responsibility for the following: ***study conception and design, data collection, analysis and interpretation of results, and manuscript preparation.***

References

Ali, M. D., Bujdosó, Z., Rahmat, A. F., & Dávid, L. D. (2024). Adoption and diffusion of organizationorganisational innovation, the winning mantra for growth: A case of manufacturing SMEs in Pakistan. Journal of Infrastructure, Policy and Development, 8(6), 3474. https://doi.org/10.24294/jipd.v8i6.3474

Ardito, L., Raby, S., Albino, V., & Bertoldi, B. (2022). The duality of digital and environmental innovations in SMEs: Implications for open innovation and green transitions. Journal of Business Research, 140, 328-340. https://doi.org/10.1016/j.jbusres.2021.11.039

Badghish, S., & Soomro, Y. A. (2024). Artificial Intelligence Adoption by SMEs to Achieve Sustainable Business Performance: Application of Technology Organisation–Environment Framework. Sustainability, 16(5), 1864–1864. https://doi.org/10.3390/su16051864

Badr, N. (2017). Empowering capability for innovation in IT organizationorganisations - A confluence of knowledge for continual organisational learning. https://consensus.app/papers/empowering-capability-innovation-organizationorganisations-badr/9a1b7268de925338b204691e82127056/

Branstad, A., & Solem, B. A. (2020). Emerging theories of consumer-driven market innovation, adoption, and diffusion: A selective review of consumer-oriented studies. Journal of Business Research, 116. https://doi.org/10.1016/j.jbusres.2020.01.028

Camisón, C., & Villar-López, A. (2014). Organisational innovation as an enabler of technological innovation capabilities and firm performance. Journal of Business Research, 67(12), 2891-2902. https://consensus.app/papers/innovation-enabler-innovation-capabilities-performance-camisón/664d6403bcf25119afef587a316a3686/

Cenamor, J., Parida, V., & Wincent, J. (2019). How entrepreneurial SMEs compete through digital platforms: The roles of digital platform capability, network capability and ambidexterity. Journal of Business Research, 100, 196-206. https://doi.org/10.1016/j.jbusres.2019.03.035

Chen, Y. (2023). Integrated and intelligent manufacturing: Perspectives and enablers. Engineering. https://consensus.app/papers/industry-smart-manufacturing-exploring-integration-solanki/d0ea3f8e2f1952648c31c02124bb5f66/

Cozzarin, B. (2017). Impact of organizationorganisational innovation on product and process innovation. Economics of Innovation and New Technology, 26(5), 405-417. https://consensus.app/papers/impact-organizationorganisational-innovation-product-process-cozzarin/c0c116b36c395264bb7e80d0f44f104e/

Dana, L.-P., Salamzadeh, A., Mortazavi, S., & Hadizadeh, M. (2022). Investigating the Impact of International Markets and New Digital Technologies on Business Innovation in Emerging Markets. Sustainability, 14(2), 983. https://doi.org/10.3390/su14020983

Daniel, L., & Grigg, L. (2003). Inter-organisational networks, value creation and the process of technology integration in research and development. International Journal of Technology, Policy and Management. https://consensus.app/papers/interorganisational-networks-value-creation-process-daniel/b4b9bff42bb354328addf3c092c3292f/

Díaz-Pelaez, A., Chura-Quispe, G., Clemente-Almendros, J. A., & Velarde-Molina, J. F. (2024). Analysing the influence of digital strategy and innovation on MSMEs' performance in emerging countries. Creativity and Innovation Management. https://doi.org/10.1111/caim.12642

Ghobakhloo, M., Fathi, M., Iranmanesh, M., Maroufkhani, P., & Morales, M. E. (2021). Industry 4.0 ten years on: A bibliometric and systematic review of concepts, sustainability value drivers, and success determinants. Journal of Cleaner Production, 302, 127052. https://doi.org/10.1016/j.jclepro.2021.127052

Guo, X., Chmutova, I., Sochynska-Sybirtseva, I., & Karpunina, M. (2023). Assessment of China's macro-readiness for integrated innovative management technologies employment. Economics. Ecology. Socium. https://consensus.app/papers/assessment-china-macroreadiness-integrated-innovative-guo/af9572e1f561505b810ac0e98210b245/

Hajoary, P. K., Jennifer, D. S., & Pathak, M. (2024). Digital technology adoption in circular startups: An integrated framework. Business Strategy & Development, 7(3). https://doi.org/10.1002/bsd2.425

Liu, Z., Liu, Y., & Osmani, M. (2024). Integration of Smart City Technology and Business Model Innovation. Sustainability, 16(12), 5102–5102. https://doi.org/10.3390/su16125102

Mahmood, I. P., & Zheng, W. (2009). Whether and how: Effects of international joint ventures on local innovation in an emerging economy. ERN: Partnership Form (Topic). https://consensus.app/papers/whether-effects-international-joint-ventures-local-mahmood/cf5498838cf6594f88bbbc03e5c52991/

Nambisan, S., Wright, M., & Feldman, M. (2019). The digital transformation of innovation and entrepreneurship: Progress, challenges and key themes. *Research Policy, 48*(8), 103773. https://doi.org/10.1016/j.respol.2019.03.018

Prakasa, Y., & Fauzan, N. (2024). Understanding the Technological-Organisational-Environmental Concepts on SMEs' Performance in Emerging Market. KnE Social Sciences, 43–66. https://doi.org/10.18502/kss.v9i11.15756

Shonubi, O. (2023). The impact of innovation adoption of emerging digital technologies within a collaborative ecosystem on firm innovation performance. European Journal of Business and Innovation Research. https://consensus.app/papers/impact-innovation-adoption-emerging-digital-shonubi/406957958f0b58689aa5ea70ba28a084/

Solanki, S. M. (2023). Industry 4.0 and smart manufacturing: Exploring the integration of advanced technologies in manufacturing. Revista Review Index Journal of Multidisciplinary. https://consensus.app/papers/industry-smart-manufacturing-exploring-integration-solanki/d0ea3f8e2f1952648c31c02124bb5f66/

Somohano-Rodríguez, F. M., Madrid-Guijarro, A., & López-Fernández, J. (2020). Does Industry 4.0 really matter for SME innovation? *Journal of Small Business Management*. https://consensus.app/papers/does-industry-really-innovation-somohanorodríguez/319032c75c50560ca7e6b443f66eaddd/

Somohano-Rodríguez, F. M., Madrid-Guijarro, A., & López-Fernández, J. (2020). Does Industry 4.0 really matter for SME innovation? Journal of Small Business Management, 60(5), 1001-1028. https://consensus.app/papers/does-industry-really-innovation-somohanorodríguez/319032c75c50560ca7e6b443f66eaddd/

Soto-Acosta, P., Popa, S., & Martinez-Conesa, I. (2021). Digital transformation, digital business strategy and e-commerce adoption: The role of organizationorganisational learning. Journal of Business Research, 139, 1226-1235. https://doi.org/10.1016/j.jbusres.2021.08.065

Thong, J. (1999). An integrated model of information systems adoption in small businesses. https://consensus.app/papers/integrated-model-information-systems-adoption-small-thong/0435ea825a105035aafa9d7c6a971f37/

Valenzuela-Fernández, L., Peñaloza-Briones, N., Barajas-Portas, K., & Marinao-Artigas, E. (2021). OrganizationOrganisational innovation capabilities: Empirical evidence from B2B contexts. *Estudios Gerenciales*. https://consensus.app/papers/innovation-capabilities-empirical-evidence-contexts-valenzuelafernández/828e8e1e3b1e53fb9ef73856de8684b7/

Wang, Q., Su, M., Zhang, M., & Li, R. (2021). Integrating digital technologies and public health to fight COVID-19 pandemic: Key technologies, applications, challenges, and outlook of digital healthcare. *International Journal of Environmental Research and Public Health*. https://consensus.app/papers/integrating-digital-technologies-public-health-fight-wang/c43493070bad501cb8ad4b19932e2ddc

Xu, L., Xu, E., & Li, L. (2018). Industry 4.0: state of the art and future trends. *International Journal of Production Research, 56*(8), 2941-2962. https://consensus.app/papers/industry-state-trends-xu/a73eab90b963583781500f78b114832f/

Xu, L., Xu, E., & Li, L. (2021). Industry 4.0 and smart manufacturing: Exploring the integration of advanced technologies in manufacturing. Revista Review Index Journal of Multidisciplinary. https://consensus.app/papers/industry-smart-manufacturing-exploring-integration-solanki/d0ea3f8e2f1952648c31c02124bb5f66/

Zahoor, N., & Al-Tabbaa, O. (2020). Inter-organisational collaboration and SMEs' innovation: A systematic review and future research directions. Scandinavian Journal of Management, 36(1), 101109. https://consensus.app/papers/collaboration-smes-innovation-review-research-zahoor/2f4b829d014e52c3894ef052d4585eeb/

Zhu, X., Xiao, Z., Dong, M. C., & Gu, J. (2020). The fit between firms' open innovation and business model for new product development speed: A contingent perspective. Technovation, 86, 102318. https://doi.org/10.1016/j.technovation.2019.102318