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Sailing the Waves of Sustainable Entrepreneurship

Unveiling the Moderator Role of Technological Adoption in SMEs Innovation

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Abstract

This research effort focuses on the Malaysian Small and Medium-sized Enterprises (SME) sector to meet the agenda of sustainable development through the adoption and implementation of the latest technological development, entrepreneurial activities, sustainability, and innovative capabilities. The prime purpose of the current research is to assess the role of technological influences on innovative capabilities through promoting entrepreneurial practices. The study was conducted on the Malaysian 120 SMEs by applying structural equation modeling (SEM), and the results revealed that a strong association was reported between the adoption of emerging technologies and innovativeness capacity for sustaining entrepreneurial performance. Technological adoption has the tendency to increase the innovative capabilities that significantly influence sustainable entrepreneurial activities. The study also focuses on the complex dynamics of innovation capabilities and sustainable entrepreneurship by assessing the moderating effect of technological adoption for operations. This research is novel because it examines the Malaysian SME sector in-depth and applies a particular

conceptual model that combines the ability to innovate with technology adoption to promote sustainable entrepreneurship. By offering factual proof of the crucial role technology plays in fostering innovation and sustainability in emerging economies, the findings add to the conversation on sustainable development. This study enriches the theoretical framework around sustainable entrepreneurship and offers practical insights for policymakers and business leaders aiming to leverage technology for sustainable growth.

Keywords: Sustainable Entrepreneurship, Innovation, Technology Adoption, IoT, Big Data, Blockchain.

13.1 INTRODUCTION

Many people think businesses are the leading causes of environmental and social issues, undermining social sustainability. In order to regulate corporate operations, stringent regulatory frameworks need to be implemented since the emergence of the UN 2030 agenda [1]. Business management's problem is following these rules and specifications while minimizing unfavorable effects. This viewpoint, however, has the propensity to exaggerate the effectiveness of the controlling mechanism while underplaying and misrepresenting the function of businesses in society. The management of well-known companies has evolved over time into a driving force for sustainable development. Entrepreneurs are profoundly changing markets and society through their innovations [2]. In a market-driven system, sustainable development

depends on entrepreneurs who can achieve environmental or social goals through outstanding products or processes. Market innovations that support sustainable development are not always accidental but are consciously produced by companies or entrepreneurs concerned with environmental sustainability. Sustainable entrepreneurs are more appreciable as they achieve significant environmental improvements within their primary operations. The quality of life is improved, and environmental impacts are significantly reduced by sustainable entrepreneurs introducing new products, services, organizational structures, and methods.

Sustainable entrepreneurship has become vital in today's business environment for attaining economic growth while tackling urgent environmental and social issues [3]. Innovation is the driving force behind this movement, turning concepts into workable solutions that strike a balance between business and environmental responsibility [4]. However, technology significantly limits innovation's ability to advance sustainable entrepreneurship [5]. In order to better understand how technology influences, shapes, and even contradicts the pursuit of sustainability in entrepreneurial endeavors, this study will look at the moderating function that technology plays in innovation for sustainable entrepreneurship [6].

Sustainable entrepreneurs redesign the existing market structures, consumption habits, and production methods in favor of ones that produce more outstanding goods and services for the environment and society [7]. They propel

market dynamics that promote societal and environmental improvement. This chapter aims to investigate which actors are most likely to support sustainability innovation under various circumstances. A positioning matrix for sustainable entrepreneurship is used to summarize it, allowing management to assess the effectiveness of its economic and environmental actions compared to others. The framework for sustainable entrepreneurship has been expanded to include social entrepreneurship, which prioritizes achieving societal goals using an entrepreneurial strategy. The framework for sustainable entrepreneurship was originally focused on business strategies with a strong emphasis on sustainability. A vital role in this context is also played by the idea of institutional entrepreneurship, which refers to attempts to change market regulations in the face of opposition to change [8].

Sustainable entrepreneurship is an idea that goes beyond the conventional profit-centric business paradigm and integrates social and environmental factors into the foundation of corporate strategy [9]. The processes have to be modified through technological innovations; the products must be designed with the latest technologies, and the models must be comprehensive for incremental improvements [10]. The technological environment and innovation effectiveness were found to be very close [11], which means sustainable innovation is necessary for overcoming the obstacles technologically through the proper guidance [12]. Innovation is influenced by technological involvement; on the other hand, the latest procedures enable firms to

reduce wastage and enable more effectiveness of resources and production of sustainable goods and services [13]. On the contrary, there are drawbacks to technological adoption, such as the increased cost of technological implementation and special skills, but technology also causes an increase waste and inequality [14]. The older technological was found to be less effective, and newly developed technology has better platforms to achieve the required goals [15]. Nemours studies have been conducted to determine the relationship between innovation and sustainable entrepreneurship, which reveals the technological advancements and information and communication technologies that have the full potential of understanding the benefits of technological implementation from a social perspective. SMEs utilize diverse technologies, including big data, the IoT (internet of things), and blockchain as, these are considered crucial technologies. Large-scale data processing and transmission, storage, and the data analysis must be carried out with extraordinary privacy and security while using these technologies. Data security is crucial; there are a number of cyber threats, and blockchain technologies are renowned for security, keeping effective privacy, immutability, and decentralization [16].

The technologies that have been used for decentralized and private data management, digital property, IoT, communication, and public institution reforms are based on the latest developments related to technologies for ensuring effectiveness [17]. The IoT sector and blockchain have the capabilities to handle the transactions

and billions of connected devices and coordinate across devices [18]. The IoT enables firms to decentralize processes and enable firms to have secure and efficient storage [19]. Big data technologies enable firms to adopt the technologies for industrial firms in both public and private sectors [20]. Firms can gain a competitive advantage through the utilization of the latest technologies, including big data and IoT. The smart management system also helps firms organize tasks efficiently [21]. The implementation and adoption of such technologies enable firms to sustain their performance in manufacturing and SMEs operations. The IoT devices have the capability to utilize computing resources, including cloud mining pools, to offload the mining process, and increase efficiency [22]. The blockchain has the capability to manage a large volume of data effectively. Further, it is secured and has an efficient control system for IoT and big data [23]. These latest updated technological advancements enable SMEs to increase the data security and operational efficiency by streamlining their information and developing creative solutions to challenging situations. The manufacturing industry enables firms to run sustainability initiatives and foster an effective entrepreneurial system that addresses social and environmental issues and advanced economic development. The sustainable entrepreneurial ecosystem is fostered through the implementation of technologies that can contribute to economic strength and address social and environmental issues and challenges.

This research effort examines the adoption and implementation of IoT, Big data, and blockchain with moderating effect for fostering the innovation for sustainable entrepreneurship. This research also intends to determine the technological adoption that may used for sustainability among Malaysian SMEs in the manufacturing sector [24]. This research chapter contributes to the knowledge of the crucial role of technology in sustainable entrepreneurship and enables firms to gain higher benefits for a sustainable future [25].

13.2 THEORETICAL BACKGROUND

13.2.1 Sustainable Development and Entrepreneurship

The word “entrepreneur” comes from French and means someone willing to bring together different things, like money, people, and ideas, to create networks that create value [26]. All entrepreneurs work to connect suppliers and buyers in order to make and change markets. In this type of entrepreneurship, entrepreneurs start new businesses and are involved in making these businesses grow.

- Some business owners focus on making their current companies bigger.
- People who start their own businesses often want to change how people buy and make things. This can be seen as a social trend.
- Entrepreneurship is often linked to innovation because it helps new ideas become successful in the market.

- Personal traits like drive, loyalty, cooperation, and the ability to lead others are also crucial in being an entrepreneur.

In the past, entrepreneurship was thought of little in economics and management theory. However, thanks to the work of experts like Schumpeter and Kirzner, more attention has been paid to entrepreneurship in recent years [27]. However, in the realm of entrepreneurship research, sustainable entrepreneurs stand out because they also link environmental progress to market success. As a result of this growing interest, sustainable Entrepreneurship has become its own type of business action.

Various academic disciplines and literary genres have examined the relationship between entrepreneurship and sustainable development, including social entrepreneurship, sustainable entrepreneurship, and, unintentionally, institutional entrepreneurship. To make money while helping to address environmental issues is entrepreneurship's primary driving force and objective [28]. The business's economic objectives are its ultimate goals, but its environmental objectives are integral to its economic reasoning [29].

Sustainable entrepreneurship is the search for environmentally friendly products and ideas that can be bought by most people intending to help a large part of society. Stakeholders are people or groups that are directly or indirectly affected by or affect a business's actions [30]. Sustainable entrepreneurs often find and meet the

unmet needs of a wide range of stakeholders. These groups have interests that go beyond the narrow economic interests of shareholders. They are also the main places entrepreneurs can find chances to make money with sustainable ideas [20]. To take advantage of these chances, you must find and use market failures, which can lead to societal and environmental changes. Stakeholders can be many different groups, such as customer groups and environmental NGOs, who want to see societal or environmental changes [31]. These broader partner demands can also be necessary for the economy because they can predict what customers will want in the future. Even though some stakeholders do not have as much power in negotiations, they may act as lead users, giving sustainable entrepreneurs important information about business possibilities they can later find and take advantage of. Sustainable entrepreneurship is based on this dynamic interaction with partners.

Sustainable entrepreneurship brings together many of these business trends and blends the ideas of sustainability and entrepreneurship [32]. It stresses taking the initiative and the ability of creative people or groups to make big profits in the market and change society through social or environmental innovations. Sustainable entrepreneurship refers to new, creative businesses that offer products and services that are good for the environment or society and have the potential to get a significant share of the market. Nevertheless, start-ups are just some of the ones who can use the spirit and process of market success to make good products for people or the world.

Sustainable entrepreneurship can also appear in businesses that are already up and running, corporate projects, spin-offs, and other places. Sustainable entrepreneurship is different from other types of entrepreneurship because its goal is to change more than just the market [33]. It also wants to bring about social change and shape market conditions and rules. This goal fits with the idea of social entrepreneurship, in which companies try to ensure that social and economic wealth is fairly shared.

In a broader sense, sustainable entrepreneurship includes new and market-driven ways to make money and help society by making significant changes in markets or institutions that are good for the environment or society [34]. Innovation in industrial technology, organizational concepts, and offered goods and services are all necessary for this. Beyond the effects of the market, sustainable growth necessitates innovation in various areas, such as manufacturing, procedures, and the training and development of highly qualified workers.

13.2.2 Role of Innovation for Sustainable Development

The literature shows that innovation and Information and Communication Technology (ICT) adoption are critical factors in promoting sustainable entrepreneurship. The empirical investigation by Afum [35] clarifies the barriers to ICT adoption and differences between SMEs in the US and China. In China, major impediments included high ICT expenses, low salaries, low knowledge and education levels, and a distrust of technology. On the other hand, there is a greater rate of ICT adoption in the

US due to a greater awareness of the benefits of technology for corporate growth. This shows that although ICT is an effective instrument for sustainable entrepreneurship, due to various obstacles, its advantages are only sometimes realized in various economic circumstances. The role of ICT in the enterprise is further supported by the work of Lüdeke-Freund [36], especially for SMEs. The study emphasizes the complex interaction between ICT and SMEs by creating a conceptual model that adds new constructs and variables to quantify ICT entrepreneurship, such as team-based entrepreneurial activities, experimental activities, and entrepreneurship skills development. The results highlight the importance of ICT entrepreneurship for a country's economic growth since it is associated with shorter time-to-market for new inventions, quicker prototyping, and more R&D spending.

In addition to that, the research study has expressed that institutional perspective influences and impacts innovation, and drivers are considered as government efficacy, the regulation authorities, and control of corrupt practices. The above suggestions can enable firms to promote favorable situations for sustainable entrepreneurship and organizational success. This study also pinpoints that innovation is considered the key point of sustainable entrepreneurial success. Technological capabilities have the tendency to ensure entrepreneurial success through the effective implementation of the latest available technologies [37].

Innovation is the key to entrepreneurial sustainability, and it offers the instruments, approach, and attitude for an environmentally friendly perspective [38]. It's an emerging idea to develop technological-based business models, society, and technology. A supportive ecosystem can be ensured by the implementation of sustainable entrepreneurial activities, favorable policies, and resilient institutions that focus on education and skill development and foster long-term benefits [39]. Innovation is considered a vital and crucial driver for the transformation of firms and economies that enable sustainability and ensure the entrepreneurial promotions for economic strength, social well-being, and environmental protection.

The sustainable development goals aligned by the UN are supported by innovation and innovative initiatives. The entrepreneurs contribute to the sustainable future of nation and firm through the latest technologically advanced applications; the goals entail responsible consumption and production as goal 12, industry and innovation and efficient infrastructure as goal 9, and decent work with economic strength as goal number 8, and the affordable clean energy the goal number 7, integration of eco-innovation measure can assist and promote the alignment of entrepreneurial activities for sustainable development [40]. Innovation is crucial for firms to grow faster, and sustainable entrepreneurship offers different instruments and approaches for environmental outcomes. Technological innovation, society, and business models enable the firms to gain the benefits and support the environment

with strong institution favorable policies that develop the skills for promoting the implementation of sustainable entrepreneurship [41]. The strong economic strength and sustainability guarantee entrepreneurial promotion and economic expansion, societal welfare, and environmental protection [42].

13.2.3 Digitization and Sustainable Entrepreneurship

In IR 4.0 the digitalization of entrepreneurship has taken the attention that is transformed in current scenario for achievement of organizational objectives. The digital capabilities are required for effective social and environmental values that entails the big data, utilization of AI, and IoT for efficient usage of resources, reduce waste and increase the sustainability of operations [43].

In China, technological adoption has improved the business sector; through innovation, the firms have gained economic strength and sustainability as the implementation of technology has an impact on performance-related outcomes [44]. The advantages of technological utilization have incorporated business expansion and economic growth, and the emergence of information and communication technologies among SMEs influences the innovative capacity. Further, the required skills are essential for entrepreneurial skills and development to achieve sustainable entrepreneurship [45].

Innovation and digitalization tend to increase the sustainable perspective and performance-related outcomes. The development of clever, energy efficiency, and

minimization of resource utilization increases the benefits through the implementation of big data and IoT [47]. Human capital is required for the adoption of such technological implementation; digital technology has the tendency to produce the inclusive goods that present digital transformation [48]. Entrepreneurial sustainability can only be ensured through digital technologies, e-commerce, and by reducing the carbon footprints [49].

Moreover, resource sharing and asset management through digital platforms can be used to improve economic strength and lower overproduction and consumption. The digitalization of processes increases the venture values, and the transactional transparency and utilization of blockchain technology enable understanding the long-term benefits and effectiveness [50]. The sustainability of both services and goods has been found to be crucial in the adoption and implementation of digital technology [52].

13.2.4 Block Chain Technology for Sustainable Entrepreneurship

Blockchain has become essential, and SMEs need technological advancements for the achievement of sustainable performance and success. The adoption of blockchain capabilities gives strength to transparency and traceability, which found to be crucial for sustainable goods. The diverse sectors have gained the benefits from blockchain

including agriculture sector and transparent transactional procedure has removed the inefficiencies [53].

Moreover, the security and dependability on shared resources through technological adoption include the privacy and decentralization that improve the business procedures. The adoption and implementation of technology has the potential to develop the agricultural goals [54].

Blockchain technology has a number of advantages that are expected by the firms that adopt and implement such technologies to foster the large-scale benefits for the SMEs sector of Malaysia. Technological influences alter the business operations of the SMEs sector in manufacturing, promoting sustainable performance and innovative capability to encourage sustainability of the performance, and encourages the entrepreneurial activities. The business models have to be designed or developed for the adoption of technological support as it has become essential in today's digital and global phenomenon [55]. In addition, the adoption of green innovation increases the strength of firms through the promotion of a sustainable economy [56]. The blockchain has the capability to promote a sustainable economy and facilitate efficiency in the supply chain through technological advancements to achieve long-term success [57]. Technological advancements can also help in greening the production procedure to further influence sustainable entrepreneurship [58]. Blockchain plays a crucial role in the adoption and implementation of technological

IT applications that enable firms to sustain their performance. The versatile technology pillar for manufacturing enables firms to develop and adopt such technologies that contribute to sustainability and are ecologically friendly [59]. Thus, the SMEs sector of Malaysia is expected to become sustainable and environmental friendly to reduce wastage and negative carbon footprints.

13.2.5 IoT for Sustainable Entrepreneurship

The businesses and SMEs observed to be revolutionized through IoT and enable the firms to achieve a higher level of connections through intelligence; the IoT devices serve the business operations in collecting data, analyzing data, and analyzing the environment for better decision-making to achieve the organizational goals. The IoT has an influence on SMEs that enables the firms to adopt smart manufacturing practices that, in long term, enable them to achieve the sustainable performance and entrepreneurial activities. The IoT enables SMEs to adopt smart practices for their operations that modify the various operational acts through efficient utilization of energy and resources. The integration of IoT in SMEs business operations for production systems is observed to be crucial that enable the firms to gain a competitive advantage. Further, IoT has a tendency to produce personalized products through adaptable manufacturing systems that enable the firms to meet the increasing demand in the market, derive effective customization, and promote environmentally friendly business practices that also assist in reducing the cost of employees that

sliced the wage rate [60]. The production system is altered due to the implementation of IoT as SMEs can get more agility through integration of IoT, which makes it possible to produce an adaptable manufacturing system to meet the market demand. The proactive perspective is very important for technological adoption in order to meet sustainable development goals.

13.2.6 Big Data for Sustainable Entrepreneurship

The SMEs manufacturing big data analysis emerged as the most striking factor for business conduct that supports the innovative capacity and enables the firms to gain long-term success efficiently. The massive volume of data can be processed through such technologies from diverse IoT devices. The business operations harvest the various benefits of big data and intricate simulations that improve the product and reduce wastage while ensuring production in the minimum time span to bring the product to the market. Quality improvement is important, and data analysis has a prime role in increasing the performance and increasing entrepreneurial activities. Reducing waste and rework benefits SMEs not just in terms of increased product quality but also in terms of significant cost savings. Big data analytics also helps with supply chain optimization, which enables SMEs to lower inventory costs, simplify processes, and react faster to changes in the market. Achieving sustainability requires this degree of operational efficiency since it reduces resource consumption and the environmental impact [61]

An understanding of how digital technologies are applied in developing countries can be gained from studies on their adoption and usage in business models, which have been investigated [62]. It draws attention to how digital technologies can close the gap between sustainable business practices between developed and developing nations [63]. Digital technologies are catalysts for a paradigm shift in the way organizations function and interact with society, not only instruments for efficiency and profitability. Digitization provides a method to integrate economic, social, and environmental goals for born-sustainable companies. This holistic approach to value is crucial for the firm's and the planet's long-term sustainability [64]. Hence, this study builds the notion that using digital technology stimulates the innovation process to foster sustainable innovation. The model in Figure 13.1 shows the detailed flow of research.

Figure 13.1 Here

The figure demonstrates the moderating role of technology adoption in influencing innovation capability to achieve sustainable entrepreneurship.

13.3 METHODOLOGY

This study used a quantitative research approach to get a complete picture of the role of digital technology in enhancing innovation capability for sustainable entrepreneurship. A deductive approach frequently utilized in business research was utilized in this study [65]. The way the study was set up was meant to give a complete picture of the topic. For our study, we used a non-probability sampling technique.

With a particular focus on entrepreneurs, our study examined 120 Malaysian SME businesses. The sample size for this study was 260, and we received 210 completed surveys, which made an 80.76 percent response rate. Our data analysis was conducted using AMOS for structural equation modeling (SEM) and SPSS version 20 for descriptive analysis. In the end, we wanted to understand how adopting technologies influences the innovation capability of Malaysian manufacturing SMEs to behave toward sustainability in terms of performance and entrepreneurial mindset.

13.4 INSTRUMENT DEVELOPMENT

The questionnaire was structured into three categories. The first section is about technology adoption in the business model and contains seven items that investigate explicitly the adoption of Blockchain, IoT, and Big Data. We do not specify the use of these technologies in particular business processes. Instead, general questions were asked to understand the level of adoption of these technologies in the business. These items cover topics like the type of technology being used, the extent of utilization, and the reasons for adoption by following the guidelines of [66]. We used a 5-point Likert scale to measure the responses [67].

13.5 MEASUREMENT OF MODEL

According to Hair et al. (2010), it is crucial to establish the validity and reliability of a research instrument in order to assess the conceptual model effectively. The factor loading for each indicator is indicated in diagram 13.2 below. It has been observed

that all the items have achieved the threshold level. As indicated in Table 13.1, each variable has attained a robust reliability score. The findings demonstrate that all variables have exceeded the established thresholds for validity and reliability, with Cronbach's alpha values exceeding 0.70, composite reliability scores above 0.80, and average variance extracted (AVE) values greater than 0.50 (Figure 13.2).

Table 13.1 Here
Figure 13.2 Here

Additionally, the discriminant validity of the instrument was evaluated. The outcomes of this assessment are detailed in Table 13.2, which outlines the results for discriminant validity. For discriminant validity to be established, the square root of each variable's value must exceed the correlation values between the variables. The diagonal values presented in Table 13.2 provide ample evidence to confirm the instrument's discriminant validity.

Table 13.2 Here

13.6 ESTIMATION OF STRUCTURAL EQUATION MODEL

To test the proposed research model, regression analysis has been carried out. Table 13.3 presents the findings for the direct relationships between the investigated variables. The structural model of the study explored the links between innovation capability and sustainable performance. We also explore the relationship between innovation capability and technology adoption. The results suggest that innovation

capability impacts sustainable entrepreneurship with a coefficient of 0.726 and a significance level of $p<0.001$. Similarly, technology adoption is found to have a direct and positive influence on the innovation capability of the firms, with a coefficient of 0.338 and a significance level of $p<0.000$.

Table 13.3 Here

Moreover, to examine the moderating effect of technology adoption on the relationship between innovation capability and sustainable performance, SEM was utilized. The findings are displayed in Table 13.4. The analysis revealed that e-CS serves as a mediator in the relationship between e-SQ and e-Trust. Similarly, e-Trust plays a mediating role in the connection between e-CS and ORI.

Table 13.4 Here

13.7 FINDINGS AND DISCUSSION

The research instrument's validity and reliability evaluations support the study's methodological rigor. The conceptual model is considered intact since the variables' Cronbach's alpha, composite reliability, and AVE values surpass the suggested levels. This rigorous validation process upholds the validity of the results and is consistent with the methodological guidelines provided by Davcik [68].

Given the body of literature already in existence, the study's conclusions add to the conversation about sustainable entrepreneurship by confirming the idea that technology adoption not only facilitates but also amplifies innovation's influence on sustainable business results. This is especially important in the context of emerging

economies, where implementing technology may present particular opportunities and challenges [69]. The study gives the important revealing that technological adoption enables the Malaysian firms SMEs to become innovative and ensure the sustainable performance and entrepreneurial activities.

A significant positive relationship has been reported regarding the capacity of the firm to innovate through the utilization of technology. The coefficient of 0.338 with a *p*-value of 0.000 shows statistically significant results; the findings supported the argument of the study that adoption of technology is one of the very important key components of business success and innovation (Baldassarre et al., 2017). The results of the study found to be consistent with notion that information communication technologies increase the capacity and abilities of firms to innovate and increase sustainable entrepreneurship. The coefficient of 0.726 and *p*-value less than 0.001 demonstrate that innovation capability has an influence on sustainable entrepreneurship. Similar findings have been presented in prior literature that innovation has the tendency to achieve the sustainable development in determining sustainability [70]. The path coefficients of 0.862 and 0.837 present the moderating effect of technological adoption on the relationship between innovation capabilities and sustainable performance; statistically significant results have been reported. Further, this study was found to be in line with the research of Hansen, Grosse-Dunker, and Reichwald (2009), which states that technology influences innovation

and performance [71]. The influence of technological adoption on sustainable entrepreneurship is also supported by the R^2, which is reported as 0.61, that meets the satisfaction criteria. This research effort endorses the findings and relationship between technological adoption and innovation capacity to explain the phenomenon of sustainable entrepreneurship.

The findings of the study support the prior findings that technology has significant influence on entrepreneurial landscape and effort to achieve the sustainability. The Malaysian market is rapidly growing and changing scenario of SMEs sector, the findings of the study is useful for assessing the role of technology adoption for supporting the innovation and sustainability.

13.8 LIMITATIONS AND FUTURE DIRECTIONS

The study was conducted on 120 Malaysian firms that reflected the SMEs sector of Malaysia in an emerging economy. For a detailed understanding, researchers in the future may focus on a bigger sample size from diverse industries for more specific results and strategies to devise. This study employed a cross-sectional design, making determining causality more difficult. More information about how innovative capacities, sustainable entrepreneurship, and technology adoption change over time may be gained from longitudinal research. Furthermore, responses may contain subjective biases due to the reliance on survey data. Future research could use mixed-method approaches or more objective measurements to validate findings. An in-depth

understanding can be developed by qualitative research techniques in future research to identify the difficulties and opportunities in technological adoption and sustainable entrepreneurial performance.

Artificial intelligence and machine learning are observed to be the important technologies that can influence entrepreneurial sustainability; there is a dire need to conduct a study to explore the relationship. This study focused on the moderating effect of technology adoption. However, a number of variables can also be examined as moderation effect assessment, specifically the leadership type, environmental factors, organizational culture, and entrepreneurial passion to predict sustainable performance or entrepreneurial sustainability. Moreover, worthwhile studies can be conducted through digital literacy and specific development of skills can assist SMEs in reshaping the large-scale benefits of the implementation of newer and emerging technologies. The subsequent studies must be conducted on technology adoption, innovation, and sustainability while keeping in view the explained limitations and recommendations.

13.9 CONCLUSION

The prime concern of this research effort was to contribute knowledge to the phenomenon of sustainable entrepreneurship through technological adoption among the SMEs sector in Malaysia to strengthen the economy. The results of the study revealed that technological adoption is required for business sustainability. Innovation

is a key element for increasing performance and entrepreneurial activities. The study established that the managerial core must be efficient enough to devise strategies for technology adoption that promote innovation and sustainability objectives. It has also been suggested that the government should take an interest in devising strategies SMEs to encourage for technological adoption and a platform must be provided to innovate the processes for higher efficiency achievement.

. In today's complex and rapidly changing environment, economic growth has become tough, so therefore technological integration is essential for organizational success to achieve sustainability.

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TABLE 13.1 Validity and Reliability Estimations

Variables	CA	CR	AVE
Technology Adoption	.852	.841	.582
Innovation Capability	.751	.833	.562
Sustainable Entrepreneurship	.815	.827	.598

TABLE 13.2 Discriminate Validity Estimation

Variables	TA	IC	SE
Technology Adoption	0.892		
Innovation Capability	0.792	0.713	
Sustainable Entrepreneurship	0.712	0.581	0.952

*SC = Sustainability Performance, IC = Innovation Capability, SE = Sustainable Entrepreneurship.

TABLE 13.3 Direct Relationship

	Direction		Estimates	SE	CR	Sig.	Remarks
SC	→	IC	0.726	.027	6.723	***	supported
IC	→	TA	0.338	.026	5.145	***	supported

SC = Sustainability Performance, IC = Innovation Capability, SE = Sustainable Entrepreneurship.

TABLE 13.4 Moderation Effect

Path	Coefficient	R^2	*P*-Value
IC InlineFig_001 TAInlineFig_002 SE	0.862 and 0.837	0.61	0.00 0.00

FIGURE 13.1 Research model (authors development).

The figure shows the moderating role of Technology Adoption influencing the Innovation Capability to achieve sustainable entrepreneurship. The dotted downward arrows indicate the involved technologies, such as blockchain, the Internet of Things, and big data.

FIGURE 13.2 Factor loading diagram.

This is a factor loading figure of AMOS for structural equation modeling which exhibits the Factor loading analysis showing relationships between independent variables (Innovation capability), moderator (Technology adoption), and dependent variable (sustainable entrepreneurship). The arrows indicate the direction of the relationships, with significant factor loadings that match the threshold.