International Journal of Creative Multimedia

Conceptualising the Digital ESG Shift: A Stakeholder Theory Perspective on SMEs and Emerging Technologies

Anis Farzana Zulkefli
2023200932@student.uitm.edu.my
Universiti Teknologi MARA (UiTM) Shah Alam, Malaysia
ORCID iD: 0009-0007-0794-3676
(Corresponding Author)

Memiyanty Abdul Rahim
memiyanty@uitm.edu.my
Universiti Teknologi MARA (UiTM) Shah Alam, Malaysia
ORCID iD: 0000-0003-4763-5938

Nor Suziwana Tahir
suziwana@uitm.edu.my
Universiti Teknologi MARA (UiTM) Shah Alam, Malaysia
ORCID iD: 0000-0002-0082-9332

Abstract

Small and medium-sized businesses (SMEs) are under more pressure to adopt Environmental, Social, and Governance (ESG) practices. However, they face problems like not having enough resources, not knowing how to use technology, not having enough skilled workers, and not wanting to change. These challenges make it hard to understand how SMEs can stay competitive while also following ESG rules. This paper analyses the impact of digital technologies, such as artificial intelligence (AI), the Internet of Things (IoT), and digital platforms, on facilitating the adoption of ESG by enhancing transparency, efficiency, and stakeholder trust. Utilising Stakeholder Theory, this research articulates how digitalisation enhances relationships with customers, investors, and regulators. It puts forward a conceptual framework and ideas that explain how digitalisation and ESG adoption are connected in SMEs. The paper also talks about useful strategies like getting help from the government, getting formal training, and working with technology providers. By combining ESG and digitalisation from a stakeholder-focused point of view, the study adds to the ongoing discussions about sustainability and gives ideas for how to make SMEs more resilient and competitive in the long run.

Keywords ESG digitalisation; Small and Medium-sized Enterprises (SMEs); Sustainability and digital transformation; Stakeholder theory; Emerging technologies (AI, IoT, digital platforms)
Received: 17 September 2025, **Accepted:** 27 September 2025, **Published:** 30 September 2025

International Journal of Creative Multimedia (2025) 6, 2, 231-248
doi: https://doi.org/10.33093/ijcm.2025.6.2.12

Published by MMU PRESS. URL: https://journals.mmupress.com/index.php/ijcm

Introduction

Small and medium-sized enterprises (SMEs) are widely acknowledged as key drivers of economic growth, accounting for nearly 90% of businesses globally and providing more than half of total employment (World Bank, 2023). In Malaysia and other emerging economies, SMEs play a central role in fostering innovation, sustaining livelihoods, and building competitiveness (Raihan, 2024). The COVID-19 pandemic accelerated the urgency of digital transformation, highlighting that digitalisation is no longer optional but essential to SME resilience and long-term sustainability. Digital transformation has altered the way firms compete, forcing SMEs to adopt digital tools to improve efficiency, innovate, and meet evolving market demands.

Digitalisation refers to the integration of digital technologies into core business processes (Maties, 2023). What was once peripheral like digital tools and platforms have now become central to innovation-driven economies (Kääriäinen et al., 2020). For SMEs, digitalisation enables real-time engagement with stakeholders, enhances transparency, and allows greater disclosure of non-financial information such as sustainability performance. These affordances are particularly relevant for Environmental, Social, and Governance (ESG) practices, which require ongoing stakeholder dialogue and accountability.

Despite these opportunities, the reality of SME digitalisation remains uneven. Larger firms, with stronger market positions and resource endowments, are better able to harness digitalisation for ESG adoption, while SMEs face substantial restrictions (Walton & Hamilton, 2024). Resource scarcity, technical skill shortages, limited digital know-how, and resistance to change continue to constrain SME efforts. At the same time, advanced technologies such as artificial intelligence (AI), the Internet of Things (IoT), and digital platforms offer potential to offset these limitations by reducing costs, expanding market access, and strengthening customer and regulator relationships.

Prior research has extensively documented the benefits of digitalisation, yet much of this work is oriented toward larger firms. SME-focused studies remain descriptive, highlighting challenges and opportunities but offering limited integrative frameworks tailored to resource-constrained SMEs (Eller et al., 2020; Adekomaya & Dhliwayo, 2024). This creates a clear knowledge gap: how can digitalisation enable SMEs to embed ESG principles, despite structural constraints, and what theoretical lens can best explain this process?

This paper addresses this gap by conceptualising how digital technologies facilitate ESG adoption in SMEs, using Stakeholder Theory as an analytical lens. By examining how technologies such as AI, IoT, and digital platforms reshape stakeholder relationships, the paper seeks to advance

understanding of the mechanisms through which digitalisation supports SME competitiveness and long-term sustainability.

Research Questions and Aim

- How can digital technologies (AI, IoT, digital platforms) facilitate ESG adoption in SMEs?
- In what ways do digital tools reshape SME relationships with customers, investors, and regulators?
- What strategies can SMEs, policymakers, and technology providers adopt to overcome digitalisation barriers?

Contributions

- **Theoretical:** Extends Stakeholder Theory by integrating digitalisation and ESG adoption in SMEs, proposing a conceptual framework and propositions for empirical testing.
- **Practical:** Offers strategies for SME managers to leverage digital tools for efficiency, transparency, and stakeholder trust.
- **Policy:** Provides insights for designing support measures such as training, subsidies, and partnerships to strengthen SME digital ESG adoption.

Literature Review

Methodological Note

This paper adopts a conceptual approach, drawing on an integrative review of existing literature on SME digitalisation, ESG adoption, and stakeholder theory. Sources were identified through searches of major academic databases including Scopus, Web of Science, and Google Scholar. The search focused primarily on publications from 2020-2025, reflecting the acceleration of digital transformation and ESG discourse in the past few years. Inclusion criteria emphasised peer-reviewed studies and authoritative reports that examined digital technologies (AI, IoT, digital platforms), SME constraints, and ESG practices. Excluded were highly technical studies with limited organisational or managerial relevance, as well as cases focusing solely on large corporations. Rather than claiming systematic coverage, the aim was to synthesise diverse strands of scholarship into an integrative framework that links digitalisation and ESG adoption in the SME context.

Theoretical Foundation

It is essential to define the terminology associated with digitalisation prior to examining the literature. Digitalisation is more than just using new tools; it is a social and technical process that changes the way businesses work, talk to each other, and make money using digital technologies (Rijswijk et al., 2020).

Small and medium-sized businesses (SMEs) need to embrace digital transformation to stay competitive. It opens new markets, makes things more efficient, and encourages new ideas (Li, 2022). But small and medium-sized businesses (SMEs) often have problems like not having enough resources or digital skills.

At the same time, companies are shifting their focus from short-term profits to long-term sustainability by involving all of their stakeholders. This strategy combines both financial and non-financial goals to meet the needs of employees, customers, suppliers, communities, and society (Maties, 2023). This change is mostly due to clear communication and ESG disclosures. Different points of view, like legitimacy or institutional theory, say that ESG reporting is a reaction to outside pressures or social norms. Stakeholder Theory is more appropriate in this context, as it conceptualizes organisations as integrated within a network of relationships that includes not only shareholders but also employees, customers, regulators, and communities (Akhtar, Senadjki & Kumaran, 2025). This viewpoint stresses being responsible to important stakeholders whose support is necessary for the organisation to survive and thrive.

Therefore, ESG practices help companies to serve their stakeholders by promoting fairness, transparency, and long-term sustainability. Proper management of stakeholders means creating confidence and responsibility on one side and minimizing reputational risk and firm resilience on the other side. Stakeholder Theory demands that managers must reconcile various stakeholder interests and create value together, rather than focusing mainly on profit maximization. Companies that involve their stakeholders in a meaningful manner reap reputational benefits, legitimacy, and loyalty, which help them perform better in the long run.

Digitalisation complements this dynamic by altering the manner where ESG information is created, released, and obtained. It allows for real-time transparency, interactive disclosure, and enhanced outreach to stakeholders. ESG disclosures build stakeholder trust and organisational legitimacy, leading to better performance and more sustainable outcomes. ESG value is generated by two channels: firstly, through the creation of reputation, loyalty, and morale; and secondly, by pulling in investors who look for ethical and responsible businesses (Landi & Sciarelli, 2018). Using Stakeholder Theory to analyse ESG integrates economic and ethical consideration. It uncovers digitalisation as a key factor in making SMEs responsible and resilient.

Theoretical Framework

The proposed framework shows how digital skills are important tools that help SMEs improve their sustainability practices. Artificial intelligence (AI), the Internet of Things (IoT), and digital platforms

are all examples of technologies that SMEs can use to change how they do business. AI capability is the ability to look at data and make decisions based on what we find. IoT capability is the ability to use connected devices to keep an eye on and share real-time information. Digital platform capability is the ability to use online systems for e-commerce, traceability, and interaction with stakeholders. These inputs set off systems that promote openness, efficiency, and trust among stakeholders. By going digital, SMEs make their operations and results more visible, which increases transparency; they cut costs and improve processes, which makes them more efficient; and they show that they are responsible and responsive, which builds trust with stakeholders. All of these things together make SMEs more resilient, innovative, and well-known, which helps them stay in business for a long time in competitive markets.

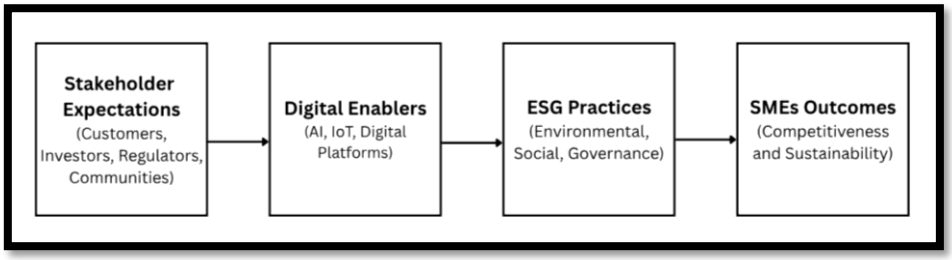

Figure 1. Theoretical Framework based on Stakeholder Theory, Illustrating How Digital Technologies Enable ESG Practices to Meet Stakeholder Expectations and Improve SME Outcomes

Definition of Constructs

Stakeholder expectations refer to the varying demands and interests of stakeholders shaped by their roles, constraints, and priorities in a specific context (Li, Verhagen & Curran, 2020). These expectations influence firms' strategic decisions, particularly in relation to transparency, accountability, and sustainability practices.

Digital enablers represent technological capacities that allow firms to enhance operations and stakeholder engagement. They include artificial intelligence (AI), defined as technologies that mimic human intelligence to perform tasks (Kaplan, 2016); the Internet of Things (IoT), a global network of interconnected devices communicating through wireless or hybrid systems (Lee & Lee, 2015); and digital platforms, web-based applications that enable interaction and exchange of information between users (Kaplan & Haenlein, 2016).

Environmental, Social, and Governance (ESG) practices are organisational activities guided by a framework for evaluating and managing sustainability and ethical impacts on society and the environment (Meiden & Silaban, 2023). These practices encompass initiatives such as reducing environmental footprint, fostering social responsibility, and strengthening governance structures to meet stakeholder demands.

SMEs outcomes capture the degree to which small and medium enterprises achieve their strategic goals and long-term sustainability (Anggadwita & Mustafid, 2013). They are reflected not only in competitiveness and resilience but also in non-financial performance dimensions such as reputation, innovation, and stakeholder trust.

Propositions

The framework shows how things are connected, and these are the ideas that follow:

P1: The expectations of stakeholders have a positive effect on how quickly SMEs adopt digitalisation.

P2: Digitalisation has a positive effect on SMEs' ESG practices.

P3: ESG practices improve the competitiveness and sustainability of small and medium-sized businesses.

Common Struggles for SMEs

Global Perspective

SMEs globally face challenges in adopting digital transformation, in comparable to larger firms that usually have more resources at their disposal. The barriers can be categorized into two: structural constraints and organisational factors. Structural constraints refer to systemic issues such as financial and skills-related limitations. SMEs are often prevented from investing in digital technologies, upgrading systems or hiring skilled staff due to financial constraints. Studies have shown that limited financial and human capital significantly restrict SME participation in digital transformation (Lester & Charles, 2024; Jin & Liu, 2025). Additionally, SMEs struggle with attracting and retaining employees with necessary digital expertise, and rapid technological changes exacerbate existing skill gaps (Troise, Corvello, Ghobadian, & O'Regan, 2022; Feroz, Zo, & Chiravuri, 2021).

Organisational factors concern internal dynamics within SMEs. Employee resistance to change is a common challenge, as staff may fear job displacement and feel uncertain about the value of new technologies (Ahmed et al., 2024). Similarly, being hesitant to alter established practices as part of management cultures can also impede adoption. A lack of effective change management strategies can make the digital transition more difficult, as it often intensifies this resistance.

Malaysia Perspective

Global research identifies prevalent obstacles to SME digital transformation; however, these challenges present are unique in Malaysia. Small and medium-sized enterprises (SMEs) in Malaysia usually have few resources and are at risk during times of uncertainty, like the COVID-19 pandemic (Jaish, Murdipi, Razak & Alwi, 2023). Recent surveys indicate that approximately 77% of Malaysian SMEs remain at

the fundamental stage of digitalisation, predominantly utilizing social media and basic ICT tools, while a significantly smaller proportion has embraced advanced technologies such as e-commerce platforms, cloud computing, or data analytics (SME Corp, 2023).

Structural barriers are very clear. Financing is still a major problem because many small and medium-sized businesses (SMEs) say they have trouble getting money for digital investments, and others don't know about available financing programs or think that the costs of digitalisation, like software subscriptions and infrastructure upgrades, are too high (SME Corp, 2023). A lack of skilled workers also slows progress, as small and medium-sized businesses (SMEs) have trouble finding and keeping employees who have the right digital literacy and technical skills (SME Corp, 2023). In rural areas, these gaps are even bigger because small and medium-sized businesses (SMEs) have trouble connecting to the internet and do not have many chances to use digital tools (The Star, 2025).

Organisational factors further complicate the digitalisation process. Many SMEs display low awareness of the potential benefits of advanced digital tools, and resistance to change among employees and management often slows adoption (Ahmed et al., 2024). These issues reflect broader cultural and managerial challenges, where established practices, fear of job loss, and uncertainty about digital returns contribute to slow uptake.

These challenges have kept them in a financially vulnerable position and forced many of them to migrate to online approximations of their businesses to be competitive and survive. One of their biggest needs right now is creating new business models that can aid their recovery more substantially and create sustainability. SME should have a plan in place for their digital transformation while actively engaging employees to adopt new tools and emerging technologies as all staff need to be working towards transforming the floor of an organisation.

Leveraging Technology for Digitalisation

Organisations moving towards digitalisation or initiating digital strategies must be aware that to attain the full potential will require strategic direction, conscious choices, and management practices to lead the transformation. Digitalisation is complex and multi-dimensional, and it goes beyond just the IT department as it transforms operations, products and processes, often resulting in organisation-wide challenges. Technologies like AI, IoT, and digital platforms can be considered strategic resources in supporting SMEs.

Artificial Intelligence (AI)

AI transforms business operations with better decision-making, efficiency, and data analysis, particularly in ESG (Sklavos et al., 2024). By processing large amounts of data, AI enables businesses to become aware of their environmental impact, social responsibilities, and governance efficacy, leading to better-informed and fact-based decision-making. AI enables the formulation of robust ESG policies through the analysis of past data and predicting likely outcomes. Accordingly, the integration of AI into ESG programs is ever more a requirement for organisations seeking long-term sustainability, accountability, and stakeholder trust.

Businesses can extract useful insights on their environmental footprint, social actions, and governance policies from intricate data using sophisticated machine learning algorithms (Sklavos et al., 2024). AI analytics also supports real-time monitoring and assessment of ESG performance, allowing companies to identify areas of improvement and develop effective, data-driven solutions. Moreover, AI is significant in overseeing ESG risks through precisely forecasting and identifying the potential outcomes associated with environmental issues, social conflicts, and governance weaknesses. Predictive analytics allows machine learning algorithms to help businesses proactively solve and respond to these risks prior to their escalation.

In terms of ESG data capture and quality, AI enables machines to perform certain tasks and replace traditional labour to a certain extent. The application of AI can reduce enterprises' reliance on human resources that can reduce enterprises' operating costs (Zhu & Xiong, 2024). AI relies on advanced algorithms such as machine learning and deep learning that help businesses go beyond their own human limitations. This means AI can stimulate innovation and raise overall technological capability of firms, especially in handling non-routine tasks. As a result, it leads to higher productivity and long-term competitiveness. AI, as a high-tech production resource, the realized value growth not only promotes enterprise's own economic efficiency but also provides a solid material foundation for ESG.

In terms of constraints or risks, firstly, the application of AI involves initial costs and implementation risks that are relatively higher for SMEs than large enterprises due to difficulty of recovering resources to invest and due to lower endogenous skills in SMEs (Ferraro, Quinto, Scandurra & Thomas, 2025). Next, AI can also create new ethical and social challenges through its data privacy risks (Sulkowski, 2025). Therefore, businesses need to ensure that the usage of AI is in line with their ESG values and goals and take actions in mitigating the negative impacts of AI.

In terms of adoption pathway, various studies (Ancillai et al., 2023; Chaudhuri et al., 2022; Zhu et al., 2024) concur that business operations can be improved, streamlined in processes, and assist in

decision-making using AI. AI can predict market trends and customer behaviour, and based on this, businesses can prepare for future needs and adjust plans accordingly. AI is also very crucial in terms of utilizing strategic capabilities to build new competitive strengths and speeding up the decision-making process.

As per the Google SEA e-Conomy report, small businesses in Southeast Asia are starting to use generative AI for marketing through AI-powered livestreaming (Ooi, 2025). An AI host can display products, engage with customers in real time, and make product suggestions based on what customers like during these broadcasts. That is fewer full-time sales associates' small and medium-sized businesses need to employ and more individuals being reached through the internet. There are still problems to solve, such as the cutting-edge AI technology costing a lot of money, making sure that the AI responses are correct, and the protection of customer data.

Internet of Things (IoT)

IoT technology, which is smart and connected, allows firms to move beyond traditional ways of conducting business. IoT is capable of bringing physical objects to digital systems, thus facilitating the creation of innovative business models and services. Through this connectivity, firms able to collect and analyse real-time data from their services and products. For instance, manufacturing industry firms can use IoT for predictive maintenance and real-time monitoring on the shop floor, enhancing efficiency and reducing downtime. IoT helps firms to develop new products and services better aligned with customer needs. Smart houses, health tracking devices, and smart city projects are a few examples of how IoT can generate new opportunities and deliver additional value to customers (Zeng et al., 2024).

IoT technology is very much capable of enabling ESG practices. For example, IoT can help firms monitor and control energy use that can reduce their carbon footprint. This data-driven approach supports companies in gaining a better understanding and management of their environmental and social impacts. It also allows them to develop more specialized and effective ESG strategies and improve performance. Small businesses with little amount of resource can access fundamental knowledge regarding their firms and impacts, thereby more easily engaging in significant ESG activities.

In terms of ESG data capture and quality, IoT can significantly streamline ESG data collection. For instance, sensors can monitor environmental conditions, such as air and water quality, in real time. This data can then be automatically recorded and analysed, reducing the need for manual data collection and increasing accuracy. IoT technology provide a cost-effective solution for the reporting of ESG data

(Salehi, 2023). This is due to the automation and real-time data provided by IoT not only streamline the data collection process but also enhance accuracy and efficiency.

In terms of constraints or risks, IoT technology is a complicated process that integrates several technical systems, which presents risks and limitations. According to Zeng et al. (2024), sensor technologies, communication networks, data storage, and analytic tools must usually be integrated into IoT systems. These technologies provide difficulties for businesses because they will require large upfront expenditures for staff training, software development, and hardware purchases. These upfront expenditures could be quite difficult for SMEs with little capital. The next major obstacle to developing ESG principles through IoT is data security and privacy protection. Cyberattacks could target IoT devices, particularly those in charge of sensitive data or vital infrastructure.

In terms of adoption pathway, IoT devices can track different types of air pollution, which is very important for keeping an eye on air quality, especially in cities where pollution is a big problem that can make people sick. InfiSIM is a company that makes IoT solutions that can gather real-time data on different environmental factors (Salehi, 2023). Wireless IoT sensors gather this data and send it to a central database or cloud platform.

Bretzel Bakery in Ireland, an artisanal bakery that has been around for 150 years, has started using IoT technology to make its business more sustainable and efficient while still keeping the quality of its products (McGrath, 2018). The bakery uses IoT tools to keep an eye on production and make operations more efficient. This is in addition to earlier investments like electric delivery vehicles. IoT helps small businesses like Bretzel use their resources better and have less of an impact on the environment without giving up traditional methods. However, one problem is that you have to spend money on digital infrastructure and train your staff to use the new systems well.

Digital Platforms

E-Commerce Platforms

Usage of e-commerce platforms is the most significant tactic that small businesses employ to take advantage of digitalisation. E-commerce platforms allow small companies to establish an online presence, increase the number of customers, and make transactions more efficient. SMEs that engage in e-commerce experience greater revenue growth and profitability rates than those that operate only through physical stores (Lester and Charles, 2024). E-commerce platforms also enable businesses to tailor customers' experiences, automate inventory control, monitor sales performance, and enable overall business expansion and long-term sustainability.

Social Media Platforms

Social media marketing has been a successful method for brand awareness and engaging customers (Lester and Charles, 2024). Social media offers SMEs a platform for building intimate relationships with customers and understanding consumer behaviour. In the current digital age, enhancing visibility, consumer engagement, and sales through the adoption of digital marketing is of paramount importance to SMEs. Jones, Hutcheson, and Camba (2021) emphasize the importance of using digital marketing media such as social media to access target markets effectively. Social media assists SMEs in enhancing brand visibility, developing more effective customer relationships, and consequently, sales and revenue growth. The authors also point out that internet marketing facilitates monitoring of performance, examination of customer behaviour, and ongoing optimisation of marketing strategies for better results.

In terms of ESG data capture and quality, digitalisation has a significant impact on businesses that apply ESG (Oktavianti, Alpian, Mudzaki & Savitri, 2024). The implementation of sustainable practices can be strengthened through the integration of digitalisation in business strategy, since it can increase operational efficiency and enable businesses to track and report on ESG performance more transparently. The influence of the development of digital platform has revolutionized the way SMEs do business. It offers new opportunities for SMEs to reach wider markets, optimize operations and increase customer engagement. It also can be a powerful tool for SMEs in promoting sustainable business practices, especially in the ESG context.

In terms of constraints or risks, SMEs confront significant obstacles in terms of limitations or hazards. First, budgetary limitations. Due to their limited financial means, SMEs frequently struggle to improve their current systems, hire qualified staff, and invest in new technologies. As a result, it may make it more difficult for companies to compete successfully in the digital market. The next issue is that personnel lack digital skills and knowledge. Many SMEs find it difficult to find and keep workers who possess the digital skills needed to properly handle digital technology (Adekomaya & Dhliwayo, 2024). SMEs run the danger of lagging behind rivals and losing out on growth prospects if they don't make enough training and upskilling efforts. Concerns about cybersecurity are also present. Due to their weak cybersecurity defences, SMEs are increasingly the target of cyberattacks. They run the danger of falling victim to ransomware attacks, phishing schemes, and data breaches.

When it comes to the adoption pathway, the adoption of e-commerce platforms is very important because it can help digital transformation work better. By using these platforms to create an online presence, businesses can reach more customers and make transactions easier. Companies that start doing business online make more money than those that only do business in person (Adekomaya & Dhliwayo, 2024). SMEs could also work with influencers or well-known internet stars to get the word out about their brand on social media. Seeing that the influencer is credible can also make people

more confident about buying things, because SMEs work with influencers who have a good brand image (Oktavianti, Alpian, Mudzaki & Savitri, 2024). YouTube and TikTok are two examples of digital platforms where we can make great marketing content that will reach a larger audience and get more people involved.

Small dairy producers in Greece adopted a digital traceability platform that lets customers scan QR codes on cheese packaging to find out where and how the cheese was made (Rotsios et al., 2022). This made things clear and helped people trust the company, especially when it came to the quality of the products and the company's environmental practices. For small and medium-sized businesses, these kinds of platforms make governance stronger and improve relationships with customers. However, businesses that did not have enough money had to spend money on basic IT infrastructure and training their employees, which can be hard.

Contribution and Implications

For SMEs owners and managers, the proposed framework will benefit them since it demonstrates on how digital tools like AI-driven analytics and IoT-based energy monitoring can enhance ESG compliance, strengthen transparency and build stakeholder trust. SMEs may adopt affordable digital solutions to reduce on operational costs, streamline processes and improve competitiveness while meeting sustainability expectations.

For technology and platform providers, the outcomes highlight chances for them to design solutions tailored to SMEs that balances between functionality and affordability. By effectively collaborating with SMEs to co-develop sector specific ESG tools will allow them to address real operational pain points that will increase adoption and create long-term value for both parties.

For policymakers, the framework underscores the importance of targeted support measures such as digital audit vouchers, training initiatives, and ESG-focused grants. Public–private partnerships can further enhance SME digital capacity, ensuring that even resource-constrained enterprises have equitable access to advanced technologies and are not left behind in the transition toward sustainability.

Conclusion

This paper conceptualised how digital technologies such as AI, IoT, and digital platforms can enable SMEs to adopt ESG practices under resource constraints. Drawing on Stakeholder Theory, the framework highlights the mechanisms through which digital tools enhance transparency, efficiency, and stakeholder engagement. By linking digitalisation with ESG adoption, the study contributes to theory by extending stakeholder-driven approaches to contexts where SMEs face limited resources.

Future empirical research can test the proposed propositions to refine understanding of how digital enablers affect disclosure, competitiveness, and sustainability outcomes.

Future Research Directions

The contribution of external assistance to enable digital transformation in SMEs is well-documented in the literature. Government initiatives, trade associations, and exposure to digital tools enhance SMEs' capacity to adopt and utilize digital technologies. Empirical evidence suggests that focused programs offering training, mentorship, and financing help SMEs overcome common barriers and accelerate digital adoption (Lester & Charles, 2024). Digitalisation is increasingly recognized as essential for SMEs to improve competitiveness and growth through strategic technology use. While studies highlight SME competitiveness, further research is required to examine the long-term effects of digitalisation on firm performance (Walton & Hamilton, 2024). To sharpen this inquiry, future research should move beyond general claims by addressing operational questions, such as:

- How do AI-enabled ESG analytics tools affect disclosure quality in micro-SMEs compared to medium-sized SMEs?
- What is the cost–benefit threshold for IoT-based energy monitoring in small-scale manufacturing firms?
- Which governance mechanisms (e.g., third-party assurance) most effectively build stakeholder trust in SME ESG data?

Moreover, investigating how internal and external drivers shape digitalisation strategies would be beneficial. Overall, the literature converges on the critical role of digitalisation for SME competitiveness in a rapidly digitalizing economy. Yet, persistent barriers such as resource scarcity and resistance to change remain. To overcome these challenges, SMEs must actively leverage external assistance and embed systematic frameworks that enable them to exploit digital technologies fully in the accelerated business landscape.

References

[1] Adekomaya V. O., & Dhliwayo, S. (2024). Exploring The Impact of Digital Transformation on Small Business Sustainability: Strategies, Challenges and Opportunities. *Social Sciences Research and Innovation Conference (SSRIC) Proceedings*. https://commerce.nwu.ac.za/sites/commerce.nwu.ac.za/files/files/SSIRC/2024/C-SSIRC-2024-Papers-056-072.pdf

[2] Ahmed, S., Abd Aziz, N., Haque, R., Bin S. Senathirajah, A. R., & Qazi, S. Z. (2024). Digital transformation in Malaysian manufacturing: a study of change sensing and seizing

capabilities. *Cogent Business & Management*, *11*(1), 2392046. https://doi.org/10.1080/23311975.2024.2392046

[3] Akhtar, F., Senadjki, A., & Vija Kumaran, V. (2025). Sustainability meets digital culture: the influence of ESG on financial performance in Malaysian manufacturing SMEs. *Journal of Innovative Digital Transformation*, *2*(1), 90-108. https://doi.org/10.1108/JIDT-10-2024-0031

[4] Ancillai, C., A. Sabatini, M. Gatti, and A. Perna. 2023. Digital Technology and Business Model Innovation: A Systematic Literature Review and Future Research Agenda. *Technological Forecasting and Social Change*. https://doi.org/10.1016/j.techfore.2022.122307

[5] Anggadwita, G., & Mustafid, Q. Y. (2014). Identification of factors influencing the performance of small medium enterprises (SMEs). *Procedia-Social and Behavioral Sciences*, *115*, 415-423. https://doi.org/10.1016/j.sbspro.2014.02.448

[6] Chaudhuri, R., S. Chatterjee, D. Vrontis, and S. Chaudhuri. 2022. Innovation in SMEs, AI Dynamism, and Sustainability: The Current Situation and Way Forward. *Sustainability* 14, no. 19: 12760. https://doi.org/10.3390/su141912760

[7] Eller, R., Alford, P., Kallmünzer, A., Peters, M. (2020). Antecedents, consequences, and challenges of small and medium-sized enterprise digitalization. *J Bus Res*, 112, 119–127. https://doi.org/10.1016/j.jbusres.2020.03.004

[8] Feroz, A. K., Zo, H., & Chiravuri, A. (2021). Digital transformation and environmental sustainability: A review and research agenda. *Sustainability*, *13*(3), 1530. https://doi.org/10.3390/su13031530

[9] Ferraro, G., Quinto, I., Scandurra, G., & Thomas, A. (2025). The Impact of Artificial Intelligence and Sustainability Management on Fostering ESG Practices and Competitive Perspectives Among SMEs. *Corporate Social Responsibility and Environmental Management*. https://doi.org/10.1002/csr.70051

[10] Jaish, A. A., Murdipi, R., Razak, D. A., & Alwi, N. M. (2023). The effect of digitalization on the sustainability of Malaysian SMEs. *International Journal of Academic Research in Business & Social Sciences*, *13*(1), 655-668. http://dx.doi.org/10.6007/IJARBSS/v13-i1/15994

[11] Jin, L., & Liu, M. (2025). Unlocking financial opportunities: The substantial alleviation of financing constraints on small and micro enterprises through digital inclusive finance. *Journal of the Knowledge Economy*, *16*(1), 2283-2309. https://doi.org/10.1007/s13132-024-01863-7

[12] Jones, M. D., Hutcheson, S., & Camba, J. D. (2021). Past, present, and future barriers to digital transformation in manufacturing: A review. *Journal of Manufacturing Systems*, *60*, 936-948. https://doi.org/10.1016/j.jmsy.2021.03.006

[13] Kaplan, J. (2016). Artificial Intelligence: What Everyone Needs to Know. Oxford University Press, New York, NY. Retrieved from https://books.google.com.my/books?hl=en&lr=&id=wPvmDAAAQBAJ&oi=fnd&pg=PP1&dq=Artificial+Intelligence:+What+Everyone+Needs+to+Know&ots=NzFKOBtwOb&sig=xAz6p

zfe9pVY4NGtuMuJrSHQtGo&redir_esc=y#v=onepage&q=Artificial%20Intelligence%3A%20What%20Everyone%20Needs%20to%20Know&f=false

[14] Kaplan, A.M., Haenlein, M. (2016). Higher education and the digital revolution: about MOOCs, SPOCs, social media, and the cookie Monster. *Business Horizons*, Vol. 59 No. 4, pp. 441-450. https://doi.org/10.1016/j.bushor.2016.03.008

[15] Kääriäinen, J., Pussinen, P., Saari, L., & Kuusisto, O. (2020). Applying the positioning phase of the digital transformation model in practice for SMEs: toward systematic development of digitalization. *International journal of information systems and project management*, *8*(4), 24-43. https://aisel.aisnet.org/ijispm/vol8/iss4/3

[16] Landi, G., & Sciarelli, M. (2018). Towards a more ethical market: the impact of ESG rating on corporate financial performance. *Social Responsibility Journal*, *15*(1), 11–27. https://doi.org/10.1108/SRJ-11-2017-0254

[17] Lester, M., & Charles, H. (2024). Leveraging Digitalization for SME Growth: A Roadmap to Competitive Advantage. https://www.researchgate.net/profile/Harvey-Charles-2/publication/384442010_Leveraging_Digitalization_for_SME_Growth_A_Roadmap_to_Competitive_Advantage/links/66f939169e6e82486ff58463/Leveraging-Digitalization-for-SME-Growth-A-Roadmap-to-Competitive-Advantage.pdf

[18] Lee, I. and Lee, K. (2015). The Internet of Things (IoT): applications, investments, and challenges for enterprises. *Business Horizons*, Vol. 58 No. 4, pp. 431-440. https://doi.org/10.1016/j.bushor.2015.03.008

[19] Li, L. (2022). Digital transformation and sustainable performance: The moderating role of market turbulence. *Industrial Marketing Management*, *104*, 28–37. https://doi.org/10.1016/j.indmarman.2022.04.007

[20] Li, R., Verhagen, W. J., & Curran, R. (2020). Stakeholder-oriented systematic design methodology for prognostic and health management system: Stakeholder expectation definition. *Advanced Engineering Informatics*, *43*, 101041. https://doi.org/10.1016/j.aei.2020.101041

[21] Matieș, T. C. (2023). Non-financial Reporting and Digitalization, Key Factors in Stakeholder Engagement. *Revista de Studii Financiare*, *8*(Special), 46-66. https://revista.isfin.ro/wp-content/uploads/2023/12/3.-Curcerzan-Teodora.pdf

[22] McGrath, T. (2020). *When "smart" has a whole new meaning: using IoT in an artisan bakery*. New Food Magazine. https://www.newfoodmagazine.com/article/73703/bakery-iot-technology-reduce-energy-costs/

[23] Meiden, C., & Silaban, A. (2023). Exploring the measurement of environmental performance in alignment with environmental, social, and governance (ESG): a qualitative study. *Information Sciences Letters*, *12*(9), 2287-2297. https://digitalcommons.aaru.edu.jo/cgi/viewcontent.cgi?article=2265&context=isl

[24] Oktavianti, A., Alpian, I., Mudzaki, A., & Savitri, E. (2024). Leveraging Environmental, Social, and Governance Perspectives for Enhancing Marketing Strategies in Indonesia's Small to Medium Enterprises Across Digital Platforms. In *International Conference on Business, Economics, Social Sciences, and Humanities-Economics, Business and Management Track (ICOBEST-EBM 2024)* (pp. 4-26). Atlantis Press. https://doi.org/10.2991/978-94-6463-465-5_2

[25] Ooi, B. (2025, June 26). *Adopt or die? How Southeast Asian small businesses are using AI to stay competitive*. CNBC. https://www.cnbc.com/2025/06/26/southeast-asian-small-businesses-using-ai-to-stay-competitive.html

[26] Raihan, A. (2024). A review of the digitalization of the small and medium enterprises (SMEs) toward sustainability. *Global Sustainability Research*, *3*(2), 1-16. https://doi.org/10.56556/gssr.v3i2.695

[27] Rijswijk, K., Bulten, W., Klerkx, L., den Dulk, L., Dessein, J., Debruyne, L. (2020). Digital transformation: Ongoing digitisation and digitalisation processes. EU Horizons, Desira, Wageningen Univ Res., Wageningen. https://edepot.wur.nl/544951

[28] Rotsios, K., Konstantoglou, A., Folinas, D., Fotiadis, T., Hatzithomas, L., & Boutsouki, C. (2022). Evaluating the use of QR codes on food products. *Sustainability*, *14*(8), 4437. https://doi.org/10.3390/su14084437

[29] Salehi, M. (2023). The Power of IoT in ESG Data Collection and Analysis. *Social Science Research Network.* https://ssrn.com/abstract=4501798

[30] Sklavos, G., Theodossiou, G., Papanikolaou, Z., Karelakis, C., & Ragazou, K. (2024). Environmental, social, and governance-based artificial intelligence governance: Digitalizing firms' leadership and human resources management. *Sustainability*, *16*(16), 7154. https://doi.org/10.3390/su16167154

[31] Sulkowski, A. J. (2024). AI, ESG, and Law: Potential, Limitations, and Strategies Concerning Artificial Intelligence in Sustainability Reporting. *Social Science Research Network.* http://dx.doi.org/10.2139/ssrn.4972787

[32] SME Corp. (2023). Challenges in Digital Adoption. https://smecorp.gov.my/index.php/en/resources/2015-12-21-10-55-22/news/4461-challenges-in-digital-adoption

[33] The Star. (2025). SMEs in rural areas still face challenges with adopting tech**.** Retrieved from https://www.thestar.com.my/business/business-news/2025/03/24/smes-in-rural-areas-still-face-challenges-with-adopting-tech

[34] Troise, C., Corvello, V., Ghobadian, A., & O'Regan, N. (2022). How can SMEs successfully navigate VUCA environment: The role of agility in the digital transformation era. *Technological Forecasting and Social Change*, *174*, p. 121227. https://doi.org/10.1016/j.techfore.2021.121227

[35] Walton, M., & Hamilton, J. (2024). Digitalization and Competitiveness: How SMEs Can Thrive in the AI-Driven. *Research Gate.* https://www.researchgate.net/profile/Jenson-

Hamilton/publication/384443815_Digitalization_and_Competitiveness_How_SMEs_Can_Thrive_in_the_AI-_Driven/links/66f95cfc906bca2ac3d3ff69/Digitalization-and-Competitiveness-How-SMEs-Can-Thrive-in-the-AI-Driven.pdf

[36] World Bank. (2023). World Bank SME Finance: Development News, Research, Data. *World Bank*. Available online: https://www. worldbank.org/en/topic/smefinance

[37] Zeng, Q., Pan, Z., Zhang, Q., Han, T., Zheng, W., Li, J., ... & Xing, S. (2024). CSR Evolution: New Opportunities and Challenges for IoT in Advancing ESG Practices. *International Journal of Frontiers in Engineering Technology*, *6*(3). https://doi.org/10.25236/IJFET.2024.060301

[38] Zhu, C., N. Li, J. Ma, and X. Qi. 2024. CEO's Digital Technology Backgrounds and Enterprise Digital Transformation: The Mediating Effect of R&D Investment and Corporate Social Responsibility. *Corporate Social Responsibility and Environmental Management* 31, no.3: 2557–2573. https://doi.org/10.1002/csr.2704

[39] Zhu, Yixuan and Xiong, Bo. (2024). The Impact of Ai Applications on ESG in the Context of New Quality Productivity. *Social Science Research Network*. http://dx.doi.org/10.2139/ssrn.4987813

Acknowledgment

I want to sincerely thank both of my supervisors, Dr. Memiyanty Abdul Rahim, and Assoc. Prof. Dr. Nor Suziwana Tahir for their helpful advice, insightful criticism, and unwavering support during this effort. Additionally, I want to thank Universiti Teknologi MARA (UiTM) for the academic environment and resources that enabled me to complete this conceptual paper. Lastly, I want to express my gratitude to my family and friends for their unwavering understanding and support.

Funding Information

Not applicable.

Authors' Bio

Anis Farzana Zulkefli, is a PhD student in Administrative Science at Universiti Teknologi MARA (UiTM), Shah Alam. Her research centre on the adoption of ESG practices among SMEs. She has presented her work at international conferences and contributed to academic journals as well as collaborative innovation projects. Anis actively engage with both scholarly and professional communities. Passionate about sustainability, leadership, and innovation, she aspires to shape meaningful dialogue that advances responsible business practices and contributes to long-term societal well-being.

Memiyanty Hj. Abdul Rahim, FCIS (CS) (CGP), is a senior lecturer at the Faculty of Administrative Science and Policy Studies, Universiti Teknologi MARA, Shah Alam. She began her career in industry in 2000 and joined academia in 2007. She holds a PhD in Islamic Banking and Finance from the International Islamic University Malaysia (IIUM), a Master in Accountancy from UiTM, and a Bachelor of Accounting (Hons.) from IIUM. She is also professionally qualified with the Institute of Chartered Secretaries and Administrators (ICSA, UK). Her teaching covers Research Proposal, Research Methodology, Financial Decision Making, Accounting Information, and Corporate Risk Management. She actively leads research projects funded by the Ministry of Higher Education, MOTAC via Jabatan Warisan Negara, and other agencies.

Nor Suziwana Hj. Tahir (PhD), is a senior lecturer at the Faculty of Administrative Science and Policy Studies, Universiti Teknologi MARA (UiTM) Shah Alam, with nearly 24 years of academic experience. She holds a PhD from the International Islamic University Malaysia (IIUM), an MBA, a Bachelor's in Corporate Administration, and a Diploma in Banking from UiTM. She has served at UiTM campuses in Sarawak, Malacca, and currently Shah Alam. She teaches courses in corporate strategy, accountability, sustainability, leadership, and strategic management at the master's levels. Her research interests include Islamic work ethics, CSR, business ethics, management, and governance. She has supervised 11 PhD students, co-authored two books, authored one, and published in Scopus-indexed and refereed journals.