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Mediating Role of Green Knowledge Management in Improving Business Sustainability: Questionnaire Development and Validation

Nur Shaliza Sapiai[1], Hafizah Mat Nawi[1]*, Firdaus Abdul Rahman[2], Azra Ayue Abdul Rahman[3],Rogis Baker[1], T. Ramayah[4]

**Corresponding Author*

[1] Faculty of Defence Studies and Management, National Defence University of Malaysia, 57000, Kuala Lumpur ,Malaysia
[2] Faculty of Information Science,University Teknologi MARA, Cawangan Kedah , Kampus Sungai Petani, 08400 Merbok, Kedah, Malaysia
[3] Affiliation, School of Human Resource Development & Psychology,Faculty of Social Sciences & Humanities,Universiti Teknologi, Malaysia
[4] School of Management, Universiti Sains Malaysia, Minden, 11800, Penang, Malaysia

nurshaliza@uitm.edu.my , hafizah.matnawi@upnm.edu.my , firdaus396@uitm.edu.my, azraayue@utm.my, rogis@upnm.edu.my , ramayah@usm.my
Tel: 6012-5223553

Abstract

A questionnaire is developed to explore the determinants of business sustainability among women micro-entrepreneurs in the East Coast of Peninsular Malaysia. The theoretical model is underpinned by the Resource-Based View and Knowledge-Based View, where Green Knowledge Management plays a mediating role in the association between financial literacy, entrepreneurial competence, digital inclusion, governmental support, and business sustainability. A pilot survey of 116 respondents using a self-administered questionnaire was conducted. Reliability and validity were measured using Cronbach's alpha. Satisfactory reliability (α > 0.70) and sampling adequacy were confirmed in all constructs, and low-loading items were eliminated.

Keywords: Business Sustainability; Green Knowledge Management; Financial literacy; Digital Inclusion

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1.0 Introduction

1.1 Research Background

Women micro-entrepreneurs are the backbone of economic growth in developing countries, contributing to poverty reduction, community resilience, and sustainable livelihood (Yasir et al., 2021). Yet, their growth and survivability are continuously threatened by issues such as lack of financial and digital access, insufficient entrepreneurial skills, and lack of government support (Noor et al., 2024). The East

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Coast region of Peninsular Malaysia (i.e., Kelantan, Terengganu, and Pahang) provides a different social context for researching women micro-entrepreneurs. The region is predominantly more impoverished, lacks digital connectivity, and has different socio-cultural norms relative to the more developed western areas (Economic Planning Unit, 2021). In the context of global sustainability challenges, and especially in light of the United Nations Sustainable Development Goals (SDGs), it is increasingly being acknowledged that micro-entrepreneurs need to align economic objectives with environmental and social aspects in order to realize comprehensive business sustainability (Pardo Martínez & Cotte Poveda, 2022). The creation, application, sharing, storage, and retrieval of environmental and sustainability knowledge in a systematic manner has become so important that Green Knowledge Management (GKM) is now recognized as a critical organizational capability for sustaining business practices oriented towards ecological structures (Yu et al., 2022). But empirical work on GKM as a mediating mechanism that connects entrepreneurial resources and capability to sustainability performance is still rather rare, especially in the case of women-owned micro-enterprises in developing markets.

1.2 Research Problem

Despite the documented importance of women micro-entrepreneurs to economic development, there exists a significant knowledge gap regarding the specific determinants that enable these enterprises to achieve sustainable business outcomes. Prior research has examined individual factors such as financial literacy (Buchdadi et al., 2020), entrepreneurial competence (Schelfhout et al., 2016), digital inclusion (Khairuddin et al., 2021), and government support (Belas et al., 2025) in isolation. However, there is limited understanding of how these factors interact synergistically through knowledge management mechanisms to influence sustainability. Furthermore, there are very few validated tools for measuring business sustainability determinants related to women micro-entrepreneurs in Southeast Asia. A majority of the existing scales have been developed and validated in Western settings, leaving questions about their cultural applicability and psychometric robustness when used on women entrepreneurs in Malaysia.

1.3 Research Gap

This study addresses several critical gaps in the existing literature:

Theoretical Gap: While the Resource-Based View (RBV) and Knowledge-Based View (KBV) have been extensively applied to explain firm performance and competitive advantage, their integration in the context of micro-entrepreneurship sustainability, particularly regarding the mediating role of green knowledge management, remains underexplored. Prior studies have examined RBV and KBV separately (Kodua, 2019), but few have synthesized these perspectives to understand how knowledge-based resources mediate the link between tangible/intangible resources and sustainability outcomes in micro-enterprises.

Contextual Gap: Most sustainability research focuses on formal SMEs or large corporations in developed economies, with limited attention to women-led micro-enterprises in developing regions. The unique socio-economic, cultural, and institutional context of East Coast Peninsular Malaysia characterized by resource constraints, traditional gender roles, and limited digital infrastructure requires context-specific investigation.

2.0 Theoretical Reviews

2.1 Knowledge-Based View (RBV)

The Knowledge-Based View (KBV) confirms that knowledge is the most strategically important resource of a company, supporting its competitive advantage and ability to innovate (Kodua, 2019). KBV recognizes that the development, procurement, sharing, and utilization of knowledge, especially green knowledge which includes green practices and sustainable innovations, are the key facilitators of sustainable business performance. The theory presupposes that it will be especially applicable to women micro-entrepreneurs who often face resource constraints; optimal utilization of green knowledge via collaborative networks, digital networks, and learning communities will increase their sustainable innovation potential (Sarma et al., 2022).

2.2 Resource-Based View (RBV)

Meanwhile, the Resource-Based View (RBV), employed in this paper to complement the KBV, concerns the internal, physical, and intangible resources of a firm, thus creating sustainable competitive advantages (Caravaggio et al., 2025). The RBV asserts that having entrepreneurial skills, financial acumen, and network position saliently contributes to sustainability outcomes. The RBV therefore provides a strong theoretical basis that can be used for identifying and mobilizing the necessary resources that would support women micro-entrepreneurs, especially those located in underserved areas like the East Coast of Peninsular Malaysia. Such resources are critical in buffering entrepreneurs so that they can be more resilient and dynamically adjusted to market changes (Noor et al., 2024).

2.3 Business Sustainability

2.3.1 Influential Factors

The conceptual model suggested in this paper puts Green Knowledge Management (GKM) at the center of the relationship by elucidating how the antecedent variables, such as financial literacy, entrepreneurial competence, government support, and digital inclusions, can help women micro-entrepreneurs achieve sustainable livelihoods. The framework is based on the theoretical constructs and the empirical evidence in existing literature, which proves that such determinants have an impact on the acquisition, dissemination, and use of green knowledge, and consequently bring about economic, environmental, and social sustainability for micro-enterprises.

Financial literacy is revealed as a root factor that largely determines the ability of an entrepreneur to learn and utilize green knowledge. Li et al. (2024) proved that high financial literacy significantly increases the chances for farmworkers to enter non-farm jobs, enabling access and use of digital tools and financial services more readily and efficiently. Wang et al. (2025) also maintained that digital inclusive finance supports the stimulation of entrepreneurial activity and sustainable development of businesses. These results clarify the processes by which financial literacy enables women in business to manage green knowledge resources in a strategic way and make sound decisions with regards to sustainable business operations.

The GKM is further stimulated by entrepreneurial competence, which is a combination of skill acquisition, motivation, and leadership, enabling the micro-entrepreneurs to internalize, absorb, and exploit green knowledge. Belas et al. (2025) hypothesized that government support is a predictor of entrepreneurial propensity and a precursor of competence development. This ability, therefore, helps in the sharing and utilization of knowledge, transforming green knowledge into a sustainable business.

The conceptual model includes the element of digital inclusion because it embodies the extensive coverage of digital infrastructure and tools that can be used to access, spread, and use green knowledge. Li (2025) proved that digital literacy strengthens the encouragement of non-farm jobs and entrepreneurship, with social networks and trust serving as mediating variables. Chang et al. (2024) also acknowledged digital platforms as tools that restructure the ability of SMEs in the context of business model innovation with a focus on sustainability. In this way, digital inclusion is an initiator of GKM processes which speeds up the transformation of women's micro-entrepreneurial activities towards more sustainable models.

The framework is based on GKM and its five interrelated processes: acquisition, storage, sharing, application, and creation of environmental and sustainability knowledge. Caravaggio et al. (2025) offered empirical evidence that the implementation of knowledge based on digital innovation strategies facilitates sustainability outcomes. Furthermore, Sapiai et al. (2025) stressed the importance of knowledge exchange in the spread of sustainable innovation and skills within organizations. GKM facilitates decisionmakers in internalizing green practices in line with the SDGs, thus promoting holistic business sustainability. This includes economic prosperity, environmental stewardship, and social accountability in the micro-enterprise sector.

3.0 Materials and Methods

3.1 Research Design

This research aims at estimating the validity and reliability of a questionnaire in determining the effect of entrepreneurial competence, financial literacy, digital inclusion, government support, as well as green knowledge management on women entrepreneurs' business sustainability in the context of Peninsular Malaysia's East Coast region. The research is descriptive in design, with systematic collection, analyses, preparation, as well as presentation of data in a conceptual framework. The research design selected is cross-sectional because the data was collected at one point in time, with several variables measured simultaneously.

3.2 Participants of the Pilot Study

First, this pilot study utilized convenience sampling to gain a sample size of 100 women micro-entrepreneurs from the East Coast area of Peninsular Malaysia (Kelantan, Terengganu, and Pahang). Although convenience sampling is acceptable and commonly used in pilot studies for the development and validation of instruments (Hair et al., 2020), it may cause selection bias. Women entrepreneurs with higher levels of accessibility and willingness to participate may systematically differ from the population of female micro-entrepreneurs in terms of business age/stage or the extent to which they incorporate environmental/sustainability practices into their businesses. The authors noted that the potential response is more likely to be truthful when completed via self-administered questionnaires than when the question is posed during an interview (Hair et al., 2020).

3.3 Development of Measurement of Questionnaire Design

Prior to finalizing the questionnaire, the authors checked and ensured the following: the clarity of the language, whether the questionnaire bears a well-stated title, whether the questionnaire has a cover letter stating the purpose of the study and that the response is confidential, whether the overall questionnaire aligns with the research objectives, and whether the questionnaire has grammatically correct sentences, conference in the construction of sentences, words spelt correctly, no negative question, and no double-barreled questions, among others.

A 71-item questionnaire was designed to align with the research objectives. It was grouped into seven sections based on earlier studies and hypotheses. A detailed introduction of the identity of the researchers and the purpose of the study was indicated in the cover letter. Scale validation was performed in the initial phases of the development of the questionnaire. The use of questionnaires in a variety of study settings is made possible by the translation and customization of scales into several languages (Cid et al., 2022). Therefore, the questionnaire in this research was originally translated before the validity and reliability testing. Due to the dual versions, reliability and validity tests were conducted in the current investigation. The questionnaire was originally written in English, and then translated into Bahasa Malaysia Trained non-English speaking respondents had the questionnaires administered in Bahasa Malaysia. Five-point Likert scales are commonly used to evaluate the level of agreement or disagreement with a statement.

3.4 Content/Face Validation

In this research, instrument validity and reliability are highlighted to ensure its suitability for usage. Following instrument development, expert selection was guided by established criteria reflecting expertise and experience in the study area (Nor & Che, 2024). The

specialists should have relevant qualifications in terms of education and industrial experience (Isaac et al., 2022). Four (4) validators (three scholars, experts from Kementerian Pembangunan Usahawan dan Koperasi, and one senior lecturer from the entrepreneurial field) were selected to take part in the research.

Two types of validity namely face validity and content validity were also determined. Face validity measures whether the questions properly reflect a construct of interest (Isaac et al., 2022). Meanwhile, content validity reflects the applicability and accuracy of the measurement items in relation to the target constructs (Isaac et al., 2022). Construct validity should also be evaluated through the content validity of the instrument. Content validity is defined as the degree to which an instrument reflects the concept being measured (Mohd Noor et al., 2022) and it can be determined following a review by trained evaluators (Hair et al., 2020).

3.5 Scales of Measurement

Two approaches were applied in developing the measurement items in this research. Six constructs were selected based on the literature reviews. The determined constructs were then synthesized in order to be concise. Table 1 presents the results of the pilot study (EFA & Reliability analysis) along with the corresponding items.

4.0 Findings

The pilot study confirmed the reliability and validity of all the measurement constructs. The Cronbach's alpha values (0.820–0.943) exceeded the acceptable threshold, indicating strong internal consistency. The KMO values above 0.70 validated sampling adequacy, and the factor loadings above 0.60 confirmed construct validity. Refer to Table 1: Results of Pilot Study: EFA and Reliability analysis

Table 1. Results of the pilot study (EFA & Reliability analysis)

Constructs/ Label	Items	Loading	KMO	Bartlett's Test of Sphericity			Eigen Value	% of Variance	Cronbach Alpha
				Approx. Chi-Square	df	Sig.			
BUSINESS SUSTAINABILITY (Venkatraman & Nayak, 2015b)			0.749	958.479	91	<0.001	5.421	38.720	0.865
	Economic Performance								
ECOP1	My organisation is making profits.	0.858							
ECOP2	The return on my business capital is high.	0.791							
ECOP3	My business pays bonus to staff.	0.663							
ECOP4	I pay business taxes.	0.780							
ECOP5	My business is financially stable.	0.853							
	Social Performance								
SOCP1	My business pays all workers their entitlements.	0.723							
SOCP2	My business has a good employee retention rate.	0.501							
SOCP3	I communicate regularly with my employees to understand their needs and suggestions.	0.534							
SOCP4	I ensure that my employees are treated fairly and with respect.	0.873							
SOCP5	My organisation adheres to relationship monitoring with stakeholders such as customer , supplier , vendor etc.	0.725							
	Environment performance								
ENVP1	My business emphasizes on waste recycle.	0.831							
ENVP2	My business has regulations that guide our organisational waste disposal.	0.595							
ENVP3	My business emphasizes on reduction and replacement of hazardous chemical materials.	0.681							
ENVP4	I always ensure that my business does not have a negative impact on the environment.	0.526							
FINANCIAL LITERACY (Buchdadi et al., 2020)			0.827	643.659	21	<0.001	4.467	63.820	0.885
FL1	I can calculate my business income.	0.935							
FL2	I have received training on bookkeeping.	0.871							
FL3	I know the documents required to get a loan from a bank.	0.929							
FL4	I am knowledgeable and can prepare basic accounting bookkeeping.	0.833							
FL5	I have business saving account.	0.674							
FL6	I can understand how interest rates and loan payments.	0.637							
FL7	I can regularly analyze my business finances.	0.744							

ENTREPRENEURIAL COMPETENCE (Schelfhout et al., 2016)			0.741	335.414	21	<0.001	3.487	49.819	0.820
EC1	I constantly desire to do better by placing their highest regard on the quality of my own work.	0.850							
EC2	I have a free perspective on the world, and I am able to blend things across the field of interest	0.830							
EC3	I venture to do first and do not wait till others do.	0.657							
EC4	I will accept risks which were associated with my character (image and personal investments).	0775							
EC5	I am able to plan, considering both time and place.	0.722							
EC6	I can see needs and offer helps where I can.	0.717							
EC7	I am open to critism.	0.759							
GOVERNMENT SUPPORT (Yasir et al., 2021)			0.746	396.627	6	<0.001	3.250	81.251	0.921
GS1	Government and the agencies have a great contributions in terms of financial assistance to companies.	0.883							
GS2	The government consistently organizes courses related to entrepreneurial competency for companies (e.g., entrepreneurship courses, digital marketing.	0.928							
GS3	Government and its agencies supply the required technical support such as IT facilities, technologies, machine in my business.	0.923							
GS4	The government and its agencies provide business incubator to my business collaborate , share sources and make network with others.	0.870							
DIGITAL INCLUSION. (Khairuddin et al., 2021)			0.816	1313.369	66	<0.001	7.338	61.154	0.925
	Social Networking								
DISN1	I incorporate the use of ICT to reach the customers.	0.832							
DISN2	I apply ICT to reach supplier.	0.757							
DISN3	ICT assists me in searching new customers.	0.890							
	Information Search								
DIIS1	ICT helps me to get information concerning new and latest products in the market.	0.813							
DIIS2	I apply ICT to obtain knowledge on same products / services like my product / service.	0.776							
DIIS3	I rely on ICT to access information regarding business policies that are stipulated by the government.	0.726							
	E- Commerce								
DIEC1	I deploy ICT to transact financial deals online with customers/suppliers.	0.829							
DIEC2	I use ICT to buy and order essential goods for my business through online.	0.937							
DIEC3	I utilize ICT to transact online financial transactions with the government to pay taxes and so on.	0.657							
	E- Marketing								
DIEM1	I advertise business products / services through social media on the internet / web.	0.718							
DIEM2	I use social media to Advertise "live" for products / services on social media.	0.796							
DIEM3	I am a subscriber to paid advertisements in the internet of social media company.	0.867							
GREEN KNOWLEDGE MANAGEMENT. (Yu et al.,)			0.786	2089.099	136	<0.001	9.465	55.677	0.943
	Knowledge Acquisition								
GKM1	My business stimulates and promotes the employees to learn more about the environment-friendly products and processes /services.	0.804							
GKM2	My business possesses a well established information system where employees are able to access the necessary information.	0.651							

GKM3	My business obtains regularly information on environmental friendly products and processes / services provided by external parties (e.g customers and suppliers).	0.737
GKM4	My business constantly receives the information on the environment-friendly products and processes / services provided by internal stakeholders (e.g management and staff).	0.856
	Knowledge Storage	
GKM5	My business boasts a good information system to handle in terms of environment-friendly products and processes /services.	0.790
GKM6	My business is well equipped with information about our competitors and how their operations are affecting the natural environment.	0.863
GKM7	Our information system stores the best knowledge even when any individual is gone.	0.702
GKM8	Our information system has easy access to information on a particular problem.	0.891
	Knowledge Sharing	
GKM9	Individuals in my business actively communicate with one another on a regular basis to communicate on various developments concerning the environment as well as exchange knowledge.	0.863
GKM10	My business has a well structured system whereby we are able to share knowledge and learn with one another.	0.598
GKM11	My business will have offered the newest equipment and technologies to acquire and distribute the knowledge.	0.680
	Knowledge Application	
GKM12	My business has been operating within the environmental regulations.	0.791
GKM13	The knowledge that I procure through our experiences and errors is used in my business to enhance our environmental performance.	0.720
GKM14	My business applies the learned knowledge to formulate our green business strategies.	0724
	Knowledge Creation	
GKM15	My business applies the already available information to develop products and services that are friendly to the environment.	0.384
GKM16	My business partnered with other companies to produce environment-friendly products or processes/ services.	0.597
GKM17	The management values and rewards employees who came up with new ideas, knowledge and solutions.	0.675

(Source: Developed by the authors for the current study)

5.0 Discussion , Future Research and Conclusions

This study identified and confirmed the key factors influencing business sustainability among women micro-entrepreneurs in the East Coast of Peninsular Malaysia. The results provide new insights into the role of knowledge-based and resource-based elements, particularly the integration of green knowledge management in strengthening entrepreneurial practices. The methodology, operationalization of constructs, and theoretical framework used in this research provide a strong basis for future works. The results show that the multifaceted view of business sustainability takes into consideration financial literacy, entrepreneurial competence, digital inclusion, government support, and GKM.

The interdependencies between these constructs show how difficult and dynamic entrepreneurial sustainability is. Although the relevance and use of GKM, digital inclusion, financial literacy, entrepreneurial competency, and government support have been studied elsewhere, their interconnected relationship within the Malaysian framework has not been studied in detail. The results of the current pilot study indicate that these constructs tend to be valid, reliable, and applicable among women entrepreneurs. Hence, the construct validity of the existing scales.

Future research should examine the validated survey with probability samples drawn from broader and more diverse samples outside the East Coast region, utilize longitudinal or multiwave designs to mitigate common method bias, and include multisource data

(e.g., program records, customers). Future research might expand the RBV–KBV model by including moderators, and have an international comparison of women- and men-owned micro-enterprises in different regions or countries.

The results show that sustainability is a multidimensional characteristic driven by both internal and external forces. GKM in business is in line with the international need to have sustainable businesses and environmental accountability. The conceptualized theoretical underpinning empirically tested in this study could eventually be used as a yardstick to gauge the viability and sustainability of women-owned micro-enterprises in Malaysia.

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Paper Contribution to Related Field of Study

The framework has implications for policymakers, development organizations, and training agencies like TEKUN, AMANAH IKHTIAR, MARA and others in promoting interventions that could improve financial literacy, digital preparedness, and green-oriented practices among entrepreneurial populations.

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