Asian Journal of Social Science Research (e-ISSN: 2600-9706)
Volume 7, Issue 2, 2025
DOI: https://doi.org/10.5281/zenodo.18227753

5G PUBLIC AWARENESS AMONG SMEs IN MALAYSIA USING SOCIAL MEDIA ALGORITHM

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Received Date: 29/8/2025 Accepted Date: 30/11/2025 Published Date: 31/12/2025

ABSTRACT

Fifth-generation (5G) technology offers many opportunities for businesses, especially for small and medium-sized enterprises (SMEs). Yet, data indicates that the level of awareness and detailed understanding of 5G remains limited among Malaysian SMEs. Hence, this research investigates the mechanism by which social media algorithms can enhance public awareness of 5G technology within this crucial sector. We leveraged advanced data analytics to examine how personalized content on platforms such as Facebook and Instagram can be utilized to improve outreach, engagement, and education regarding practical 5G applications. Specifically, the methodology involved designing and conducting a survey to first assess current awareness levels and then evaluate the effectiveness of this algorithm-driven communication in supporting informed SME decision-making. These findings are instrumental in overcoming the knowledge gap and promoting the wider adoption of 5G technology. The paper concludes by proposing a comprehensive recommendation framework to guide SMEs in confidently embracing this transformative technology.

Keywords: 5G technology, small and medium-sized enterprises (SMEs), awareness, social media algorithms, digital adoption

INTRODUCTION

Fifth-generation (5G) technology fundamentally alters modern business operations. It provides the necessary infrastructural foundation – ultra-fast data transmission, low latency, and high capacity – to power advance digital applications that significantly boost both innovation and operational efficiency (IEEE WCNC, 2023). Importantly, 5G infrastructure is now integrating recent advancements in Optical Wireless Communication (OWC) systems, including Light Fidelity (LiFi), visible light communication (VLC), and free-space optical (FSO) links. This integration improves spectral efficiency and network reliability, making these hybrid network architectures essential for meeting the massive demand for high-speed connectivity in environments like smart cities and Industry 4.0 applications (IEEE WCNC, 2023).

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These technological gains offer significant opportunities for small and medium-sized enterprises (SMEs) to boost their digital transformation journeys. Improved connectivity directly enables SMEs to adopt essential digital economy enablers, such as real-time analytics, automation, and Internet of Things (IoT) solutions, thereby dramatically enhancing their competitiveness (Kementerian Digital Malaysia, 2024). Nevertheless, many Malaysian SMEs remain under-informed and unprepared to adopt 5G, despite these profound advancements. Several factors contribute to this lag, including inadequate infrastructure, persistent limitations in digital literacy, and continued uncertainty surrounding regulatory frameworks (Musa, Hassan, & Halim, 2023). Therefore, closing this national gap requires a concerted effort to foster 5G literacy, support digital capacity-building, and promote enabling policies that enhance SME participation in Malaysia's evolving digital ecosystem.

In the digital age, social media platforms, including Facebook and Instagram, now serve as influential tools for communication and knowledge dissemination. These channels employ sophisticated algorithms that precisely tailor content to specific user demographics, thereby creating unique opportunities for personalized and impactful engagement (Appel et al., 2020). Applied effectively, these algorithms can significantly amplify educational and outreach campaigns centered on emerging technologies, such as 5G (Dhanesh, Sriramesh, & Manohar, 2022). Despite this clear potential, a critical research gap persists: there is a lack of rigorous investigation into how these algorithmic tools can be strategically utilized to specifically address the 5G knowledge deficit among the SME sector in Malaysia.

The present study addresses this gap by examining the role of social media algorithms in raising 5G awareness and deepening understanding among Malaysian SMEs. We specifically evaluate how targeted content dissemination via platforms like Facebook and Instagram can enhance engagement and directly support informed decision-making regarding 5G adoption. Using a quantitative, survey-based approach, the research assesses the current level of 5G awareness and measures the efficacy of algorithm-driven strategies in improving educational outcomes. Ultimately, the results are intended to inform future public and private sector initiatives designed to promote broader 5G adoption, thus facilitating the transition of SMEs into a more connected and competitive digital environment.

RELATED WORKS

Fifth-generation (5G) technology is poised to significantly transform business operations, especially within small and medium-sized enterprises (SMEs), which are critical drivers of global economic development. In Malaysia, SMEs constitute a substantial 97.4% of all business establishments, which necessitates a detailed assessment of how 5G may influence their productivity, innovation capacity, and overall competitiveness (Department of Statistics Malaysia, 2022). Nevertheless, the awareness and subsequent adoption rates of 5G technology remain comparatively low among SMEs. This reluctance is largely attributable to limited access to reliable information and persistent misconceptions surrounding the technology's practical business benefits (Musa, Hassan, & Halim, 2023).

Social media has emerged as an influential platform for information dissemination and public awareness campaigns, primarily due to the effectiveness of algorithmic targeting. The sophistication of social media algorithms allows platforms such as Facebook, Instagram, and LinkedIn to deliver highly customized content based on granular user data, including demographics, interests, and past behavior. This tailored approach is instrumental in facilitating more precise and impactful outreach to specific SME audiences, ultimately enhancing engagement and communication regarding technological innovations like 5G (Abbasi et al., 2022).

Previous empirical studies have consistently underscored the effectiveness of social media in driving technology adoption. For instance, Abbasi et al. (2022) observed that Malaysian SMEs showed a more favorable response to targeted digital marketing campaigns about emerging technologies when these were delivered via personalized social media advertisements. Similarly, research conducted by Musa et al. (2023) indicates that algorithm-driven content significantly increases the likelihood of SME owners engaging with 5G-related information, thereby raising their awareness and advancing their readiness for adoption.

Despite these promising findings, a few implementation challenges persist. The persistent digital divide—particularly evident between urban and rural SMEs—and the varying levels of digital literacy among business owners often compromise the overall effectiveness of current algorithm-based outreach strategies (Musa et al., 2023). Furthermore, the credibility of information sources plays a central role in how 5G-related content is received. The same study highlights that SMEs are far more likely to engage with social media campaigns only if they perceive the content's source as trustworthy, which emphasizes the necessity of trust-building mechanisms in successful algorithmic messaging.

Therefore, the strategic deployment of social media algorithms represents a viable path toward increasing 5G awareness and understanding among Malaysian SMEs. Future research should prioritize optimizing personalization techniques and investigating trust-enhancing mechanisms to ensure that 5G-related content is disseminated effectively and widely accepted within this essential economic sector.

THEORITICAL FOUNDATION

This study adopts the Technology Acceptance Model (TAM) (Davis, 1989) as its theoretical framework to examine how social media algorithms influence Small and Medium-sized Enterprises (SMEs)' awareness of and prospective adoption of 5G technology. The intention to adopt new technology is directly shaped by two core constructs: Perceived Usefulness (PU) and Perceived Ease of Use (PEOU). In the context of this research, PEOU is defined as the owner's perception of how easily they can access and understand 5G-related information distributed via social media. On the other hand, PU captures their belief regarding the tangible benefits of 5G for business efficiency, such as streamlining supply chain management, enhancing communication, and improving remote operations

To accurately reflect the specific dynamics of social media-based communication, this research incorporates a modified TAM framework that introduces trust in information sources as a crucial mediating variable. This adjustment is essential given the established literature that underscores the importance of source credibility and reliability in shaping SME behavior toward emerging technologies. The conceptual model developed by the authors—building directly upon the foundational TAM by Davis (1989)—visually articulates the proposed relationships among trust, perceived ease of use, perceived usefulness, and the ultimate intention to adopt 5G technology.



Figure 1. Conceptual Model (Developed by Authors, based on Davis, 1989)

METHODOLOGY

RESEARCH FRAMEWORK

This study outlines the methodological framework employed for data collection, measurement, and analysis, developed in alignment with the stated research objectives. The overarching aim is to describe the design and procedural approach undertaken to effectively investigate the research questions concerning 5G technology awareness among small and medium-sized enterprises (SMEs) in Malaysia.

Given the crucial contribution of SMEs—constituting 97.4% of total business establishments in Malaysia—to the national economy (Department of Statistics Malaysia, 2022), addressing the knowledge gap surrounding 5G adoption becomes imperative. While 5G technology holds immense potential to boost the efficiency, connectivity, and competitiveness of these enterprises, current awareness and understanding of its applications remain limited (Musa et al., 2023). In response, this study seeks to evaluate the current level of awareness and assess the potential of social media algorithms to enhance targeted educational outreach and engagement with 5G-related content.

The research process is structured into four key phases, as depicted in Figure 2.
These phases include:

1. Initial Survey on 5G Awareness
2. Targeted Questionnaire Development
3. Algorithms and Platform Identification
4. Proposal of a Social Media Algorithm Model

This phased approach ensures a structured pathway from understanding current SME awareness levels to proposing an actionable solution that utilizes social media algorithms for targeted educational dissemination. By engaging with industry experts, SME

representatives, and other stakeholders throughout the process, the research remains adaptable and responsive to changing dynamics within the SME community.

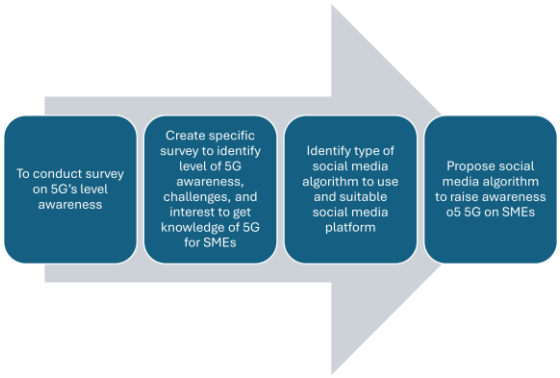


Figure 2. Research Framework (Developed by Authors)

As illustrated in Figure 2, the research process follows four distinct phases. This framework was developed by the authors to suit the specific needs of this study. Each phase—from initial awareness measurement to algorithm selection and strategic dissemination—was designed to align with the study's objectives and contextual SME dynamics in Malaysia. It guides the research from initial awareness measurement through to algorithm selection and strategic content dissemination (Figure 2.1).

The systematic framework is the backbone of the entire study, organizing the sequence of data collection, processing, and analysis to ensure that the research questions are effectively addressed. The process is strictly structured and includes the core stages of defining the research problem, conducting a comprehensive literature review, formulating hypotheses, designing the methodology, collecting and analyzing primary data, testing the hypotheses, and interpreting the findings (Scribbr, 2023).

Research designs are typically categorized as either inductive (building theories from observed facts) or deductive (testing existing theories through empirical research). While both contribute to intellectual outcomes, this study adopts a linear deductive approach.

This design was chosen to ensure methodological consistency and rigorous analysis. It began with a conceptual understanding, derived from the literature, of 5G awareness and social media algorithm application. This conceptual foundation was then systematically tested through primary data collection targeting SMEs in Malaysia. This deductive pathway ensured ethical data collection practices and led to a robust interpretation of the results.

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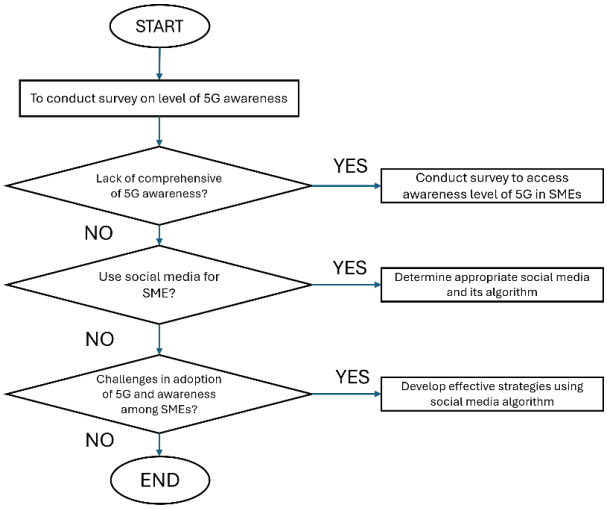


Figure 2.1 Flowchart of the research process (Developed by authors)

DATA COLLECTION AND SAMPLING

This study utilizes a structured questionnaire survey to assess 5G technology awareness and understanding among SMEs in Selangor, Malaysia. We analyzed the collected data using descriptive statistics, presenting the results via tables and charts to address the research questions effectively (Musa et al., 2023).
The survey was administered online over a 10-day period and gathered responses from 20 SME participants. These participants provided a valuable cross-section of business types, spanning service-oriented businesses (e.g., coffee shops and florists), ICT firms, e-commerce enterprises, and companies within the creative industries. This categorical diversity ensures a nuanced understanding of how 5G awareness varies across different SME sectors (Hudi et al., 2024).

MEASUREMENT INSTRUMENT

The study employed both nominal and ordinal levels of measurement. We applied nominal measurement in Section 1 to gather categorical data, such as respondent demographics (age groups, gender) and SME type, which established the demographic profile. Conversely, we utilized ordinal measurement in Sections 2 through 6, where participants rated their awareness, perceptions, and attitudes using a Likert scale. This scale is widely recognized for its effectiveness in quantifying subjective constructs like opinions and behavior in technology adoption studies (Tuan et al., 2023).

The Likert scale provided a structured framework to quantify subjective opinions, enabling a precise analysis of how these perceptions influence SMEs' use of social media for learning about and promoting emerging technologies like 5G (Hudi et al., 2024). The strategic combination of nominal and ordinal scales allowed for a comprehensive exploration of both respondent characteristics and attitudinal trends within the SME sector.

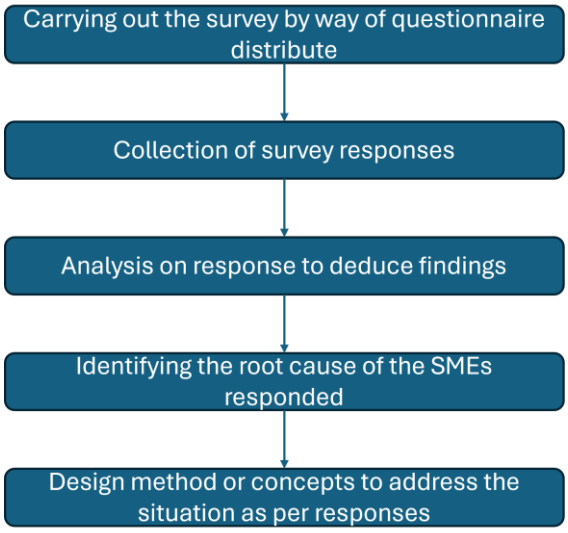


Figure 2.3 Analysis Flowchart: Survey until Addressing Method Designing

Figure 2.3 illustrates the sequential flow of analysis conducted in this study. The process begins with the questionnaire distribution, immediately followed by the collection of responses. We then analyze these responses to deduce meaningful findings. This analysis helps identify the underlying causes of the observed patterns among the surveyed SMEs. The final step involves designing targeted strategies and concepts to address issues raised by respondents, thereby ensuring the proposed solutions are both relevant and data-informed.

Table 1.1 details the structure of the questionnaire used to assess various aspects of 5G awareness among SMEs. The instrument was organized into six thematic sections, each targeting a specific variable crucial to the research objectives.

- Section 1 gathered demographic information, including age, gender, SME type, and social media usage frequency.

SECTION	ITEM
Section 1 Demographic questions	• Respondent's general information (age group, gender) • Respondent's social media usage and most-used platforms in daily life • Type of SME the respondent works in, and digital marketing platforms used for business purposes
Section 2 Awareness Questions	• Familiarity with 5G technology • Efforts made to search for 5G-related information • Self-assessed basic understanding of 5G technology
Section 3 Perceived Benefits Questions	• Belief that 5G can improve supply chain efficiency in SMEs • Belief that 5G can create job opportunities in SMEs • Belief that 5G can enhance interpersonal communication within SMEs

Section 4 Perceived Challenges Questions	• Concerns regarding the cost of implementing 5G in SMEs • Worries about limited range or signal coverage of 5G • Perception that a lack of experience with 5G is a major challenge
Section 5 Information Source and Trust Questions	• Trust in information provided by industry experts on 5G for SMEs • Reliance on social media platforms for 5G-related information • Frequency of fact-checking 5G-related information before believing it
Section 6 Interest and Engagement Question	• Interest in staying updated on 5G developments • Interest in attending webinars or workshops about 5G in SME contexts • Willingness to recommend 5G adoption to other SMEs based on personal knowledge

- Sections 2 through 6 explored more complex constructs, such as awareness of 5G technology, perceived benefits and challenges, trust in information sources, and interest in further engagement.

The design of each section was carefully guided by validated survey practices and previous literature on technology adoption. This robust structure allowed us to collect a balanced set of both descriptive and perceptual data, enabling a comprehensive analysis of SME readiness and digital behavior regarding 5G adoption.

Table 1.2 summarizes the item count for each section of the questionnaire. The design ensured that every research construct was **adequately represented**, with a minimum of three items allocated per section.

This structured distribution allowed for a rigorous assessment of each variable:

- For instance, **Section 2 (Awareness)** included three items to assess the respondent's familiarity, search behaviour, and fundamental understanding of 5G technology.

- Similarly, **Section 4 (Perceived Challenges)** specifically covered concerns related to adoption cost, potential coverage limitations, and users' lack of experience with 5G.

The structured item distribution across all sections helped maintain consistency in data collection while enabling meaningful cross-variable analysis. The questionnaire primarily utilized Likert-scale items (ordinal measurement), combined with some nominal questions, allowing the study to robustly quantify both perceptual and behavioural tendencies toward 5G and social media usage.

Table 1.2 Section of Questionnaire

Section	Question	Item Quantity	Item No.
1	Demographic Question	7	1 – 7
2	Awareness Question	3	1 – 3
3	Perceived Benefits Questions	3	1 – 3
4	Perceived Challenges Question	3	1 – 3
5	Information Source and Trust Question	3	1 – 3
6	Interest and Engagement Question	3	1 - 3

RESULTS

This final chapter presents and interprets the key results of the study, which investigated the role of social media algorithms in enhancing 5G awareness among Malaysian SMEs. The analysis is based on the 53 participant responses collected from 20 SMEs in Selangor, Malaysia.

The chapter initially provides a descriptive summary of the participants' profiles and their overall familiarity with 5G technology. We then systematically examine the main thematic results, including levels of awareness, perceived benefits and challenges, confidence in information sources, interest in further engagement, and the outcomes of the awareness campaign. These findings are subsequently synthesized and contrasted with previous research to underscore their importance and practical ramifications.

DESCRIPTIVE ANALYSIS

We obtained a total of 53 valid responses from participants across 20 SMEs in Selangor. Descriptive statistics were used to organize and analyze the data across six thematic categories: demographic characteristics, 5G awareness, perceived benefits, perceived challenges, trust in information sources, and engagement interest.

The respondents were heavily concentrated in the 18–34 age group (84.9%), with a slight majority identifying as male (56.6%). A considerable proportion of participants reported high daily social media usage, with nearly half (49.1%) spending over five hours per day on these platforms. Among these, TikTok (43.4%) and Instagram (39.6%) emerged as the most commonly used platforms for both personal and business purposes, highlighting their significance in the digital communication landscape for SMEs.

The participating SMEs represented diverse sectors, including service-oriented businesses (such as florists and coffee shops), ICT, e-commerce, and the creative industry. A striking 86.8% of respondents confirmed that their companies actively utilize social media for communication and marketing. This finding reflects a high level of existing digital engagement and strongly positions social media as a viable and effective platform for educational outreach efforts.

FINDINGS AND INTERPRETATION

5G AWARENESS LEVELS

Respondents demonstrated moderate general familiarity with 5G technology. Over half (56.6%) rated themselves as fairly or very familiar with the concept, and a significant 60.9% reported having actively sought information on 5G within the past six months. Critically, however, only 30.2% felt confident enough to explain 5G to others, which points to a clear gap in deeper technical understanding. This finding aligns with Musa et al.'s (2023) earlier reports emphasizing limited technological preparedness among Malaysian SMEs despite generalized interest.

PERCEIVED BENEFITS AND CHALLENGES

Perceptions of 5G's benefits were overwhelmingly positive. A majority of participants viewed the technology as an enabler for business efficiency: 63.4% believed it could enhance internal communication, while 62.2% saw it as a catalyst for remote job creation. Furthermore, over half (54.7%) acknowledged its potential for improving supply chain management. These views strongly reinforce the claims made in national digital policy documents (Kementerian Digital Malaysia, 2024), which position 5G as essential for SME competitiveness.

Despite recognizing the value, participants articulated several significant concerns, revealing crucial barriers to adoption. Nearly 70% (69.8%) expressed moderate to high concern over implementation costs. Other frequently cited obstacles included perceived signal or range limitations (64.1%) and a fundamental lack of technical experience or readiness within their firms (73.6%). These expressed concerns clearly mirror the adoption barriers noted in previous studies focused on underserved or rural SMEs (Razak et al., 2023; Shamsuddin et al., 2023).

TRUST AND ENGAGEMENT

Trust in information sources played a notable role in content engagement. While a majority (62.3%) indicated they trusted information originating from industry experts, 54.6% also admitted to relying on social media platforms for current updates. Encouragingly, a large portion of respondents reported actively verifying information before accepting it as accurate, which suggests a healthy level of digital literacy. This behaviour echoes Salloum et al.'s (2021) finding that credibility and trust are fundamental in shaping user behaviour around new technologies.

Respondents also showed a strong willingness for future engagement. Over seven in ten 71.1% expressed interest in staying updated on 5G developments, and 60% were open to attending educational workshops or webinars. Furthermore, a substantial 63/4% were willing to recommend 5G adoption to other SMEs, indicating a highly favourable outlook for successful, continued awareness-building initiatives.

POST-CAMPAIGN EVALUATION

CAMPAIGN IMPLEMENTATION AND IMPACT

To directly address the identified awareness gaps, the study executed a targeted Instagram campaign leveraging algorithmic features like feed prioritization and engagement boosters. The campaign delivered content tailored specifically to SME stakeholders, focusing on simplifying 5G concepts and highlighting their practical business relevance in logistics, remote operations, and communication.Following the campaign, participant feedback confirmed a notable improvement in 5G understanding. Respondents widely reported the content as clear, highly relevant, and engaging.

KEY BEHAVIORAL OUTCOMES

The interactive nature of the campaign, particularly its use of infographics and short videos, proved instrumental in sustaining attention. This format not only enhanced the learning process but also successfully encouraged social sharing and discussions within SME networks. These positive outcomes reinforce Hudi et al.'s (2024) claims regarding the power of social media engagement algorithms in business communication.

Most importantly, many participants expressed a significantly higher confidence level in explaining 5G concepts *after* the campaign. Several also indicated that they had actively shared the content with their colleagues or business networks. These clear behavioural indicators suggest a critical shift from mere passive awareness to active advocacy, a dynamic essential for technology diffusion within the SME sector.

DISCUSSION

The The findings of this study significantly advance the literature on using digital tools to promote technology adoption among SMEs. Our results confirm that while Malaysian SMEs exhibit widespread social media usage, their awareness of emerging technologies like 5G remains moderate. Crucially, the post-campaign evaluation demonstrated that this knowledge gap is not insurmountable; it can be effectively bridged through the strategic deployment of social media algorithms. The research also strongly reinforces the necessity of building user trust via credible sources and personalized content, a core principle supported by prior work (Appel et al., 2020; Shauri et al., 2023).

While the outreach campaign successfully elevated awareness, it simultaneously illuminated the key barriers hindering actual 5G adoption, notably high cost concerns and technical barriers. These findings underscore that successful awareness initiatives require pairing with tangible support mechanisms, such as financial incentives, targeted training programs, and effective policy alignment, to ensure the transition leads to meaningful adoption. Ultimately, this research stresses the imperative for a multi-faceted approach—one that integrates sophisticated digital outreach with necessary infrastructure support and institutional collaboration—to fully realize 5G's benefits for Malaysia's SME community.

Summary Table: Comparison with Literature

Key Findings from This Study	Supporting/Contrasting Literature	Remarks
High social media usage among SMEs, especially on Instagram and TikTok.	Hudi et al. (2024); Tuan et al. (2023)	Consistent with national trends showing increased social media marketing among SMEs.
Moderate awareness of 5G technology, despite frequent online engagement.	Musa et al. (2023); Shauri et al. (2023)	Supports prior findings that digital usage does not equate to technology-specific awareness.
Concerns about cost, lack of knowledge, and infrastructure as adoption barriers.	Ghazali et al. (2022); Razak et al. (2023)	Reinforces the need for targeted support and digital readiness frameworks.
Trust in credible sources (e.g., experts and government bodies) is higher than in social media.	Musa et al. (2023); Dhanesh et al. (2022)	Highlights the importance of source credibility in information dissemination strategies.
Algorithm-driven content increases engagement with 5G information.	Appel et al. (2020); Shauri et al. (2023)	Confirms that personalization improves effectiveness when raising awareness.
SMEs are willing to learn more and attend educational events if content is accessible.	Ghazali et al. (2022); Hudi et al. (2024)	Shows opportunities for webinars, e-learning, and workshops to build sustained digital engagement.
Underrepresentation of rural SMEs and non-digital sectors (e.g., agriculture, logistics).	Shamsuddin et al. (2023); Razak et al. (2023)	Suggests future studies should include more diverse SME sectors and geographic regions.

CONCLUSION

This study successfully examined the potential of social media algorithms (specifically on platforms like Instagram and TikTok) for boosting 5G awareness and understanding among Malaysian SMEs.

The findings establish a significant disparity: while SMEs are highly engaged in the digital sphere, their understanding of 5G's specific benefits and applications remains moderate. Many participants exhibited a lack of technical confidence and articulated clear concerns regarding cost and complexity.

To address this, the implemented, algorithm-driven campaign demonstrated positive, measurable outcomes: participants reported improved conceptual understanding, increased interest, and a willingness to engage further. These results confirm that algorithmic content delivery effectively bridges knowledge gaps when the content is credible, visually engaging, and highly personalized.

Furthermore, the research underscores the pivotal role of trust. Participants valued

information from credible institutions and industry experts more highly, suggesting that future outreach must deliberately incorporate these trusted sources (e.g., government agencies and technology providers) to maximize legitimacy and impact. By integrating survey data and campaign outcomes, this study provides an evidence-based strategic model for enhancing SME readiness, directly supporting Malaysia's broader digital economy agenda.

RECOMMENDATION

In light of the findings and study limitations, we propose the following actions for researchers, policymakers, and SME stakeholders:

1. **Broaden Geographic Scope:** Future research must extend outreach beyond Selangor to include rural and semi-urban regions. Addressing the inherent rural-urban digital divide is essential for equitable 5G access and adoption, requiring both infrastructural investment and targeted education (Shamsuddin et al., 2023).
2. **Adopt Multi-Platform Strategies:** Campaigns should utilize multiple platforms (e.g., TikTok, LinkedIn, and Facebook) beyond Instagram to leverage platform-specific algorithms. This strategy broadens reach and ensures content is delivered in the format most appealing to diverse demographic segments (Shauri et al., 2023).
3. **Strengthen Institutional Collaboration:** Partnerships with government agencies and industry bodies (like MCMC, SME Corp, and DNB) are crucial. Collaboration lends legitimacy, aligns efforts with national policies, and aids in developing standardized frameworks for assessing SME digital readiness (DNB, 2022).
4. **Develop Tailored Digital Literacy Programs:** We recommend structured workshops, webinars, and e-learning customized by industry type and organizational size. Practical, sector-specific training directly addresses the demonstrated lack of confidence in implementation (Ghazali et al., 2022).
5. **Utilize Mixed-Method Designs:** Future studies should integrate qualitative methods (interviews, focus groups) with quantitative surveys to gain deeper insights into adoption barriers. Integrating platform analytics (e.g., click-through rates) will further validate campaign impact (Salloum et al., 2021).
6. **Conduct Longitudinal Monitoring:** Subsequent research must employ longitudinal studies to evaluate the long-term impact of awareness campaigns. Tracking adoption pathways over time is necessary to assess whether initial interest translates into sustainable transformation and to build effective digital policies (Razak et al., 2023).

Summary Table: Recommendations for 5G Awareness Among SMEs

Recommendations	Rationale
Expand Outreach to Rural and Semi-Urban SMEs	**Address the significant digital divide** and underlying infrastructure gaps to ensure equitable access to 5G benefits (Shamsuddin et al., 2023).
Adopt Dynamic Multi-Platform Strategies	**Maximize campaign reach** by leveraging the unique algorithmic features and audience appeal of platforms like TikTok, LinkedIn, and Facebook (Shauri et al., 2023).
Collaborate with Government & Industry Bodies	**Enhance legitimacy and scale** by ensuring messaging is credible, aligns with national policy, and provides standardized readiness frameworks (DNB, 2022).
Develop Sector-Specific Digital Literacy Programs	**Boost implementation confidence** and ensure practical application by tailoring technical training based on industry type and organizational size (Ghazali et al., 2022).
Integrate Mixed-Method Research Approaches	**Obtain richer, deeper insights** into SME behavior and adoption barriers by combining quantitative surveys with qualitative data (Salloum et al., 2021).
Evaluate Campaign Impact Longitudinally	**Measure sustainable adoption and transformation** by tracking the pathway of awareness to actual implementation over an extended period (Razak et al., 2023).

ACKNOWLEDGMENT

The author thanks UNITAR International University for the support of the publication of this research

CONFLICT OF INTEREST

The authors declare no conflict of interest.

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