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Investigate The Relationship Between ICT Adoption and SME Performance with Digital Literacy Serving as A Mediator Variable Using TOE Framework

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Abstract

The current study investigates the relationship Information Communication Technology (ICT) and social media adoption, with Small Medium Enterprise (SME) performance in West Java, Indonesia, utilizing digital literacy as a mediator variable. The Technology-Organization-Environment (TOE) paradigm was utilized in conjunction with Diffusion of Innovation (DOI) theory to evaluate the impact of nine technological, organizational, and environmental features on ICT adoption. To collect data, an online questionnaire was distributed to 396 small business owners, executives, and supervisors in West Java, and the results were analyzed using Partial Least Squares Structural Equation Modeling. According to the findings, organizational and contextual variables had a substantial impact on both ICT acceptance as well as digital literacy, but technological factors only influenced ICT adoption. The study found that ICT usage improves SME performance both directly and indirectly through the mediation of digital literacy. The study broadens the TOE framework by incorporating previously underutilized factors like interactivity, visibility, and the bandwagon effect, while also providing empirical evidence of digital literacy's critical role in improving the relationship between technology adoption and business performance. These findings provide useful insights for SME stakeholders in emerging economies looking to capitalize on digital transformation for a competitive advantage, emphasizing the significance of complete digital literacy development alongside technology adoption efforts.

Keywords: ICT Adoption, Digital Literacy, SME performance, TOE Framework, West Java, Digital transformation

Abstrak

Studi terkini menyelidiki hubungan Teknologi Informasi Komunikasi (TIK) dan adopsi media sosial, dengan kinerja Usaha Kecil Menengah (UKM) di Jawa Barat, Indonesia, menggunakan literasi digital sebagai variabel mediator. Paradigma Teknologi-Organisasi-Lingkungan (TOE) digunakan bersama dengan teori Difusi Inovasi (DOI) untuk mengevaluasi dampak sembilan fitur teknologi, organisasi, dan lingkungan pada adopsi TIK. Untuk mengumpulkan data, kuesioner daring didistribusikan kepada 396 pemilik usaha kecil, eksekutif, dan supervisor di Jawa Barat, dan hasilnya dianalisis menggunakan Pemodelan Persamaan Struktural Kuadrat Terkecil Parsial. Menurut temuan, variabel organisasi dan kontekstual memiliki dampak substansial pada penerimaan TIK maupun literasi digital, tetapi faktor teknologi hanya memengaruhi adopsi TIK. Studi ini menemukan bahwa penggunaan TIK meningkatkan kinerja UKM baik secara langsung maupun tidak langsung melalui mediasi literasi digital. Studi ini memperluas kerangka kerja TOE dengan menggabungkan faktor-faktor yang sebelumnya kurang dimanfaatkan seperti interaktivitas, visibilitas, dan efek ikut-ikutan, sekaligus memberikan bukti empiris tentang peran penting literasi digital dalam meningkatkan hubungan antara adopsi teknologi dan kinerja bisnis. Temuan ini memberikan wawasan bermanfaat bagi para pemangku kepentingan UKM di negara-negara berkembang yang ingin memanfaatkan transformasi digital untuk keunggulan kompetitif, sekaligus menekankan pentingnya pengembangan literasi digital yang menyeluruh di samping upaya adopsi teknologi.

Kata Kunci: Adopsi TIK, Literasi Digital, Kinerja UKM, Kerangka Kerja TOE, Jawa Barat, Transformasi Digital

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INTRODUCTION

Digital transformation, using creative ways such as e-commerce, data-driven decision making, collaboration, and improving customer experience, can help Indonesian SMEs overcome challenges and capitalize on digital opportunities. This method contributes significantly to the competitiveness, expansion, and sustainability of SMEs enterprises (Muhammad, A. S., Adalier, A., & Adeshola, 2025). SMEs must invest in technological innovation to increase competitiveness, market share, and efficiency in operation (Lewandowska et al., 2021). SMEs can meet global problems, react to change, and achieve long-term business growth by implementing the appropriate digitization strategy (Kraus et al., 2021). SMEs must develop digital literacy and use information technology especially social media to strengthen their company strategy (Rafieq et al., 2024). The perception of SMEs as being essential to China's economic development has long existed (Yu, 2001). The survival and expansion of SMEs contribute to the generation of wealth and jobs in the economy. Small enterprises play an important role in every country. The utilization of information communication technology especially social media will provide new chances for small enterprises in both developed and developing countries. Small enterprises that can efficiently employ information systems can develop to be extremely profitable (Qureshi & Kang, 2015). Small and medium-sized firms (SMEs) play an important role in the Indonesian economy, accounting for more than 60% of GDP and employing over 97 percent of the population. However, since 2020, SMEs have encountered a number of more complex challenges as a result of global turmoil, the COVID-19 pandemic, and rapid technology advancement (Khalil et al., 2022). To figure out why SMEs in Indonesia frequently do improperly, we need to consider several important conditions. Many small and medium-sized businesses have problems acquiring capital. Banks and financial institutions are frequently hesitant to extend credit to SMEs because they are perceived to be risky and without protection (Ghulam et al., 2025).

SMEs' manufacturing and effectiveness decrease as the result of a shortage of modern technology and creative company strategies. Many SMEs continuing to use old methods and do not have educated and competent personnel, that are becoming less competitive in today's market (Kumar et al., 2024). Financial and limitations on resources prohibit many SMEs to addressing personnel education and professional growth (Iyelolu et al., 2024; Sutanto et al., 2023). SMEs have to compete with bigger enterprises that have larger assets and have the ability for reduced prices than fight for survival and development as consequence of the strong rivalry (Raji et al., 2023; Diana et al., 2020). SMEs' productivity decreases as an effect of their use of obsolete technologies. The use of innovative technologies can have significant effects on a country's multiple sectors, especially its economic progress and growth (Juniarti & Omar, 2021). Small and medium-sized businesses have to incorporate technology into their everyday activities. Technology can be defined as a capital investment in a business that seeks to gain a competitive edge. Utilization of technology could offer firms with a benefit over others in the industry (Andaregie & Astatkie, 2022). Difficult licenses and authorization procedures, as well as excessive paperwork, may hinder SMEs' capability to run their businesses efficiently. This increases the cost of operations and expands the amount of time required for establishing or growing a business (Achmad et al., 2023). Digital innovations drive companies and entrepreneurs to re-evaluate their organizational systems. A lot of organizations show how they use digital tools to gain advantages over others in several different sectors (Mubarak, et., 2019). SMEs must create internal digital skills for reacting quickly to competitor innovations, and efficiently promote creative thinking and revenue in an expanding dynamically challenged world (Radicic & Petković, 2023).

Numerous studies have been conducted to investigate the deployment and use of social media (SM) from a business-consumer perspective. The researchers, for example, evaluated the effects of social media on customer purchasing choices (Sohn & Kim, 2020), in addition to how it impacts on advertisement for

brands, positioning as well as and electronic commerce (Melović et al., 2020). Regarding the important consequences and obvious relevance for SMEs, there's not as much data concerning how SMEs adopt, select, or use SM platforms (Qalati, Li, et al., 2021). Several investigations have explored the adoption and exploitation of social media to improve management in firms, as well as the impact on company performance (Garg et al., 2020). SM can assist SMEs due to its inexpensive price and simplicity of use, and it has also proved the ability to help SMEs reach a large number of clients. But the acceptance and utilization of social media has grew; digital security considerations represent particularly highly sensitive in Indonesia because numerous buyers are inexperienced with businesses that operate online (Adha, 2022). Although citizens' anxiety, state oversight of e-commerce is prevalent in Indonesia (Khairunnisa & Jamiat, 2021). Nonetheless, despite a shortage of studies on SM use by SMEs in nations with limited resources, such as Indonesia. SMEs and commercial marketing academics are putting greater emphasis on the elements and the surroundings that dictate how SMEs get impacted by SM impacts (Dwivedi et al., 2023).

Even though ICT and SM adoption have an excellent opportunity to improve SMEs' performance, a lack of digital literacy among players in the sector represents a significant obstacle. Digital literacy, which involves a willingness to proficiently use, comprehend, and uses technology, is essential to determining that technology adoption is properly implemented. SMEs without suitable digital literacy could be difficult to take complete advantage on all the advantages of the technology that they use, constraining growth in performance (Milenkova et al., 2020). A lot of previous research has centered on the advantages of ICT adoption in increasing company productivity in general, while there currently is a shortage of research that specially investigates the purpose of digital literacy as a moderating variable in the SMEs context. As an example, Youssef et al. (2022) despite the fact that the study is limited to the education sector and is not intended at SMEs, it was shown that digital skills have a significant impact on student academic achievement. Milenkova and Peicheva (2020) did a further investigation that emphasized the importance of digital literacy, however at this point researchers addressed media literacy in social environments opposed to technology adoption in business.

This study initiatives to enhance our insight of how ICT and SM adoption can be achieved and realizable at the SME level, and it also investigates determining components within the framework of the technology-organization-environmental (TOE) model. Qalati (2021)defined TOE framework as a combination of three (technological, organizational, and environmental) aspects. The technology construct means current and future technologies that are suitable for a company. Organizational construct relates to the many different characteristics of organizations, especially their categories, scale, level of management, and other related issues. Environmental means the conditions that exists as organizations function, referring to governments, businesses, and competing companies. As consequence, there is a significant investigation gap in figuring out how digital literacy impacts the relation between ICT and SM use and expanded SMEs performance. This inquiry intends to bridge this gap by exploring the importance of digital literacy in boosting the positive effects of ICT adoption on the performance of SMEs (Tamrin, 2023). This investigation is anticipated to offer an important fundamental reference to previously relevant research, in addition to providing practical guidance for stakeholders for developing successful digitisation tactics for SMEs.. So, the main objective of the current study is to analyze the relationship among ICT and SM adoption and SME performance, with digital literacy standing the role of mediator.

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LITERATURE REVIEW

Current State of SMEs

Currently, SMEs situations globally are facing several kinds of issues. Previous investigation into SMEs started around 2015, and this the previous year's investigation uses Facebook as a platform for improving SMEs performances. Based on the study, Facebook improves SMEs increase their both financial and non-financial performance. Compatibility, effectiveness, and interaction are all important variables. Online social networking sites have been demonstrated found to strengthen the connection among dynamic talents and technological advances (Tortora et al., 2021). Social networking site engagement showed a beneficial impact on both monetary and non-monetary achievement, however awareness of its beneficial effects among SMEs remains poor (Daowd et al., 2021). Though use of social media increases web traffic, it has relatively a small impact on purchases and transactions. Larger campaigns, especially on Facebook, are more efficient.Online marketing is more efficient for premiums, complicated items like the iPhone than for lower-end, less complicated products such as toys (Dolega et al., 2021). Taking advantage of innovative technology can significantly enhance the effectiveness and efficiency in entrepreneurship organizations, especially when used by lower-income companies. But financial constraints and prohibited accessibility to technology cause important barriers (Neumeyer et al., 2021). Digital transformation increases competitive edge but does not enhance performance. Innovation and innovative business strategies enhance both performance and competitive edge. Competitive edge increases performance (Adisaksana, 2022).

Business strategy, employee resources, information technology, goods, advertisement, collaboration and corporate social responsibility (CSR) are the seven most significant aspects for SMEs that provide a competitive advantage (Jatmiko et al., 2021). When SMEs lack this, the outcomes show poor competitiveness among SMEs, that is caused by general problems such as poor management, a lack of strategic planning, and poor control of inventories (Navarro et al., 2020). Indonesian SMEs are trying to maintain their competitive edge as a consequence of technological advances. Numerous investigations looked explored how digitalization can help SMEs get clients, create prestige, and enhance customer satisfaction (Navarro et al., 2020). Limited funds are just some of the current challenges facing SMEs. Many SMEs strain to fund their adoption of digital technology. There is a lack of competent employees with digital abilities. Cybersecurity problems, data security concerns, and potential of cyber attacks. Consumer buying habits changes, while companies have no ability to rapidly adjust to directing client expectations (Cueto et al., 2022). Small and medium-sized enterprises (SMEs) rely heavily on technology. ICT is intended to promote digitalization and create a technological environment that can assist developing-country SMEs in becoming more competitive and sustainable (Das et al., 2020). SMEs in Indonesia needs to embrace digital transformation as a way to stay competitive, improve their presence in the market, and improve efficiency in operations. SMEs confront various obstacles, including: lack of cash, digital literacy, accessibility to science and technology, and knowledge security (Sri Hariyanti, 2024a).

Technological Construct

The use of information and communication technology, or ICT, has become essential in many areas of daily life throughout the modern age of digitization, namely businesses, governance, educational institutions, and others. Putting digital technology within every element of an organization, or digitalization, improves innovation, efficiency, and greater competitiveness in in addition to accelerating procedures for operations (Yuwono et al., 2024). However, there is concern about how this technology will be adopted, particularly in underdeveloped countries or with small and medium-sized firms. Small

and medium-sized enterprises (SMEs) constitute the core of the Indonesian economy, contributing significantly to employment and economic growth. But lots of SMEs struggle diminished competitiveness, poor productivity, and low performance as the result of many kinds of difficulties such as lack ability to access technology, weak management skills, and a lack of financial capital. The study suggests a systematic strategy to addressing these issues and improving the overall performance of SMEs in West Java, Indonesia. SMEs lack financial and human resources, but they gain from key organizational structures and their ability to adjust quickly to market advancements (Redd et al., 2020). SMEs tend to be more conservative in their creativity less geared toward exports than big SMEs (Dolega et al., 2021).

Previous research has investigated many technological variables that affect SM adoption, such relative advantage (Alkateeb & Abdalla, 2021), complication (Ebrahim, 2020), perceived value (Abed, 2020), and interaction (Adamantia et al, 2020). Regarding the components of the technical construct, earlier studies based on diffusion of innovation (DOI) theory have typically emphasized competitive advantage and cost-effectiveness as reasonable predictors of acceptance of technology (Pateli et al., 2020). The current investigation used five technology factors (compatibility, interactivity, relative advantage, visibility, and cost-effectiveness).

H1a. Technological construct strongly impacts ICT and SM adoption in SMEs.

H1b. Technological construct strongly impacts Digital Literacy in SMEs.

Organizational Construct

Organizational aspects are correlated with any organization's internal features, including size, centralized or formalizing of operations, employment, and managerial concerns (Markard, 2020). Regardless of the advantageous effects of information technology, businesses need to determine if their capacities and assets are suitable to facilitate its adoption (Raji et al., 2023). Considering the advantages of IT, organizations have to consider if their abilities and assets are suitable for allowing SM adoption (Abed, 2020). Furthermore accordance with previous studies, management support has traditionally been employed to symbolize the TOE framework's organizational construct. Based on Reference, managerial support is the owner/manager's approval to adopt a project, regulations, or transition inside the organization. In a similar way, it should be mentioned that the adoption of IT-based solutions in SMEs is mostly affected by managerial levels, which make many decisions ranging from day-to-day operations to investment opportunities (Pateli et al., 2020; Georgios et al., 2023).

H2 a Organizational considerations have a considerable impact on SMEs' utilization of ICT and SM.

H2 b Organizational characteristics have a big impact on digital literacy.

Environment Construct

Environmental constructs involve markets and variables starting from the company external surroundings. Environment features many characteristics, such pressure from competitors, regulation support, pressure from outside, intense competition, bandwagon effect, customer strain, unpredictability, and pressure from organizations (Raji et al., 2023); Adade & Vries, 2025). According to previous studies, the pressure to compete, extent, and the bandwagon influence had been employed to explain the environmental component of the TOE model in the surroundings of SMEs. Competitive intensity generally occurs when a company has lots of competitors in the sector but only a small amount of potential for growth within the sector (Abdullahi & Ajulo, 2023). Competitive pressure is defined as the amount of tension felt by competitors in the same industry/market as the business. In respect to SMEs, it says that the bigger the number of enterprises competing, the more innovations are expected to be generated and established (Maroufkhani et al., 2020). The bandwagon effect was commonly referred to the infection

effect. This is a phrase from psychological which suggests that firms/individuals can participate in certain activities, such as integrating innovative technologies, whenever their competitors/colleagues are undertaking so, instead of working for strategic goals (Sunali et al., 2022).

H3 a. Environmental factors significantly influence SMEs' adoption of ICT and SM.

H3 b. Environmental factors significantly influence Digital Literacy.

SMEs Adoption ICT and SMEs Performance

Adoption technology is a procedure that helps individuals or companies adopt emerging technologies within their business processes or daily activities. This includes examining, determining, and executing technologies that increase effectiveness, productivity, or competitiveness (Ghobakhloo & Ching, 2019). The use of ICT has been a prominent focus in many study domains, owing to its enormous impact on organizational performance, particularly in SMEs. Computers, the internet, management software, and other digital platforms are examples of ICT. SMEs' adoption of ICT is viewed as a strategic move toward enhancing efficiency, productivity, and competitiveness in an increasingly competitive global market (Das et al., 2020). The adoption process can be affected by numerous triggers including technological innovations characteristics, capacity for organization, and constraints from the environment. As an illustration, SMEs with greater information requirements for processing are more probable to implement Smart Manufacturing Digital Technologies (SMIDT) to improve their operating skills (Putri & Iffan, 2024).

To ensure the continuing existence of SMEs in Indonesia, the need is important to improve their digital infrastructure, organizational ability and technological capabilities because they greatly increase SMEs' performance. However, obstacles including lack of funding and lack of technological knowledge limit its effectiveness (Abdillah, 2023). In this situation, coaching enhances transfer of information, education, and improvement of abilities by creating confidence in digital technologies. To take advantage of on digital innovation, SMEs need to participate in continual regional mentoring (Ollerenshaw et al., 2021). For achieving satisfying results, multiskill, multitasking retraining and fresh technological tools are needed addition to soft abilities education and employment development (Vedhathiri, 2020).

Digital technology could assist SMEs operating with greater responsibility and in alignment with Green Economy concepts, however not all are ready to implement the change (Astadi et al., 2022). Additional components are required to help expedite the adoption of new technologies. This requires strong digital literacy skills. Digital literacy provides an essential effect on user conduct and requirements, and this in effect strengthens their capacity to apply digital tools and perform jobs with greater efficiency (Mohammadyari & Singh, 2015; Alexandro & Alexandro, 2025). The key factor determining the implementation of advanced information and digital technology is the creation of a roadmap of strategy to industrial digitalization. Other essential factors including information storage specifications, perceived expense, perceived benefit, perceived compatibility, and information technology and digital knowledge skill. Recognizing utilize through digital literacy fosters the utilization of digital technologies (Ghobakhloo & Ching, 2019).

There are several reasons for social networking, the most frequent and powerful among them is a type of internet-powered apps that are predicated on the technology and conceptual foundations of Web 2.0 and promote the production and publication of content provided by users (Dimitris et al., 2021). Today's social media trends influence how businesses and individuals connect with one another. When effectively implemented, SM helps firms to create advances in many various types of operations, such as global company operations, competitive efficiency, retention of clients and satisfaction, and international connections. (Solomon et al., 2023), sharing of information, managing communications, partnerships, and supplies chain logistics (Cao et al., 2018). SMEs' performance is strongly related to many different kinds

supported variables. According to Qalati (2021), there are many different indicators of SME performance. Technology is anticipated to improve customer relationships, service quality, customer engagement, company/brand publicity and reputation, loyalty and retention of clients, satisfaction with service, awareness, and market penetration. Besides to the challenges of limited access to advanced technology and digital devices, SMEs have other challenges, including lacking managerial skills and business experience, having trouble accessing markets and consumers monetary limitations and limited funding, and regulatory and governmental barriers (Firmansyah et al., 2022).

H5. The performance of SMEs is significantly impacted by ICT and SM adoption.

H5a. The association between the performance of SMEs and the adoption of Technology Construct is mediated by ICT and SM adoption.

H5b. The relationship between the performance of SMEs and the adoption of organizational constructs is mediated by ICT and SM adoption..

H5c The relationship between the performance of SMEs and the adoption environment construct is mediated by ICT and SM adoption.

Digital Literacy and SMEs Performance

The ability to successfully and rationally comprehend, use, and apply knowledge gleaned from various digital sources is known as digital literacy. This capability involves technological abilities for controlling technological devices, analytical skills in assessing information, and an awareness of ethics for engaging with the internet (Putri & Iffan, 2024). It dealt with the potential as well as the difficulties of growing disparities and new issues. In addition to having varying degrees of technological literacy, people of different ages, occupations, and geographic locations likewise differ in their access to, usage of, and aptitude for utilizing electronic devices and the internet. (Milenkova et al., 2020). Digital skills were an assess of society growth, population ability, and capacity to face new challenges in the environment of society evolution (K. Y. Li, 2020). Digital skills were a significant component of fundamental capabilities. Everyone needs to possess an appropriate quantity of technology capabilities in order to successfully participate in social life and their jobs. Because the internet is a critical component of what we do every day, the majority of individuals have a connection with it as a way to take benefit from online services, instruction, communication, and information prospects (Nikou et al., 2022).

Other issues involve obstacles to organization, such as lacking financial resources, lack of leadership support, an inability to respond to change, and lack of facilities, technical obstacles due to a shortage of knowledge: SMEs ponder to adopt advanced technology products and services, such as Enterprise Resource Planning (ERP) technology innovations and artificial intelligence, and regulatory obstacles related to a lack of collaboration as well as integration within leadership and divisions (Chatterjee et al., 2022). Many initiatives have already been implemented to support SMEs, including governmental initiatives and independent business behaviors. But these treatments commonly lack coordination and unable to deal with the different kinds of SMEs challenges (Arianto, 2021).

H6. The performance of SMEs is significantly impacted by digital literacy.

H6a. The relationship between SMEs' performance and technology construct is mediated by digital literacy.

H6b. The relationship between the performance of SMEs and organizational construct is mediated by digital literacy.

H6c. The relationship between the performance of SMEs and the environment is mediated by digital literacy.

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H7. The relationship between ICT use and SM, and SMEs' performance is mediated by digital literacy.

RESEARCH METHOD

Sampling and data collection

A quantitative method is employed in this work to ascertain the proposed relationships. The study employed a non-probability sampling technique, namely a convenient one. The investigation's sample represents small and medium-sized enterprises from West Java, Indonesia. West Java is a barometer for the Indonesian economy (Saputri et al., 2020). West Java is also a hub for fashion and culinary artisans (Tamyiz et al., 2019). In addition, comfortable sampling is frequently implemented because it is simpler and less costly when capturing data from a large sample. The participants in the current investigation were executives or managers who were considered to be highly competent about the performance of their company and conditions (Qalati et al., 2020). As previously mentioned, the study selected participants at random; nevertheless, considering the SMEs' cultural background and organizational structure (W. Li et al., 2022). This study used proportional random sampling methods. Samples were collected proportional to the amount of staff members in the firm. In this study, the sample size was determined by multiplying the number of indicators in the model by ten (10) (Hair et al., 2022). The model in this study has 29 indicators, so the required sample size is 290. SEM requires a large sample size to ensure stable and valid parameter estimation results (Ghaleb & Ya, 2024). A sample size greater than 200 is considered adequate for complex models, but a larger sample size (>300) provides more robust results. Krejcie & Morgan (1970) suggested that for a population of 63,480 (>50,000), a sample size of approximately 382 respondents is sufficient for a 5% margin of error at a 95% confidence level. Based on the justification above, this study will use a sample size of 396.

The research instrument was a structured questionnaire developed from construct indicators that have been theoretically validated in prior studies. Measurement was conducted using a five-point Likert scale, ranging from 1 (strongly disagree) to 5 (strongly agree), to capture the intensity of respondents' attitudes toward the statements. Instrument validity was tested through convergent validity (factor loadings and Average Variance Extracted/AVE) and discriminant validity (Fornell-Larcker Criterion and Heterotrait-Monotrait Ratio/HTMT). Construct reliability was assessed using Composite Reliability (CR) and Cronbach's Alpha, with threshold values of ≥ 0.70 as an indicator of internal consistency (Hair et al., 2019; Henseler et al., 2015).

The choice of PLS-SEM is justified by several methodological considerations. First, PLS-SEM is suitable for research with complex conceptual models involving multiple latent variables and indicators. Second, PLS-SEM can address limitations related to relatively small sample sizes and non-normal data distributions. Third, PLS-SEM is prediction-oriented, providing better explanatory power for the variance of dependent variables. This consideration is consistent with methodological guidelines provided by Hair et al. (2022), which emphasize that PLS-SEM is effective for both exploratory research and theory development.

Respondents information

According to Table 1, the survey captured responses from 396 individuals, with males constituting 59% and females 41%. The age distribution showed that the largest segment (46%) fell within the 36–55-year bracket, while educational attainment data indicated that 55% held undergraduate. In terms of professional roles, executive represented the predominant category at 56%. In terms of business size,

slightly over half of small and medium-sized businesses (85%) employed less than 10 staff members. Social media engagement metrics revealed limited utilization, with 32% of respondents reporting minimal social media activity and an overwhelming majority (66%) dedicating less than 25% of their resources to social media initiatives. Tik Tok emerged as the preferred social media platform for 32% of SMEs, serving as their primary channel for product and service promotion and customer engagement.

Tabel 1. Descriptive statistics

		Frequency	Percentage
Gender	Male	164	41
	Female	232	59
Age (years)	Less than 25	37	9
	26-35	126	32
	36-45	183	46
	Over 50	50	12
Education	High School	232	55
	Undergraduate	155	39
	Master's	7	2
	Other	18	4
Position	Owner	136	34
	Executive	222	56
	Manager	38	10
No. of employees	Less than 10	336	85
	11–50	60	15
	51–250	0	0
Industry sector	Fashion	246	62
	Food	150	38
Firms' use of ICT and social media	Minimum	125	32
	Basic	94	24
	Moderate	90	23
	Extensive	87	22
Use of ICT and social media as a marketing technique	Minimal	22	6
	Little	46	12
	A lot	124	31
	Extensive	204	52
Fund provided	Less than 25%	262	66
	26–50%	112	28
	Over 50%	22	6
Social media platform used	Facebook	76	19
	Instagram	112	28
	Tik Tok	125	32
	WhatsApp	43	11
	YouTube	32	8
	Other	8	2

Resource: online questionnaire

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Measures

To collect participant responses, the study used five-point Likert scales, with 1 denoting "strongly disagree" and 5 denoting "strongly agree." Two items for relative advantage were included in the measurements for the technical construct (Ahmad et al., 2019). Two items for cost-effectiveness (Odoom et al., 2017). The organizational construct was evaluated using four managerial support items derived (Ahmad et al., 2019). Environmental factors were assessed through five items (Ahmad et al., 2019). Four items were used to test digital literacy (Putri & Iffan, 2024). Four items were used to measure the adoption of ICT and social media (Parveen et al., 2016), while SME performance was evaluated through eight items (Tajudeen et al., 2018; Cao et al., 2018), according to Table 2.

Table 2. Measurement model

Construct	Item code	Loading	CA	CR	AVE
Technological	"TC1 ICT and social networks enable us to increase our productivity."	0.765	0.833	0.889	0.666
	"TC2 We use ICT and online platforms to decrease the expense of commercial activity. "	0.831			
	"TC3 ICT and online social networking usage are suitable with our company's methods and activities."	0.864			
	"TC4 ICT and online platforms allow us to promote our newest offering. "	0.802			
Organizational	"OC1 My organization's top management is interested in implementing social networking sites and ICT."	0.855	0.821	0.882	0.652
	"OC2 My organization's top management believes that ICT and online social networking adoption are vital."	0.769			
	"OC3 My organization's top management supports the deployment of ICT and social networking platforms."	0.851			
	"OC4 Top management prioritizes research and development, leadership in technology, and advancements."	0.749			
Environmental	"EV1 There is competitiveness between the companies in the field that and my company is currently operating in intense"	0.799	0.867	0.904	0.653
	"EV2 ICT and Social media could offer the firm better advantages in competition"	0.787			
	"EV3 ICT and Social media could enable the firm to achieve bigger profits"	0.830			
	"EV4 ICT and online social networking is a famous app; so, our company wishes to use it as well. "	0.832			
	"EV5 We decided to use ICT and online platforms when many other firms are already using them"	0.789			

ICT and SM adoption	"AD1 Communicate and advertise the goods or services."	0.855	0.881	0.918	0.737
	"AD2 Offer services for consumers."	0.832			
	"AD3 Reach new customers"	0.861			
	"AD4 Search for general information"	0.885			
Digital Literacy	"DL1 Has the capability to use digital devices".	0.859	0.921	0.944	0.809
	"DL2 Possess the intelligence to manage data from numerous digital sources"	0.914			
	"DL3 Possess the ability to control technical devices"	0.908			
	"DL4 Have analytical skills for evaluating information and ethics when using the internet"	0.916			
SMEs' performance	"PI1 Enhanced relations with clients"	0.844	0.929	0.942	0.669
	"PI2 Enhanced quality of service."	0.835			
	"PI3 Enhanced client involvement"	0.866			
	"PI4 Enhanced company/brand exposure and repute"	0.828			
	"P5 Improved consumer loyalty as well as retention."	0.744			
	"PI6 The adoption of ICT and SM has increased our company's revenue significantly."	0.812			
	"PI7 Increase company profits"	0.795			
	"PI8 increases market reach more widely"	0.815			

Resource: Smart PLS

RESULTS AND DISCUSSION

To analyze the proposed model and evaluate the mediating effects of social media adoption, the current study used PLS-SEM variance-based techniques through SmartPLS v.3.2.9 software. With its user-friendly graphical user interface, SmartPLS 3.0 is a comprehensive software package that has shown significant effect in the field for conducting PLS-SEM analysis. Detailed connections between latent and observable structures can be specified thanks to this analytical framework. PLS-SEM, also known as route modeling, has become a well-known prediction method that has attracted a lot of interest lately from a variety of interdisciplinary domains, such as the fields of environmental science, geographical areas, the natural world, psychological research, and farming. (Qalati et al., 2020; C. Li et al., 2020; W. Li et al., 2022). Additionally, this study examined how social media adoption acts as a mediator. (Matthews et al., 2018). The PLS-SEM methodological framework follows a methodical two-phase process, first assessing the measurement model and then examining the structural model. (Joe F et al., 2018; Khan et al., 2020).

Assessment of the measurement model According

Ref asserts that internal consistency, content validity, convergent validity, discriminant validity, and individual item reliability are all essential elements of model assessment (Matthews et al., 2018; Joe F et al., 2018). The outer loadings of items linked to particular dimensions were used to measure the reliability of each individual item. As recommended by, acceptable values range between 0.40 and 0.70; notably, all values in the current investigation exceeded 0.5 (Table 2). Regarding internal consistency, Ref requires

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Cronbach's alpha coefficients to be greater than 0.7; in this study, threshold values for all constructs varied from 0.821 to 0.929. Additionally, the evaluation of internal consistency reliability requires composite reliability (CR) values of at least 0.7; in this investigation, the CR coefficient values ranged from 0.882 to 0.944 (Table 2). For validity of convergence, Ref indicates that the average variance extracted (AVE) should be at least 0.5; the AVE values that were found in this study varied from 0.652 to 0.809, indicating sufficient convergent validity (Table 2). Regarding the validity of discriminants, Ref argues that each construct's square root of AVE should be greater than its correlations with other model components (Matthews et al., 2018; Cohen, 1992). Discriminant validity in the results is empirically confirmed in Table 3.

Table 3. Discriminant validity

Construct	1	2	3	4	5	6
ICT and SM adoption	0.858					
Digital Literacy	0.675	0.899				
Environment	0.630	0.763	0.808			
Organizational	0.623	0.721	0.747	0.807		
SMEs Performance	0.592	0.764	0.703	0.653	0.818	
Technology	0.453	0.482	0.547	0.552	0.427	0.816

Resource: Smart PLS

Evaluation of the structural model

Variance inflation factor (VIF) methodology was used to identify any common method bias (CMB) prior to structural model analysis. The VIF values varied from 1.528 to 2.625, as shown in Table 4, which is much less than the set threshold of 9, thereby confirming that CMB does not constitute a significant concern in this investigation (Khan et al., 2020; Joe F et al., 2018). Following CMB verification, the research implemented a partial-least-square bootstrapping technique utilizing 500 iterations across 396 cases drawn from the SME sample to evaluate the hypothesized relationships based on established statistical criteria (t-value ≥1.96 and p-value <0.05). Except for hypotheses H1b, H5a, and H6a, the empirical data shows that the Technology-Organization-Environment (TOE) dimensions had a substantial impact on ICT and social media adoption, digital literacy, and SME performance (Table 4). We then evaluated the coefficient of determination (R2) values. TOE factors accounted for 45.4% of the variance in ICT and social media adoption, whereas the combined influence of TOE factors and social media adoption accounted for 59.4% of the variance in SME performance, according to the current study's R2 value of 0.454 (Table 5). In order to thoroughly assess model modifications, the study also computed effect size (f2) and cross-validated redundancy measure (Q2) (Khan et al., 2020; Joe F et al., 2018). As established by Ref f2 value of 0.02 is considered weak, 0.15 is considered medium, and 0.35 is considered big. Additionally, posits that Q^2 values exceeding zero signify model predictive relevance (Cohen, 1992; Joe F et al., 2018). While all aspects of TOE characteristics and social media adoption showed large predictive relevance ranging between 0.33 and 0.536, the analytical model showed medium predictive relevance for SME performance (0.392), digital literacy (0.536), and ICT and social media adoption (0.33) (Table 5). Standardized-root-mean-square-residual (SRMR) was used to evaluate the model-fit adequacy (Khan et al., 2020; Joe F et al., 2018). As an absolute fit measure, SRMR values below 0.08 indicate good fit, with zero representing perfect fit; this investigation yielded an SRMR value of 0.069, which falls within acceptable parameters (Khan et al., 2020; Joe F et al., 2018).

Analysis of Mediation

Except for the correlation between digital literacy and the technological construct, the correlation between ICT and social media adoption and SMEs' performance, and the correlation between digital literacy and SMEs' performance, all of the hypotheses were validated. In order to investigate the mediating role of social media adoption, this study applied the methodology described in (Nitzl et al., 2016; Joe F et al., 2018). According to Matthews (2018), the relationship between X and Y is mediated by Z when there are substantial direct channels from X to Z and Z to Y. The results show that there were positive and statistically significant direct paths from technological construct to ICT and social media adoption (β = 0.090, t =1.898, p = 0.000), from organizational construct to ICT and social media adoption (β = 0.344, t =4.751, p = 0.000), from environmental construct to ICT and social media adoption (β = 0.253, t = 3.868, p = 0.000), and from ICT and social media adoption to SME performance (β = 0.140, t = 2.577, p = 0.005). Based on Nitzl (2016), when the indirect effect is substantial but the direct effect is not, full mediation takes place. This study found that there was non-full mediation between technological construct and digital literacy, with the direct effect being non-significant (β = 0.004, t =0.034, p = 0.486) and the indirect effect being non-significant (β = 0.001, t = 0.034, p = 0. 486). The association between the organizational construct, environmental construct, and SME performance was partially mediated by social media adoption. Partial mediation also occurs when both direct and indirect effects are significant. The presence of a positive beta coefficient in mediation is indicative of complementary mediation; this study has also demonstrated complementary mediation, as seen in Table 4.

Table 4. Path coefficient and hypotheses testing

Hypothesis	Relationship	Path coefficient	Mean	SD	t-value	p-value	Decision	f 2	Inner VIF
Direct effect									
H1a	Technological Construct → ICT and SM adoption	0.090	0.090	0.047	1.898	0.029	Supported	0.010	1.528
H1b	Technological Construct → Digital Literacy	0.001	0.004	0.040	0.034	0.486	Not Supported	0.076	2.425
H2a	Organization Construct → ICT and SM adoption	0.344	0.344	0.072	4.751	0.000	Supported	0.090	2.408
H2b	Organization Construct → Digital Literacy	0.253	0.247	0.065	3.868	0.000	Supported	0.000	1.543
H3a	Environment Construct → ICT and SM adoption	0.344	0.253	0.065	3.868	0.000	Supported	0.074	2.609
H3b	Environment Construct → Digital Literacy	0.410	0.410	0.073	5.585	0.000	Supported	0.194	2.625
H4	ICT and SM adoption → Digital Literacy	0.259	0.259	0.056	4.648	0.000	Supported	0.111	1.833

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H5	ICT and SM adoption → SMEs Performance	0.140	0.140	0.054	2.577	0.005	Supported	0.026	1.837
H6	Digital Literacy → SMEs Performance	0.670	0.670	0.045	14.775	0.000	Supported	0.602	1.837
Indirect effect									
H5a	Technological Construct → ICT and SM adoption→ SMEs Performance	0.013	0.012	0.009	1.451	0.074	Not Supported		
H5b	Organization Construct→ ICT and SM adoption→ SMEs Performance	0.044	0.044	0.020	2.168	0.015	Supported		
H5c	Environment Construct → ICT and SM adoption→ SMEs Performance	0.048	0.049	0.023	2.133	0.017	Supported		
H6a	Technological Construct → Digital Literacy→ SMEs Performance	0.001	0.003	0.027	0.034	0.486	Not Supported		
H6b	Organization Construct→ Digital Literacy → SMEs Performance	0.169	0.166	0.048	3.536	0.000	Supported		
H6c	Environment Construct → Digital Literacy → SMEs Performance	0.274	0.280	0.049	5.556	0.000	Supported		
H7	ICT and SM adoption → Digital Literacy → SMEs Performance	0.173	0.169	0.040	4.328	0.000	Supported		

This quantitative study, which employs survey technique, primarily investigates the factors influencing ICT and social media use and small-to-medium firm performance in developing economies. The research yields compelling results, indicating that social media adoption functions as a customer relationship-oriented technological framework. The investigation identifies nine distinct sub-dimensions across three independent constructs that significantly influence social media integration and SME outcomes. The technological construct encompasses five dimensions: comparative advantage, economic efficiency, system compatibility, interactive capability, and market visibility. Additionally, the organizational construct comprises top management support, while the environmental construct includes competitive intensity, market pressure, and conformity trends among industry participants.

Two hypotheses were developed using the technology construct framework: H1a looked at how the technological construct influenced ICT and social media adoption. A statistical analysis revealed a substantial positive correlation (β = 0.090, t= 1.898, p = 0.0029) between technological qualities and social media adoption. The technological construct emerged as a critical factor in SMEs' decision-making processes regarding ICT and social media implementation and utilization. These empirical results align with previous research conducted across various developing economies (Chatterjee & Kar, 2020; Ahmad et al., 2019; Abed, 2020; Chege & Wang, 2020; Cao et al., 2018; Ainin et al., 2015). The findings indicate that SMEs use ICT and social media mostly for the predicted advantages (communication, efficiency, compatibility, relative edge, and exposure). Given that social media utilization remains in its nascent stages within, there exists a pressing need for enhanced focus on social media growth and awareness cultivation to further stimulate adoption rates.

In contrast, H1b investigated the influence of technical constructs on digital literacy. The hypothesized hypothesis was not supported by the statistically negligible connection (β = 0.001, t=0.034, p = 0.486) found between cumulative technological construct and digital literacy. This non-significant result may be attributed to insufficient technical expertise, financial constraints, and inadequate technological training programs (Nisar & Shafiq, 2018; Daowd et al., 2021). Demographic data reveals that among 396 surveyed SMEs, 125 reported minimal social media engagement, while 262 allocated less than 25% of their marketing budget to such initiatives. However, a sizable majority (52%) use social media as a marketing tool. To improve overall performance metrics, SMEs must boost financial allocations and provide extensive staff training to enable efficient social media adoption.

When particular technological features were examined, a substantial association was found between relative advantage and social media adoption. This finding emphasizes relative advantage as a critical factor in social media adoption among West Java SMEs. Notably, SMEs in emerging nations have resource and financial limits while competing fiercely; social media usage provides more cost-effective alternatives to promotional activities and customer involvement than traditional marketing tactics. This observation corroborates previous research (Ainin et al., 2015). In today's business scene, an increasing share of firms and customers have internet connection and corresponding technological infrastructure; thus, SMEs can use social media platforms such as Facebook, Twitter, and WhatsApp. As a result, social media adoption shows great compatibility with the current organizational infrastructure (Ahmad et al., 2019). Interactivity appears as a critical predictor of ICT and social media adoption in the SME environment, with interactive channels allowing for bidirectional connection with suppliers, potential customers, and extra stakeholders (e.g., employees), motivating use. Social media implementation enables SMEs to market their offerings to diverse customer segments, both domestically and internationally. Thus, the current study reveals that ICT and social media adoption in SMEs is externally driven and heavily impacted by executive-level decisions, demanding employee participation in marketing operations.

Within the organizational environment, this study proposed two independent hypotheses: H2a investigated the impact of organizational characteristics—specifically, top management support—on ICT and social media adoption. The organizational construct emerged as a fundamental determinant in SMEs' social media implementation decisions and subsequent utilization patterns (β = 0.344, t=4.751, p = 0.000). Notably, executive leadership support has consistently manifested as a critical factor for social media adoption in previous scholarly investigations. This empirical finding corroborates existing literature (Pateli et al., 2020). The findings show that managerial endorsement is an important factor influencing ICT and social media adoption and motivating employees to extensively use social media platforms for marketing campaigns. Moreover, the current research suggests that younger, academically credentialed proprietors and executives in Pakistan, who already incorporate social media into their personal

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communications with family and social networks, demonstrate greater propensity to implement social media as a marketing instrument. Additionally, SMEs operating across various developing economies frequently lack adequate managerial support regarding innovative technology adoption (Tajudeen et al., 2018).

H2b investigated organizational construct influence on digital literacy. Statistical analysis confirmed a significant relationship between organizational construct and digital literacy indicators (β = 0.253, t=3.868, p = 0.000). Consistent with previous research, the hypothesis findings demonstrated that top management has a positive effect on digital literacy outcomes in developing economies. These findings highlight management's pivotal role in enhancing SME performance within developing countries where such enterprises face numerous challenges such as financial constraints, resource limitations, and governmental instability. The proposed method takes a holistic approach to tackling the difficulties that SMEs face in Indonesia. The system seeks to improve SMEs' competitiveness, productivity, and performance by using technical improvements, strategic management techniques, financial support, and supportive legislation. To be successful, many stakeholders must work together and commit to constant improvement and adaptation.

Within the environmental context, two theories were formed: H3a investigated the impact of environmental factors on ICT and social media adoption within the SME context. Statistical research found a substantial correlation (β = 0.344, t= 3.868, p = 0.000) between environmental characteristics and ICT and social media adoption. These empirical findings agree with earlier research. (Cao et al., 2018). The findings show that SMEs must adopt ICT and social media platforms in response to competitive challenges in order to gain a competitive advantage, obtain market intelligence, respond effectively to customer needs, and create strong relationships with customers and other stakeholders. The data also show that some SMEs adopt emerging technologies solely because of industry-wide adoption trends. Moreover, some enterprises implement social media due to apprehension regarding potential customer attrition and competitive disadvantage.

H3b examined environmental construct impact on digital literacy metrics. Statistical evidence supported a significant relationship between environmental factors and digital literacy (β = 0.410, t= 5.585, p = 0.000). As SMEs in developing nations work in more unpredictable environments as a result of globalization and increased industry competition, they must be vigilant about environmental changes in order to capitalize on emerging opportunities. The present study demonstrates that West Hava SMEs consistently monitor external environmental developments, subsequently enhancing their performance outcomes. These findings corroborate previous research (Sri Hariyanti, 2024b).

At a deeper level, this study aims to investigate the direct effects of social media adoption on SME performance outcomes, as well as social media's mediating function. H4 specifically examined the impact of social media use on SMEs' performance indicators. The study found a substantial correlation (β = 0.228, t= 4.648, p = 0.006) between social media implementation and SME performance measures. This empirical finding suggests that social media adoption and utilization have a significant impact on SME performance dimensions (such as improved customer service quality, stakeholder relationships, increased customer loyalty and retention rates, elevated organizational reputation and market visibility, and expanded customer base accessibility). This result corroborates previous research findings (Pateli et al., 2020).

The role of ICT and social media adoption in SME performance dynamics has received little scholarly attention in the existing literature. The major goal of the current study was to investigate the mediating effects of ICT and social media within the proposed theoretical framework. This study supports hypotheses H5b-c by demonstrating significant mediation effects organizational constructs and SME

performance outcomes (β = 0.044, t=2.168, p = 0.017), and environmental constructs and SME performance measures (β = 0.048, t= 2.133, p = 0.018) but not significant mediation in technological constructs and SME performance outcomes (β = 0.013, t= 1.451, p = 0.074), These findings correspond to prior study by (Parveen et al., 2016), who investigated social media's mediating role in virtual team conflict management, and (Reid-griffin & Carter, 2004), who identified significant relationships between student engagement and learning processes facilitated through technological mediation.

Digital literacy in SME performance dynamics has received little scholarly attention in the existing literature. This study supports hypotheses H6b-c by demonstrating significant mediation effects organizational constructs and SME performance outcomes (β = 0.069, t = 3.536, p = 0.000), and environmental constructs and SME performance measures (β = 0.274, t = 5.556, p = 0.000) but not significant mediation in technological constructs and SME performance outcomes (β = 0.001, t = 0.034, p = 0.486), These findings correspond to prior study by (K. Y. Li, 2020), who investigated assess of society growth, population ability, and capacity to face new challenges in the environment of society evolution.

H7 investigated how digital literacy mediates the relationship between ICT adoption and MSME performance. The results obtained from this mediation were (β = 0.173, t = 4.328, p = 0.000). The findings showed that digital literacy significantly mediates the relationship between ICT adoption and SME performance. This demonstrates that digital skills are a crucial component of basic competencies. Every individual and business entity needs adequate technological capabilities to participate in business competition. One essential digital skill is internet proficiency, as it is a crucial component of our daily lives. Most people connect to it to utilize online services, learning, communication, and information opportunities (Nikou et al., 2022).

CONCLUSION

This study makes theoretical contributions by employing nine elements to examine the factors influencing ICT and social media adoption, as well as digital literacy, within SMEs. Unlike prior applications of the TOE framework that focused on conventional factors, this research incorporates less commonly used technological elements such as interactivity and visibility, highlights managerial support at the organizational level, and introduces the bandwagon effect in environmental factors. Furthermore, ICT and social media adoption, along with digital literacy, are used as mediating variables to explain the indirect relationship between TOE components and SME performance, particularly in West Java, Indonesia. This extends existing knowledge by emphasizing the unexplored mediating role of adoption in linking technological advances with SME outcomes. From a practical perspective, the findings demonstrate how effective ICT and social media adoption can reduce operational costs, expand market reach, improve customer loyalty, strengthen business networks, and enhance communication through interactive platforms, thereby boosting both financial and non-financial performance. The study also provides actionable insights for SME leaders to develop realistic strategies for ICT and social media implementation. However, several limitations remain, including the restricted number of factors examined, sample size, and geographical scope. The exclusion of customer perspectives and strategic organizational characteristics such as corporate culture or entrepreneurial orientation further constrains the analysis. Future research should address these gaps by expanding the range of antecedents, incorporating multiple stakeholder viewpoints, conducting cross-sector comparisons, and exploring causal relationships across both developed and developing economies. Ultimately, this study enriches the literature on ICT, social media adoption, digital literacy, and SME performance in developing contexts while offering directions for future scholarly inquiry.

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