

Empowering SMEs through generative AI: entrepreneurial orientation and digital literacy effects

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Abstract

Purpose – This study aims to examine how generative artificial intelligence (GenAI) adoption is associated with the growth and social impact of small and medium enterprises (SMEs). Drawing on the Technology Readiness perspective, the study also investigates the mediating role of entrepreneurial orientation (EO) and the moderating role of digital literacy (DL).

Design/methodology/approach – A quantitative cross-sectional design was employed using survey responses from 65 SME professionals in India. GenAI adoption was measured through its use in idea generation, content creation, operational support and decision assistance. The proposed relationships were tested using partial least squares-structural equation modeling.

Findings – The findings indicate that GenAI adoption is positively associated with SME growth and social impact and with EO. EO partially mediated the relationship between GenAI adoption and SME outcomes. However, the moderating role of DL was not statistically supported.

Research limitations/implications – The cross-sectional design limits causal interpretation, and the relatively small sample size may affect generalizability. Future studies may examine additional organizational and contextual factors influencing GenAI adoption in SMEs.

Practical implications – The findings suggest that SMEs benefit from GenAI adoption when technological implementation is supported by entrepreneurial behavior and adaptive organizational practices.

Originality/value – This study contributes to the emerging literature on GenAI and SMEs by explaining how EO links GenAI adoption with SME growth and social impact within the context of Indian SMEs.

Keywords Generative AI, Entrepreneurial orientation, Digital literacy, Small and medium enterprises (SMEs), Technology readiness

Paper type Research paper

1. Introduction

The rapid advancement of Generative Artificial Intelligence (GenAI) has significantly transformed how organizations create value, make decisions and engage with markets. Recent evidence indicates that approximately 65% of organizations now regularly use GenAI, reflecting a sharp increase in adoption within a short period (Singla *et al.*, 2024). Small and medium enterprises (SMEs) stand to gain substantially from these developments, as GenAI has the potential to address persistent challenges related to cost efficiency, time



constraints, skill shortages and scalability (Acar and Gvirtz, 2024). At the same time, SME adoption of GenAI remains uneven, constrained by uncertainty surrounding technical expertise, data privacy, algorithmic bias and the evolving maturity of AI tools (Reports NSW Small Business Commissioner, 2026).

Despite these barriers, increasingly affordable and accessible AI-based tools offer SMEs opportunities to enhance operational efficiency and service delivery. Prior reports highlight concerns related to data privacy, output accuracy, customer acceptance and limited understanding of AI technologies, all of which shape how small businesses approach GenAI adoption (Canberra Business Chamber). These mixed opportunities and constraints underscore the need for a deeper, theory-driven understanding of how SMEs can adopt GenAI effectively while mitigating associated risks and ensuring positive social impact.

GenAI has been shown to enhance the efficiency and marketing capabilities of SMEs by enabling AI-driven content creation for advertising, social media engagement and digital campaigns, thereby supporting a sustained online presence with limited resources (Soni, 2023). It also facilitates personalized customer engagement through data-driven messaging, which can strengthen customer loyalty and repeat business – key drivers of revenue growth. Beyond marketing, GenAI accelerates product design, prototyping and 3D modeling processes, reducing development costs and time. In addition, automation of routine tasks such as documentation and reporting can lower administrative costs, reduce errors and optimize resource allocation. Collectively, these applications suggest that GenAI may contribute to SME growth not only through efficiency gains, but also by enabling new ways of organizing entrepreneurial activity.

At the same time, the ability of SMEs to realize these benefits is likely to depend on internal organizational conditions rather than technology adoption alone. Digital literacy (DL) has been widely recognized as a critical capability for small business survival and growth, as it enables firms to reach broader markets and improve efficiency with limited assets (Rakib, 2024). Entrepreneurs' ability to assess, interpret and apply digital information plays a central role in shaping technology use, while business sustainability depends on core elements such as capital, production, customers, sales and profits (Kij-itti and Jarujittipant, 2020). Empirical studies further indicate that DL and technical capability can enhance SME performance by strengthening marketing strategies and supporting revenue growth (Sariwulan *et al.*, 2020; Kulathunga *et al.*, 2020). However, existing research often assumes that DL uniformly amplifies the benefits of advanced technologies, an assumption that remains underexplored in the context of GenAI.

Accordingly, this study contributes to the emerging literature on GenAI and Entrepreneurship by developing and empirically testing a theoretically grounded model that explains how GenAI adoption is associated with SME growth and social impact through entrepreneurial orientation (EO), and whether DL strengthens the relationship between EO and SME outcomes. By adopting a Technology Readiness perspective and focusing on Indian SMEs, the study advances understanding of AI-enabled organizational transformation in resource-constrained and underexplored contexts, while also challenging assumptions regarding the uniform performance-enhancing role of DL.

The purpose of this study is to examine how GenAI adoption is associated with the growth and social impact of SMEs, with particular attention to EO as a mediating organizational mechanism and DL as a moderating capability. Accordingly, the study addresses the following overarching research question: How is GenAI adoption associated with SME growth and social impact, and how do EO and DL shape this relationship through mediating and moderating mechanisms?

1.1 Underpinning theoretical framework

Technology readiness (TR) refers to the willingness and capability of individuals, organizations or sectors to adopt and use new technologies in ways that enhance efficiency, innovation and outcomes (Blut and Wang, 2020). For SMEs, higher levels of TR have been associated with increased adoption of AI technologies, leading to improvements in growth, cost reduction, product quality and market positioning (Kulkarni *et al.*, 2024). However, SMEs often face structural constraints – including limited funding, technical knowledge gaps and resistance to change – that can impede readiness for advanced technologies. Prior research suggests that these barriers may be addressed through targeted training, collaboration with AI consultants, pilot implementations and strategic partnerships (Proietti and Magnani, 2025; Ramasamy and Sampath, 2023).

Technology Readiness provides an important theoretical lens for understanding how organizations respond to emerging digital technologies such as GenAI. The concept refers to the degree to which firms are prepared and willing to adopt and use new technologies to improve organizational performance and innovation outcomes (Blut and Wang, 2020). In the context of SMEs, TR is shaped by the availability of digital infrastructure, managerial awareness of technological opportunities and the ability of employees to engage with digital tools effectively (Ramasamy and Sampath, 2023). Firms that demonstrate higher levels of readiness are generally more capable of integrating advanced technologies into their operational and strategic activities. This integration enables organizations to explore new ways of creating value, improving efficiency and responding to evolving market conditions. Consequently, TR provides a useful framework for examining how the adoption of GenAI may translate into entrepreneurial behavior and improved business outcomes in SMEs.

Once SMEs achieve a sufficient level of TR, they are better positioned to integrate GenAI technologies based on advanced machine learning models capable of producing human-like outputs in the form of text, images, audio and video (Chowdhury *et al.*, 2024; Kanbach *et al.*, 2024). For SMEs, such capabilities can support data-driven decision-making, adaptability to market changes and experimentation with new forms of customer engagement and content creation (Abaddi, 2024; Dey *et al.*, 2024). However, the extent to which these technological capabilities translate into performance improvements remains contingent on organizational orientation and strategic behavior.

EO captures a firm's strategic posture toward innovation, proactiveness and opportunity recognition (Lumpkin and Pidduck, 2021). In SME contexts, EO is particularly important, as smaller firms often rely on adaptability, creativity and initiative to compete in dynamic environments with limited resources. Prior studies suggest that firms with strong EO are more likely to experiment with emerging technologies, including GenAI, to improve processes, engage customers and pursue growth opportunities (Khan *et al.*, 2021). Accordingly, EO may function as a key organizational mechanism through which GenAI adoption influences SME outcomes.

GenAI has also been associated with broader social and economic implications for SMEs. By automating repetitive tasks, GenAI enables employees to focus on higher-value activities, supporting workforce upskilling and human capital development (Fosso-Wamba *et al.*, 2024; Chowdhury *et al.*, 2024). It can also help SMEs compete more effectively with larger firms, contributing to a more equitable economic landscape (Acar and Gvirtz, 2024). Nevertheless, challenges related to digital infrastructure gaps, data privacy and algorithmic bias remain salient, reinforcing the importance of ethical AI practices and DL initiatives to ensure inclusive and socially responsible adoption (Proietti and Magnani, 2025; Peng and Yu, 2022).

DL, defined as the ability to understand, evaluate and apply digital technologies effectively in business contexts, represents an important complementary capability for SMEs (Peng and Yu, 2022). SMEs with higher levels of DL are generally better positioned to adopt digital business models and e-commerce practices. However, whether DL strengthens the relationship between EO and performance outcomes in the context of GenAI adoption remains an open empirical question.

Building on the overarching research question presented in the Introduction, the study develops and tests a conceptual model grounded in the Technology Readiness perspective.

1.2 Theoretical model and research hypothesis

This study adopts the Technology Readiness perspective to explain how SMEs adopt GenAI and convert technological capabilities into meaningful organizational outcomes. Technology readiness reflects an organization's preparedness to adopt new technologies through appropriate digital infrastructure, technological awareness and employee capability development (Blut and Wang, 2020; Ramasamy and Sampath, 2023). In SME environments where resources are often limited, the presence of TR plays a crucial role in determining whether new technologies are successfully integrated into business processes. GenAI provides opportunities for improving decision-making, automating routine tasks and supporting innovation-driven activities within firms (Chowdhury *et al.*, 2024; Kanbach *et al.*, 2024). However, the ability of SMEs to derive value from these technologies depends not only on technological adoption but also on organizational behavior and managerial orientation. EO reflects the strategic posture of firms toward innovation, proactiveness and opportunity seeking, which enables SMEs to effectively leverage technological tools for competitive advantage (Lumpkin and Pidduck, 2021). In addition, DL represents the capability of individuals within the firm to understand and apply digital technologies in business contexts (Peng and Yu, 2022). Guided by the TR perspective, the proposed model therefore examines how GenAI adoption contributes to SME growth directly and indirectly through EO while considering the role of DL in shaping these relationships. Figure 1 illustrates the proposed relationships among GenAI adoption, EO, DL and SME growth and social impact.

Guided by the Technology Readiness perspective, the following hypotheses examine how GenAI adoption, EO and DL interact to influence the growth and performance of SMEs.

Research on SME growth consistently highlights the importance of innovation, technological capability and strategic orientation as key drivers of firm performance. SMEs often operate in resource-constrained environments, which makes the effective adoption and utilization of digital technologies particularly important for improving efficiency, competitiveness and market responsiveness. The growing literature on digital transformation suggests that the integration of digital technologies enables SMEs to streamline operations, enhance decision-making processes and create new opportunities for value creation.

In recent years, the emergence of GenAI has further expanded these possibilities by providing tools that support content creation, information analysis and knowledge-intensive tasks within organizations (Chowdhury *et al.*, 2024; Kanbach *et al.*, 2024). However, prior studies emphasize that the impact of technological adoption on firm performance often depends on organizational capabilities and strategic orientations that enable firms to effectively leverage these technologies. EO has therefore been widely recognized as an important driver of innovation and opportunity-seeking behavior within SMEs (Lumpkin and Pidduck, 2021). Firms with stronger EO tend to be more proactive in identifying new opportunities and more willing to experiment with emerging technologies, which can enhance their ability to translate digital capabilities into improved firm outcomes.

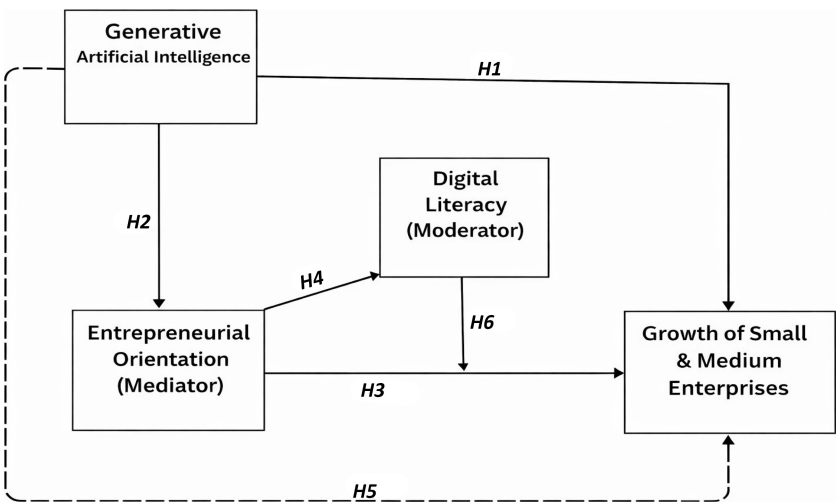


Figure 1. Theoretical model
Source: Authors' own work

At the same time, digital competencies such as DL play an important role in enabling individuals within organizations to understand and effectively use digital technologies in business contexts (Peng and Yu, 2022). Together, these perspectives suggest that the adoption of GenAI, supported by EO and digital capabilities, may represent an important pathway through which SMEs can enhance growth and competitiveness in rapidly evolving digital markets.

1.2.1 Generative AI and growth of SMEs. GenAI is proving to be a game changer for SMEs, enhancing productivity, efficiency and market competitiveness. It supports smarter decision-making, lowers operational costs and simplifies complex functions like predictive analytics and personalized marketing (Sengar et al., 2024). In South Africa, SMEs using GenAI have experienced better data-driven strategies, expanded market reach and stronger customer engagement (Muzuva et al., 2024). AI technologies also reduce risk by improving financial forecasting, pricing accuracy, HR processes and supply chain resilience (Jackson et al., 2024). In China, automation in supply chains has notably improved performance and efficiency. EO plays a key role in technology adoption – digitally proactive leadership is more likely to integrate AI successfully and drive sustainable growth (Vrontis et al. 2022). Tools like AI-powered chatbots and recommendation engines have improved customer satisfaction and loyalty (Sengar et al., 2024). However, barriers such as high implementation costs, skills shortages and data privacy issues remain significant, particularly for SMEs lacking digital infrastructure (Drydakis, 2022a). While GenAI offers clear growth potential, its impact depends on targeted support through policy, DL and infrastructure development. Hence, we can hypothesize that:

H1. Generative AI adoption is positively associated with the growth and social impact of SMEs.

1.2.2 Generative AI and entrepreneurial orientation. The adoption of advanced digital technologies can also influence the strategic behavior of firms by expanding their ability to

experiment, innovate and identify new opportunities. GenAI tools provide organizations with capabilities that support creative problem-solving, rapid content development and improved access to information, which can enhance a firm's ability to respond proactively to changing market conditions. For SMEs, which often operate with limited resources, such technologies can lower the barriers associated with experimentation and innovation by enabling faster idea generation and more efficient decision support processes (Chowdhury *et al.*, 2024; Kanbach *et al.*, 2024). These capabilities may encourage firms to pursue more proactive and opportunity-oriented strategies. EO reflects a firm's tendency to engage in innovative, proactive and opportunity-seeking behavior in pursuit of competitive advantage (Lumpkin and Pidduck, 2021). From the perspective of Technology Readiness Theory, organizations that are prepared to adopt emerging technologies are more likely to integrate them into strategic initiatives that support entrepreneurial action (Blut and Wang, 2020; Ramasamy and Sampath, 2023). In this context, the adoption of GenAI may stimulate entrepreneurial behavior within SMEs by enabling experimentation, supporting innovation-related activities and facilitating the exploration of new market opportunities. Hence, we can hypothesize that:

H2. Generative AI adoption is positively associated with Entrepreneurial Orientation.

1.2.3 Entrepreneurial orientation and growth of SMEs. EO is a well-established driver of SME growth, with its key dimensions'; innovativeness, proactiveness and risk-taking consistently linked to better performance, competitive advantage and long-term sustainability (Neneh and Zyl, 2017). Studies in South Africa and Ethiopia show that SMEs with strong EO experience higher growth in employment, sales and profits, particularly when driven by proactive innovation. In Kenya, EO has positively impacted women-led SMEs by promoting expansion and job creation, highlighting the need for supportive policies (Simiyu, Namusonge and Sakwa, 2016). In Tanzania, proactiveness was associated with increased sales, though risk-taking sometimes led to higher costs (Nyello and Kalufya, 2021). EO also enhances competitiveness through improved innovation and responsiveness, as demonstrated in Brazil, where its combination with absorptive capacity and organizational flexibility resulted in superior firm outcomes (Neto and Forte, 2023). Access to financial knowledge and capital further amplifies EO's impact, underscoring the importance of external support systems (Zulfadhli *et al.*, 2024). However, EO's effectiveness varies depending on contextual factors such as firm age, industry and economic environment – benefits tend to be greater in younger firms (Neneh and Zyl, 2017). These insights point to the importance of policy measures that build an entrepreneurial ecosystem through training, funding access and regulatory support, helping SMEs leverage EO for sustainable growth. Hence, we can hypothesize that:

H3. Entrepreneurial Orientation is positively associated with SME growth and social impact.

1.2.4 Entrepreneurial orientation and digital literacy. Based on the theoretical arguments presented earlier, the proposed research model examines several types of relationships among the study variables. First, the model explores the direct influence of GenAI adoption on SME performance and EO. These relationships reflect the role of technological capabilities in supporting organizational innovation and strategic behavior. Second, the model considers the mediating role of EO in explaining how GenAI adoption may translate into improved SME outcomes. EO represents the strategic posture through which firms identify opportunities, pursue innovation and leverage technological resources for

competitive advantage. Finally, the model examines whether DL influences the strength of the relationship between GenAI adoption and SME performance. By structuring the hypotheses in this way, the model distinguishes clearly between direct effects, mediation mechanisms and moderation effects within the broader Technology Readiness perspective.

EO plays an important role in shaping the capabilities that enable firms and individuals to operate effectively in increasingly digital business environments. Organizations characterized by strong EO tend to emphasize innovation, proactiveness and opportunity-seeking behavior, which encourages the adoption and effective use of digital tools and technologies. Entrepreneurial education and training further support this process by promoting the use of digital platforms and online resources that strengthen digital competencies among entrepreneurs and employees (Chandra and Hendayana, 2024). A strong digital learning orientation also enhances entrepreneurial capabilities by helping individuals adapt to technological change and explore new digital opportunities (Satar *et al.*, 2024). In contemporary business contexts, DL has become an important driver of entrepreneurial outcomes because individuals with strong digital skills are more innovative, more capable of using online marketing channels and better positioned to scale their ventures (Sariwulan *et al.*, 2020). Similarly, individuals with higher levels of digital proficiency are more likely to participate in entrepreneurial activities, particularly within startup environments where digital technologies play a central role in business development (Setiawati *et al.*, 2022).

Integrating DL into entrepreneurship related learning processes can further enhance adaptability, creativity and innovation, while also strengthening intentions to engage in digital business activities (Mugiono *et al.*, 2021; Satar *et al.*, 2024). Empirical evidence from SME contexts also indicates that firms with strong EO tend to demonstrate improved performance outcomes such as higher growth in employment, sales and profitability, particularly when proactive innovation is emphasized (Simiyu *et al.*, 2016; Nyello and Kalufya, 2021). EO can also strengthen competitiveness and organizational responsiveness when combined with complementary capabilities such as absorptive capacity and organizational flexibility (Neto and Forte, 2023). In addition, access to financial knowledge and capital can further amplify the influence of EO on firm-level capabilities and outcomes (Zulfadhli *et al.*, 2024). However, prior research suggests that the impact of EO may vary depending on contextual factors such as firm age, industry characteristics and economic conditions, with stronger benefits often observed in younger firms (Neneh and Zyl, 2017). Overall, these insights suggest that EO encourages the development and application of digital competencies within organizations, thereby strengthening the DL required for effective participation in modern entrepreneurial ecosystems.

Therefore, the following hypothesis is proposed:

H4. Entrepreneurial Orientation is positively associated with Digital Literacy.

1.2.5 Entrepreneurial orientation mediates the path joining generative AI and SMEs' growth. Initially, GenAI was considered to have a direct impact on SME growth and sustainability. However, its influence appears to be primarily indirect, operating through EO. While GenAI contributes to TR – an organization's capacity to adopt and apply emerging technologies (Blut and Wang, 2020) – its effectiveness depends largely on how SMEs leverage it (Kulkarni *et al.*, 2024). GenAI enhances EO by improving decision-making, streamlining operations and boosting adaptability to market changes (Chatterjee and Torres Vega, 2023). This fosters an entrepreneurial mindset centered on innovation, risk-taking and proactive strategy. SMEs applying AI insights can respond swiftly to shifting trends and deliver innovative solutions. Technology-ready SMEs that adopt GenAI are better positioned

to refine strategies and improve efficiency, as EO strengthens their ability to use AI effectively (Patel *et al.*, 2025). Firms using AI-supported decision-making often show greater agility and improved performance (Kyriakopoulos *et al.*, 2025), with over 50% of AI-investing SMEs reporting notable efficiency gains. Although GenAI's direct impact on growth may be moderated by factors like DL, EO plays a key mediating role, amplifying GenAI's indirect contribution to long-term SME sustainability.

Therefore, we propose that:

H5. Entrepreneurial Orientation mediates the relationship between Generative AI and the growth and sustainability of SMEs.

1.2.6 Digital literacy moderates the relationship between EO and SMEs' growth. DL – the ability to effectively use digital tools and technologies – plays a crucial role in enhancing business operations. While some studies emphasize its importance in maximizing the benefits of EO (Dewan and Riggins, 2005), others argue that digital skills alone are insufficient without strategic entrepreneurial thinking (Ratten, 2023). High DL enables businesses to better apply EO through tech-driven decision-making, automation and data analysis (Maldonado *et al.*, 2023). Conversely, low digital proficiency can hinder innovation and lead to inefficiencies (Bharadwaj *et al.*, 2013). Firms with strong digital capabilities are more adaptable, resilient and efficient in leveraging digital tools (Vuori and Huy, 2022). A solid digital foundation enhances EO by helping leaders integrate AI insights, refine strategies and allocate resources effectively (Rindova, Barry and Ketchen, 2009). When combined, DL and EO support sustained growth, agility and competitiveness (Leidner and Gregory, 2024). Research also links higher DL to improved innovation and financial performance. Therefore, we propose that:

H6. Digital literacy moderates the relationship between EO and the growth and sustainability of SMEs, strengthening the link when digital literacy is high.

2. Methodology

2.1 Research design

This study adopts a quantitative, cross-sectional research design to empirically examine the relationships among GenAI, EO, DL and SME performance. The research is explanatory in nature and seeks to validate a theoretically grounded structural model derived from the Technology Readiness perspective.

The unit of analysis is the firm, with data collected from individuals who are actively involved in managerial decision-making, digital transformation initiatives or technology-enabled business operations within SMEs. A survey-based approach was adopted to test hypothesized relationships among latent constructs.

India serves as the empirical context for this study. As an emerging economy with a large and diverse SME sector, India provides a relevant setting for examining GenAI adoption, entrepreneurial behavior and digital capability development. Indian SMEs are increasingly exposed to affordable AI-based tools while simultaneously facing constraints related to skills, infrastructure and uncertainty, making the context theoretically appropriate for the proposed model.

2.2 Sampling and data collection

Data were collected using a non-probability purposive sampling technique, which is commonly used in SME and technology adoption research where comprehensive sampling

frames are unavailable. Respondents were required to have sufficient exposure to digital tools and business processes to ensure informed responses regarding GenAI use, entrepreneurial practices and organizational capabilities.

The survey was administered electronically and distributed through professional networks, industry contacts and online platforms such as LinkedIn and email-based outreach. Participation was voluntary, and respondents were assured anonymity and confidentiality to reduce social desirability bias.

A total of 90 questionnaires were circulated, of which 65 valid responses were received and retained for analysis, resulting in a response rate of approximately 72%. The sample included SME owners, managers, business analysts and functional executives across sectors such as manufacturing, retail, technology and services.

2.2.1 Data screening and sample validation. Following data collection, the responses were subjected to a screening process to ensure the quality and reliability of the data set used for analysis. A total of 90 questionnaires were initially distributed and returned through the online survey platform. Each response was carefully reviewed to identify incomplete submissions, patterned responses and entries that did not meet the eligibility criteria of the study. Responses with substantial missing data across key constructs such as GenAI usage, EO, DL and SME performance were removed from the data set. In addition, responses that displayed uniform answer patterns across all scale items were treated with caution as they may indicate a lack of respondent engagement. A few submissions were excluded as respondents reported minimal familiarity with digital tools or decision-making processes in their organizations, which did not meet the study's criteria requiring participants to have adequate exposure to technology-enabled business activities. Following the application of these screening criteria, 65 responses were deemed valid for further statistical analysis. This screening process guaranteed that the final data set included respondents with pertinent experience, yielding reliable responses for the empirical evaluation of the proposed model.

2.3 Measurement of constructs

All constructs in the study were measured using multi-item scales adapted from prior literature and contextualized to reflect the SME and GenAI environment. Respondents were asked to indicate their level of agreement with each statement using a five-point Likert scale ranging from 1 (representing strongly disagree) to 5 (representing strongly agree). GenAI adoption was measured by assessing the extent to which SMEs use AI-based tools to support business activities such as idea generation, marketing content creation, decision support through information analysis and assistance with routine operational tasks. These applications reflect commonly discussed uses of GenAI in business settings where the technology supports creativity, productivity and data-informed decision-making (Chowdhury *et al.*, 2024; Kanbach *et al.*, 2024). EO was operationalized as a firm-level strategic posture that reflects the organization's tendency toward innovation, proactiveness and opportunity-seeking behavior. Consistent with prior SME research, EO was treated as an overall strategic orientation rather than separating its individual dimensions (Lumpkin and Pidduck, 2021). DL reflects respondents' perceived capability to understand, evaluate and effectively apply digital technologies within business contexts (Peng and Yu, 2022). SME performance was measured using perceptual indicators related to improvements in operational efficiency, market reach, competitiveness and overall business performance associated with the use of digital and AI-supported practices.

2.4 Data analysis technique

Partial least squares-structural equation modeling (PLS-SEM) was selected as the primary analytical technique because it is well suited for prediction-oriented research and complex

models involving multiple relationships. PLS-SEM has been widely recommended in situations where theoretical development is still emerging and where the objective is to examine relationships among latent constructs rather than confirm a fully established theory. Methodological studies highlight that PLS-SEM performs effectively with relatively small sample sizes and does not require strict distributional assumptions, making it particularly suitable for studies involving organizational data (Hair *et al.*, 2017). Recent methodological discussions also emphasize the growing use of PLS-SEM in management and entrepreneurship research where models often include mediation and moderation relationships and where obtaining large samples from managerial populations can be difficult (Payne *et al.*, 2023). Given the nature of research on GenAI adoption in SMEs and the presence of mediation and moderation effects in the proposed model, the use of PLS-SEM provides an appropriate and robust analytical approach for examining the hypothesized relationships.

Unlike covariance-based structural equation modeling, PLS-SEM focuses on prediction-oriented analysis and is less sensitive to distributional assumptions and sample size limitations. Prior methodological research suggests that PLS-SEM can provide reliable parameter estimates even when the sample size is modest, particularly when the research model is established, and the primary objective is theory development and prediction rather than strict theory confirmation (Hair *et al.*, 2017). In addition, PLS-SEM is widely applied in entrepreneurship and technology adoption research where collecting large samples from specialized organizational populations such as SME managers and technology decision makers can be challenging. Given the nature of research on GenAI adoption in SMEs and the focus on examining complex relationships involving mediation and moderation, the use of PLS-SEM is considered methodologically appropriate for the present study.

The analysis followed a two-step approach: assessment of the measurement model and evaluation of the structural model.

2.5 Measurement model assessment

The measurement model was evaluated for indicator reliability, internal consistency reliability, convergent validity and discriminant validity, following established guidelines (Hair *et al.*, 2017).

Indicator reliability was assessed through outer loadings, with values above 0.70 considered acceptable. Internal consistency reliability was evaluated using Cronbach's alpha and composite reliability (CR), both of which exceeded the recommended threshold of 0.70 for all constructs. Convergent validity was assessed using average variance extracted (AVE), with all constructs exceeding the minimum criterion of 0.50, indicating that the constructs explain a substantial proportion of variance in their indicators.

Discriminant validity was assessed using the Heterotrait–Monotrait ratio (HTMT). All HTMT values were below the recommended threshold of 0.85, indicating acceptable discriminant validity.

2.6 Structural model assessment

The structural model was evaluated by examining path coefficients, significance levels and effect sizes using a bootstrapping procedure. The analysis assessed the direct effects of GenAI on EO and SME growth, the mediating role of EO, and the moderating effect of DL on the EO–SME growth relationship.

Given the nature of the study and the emerging status of GenAI research in SMEs, the structural results are interpreted with caution. However, the model provides meaningful

insights into the mechanisms through which GenAI influences SME growth via EO and digital capability development.

3. Results

The results are presented in relation to the study’s overarching research question. *H1–H4* examine the associations among GenAI adoption, EO, DL and SME growth and social impact, whereas *H5* and *H6* assess the proposed mediating and moderating mechanisms.

3.1 Measurement model

The measurement model was assessed for indicator reliability, internal consistency reliability, convergent validity and discriminant validity, following established guidelines. Indicator loadings were examined, with values above 0.70 indicating satisfactory reliability. (Hair *et al.*, 2017) Indicators with loadings between 0.40 and 0.70 were retained where CR and AVE met acceptable thresholds, consistent with SEM practices.

Indicating acceptable construct distinctiveness through Cronbach’s alpha and CR values exceeding the recommended threshold of 0.70. Convergent validity was supported as all AVE values exceeded 0.50 (Hair *et al.*, 2017). Discriminant validity was assessed using the HTMT ratio, with all values below the conservative threshold of 0.85 (Hair *et al.*, 2017), indicating adequate construct distinctiveness. Table 1 presents the outer loadings of the measurement items. Table 2 reports Cronbach’s alpha, CR and average variance extracted values for each construct. Table 3 presents the HTMT values used to assess discriminant validity.

3.2 Structural model and hypothesis testing

The structural model was evaluated by examining path coefficients, *t*-values and *p*-values using a bootstrapping procedure. The results are presented in Table 4 and Figure 2. It is important to note that the path coefficients represent the strength and direction of relationships, while statistical significance is determined by the associated *p*-values.

Table 1. Loadings of measurement items (*n* = 65)

Item	Outer loadings
DL 1 ← DL	0.719
DL 2 ← DL	0.652
DL 3 ← DL	0.691
DL 4 ← DL	0.86
DL × EO → DL × EO	1
EO 1 ← EO	0.666
EO 2 ← EO	0.858
EO 3 ← EO	0.671
EO 4 ← EO	0.874
Generative AI 1 ← generative AI	0.772
Generative AI 2 ← generative AI	0.908
Generative AI 3 ← generative AI	0.867
Generative AI 4 ← generative AI	0.827
SME 1 ← SME	0.851
SME 2 ← SME	0.777
SME 3 ← SME	0.732
SME 4 ← SME	0.754
SME 5 ← SME	0.311

Source(s): Authors’ own work

Table 2. Scale composite reliability and average variance extracted of measurement items ($n = 65$)

Construct	Cronbach's alpha	Construct reliability and validity		Average variance extracted (AVE)
		Composite reliability (rho_a)	Composite reliability (rho_c)	
DL	0.712	0.741	0.823	0.54
EO	0.778	0.837	0.854	0.598
Generative AI	0.866	0.883	0.909	0.714
SME	0.745	0.807	0.826	0.506

Source(s): Authors' own work**Table 3.** HTMT values

Construct	Discriminant validity: Heterotrait–Monotrait (HTMT) matrix			
	DL	EO	Generative AI	SME
DL				
EO	0.779			
Generative AI	0.806	0.462		
SME	0.682	0.599	0.84	
DL $\times$ EO	0.666	0.481	0.361	0.281

Source(s): Authors' own work**Table 4.** Hypothesis testing ($n = 65$)

Hypothesis	Path	p -value	Result
$H1$	Generative AI $\rightarrow$ SME	Significant	Supported
$H2$	Generative AI $\rightarrow$ EO	Significant	Supported
$H3$	EO $\rightarrow$ SME	Significant	Supported
$H4$	EO $\rightarrow$ DL	Not significant	Not supported
$H5$	Generative AI $\rightarrow$ EO $\rightarrow$ SME	Marginal/weak	Partially supported
$H6$	EO $\times$ DL $\rightarrow$ SME	Not significant	Not supported

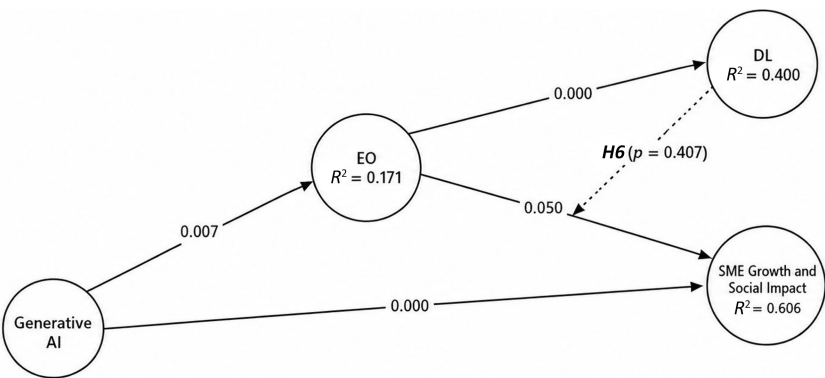
Source(s): Authors' own work

The findings indicate that GenAI has a strong and statistically significant association with SME growth, supporting $H1$. GenAI also shows a significant positive relationship with EO, lending support to $H2$. These results suggest that SMEs reporting higher engagement with GenAI tools also tend to exhibit stronger EO and better perceived performance outcomes.

EO demonstrates a positive and significant association with SME growth, supporting $H3$. However, the relationship between EO and DL ($H4$) is positive but marginally non-significant, indicating $H4$ is not supported.

The mediating effect of EO in the relationship between GenAI and SME growth ($H5$) was examined using indirect effects. While the indirect path shows a positive direction consistent with the proposed theoretical model, the mediation effect should be interpreted cautiously due to the nature of the study and sample size limitations.

The moderating effect of DL on the EO–SME growth relationship ($H6$) was found to be weak and statistically non-significant; thus, $H6$ is not supported. Although the interaction



Note: Values on the structural paths represent *p*-values. Values inside endogenous constructs represent *R*² values.

Figure 2. Structural model with path coefficients
Source: Authors' own work

term exhibits a positive coefficient, the lack of statistical significance suggests that DL does not meaningfully strengthen the EO–performance relationship in this sample.

3.3 Interpretation of structural relationships

While several hypothesized relationships exhibit statistically significant associations, these findings should not be interpreted as evidence of causal relationships. Instead, the results provide theory-consistent empirical support for the proposed directional relationships grounded in the Technology Readiness framework.

Given that constructs such as GenAI adoption, EO and DL are conceptually related, the observed associations may reflect complementary organizational capabilities rather than independent causal mechanisms. The findings therefore underscore the importance of theoretical grounding in interpreting SEM results and caution against over-attributing causality based solely on cross-sectional data.

4. Discussion and implications

This study examined how GenAI adoption is associated with SME growth and social impact and how EO and DL shape this relationship. Addressing the overarching research question, the findings indicate that GenAI adoption and EO are positively associated with SME outcomes. EO partially mediated the relationship between GenAI adoption and SME outcomes, whereas the proposed moderating role of DL was not statistically supported.

The results also demonstrate that EO plays a significant role in shaping SME growth outcomes. Firms that display stronger tendencies toward innovation and proactive opportunity seeking appear better positioned to translate technological capabilities into tangible business performance. This finding aligns with prior entrepreneurship research, which suggests that EO enables organizations to identify and exploit new opportunities created by technological change (Lumpkin and Pidduck, 2021). In the context of GenAI adoption, EO may encourage firms to experiment with new digital tools, redesign business processes and pursue innovative market strategies. The positive relationship between GenAI adoption and EO further suggests that access to advanced digital technologies can stimulate

entrepreneurial behavior within firms by expanding their capacity for experimentation and strategic initiative.

Another important insight from the study concerns the role of DL. Although DL was expected to strengthen the relationship between GenAI adoption and SME growth, the moderating effect was not statistically significant. One possible explanation is that the increasing accessibility and user-friendly design of modern AI tools may reduce the technical barriers traditionally associated with digital technologies. Many GenAI applications are designed to be intuitive and require limited specialized expertise, which may allow SMEs with varying levels of digital capability to benefit from their use. Nevertheless, DL remains an important organizational capability, as it supports the effective evaluation and integration of emerging technologies into business processes (Peng and Yu, 2022). Future research may therefore explore additional contextual factors that influence how digital competencies shape technology-driven growth in SMEs.

The findings of this study can also be interpreted through the lens of Technology Readiness Theory, which emphasizes the importance of organizational preparedness in the successful adoption and utilization of new technologies. Technology readiness suggests that firms are more likely to benefit from technological innovations when they possess the necessary awareness, capabilities and willingness to integrate digital tools into their business processes (Blut and Wang, 2020; Ramasamy and Sampath, 2023). In the context of this study, the positive relationship between GenAI adoption and SME growth indicates that firms that demonstrate readiness to experiment with and implement emerging technologies are better positioned to leverage these tools for strategic advantage. GenAI applications can support creative tasks, information analysis and operational efficiency, allowing SMEs to enhance productivity and respond more effectively to changing market conditions. From a TR perspective, the adoption of GenAI reflects not only the presence of digital tools but also an organizational mindset that is open to technological experimentation and innovation. This readiness enables firms to translate technological capabilities into entrepreneurial behavior and improved business outcomes.

4.1 Theoretical contribution

This study makes three interrelated theoretical contributions to the literature on GenAI, SMEs and social impact. First, the findings identify EO as a behavioral conversion mechanism through which SMEs translate GenAI-enabled capabilities into growth and socially meaningful outcomes. Second, the non-significant moderating effect of DL refines the prevailing assumption that stronger digital capability uniformly enhances technology-enabled performance, suggesting instead that DL may operate as a foundational or threshold capability. Third, evidence from Indian SMEs extends the literature by showing how resource constraints, uneven digital readiness and entrepreneurial agency shape the social impact of GenAI adoption in an emerging-economy context. Collectively, these contributions reposition the social impact of GenAI as a conditional organizational process rather than an automatic consequence of technological adoption.

First, the study extends research on the social impact of GenAI by explaining how technological adoption is translated into outcomes for small businesses. Prior studies primarily emphasize the capacity of GenAI to improve content creation, information processing, decision-making, innovation and operational efficiency (Chowdhury et al., 2024; Kanbach et al., 2024; Soni, 2023). Social-impact-oriented research further suggests that GenAI can strengthen SME resilience, support workforce development, reduce capability disadvantages and enable smaller firms to compete more effectively with larger organizations (Acar and Gvirtz, 2024; Fosso-Wamba et al., 2024; Kulkarni et al., 2024;

Shore *et al.*, 2024). In contrast to interpretations that position technological access as the principal source of such benefits, the present findings show that GenAI adoption alone does not fully explain SME growth and social impact. The partial mediating role of EO indicates that SMEs must convert GenAI-enabled information and ideas into experimentation, proactive opportunity recognition and innovation-oriented action. This finding extends entrepreneurship research that identifies EO as a strategic posture supporting opportunity exploitation and technology adoption (Lumpkin and Pidduck, 2021; Upadhyay *et al.*, 2022). The contribution to the social impact literature therefore lies in identifying entrepreneurial behavior as a conversion mechanism: GenAI contributes to more inclusive market participation, organizational resilience and SME development when firms possess the strategic orientation required to apply technological capabilities purposefully.

Second, the study refines the assumed role of DL in shaping the social impact of GenAI adoption among small businesses. Prior research generally associates DL with stronger technology adoption, innovation capability, market access and SME performance because digitally capable firms are better equipped to understand and apply emerging technologies (Sariwulan *et al.*, 2020; Kulathunga *et al.*, 2020; Peng and Yu, 2022; Rakib, 2024). On this basis, EO was expected to support the development of DL, while DL was expected to strengthen the relationship between EO and SME outcomes. Contrary to these expectations, neither the relationship between EO and DL nor the moderating effect of DL received statistical support. These findings indicate that an innovation-oriented and proactive strategic posture does not necessarily produce stronger digital capability, because DL may depend more directly on employee training, technological exposure, infrastructure and access to external expertise. Similarly, higher DL may not uniformly amplify the contribution of EO to SME growth and social impact, particularly when contemporary GenAI applications offer intuitive interfaces and lower the technical barriers associated with basic business use.

These non-significant findings should not be interpreted as evidence that DL lacks importance. Instead, DL may operate as a foundational or threshold capability that enables SMEs to access, evaluate and use GenAI responsibly, rather than as a continuously increasing source of performance advantage. This interpretation contrasts with studies that treat digital capability as a direct and consistent enhancer of business outcomes, while remaining consistent with research showing that the value of digital skills depends on complementary organizational and contextual conditions (Bharadwaj *et al.*, 2013; Ratten, 2023; Vrontis *et al.*, 2022). For the social impact literature, the findings suggest that the accessibility of GenAI may broaden participation by allowing resource-constrained small businesses with varying levels of digital capability to benefit from AI-supported tasks. However, such accessibility does not remove the need for skills related to output verification, data privacy, bias recognition and responsible decision-making. The socially beneficial use of GenAI therefore depends less on advanced technical proficiency alone and more on the combination of baseline DL, entrepreneurial application, responsible-use practices and context-specific organizational support.

Third, the study extends the social impact literature by explaining how the benefits of GenAI for small businesses are shaped by the institutional and resource conditions of an emerging economy. Prior research has established that AI-enabled technologies can support SME resilience, operational efficiency, innovation and social sustainability across different national contexts (Dey *et al.*, 2024; Fosso-Wamba *et al.*, 2024; Kulkarni *et al.*, 2024; Shore *et al.*, 2024). Research has also suggested that accessible GenAI tools may reduce capability disadvantages and enable smaller firms to compete more effectively with larger organizations (Acar and Gvirtz, 2024). The findings from Indian SMEs are consistent with this literature insofar as GenAI adoption is positively associated with SME growth and social impact. However, the present study qualifies

the assumption that technological accessibility generates similar benefits across firms and economic settings. In an emerging economy characterized by resource limitations, uneven digital infrastructure, skill disparities and varying levels of technological readiness, the social impact of GenAI depends on the organizational capacity to convert technological access into entrepreneurial action. The partial mediating role of EO indicates that GenAI contributes to socially meaningful outcomes when SMEs use AI-enabled information and capabilities to recognize opportunities, experiment with new practices, strengthen market participation and improve organizational adaptability. By contrast, the unsupported moderating role of DL suggests that advanced digital capability does not uniformly determine which SMEs benefit from GenAI, although baseline skills remain necessary for responsible and informed use. Theoretically, the Indian context therefore demonstrates that the social impact of GenAI in emerging economies is neither automatic nor solely technology-driven; rather, such impact emerges from the interaction between technological accessibility, entrepreneurial agency, organizational readiness and contextual resource constraints. This contextual contribution encourages future social impact research to distinguish between access to GenAI and the organizational capability required to translate access into inclusive and sustainable value for small businesses.

Taken together, these three contributions reposition the social impact of GenAI as a conditional organizational process rather than an automatic consequence of technology adoption. The findings show that GenAI access creates potential value, EO supports the conversion of that potential into SME outcomes, and DL provides a necessary but not uniformly performance-enhancing capability. Future research can build on this distinction by examining how entrepreneurial behavior, responsible digital capability and institutional conditions jointly influence the distribution of GenAI-related benefits across small businesses.

4.2 Practical implications

The findings offer realistic and evidence-consistent insights for SME owners, managers and policymakers seeking to leverage GenAI effectively. First, the results suggest that GenAI adoption alone is insufficient to drive SME growth. SMEs derive greater benefit when GenAI is integrated into an entrepreneurial organizational posture that encourages experimentation, opportunity recognition and proactive problem-solving. Managers should therefore view GenAI as a strategic support tool that complements entrepreneurial decision-making, rather than as a standalone automation solution.

Second, the non-significant moderating role of DL provides an important managerial lesson. While digital skills remain necessary for effective GenAI usage, investments in digital training should not be assumed to automatically translate into improved performance. Instead, SMEs may benefit more from application-oriented and context-specific digital learning, where GenAI tools are embedded into everyday business functions such as customer engagement, market analysis and operational planning. In this sense, DL appears to act as a foundational enabler, rather than a differentiating factor for growth.

Importantly, the hypothesis-specific findings also offer actionable guidance. The significant relationship between GenAI and EO implies that SMEs adopting GenAI should simultaneously cultivate organizational practices that support experimentation, learning from failure and proactive strategy adjustment. Conversely, the lack of empirical support for DL as a moderator suggests that policymakers and support agencies should recalibrate expectations around digital upskilling initiatives, ensuring that such programs are closely aligned with entrepreneurial application rather than generic technical training.

To translate these findings into a structured managerial assessment, [Table 5](#) presents a practical readiness checklist for SMEs considering or currently using GenAI. The checklist evaluates four organizational conditions derived from the study's findings: strategic

Table 5. Practical readiness checklist for GenAI adoption in SMEs

Dimension	Reflective question	Interpretation of a “yes” response	Remedial action when the response is “No”
Strategic alignment	Is GenAI use linked to a clearly defined business objective or social-impact outcome?	The organization has identified how GenAI supports an operational, strategic or stakeholder-related priority	Define the business problem, intended beneficiary, expected outcome and measurable indicator before expanding GenAI use
Entrepreneurial orientation	Does the firm encourage experimentation, proactive opportunity recognition and learning from unsuccessful initiatives?	The organizational environment supports the conversion of GenAI-enabled ideas into entrepreneurial action	Begin with a controlled pilot, assign managerial responsibility, permit limited experimentation and document lessons from successful and unsuccessful applications
Digital literacy	Do employees possess the baseline capabilities required to use, evaluate and monitor GenAI outputs responsibly?	Employees can use GenAI tools while exercising judgement regarding accuracy, privacy, bias and relevance	Provide application-specific training in prompting, output verification, data protection, bias recognition and responsible AI use
Learning and adaptation	Does the firm systematically review feedback, errors and performance outcomes arising from GenAI use?	The organization can modify GenAI practices in response to evidence and stakeholder feedback	Introduce periodic reviews, record errors and benefits, gather employee and customer feedback and revise operating procedures accordingly
Source(s): Authors’ own work			

alignment, EO, DL and organizational learning. Managers should respond “Yes” or “No” to each reflective question. A “Yes” response indicates that the relevant readiness condition is present, whereas a “No” response identifies a capability gap requiring managerial attention. A “No” response does not necessarily imply that the SME should discontinue or avoid GenAI adoption; rather, the response signals that the remedial action stated in the final column should be undertaken before GenAI use is expanded.

For scoring purposes, each “Yes” response should be assigned one point and each “No” response zero points, producing a total score between zero and four. A score of four indicates relatively strong readiness for the structured use or expansion of GenAI. A score of two or three indicates partial readiness, suggesting that the SME may proceed cautiously while addressing the dimensions receiving a “No” response. A score of zero or one indicates substantial readiness gaps; in such cases, managers should undertake the recommended remedial actions before implementing GenAI more widely. The checklist is intended as a reflective managerial tool rather than a psychometrically validated diagnostic scale. Accordingly, the overall score should be interpreted alongside the SME’s resource position, business objectives, industry conditions and risk exposure.

4.3 Limitations and further research

Despite its contributions, this study has several limitations. The cross-sectional design restricts causal inference and the findings should be interpreted as theory-consistent associations rather than evidence of causality. Additionally, while the sample size is appropriate for PLS-SEM analysis, it limits the generalizability of the results beyond similar SME contexts. The data were collected exclusively from SMEs operating in India, which represents a single emerging-economy setting. Accordingly, the findings reflect the institutional, technological and resource conditions within which Indian SMEs adopt and apply GenAI. Differences in digital infrastructure, access to technological expertise, regulatory support, financial resources and organizational readiness may influence the relationships examined in other national contexts. Future research should therefore test the proposed model across other emerging economies and developed economies. Comparative studies could identify which relationships are consistent across settings and which are context-specific, thereby clarifying whether EO and DL perform similar roles in shaping the social impact of GenAI across different economic and institutional environments.

Future research may extend this work by explicitly incorporating risk-taking propensity toward technology, technology adoption orientation or innovation intensity as distinct constructs to refine understanding of how entrepreneurial posture interacts with GenAI usage. Longitudinal studies could also examine whether DL operates as a nonlinear or threshold-based moderator over time. Finally, qualitative or mixed-method approaches may provide deeper insight into how SMEs internally interpret, experiment with, and institutionalize GenAI within entrepreneurial decision-making processes.

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