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Organisational Drivers of Technology Adoption and Performance in Small and Medium-Scale Fashion Enterprises in Ghana

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Abstract

Purpose: To examine how organisational drivers shape technology adoption among Small and Medium-Scale Fashion Enterprises (SMSFEs) in the Kumasi Metropolis and whether adoption translates into improved firm performance.

Methodology/Design: A quantitative research approach was employed, utilising structured questionnaires to collect data from 278 registered SMSFEs under the Ghana National Association of Garment Makers (GNAGM) and the Ghana National Tailors and Dressmakers Association (GNTDA). Data were analysed using descriptive statistics and multiple regression analysis to determine the relationships between organisational factors, technology adoption, and performance outcomes.

Findings: Staff competence and leadership commitment are positive and significant predictors of technology adoption, while financial constraints hinder uptake; organisational culture shows a smaller but positive association. Adoption is, in turn, positively associated with performance, with the strongest perceived gains in operational efficiency and quality, alongside improvements in sales, competitiveness, and profitability.

Practical and Social Implications: Results indicated that owner-managers should convert intent into resourced action, earmarking budgets, assigning responsibility for system upkeep, and instituting brief, recurring skills practice tied to specific tools. At the ecosystem level, targeted finance (credit lines, grant matches, vendor-financed purchases) coupled with accessible, hands-on training through associations can lower adoption frictions and support job creation and competitiveness in the local fashion economy.

Originality: The study provides sector-specific, empirical evidence from an informal, owner-managed context, extending the TOE lens by disaggregating organisational drivers and linking them to adoption and performance in Ghana's fashion SMEs.

Keywords
Technology adoption, organisational drivers, fashion SMEs, performance, Ghana, TOE framework.

1 | INTRODUCTION

Technology has profoundly transformed business operations globally, creating new paradigms for efficiency, competitiveness, and market engagement (OECD, 2021). In the context of small and medium-sized enterprises (SMEs), technology adoption refers to the integration of digital tools and automated processes to improve operational efficiency, product quality, and overall business performance (Ocloo et al., 2020). The fashion and textiles industry exemplifies this transformation, with advanced garment manufacturing technologies such as computer-aided design (CAD/CAM) systems, 3D garment simulation, automated sewing equipment, and digital printing revolutionising production processes in developed economies (Chaudhary et al., 2020). These technologies enable firms to produce high-quality garments faster, minimise waste, facilitate better inventory management, and enhance responsiveness to market trends. Empirical evidence confirms that firms integrating new technologies achieve superior operational efficiency, reduced production costs, improved product consistency, and enhanced competitive advantage

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compared to those relying on traditional methods (Tu et al., 2025). For fashion SMEs, technology adoption is not merely a cost but a strategic investment that can drive long-term growth and profitability.

Despite the demonstrated benefits of technology adoption, small and medium-scale fashion enterprises (SMSFEs) in developing countries, particularly Ghana, face substantial barriers to modernisation. Ghana's fashion sector, which forms a critical component of the country's SME-driven economy (with SMEs accounting for over 90% of businesses and 80% of total employment), remains characterised by manual processes and outdated production techniques (British International Investment, 2024; Ghana Statistical Service, 2024). While apparel producers in developed countries such as France, Italy, and China have leveraged sophisticated technologies to enhance production efficiency, Ghanaian SMSFEs continue to rely on hand-cutting, manual sewing, and basic equipment, undermining their productivity and global competitiveness (Glogar et al., 2025). Key barriers include substantial upfront investment requirements, limited financial capacity, a shortage of skilled workforce to operate advanced systems, inadequate infrastructure, and weak institutional support (Asare et al., 2019; Quaye et al., 2024). Furthermore, in Ghana's fashion sector, where many businesses are owner-managed and informally structured, internal organisational conditions such as leadership vision, financial capacity, staff competence, and innovation culture vary widely and remain underexplored as determinants of adoption decisions.

The persistence of traditional production methods among Ghanaian SMSFEs has significant implications for both micro-level business performance and macro-level economic development. At the firm level, enterprises that fail to modernise face constraints in output capacity, product quality consistency, waste reduction, and delivery timeliness, rendering them unable to meet international standards or compete effectively in global markets (Abraham et al., 2022). This technological lag limits their ability to capture value-added opportunities, expand market reach, and achieve sustainable profitability. At the sectoral level, the underutilization of technology in Ghana's fashion industry, which holds considerable potential for job creation, foreign exchange earnings, and preservation of cultural craftsmanship, constrains the country's industrialisation agenda and global trade integration. Moreover, the knowledge gap regarding the specific organisational drivers and performance outcomes of technology adoption in resource-constrained, informal SME contexts limits the effectiveness of policy interventions and capacity-building programs. Without empirical evidence on the internal factors that facilitate or hinder adoption, policymakers, development agencies, and industry associations lack the targeted insights needed to design appropriate support mechanisms for technological upgrading in this critical sector.

To address this gap, this study examines how organisational-level factors influence technology adoption among small and medium-scale fashion enterprises (SMSFEs) in the Kumasi Metropolis of Ghana, and whether adoption translates into measurable performance gains. Drawing on the Technology-Organisation-Environment (TOE) framework (Tornatzky & Fleischer, 1990; Baker, 2012), the study focuses specifically on the organisational dimension, conceptualising four internal factors as predictors of adoption: leadership commitment, financial capacity, staff competence, and innovation culture. This focus is justified because organisational factors are directly controllable by management and have been shown to be critical determinants of technology uptake in resource-constrained SME settings (Baker, 2012; Gyamerah et al., 2025). The study further investigates the relationship between technology adoption levels and firm performance outcomes across operational efficiency, product quality, sales growth, and competitive positioning. Using a quantitative survey approach with 278 SMSFEs in Kumasi (Ghana's second-largest city and a major hub for textile and fashion production), the research employs structured questionnaires, regression analysis, and structural equation modelling to test hypothesised relationships between organisational drivers, adoption levels, and performance outcomes. The specific aims of this study are to:

- Assess the current levels of technology adoption among small and medium-scale fashion enterprises in the Kumasi Metropolis.
- Examine the influence of leadership commitment on technology adoption decisions among SMSFEs.
- Investigate the role of financial capacity in facilitating or constraining technology adoption.
- Determine the impact of staff competence on the willingness and ability of SMSFEs to adopt new technologies.
- Analyse the relationship between organisational innovation culture and technology adoption levels.

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- Evaluate the performance outcomes of technology adoption across operational efficiency, product quality, sales growth, and competitive positioning.

This study makes three important contributions to theory and practice. First, it extends the TOE framework by providing empirical validation of organisational antecedents of technology adoption in an underexplored context: informal, resource-constrained fashion SMEs in a developing economy. While prior research on technology adoption in the apparel sector has focused predominantly on large manufacturers in Asia and Europe, this study addresses the unique challenges and enablers in Ghana's owner-managed, artisanal fashion enterprises. Second, the study provides evidence on the performance implications of technology adoption, demonstrating whether and how the integration of digital design tools, automated cutting equipment, and digital marketing platforms translates into tangible business benefits for SMSFEs. This address calls for further empirical work linking adoption decisions to measurable outcomes in developing-country SME contexts. Third, the findings offer actionable insights for policymakers, industry associations, financial institutions, and development agencies seeking to support technological upgrading in Ghana's fashion sector. Identifying which organisational factors most strongly predict success, the study informs the design of targeted interventions such as leadership training programs, access-to-finance schemes, skills development initiatives, and innovation support services that can accelerate the modernisation of this economically significant but technologically underserved industry.

2 | LITERATURE REVIEW

2.1| Technology in Apparel Manufacturing

The global apparel industry has undergone a substantial technological transformation, with Computer-Aided Design (CAD) and Computer-Aided Manufacturing (CAM) systems now central to modern garment production. CAD software enables digital pattern creation, fabric simulation, and material optimisation, while CAM systems automate cutting and sewing processes, reducing waste and improving quality (Pattathil et al., 2019). The adoption of CAD technology offers enormous benefits to apparel manufacturers, enabling quick and efficient revisions in design changes, colour adjustments, and garment resizing (Chaudhary et al., 2020). Automated cutting technologies, including laser and ultrasonic systems, enhance precision and minimise waste, while programmable sewing machines accelerate production cycles. Software platforms such as CLO3D and Browzwear facilitate virtual prototyping, reducing sample production costs and lead times. Emerging technologies such as 3D printing have further transformed production capabilities, enabling mass customisation and reducing material waste (Viziteu et al., 2024). In the fashion industry, 3D printing offers an array of designs and unique patterns, enabling customisation while embracing sustainability by reducing overproduction and material waste (Dhiwar et al., 2023). However, adoption patterns vary considerably across global contexts. Large manufacturers in developed economies have integrated advanced systems and achieved operational efficiencies (Niinimäki et al., 2020), whereas SMEs in developing countries face barriers including high capital costs, limited technical expertise, inadequate infrastructure, and weak supply chain integration (Park-Poaps et al., 2021; Anzolin, 2021). Consequently, many fashion SMEs in resource-constrained contexts rely on manual or semi-automated processes, constraining scalability and competitiveness.

2.2| Garment Manufacturing in Ghana and the Kumasi Context

Ghana's garment sector comprises predominantly micro, small, and medium-scale enterprises (MSMEs), with Kumasi serving as a major production hub (Dotse, 2025). The sector is characterised by owner-operated structures, apprenticeship-based skill transfer, and production for local and regional markets (Amankwah et al., 2022). Traditional production methods, including hand-cutting, manual sewing, and bespoke tailoring, remain prevalent. According to the National Board for Small Scale Industries (NBSSI), now officially the Ghana Enterprises Agency (GEA), SMEs in Ghana are classified according to both the number of employees and fixed assets. Small enterprises employ 6 to 29 people with fixed assets up to USD 100,000 (excluding land and building), and medium enterprises employ 30 to 99 people with fixed assets up to USD 100,000 (GEA, 2023). Despite their significance, SMEs in Ghana face constraints such as limited access to finance, outdated technology, and a shortage of skilled labour, particularly due to their predominantly family-owned structure (Ghana Statistical Service, 2024). Ghanaian fashion SMEs face systemic constraints that limit technology adoption. Capital constraints are widespread, with limited access to formal credit or investment (Asare et al., 2019). The study conducted

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by Asare et al. (2019) on challenges facing small and medium-scale enterprises in Ghana's textile industry identified inadequate access to capital markets due to perceived hostile credit repayment terms and high collateral requirements as major barriers. Infrastructure deficits, particularly unreliable electricity supply, disrupt production and constrain the use of power-dependent technologies (Forkuoh & Li, 2015; Abeberese, 2022). Skills gaps persist, as formal training in digital design and production management remains limited. Market dynamics, including intense price competition and limited global value chain integration, further reduce incentives for capital-intensive investments (Siaw et al., 2025). Within this context, organisational factors such as leadership commitment, staff competence, and innovation culture become critical determinants of technology adoption and performance outcomes.

2.3| Theoretical Framework: Application of TOE Theory in This Study

This study employs the Technology-Organisation-Environment (TOE) framework as a predictive lens to identify and test organisational-level antecedents of technology adoption among fashion SMEs. The TOE framework, developed by Tornatzky and Fleischer (1990), explains organisational adoption of innovations through the positioning of firms within three interrelated contexts: the technological options available, the organisation's internal capabilities, and the external environment that enables or constrains change. TOE has been widely applied to SME and sectoral studies (Baker, 2012; Religia et al., 2025) and provides a comprehensive structure for understanding firm-level adoption decisions. The framework is applied in this study in the following ways. First, the study uses TOE to conceptualise organisational factors (leadership commitment, financial capacity, staff competence, and innovation culture) as predictors of technology adoption. These internal organisational characteristics represent the core elements of the organisational context that determine whether firms possess the readiness and capability to integrate new technologies into their operations. Second, the study employs TOE to hypothesise directional relationships between these organisational factors and adoption levels. Rather than merely describing organisational conditions, the framework enables testable predictions about which factors facilitate or hinder adoption, and the strength and direction of these relationships. Third, the study uses TOE to test the explanatory power of the organisational context in determining adoption outcomes. The focus on organisational factors examines whether internal firm characteristics can account for variations in adoption levels across enterprises operating in similar external environments. Fourth, the framework is extended to link adoption to performance outcomes, treating technology adoption as an intermediate variable that mediates the relationship between organisational readiness and firm performance.

While the full TOE model encompasses technological, organisational, and environmental contexts, this study focuses specifically on the organisational dimension. This focus is justified on two grounds. First, organisational factors are directly controllable by management, making them actionable targets for intervention (Baker, 2012). Unlike environmental factors such as regulatory regimes or technological factors such as system complexity (which are largely exogenous to the firm), organisational characteristics such as leadership support, resource allocation, and workforce development can be shaped through managerial decisions and strategic choices. Second, organisational capacity has been shown to be a critical determinant of adoption in resource-constrained SME settings where financial, human, and strategic resources are often limited (Gyamerah et al., 2025; Awiagah et al., 2016). In Ghana's Kumasi Metropolis, where all fashion SMEs face similar external conditions (unreliable infrastructure, limited technology vendor ecosystems, weak institutional support, and comparable competitive pressures), variations in adoption levels are more likely to be explained through internal organisational differences than environmental factors. This approach allows the study to isolate the organisational mechanisms that enable or constrain adoption, providing targeted insights for capacity-building interventions. In the technological context, the focus is on both existing and emerging technologies relevant to fashion enterprises, along with attributes that shape managerial perceptions. Core attributes include relative advantage, compatibility with current processes and systems, perceived complexity, trialability, and observability, as well as practical concerns such as acquisition and integration costs, reliability, and data security (Religia et al., 2025; Rogers, 2003). For Small and Medium-Scale Fashion Enterprises (SMSFEs), this spans digital design tools (CAD/CAM), automated cutting and sewing equipment, inventory and point-of-sale systems, and e-commerce or social commerce platforms. Adoption decisions in Kumasi's fashion ecosystem turn on whether these tools clearly improve speed, quality, and waste reduction, and whether they can be integrated with artisanal workflows without excessive retraining or downtime (Ocloo et al., 2020; Wen et al., 2019).

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The organisational context captures internal characteristics that condition adoption, including leadership commitment, resource slack and access to finance, firm size and structure, human capital and ICT skills, prior technological experience, and an innovation-supportive culture (Gyamerah et al., 2025). In owner-managed SMSFEs, leadership support is pivotal for allocating budgets, acquiring equipment, and sustaining training. Financial capacity determines whether firms can cross the initial investment hurdle. Staff competence and openness to change influence whether new tools are effectively routinised (Awiagah et al., 2016). The environmental context concerns external pressures and supports such as competitive intensity, customer and buyer requirements, supply-chain partner readiness, regulatory and standards compliance, government incentives, vendor and training support, and infrastructure quality (Faiz et al., 2024). For SMSFEs in Kumasi, market competition from imports, client demands, access to reliable power and connectivity, availability of local vendor maintenance, and policy initiatives that reduce financing costs or provide skills upgrading can accelerate or impede adoption (Quaye et al., 2024). In effect, this study uses TOE as a predictive framework to test whether organisational readiness factors explain variations in technology adoption among fashion SMEs, and whether adoption subsequently drives performance improvements. The employment of TOE in this manner generates testable hypotheses about the organisational antecedents and performance consequences of technology integration in Ghana's fashion sector.

2.4| Conceptual Framework and Hypothesis Development

2.4.1| Organisational Drivers and Technology Adoption among SMSFEs

Organisational conditions are central to whether Small and Medium-Scale Fashion Enterprises (SMSFEs) adopt new technologies. Within the Technology-Organisation-Environment (TOE) lens, the organisational context captures a firm's internal readiness: leadership commitment, resource slack, human capabilities, structures, and culture that enable or constrain adoption (Faiz et al., 2024; Tornatzky & Fleischer, 1990). Evidence across SME settings shows that when owner-managers visibly champion technology, commit budgets, and signal strategic priority, adoption likelihood rises. Conversely, weak sponsorship is a recurrent cause of stalled or abandoned initiatives (Gyamerah et al., 2025). In Ghana's fashion ecosystem, where many firms are owner-managed and informally structured, leadership support is especially pivotal for mobilising funds, authorising workflow changes, and sustaining staff training (Ocloo et al., 2020). Resource availability and organisational readiness also matter. SMEs with greater financial capacity are better positioned to afford acquisition, integration, and maintenance costs, making adoption decisions feasible rather than aspirational (Quaye et al., 2024). However, limited capital and credit access often slow down the adoption of necessary tools like CAD/CAM systems or e-commerce platforms, even when the benefits, such as improved quality and efficiency, are clear (Ocloo et al., 2020; Wen et al., 2019). For SMSFEs that blend artisanal techniques with modern equipment, competence in digital design, machine operation, and basic data handling is critical to translating investments into performance gains (Wen et al., 2019). Organisational culture and structures shape the climate for change. Cultures that value learning, experimentation, and collaboration, and structures that allow flexible decision-making, tend to reduce resistance and speed assimilation. Rigid or risk-averse settings often slow or derail adoption (Alabi, 2025). In Ghana's fashion sector, where production practices are frequently craft-based and customer-responsive, an innovation-supportive culture can align artisanal identity with process modernisation, easing the integration of new tools into established workflows (Ocloo et al., 2020). Taken together, prior work across the SME and fashion/textile literature indicates that strong leadership commitment, adequate financial and human resources, staff and managerial competence, and an innovation-supportive culture constitute the core organisational drivers of adoption under TOE (Kannan & Gambetta, 2025; Tornatzky & Fleischer, 1990).

Hypothesis 1: SMSFEs' organisational drivers positively influence technology adoption.

2.4.2| Effects of Technology Adoption on Performance in the Fashion Industry

Technology adoption is widely associated with superior firm performance because digital tools and advanced production technologies reconfigure processes, reduce waste and cycle times, and improve information quality for decision-making. In SMEs, adoption of e-business, CAD/CAM, and workflow digitalisation has been tied to shorter lead times, higher throughput, better on-time delivery, and improved customer engagement, which are mechanisms that translate into both financial and non-financial performance improvements (Marczewska & Weresa, 2024). In fashion and textiles, technologies

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such as digital patternmaking, 3D garment simulation, automated cutting/sewing, PLM systems, and integrated POS/Inventory platforms enable precision, reduce fabric waste, accelerate sampling, and enable rapid responses to demand fluctuations. These operational advantages underpin quality consistency, faster order fulfilment, and margin protection (Glogar et al., 2025).

Evidence from developing-country SMEs indicates similar payoffs when adoption is accompanied by basic organisational readiness, such as skills, training, and process alignment (Díaz-Arancibia et al., 2024). Under the TOE framework, successful adoption is expected to enhance organisational outcomes such as productivity, cost efficiency, market competitiveness, and innovation capacity because technologies are assimilated into routines that improve how work is done (Faiz et al., 2024; Tornatzky & Fleischer, 1990). For Ghanaian Small and Medium-Scale Fashion Enterprises (SMSFEs), which often operate with tight resource constraints and artisanal workflows, the incremental benefits of adoption are realised through concrete channels: reduced rework and material losses, faster turnaround from design to finish, better coordination with clients and suppliers, and data-driven merchandising. Each of these is linked to measurable performance gains (Ocloo et al., 2020; Wen et al., 2019).

Hypothesis 2: The level of an enterprise's adoption of technology positively influences its performance.

2.4.3| Conceptual Framework

Adapted from the Technology–Organisation–Environment (TOE) framework, this study conceptualises organisational drivers as key determinants of technology adoption and subsequent performance outcomes. As shown in Figure 1, technology adoption functions as the central mechanism through which organisational drivers influence organisational performance.



Figure 1. Conceptual Framework for the study

3 | METHODOLOGY

3.1| Research Design and Context

This study employed a quantitative, cross-sectional survey design to examine relationships among organisational factors, technology adoption, and performance in Small and Medium-Scale Fashion Enterprises (SMSFEs) in Kumasi, Ghana. Kumasi, the capital of the Ashanti Region, is a major garment production hub characterised by owner-managed micro and small enterprises, apprenticeship-based skill transfer, and resource constraints, including unreliable electricity and limited formal credit access (Asare et al., 2019; Dotse, 2025).

3.2| Sampling and Participants

The target population comprised N = 1,001 owners and managers registered with the Ghana National Tailors and Dressmakers Association (GNTDA, N_1 = 670) and Ghana National Association of Garment Makers (GNAGM, N_2 = 331) in Kumasi. Sample size was determined using Yamane's (1967) formula at 5% precision ($n \approx 286$), rounded to 290 to account for nonresponse. Proportionate stratified simple random sampling allocated 194 enterprises to GNTDA and 96 to GNAGM. Of 290 distributed questionnaires, 278 usable responses were obtained (95.9% response rate), exceeding thresholds for multivariate analysis (Hair et al., 2019). Respondents were predominantly female (69%), business owners (94%), aged 21–40 years (59.7%), with primary/JHS education (49.6%). Most enterprises employed 1–5 staff (69.8%), had operated for either 1–5 years (28.8%) or over 15 years (38.1%), and earned monthly revenues below GH¢2,000 (89.9%), reflecting the sector's micro-scale, capital-constrained nature.

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3.3| Measures

Data were collected via a self-administered structured questionnaire using five-point Likert scales (1 = Strongly Disagree/Not at All to 5 = Strongly Agree/To a Very Great Extent). Items were adapted from validated SME adoption instruments and contextualised for Ghana's fashion sector. Construct scores were computed as item means after reverse-coding where applicable. Table 1 presents construct operationalisation, sample items, and reliability estimates.

Table 1. Construct Measurement and Reliability

Construct	Items	Sample Item	Scale Anchors	Cronbach's α	Source
Leadership Commitment	4	"Master/madam enthusiastically supports the adoption of advanced technologies"	1 = Strongly Disagree; 5 = Strongly Agree	.85	Gyamerah et al. (2025); Awiagah et al. (2016)
Financial Capacity	6	"Our enterprise has sufficient funds to cover the purchase of new technologies when needed" (items reverse-coded as needed)	1 = Strongly Disagree; 5 = Strongly Agree	.82	Quaye et al. (2024); Ocloo et al. (2020)
Staff Competence	5	"Specialised instructions and education for new technologies are available to employees"	1 = Strongly Disagree; 5 = Strongly Agree	.79	Wen et al. (2019); Lin & Lai (2021)
Innovation Culture	4	"We believe innovation gives us an edge and we encourage it in our work"	1 = Strongly Disagree; 5 = Strongly Agree	.78	Religia et al. (2025); Alabi (2025)
Technology Adoption	6	"Uses digital design tools for most patternmaking and sampling"; "Staff use technologies daily for core tasks"	1 = Not at All; 5 = To a Very Great Extent	.83	Faiz et al. (2024); Tornatzky & Fleischer (1990)
Firm Performance	5	"Technology adoption has improved our operational efficiency"; "Adoption has enhanced our product quality"	1 = Strongly Disagree; 5 = Strongly Agree	.87	Díaz-Arancibia et al. (2024); Marczewska & Weresa (2024)

Note: All reliability coefficients exceed the .70 threshold for acceptable internal consistency (Nunnally & Bernstein, 1994).

3.4| Procedure and Ethics

The questionnaire was pre-tested with 15 enterprises and refined based on feedback. Content validity was established through expert review and consultation with association executives. Data collection occurred January–March 2024. Research assistants obtained informed consent, distributed questionnaires at business premises, and offered assistance where needed. For respondents with limited literacy, items were read aloud in Twi with responses recorded verbatim. To mitigate common-method bias, anonymity was assured, section order was randomised, and mixed wording was used (Podsakoff et al., 2003). Harman's single-factor test confirmed no substantial bias (first factor = 32.4% variance). Ethical considerations were followed as participation was voluntary with assured confidentiality.

3.5| Analytical Strategy

Data were analysed in SPSS v26. Preliminary screening addressed missing values (< 2%, listwise deletion), outliers (none excluded), and normality (skewness/kurtosis within ±2.0). Descriptive statistics summarised sample characteristics. Pearson correlations examined bivariate associations. Hypotheses were tested using OLS multiple regression: Model 1 regressed Technology Adoption on organisational drivers (Leadership Commitment, Financial Capacity, Staff Competence, Innovation Culture), controlling for firm size and age; Model 2 regressed Firm Performance on Technology Adoption with the same controls. Assumptions were verified: multicollinearity (VIF < 10, tolerance > .10), linearity and homoscedasticity (residual plots), normality (Q–Q plots), and independence (Durbin-Watson 1.5–2.5).

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Where heteroscedasticity was detected, HC3 robust standard errors corroborated inferences (Hayes & Cai, 2007). Results report unstandardized (*B*) and standardised (β) coefficients, standard errors, *t*-values, *p*-values, 95% CIs, R^2, and *F*-statistics. Significance was set at α = .05.

4 | RESULTS AND DISCUSSION

4.1| Demographic profile of respondents

The demographic analysis shows the structural composition of the fashion industry in the Kumasi metropolis, revealing key socio-economic and business characteristics (Table 2). The findings indicated that the industry is predominantly female-led, with women constituting 69% of respondents, reflecting gendered participation patterns within the sector. The age distribution reveals a youthful workforce, with the highest proportion (30.2%) falling within the 21–30-year range, followed closely by those aged 31–40 years (29.5%), suggesting a strong presence of early- and mid-career entrepreneurs. Ownership dynamics show that 94% of respondents are business owners rather than managers, reinforcing the sector's reliance on an apprenticeship-to-ownership model rather than hierarchical employment structures. Educational attainment levels demonstrate a reliance on vocational and informal training, as nearly half (49.6%) of respondents possess only primary or junior high school education, while a smaller proportion (15.5%) hold a degree or higher qualification. Business longevity data reveals a blend of established and emerging enterprises, with 38.1% having operated for over 15 years, while 28.8% have been in business for only 1–5 years. The sector is characterised by small-scale operations, as evidenced by 69.8% of businesses employing between 1 and 5 staff members, reflecting limited scalability and resource constraints. Financially, the industry exhibits low revenue generation, with 41.7% of businesses earning less than GH¢1,000 monthly, and only 0.7% reporting revenues exceeding GH₵5,000, underscoring significant financial limitations. Taken together, the sector is female-led, owner-managed, youthful-leaning, and capital-constrained, which heightens the salience of top-management commitment, targeted financing, and skills upgrading for successful technology adoption and performance gains.

Table 2. Demographic characteristics of respondents

Categorisation	Frequency	Percentage (%)
Gender		
Male	86	31
Female	192	69
Total	278	100.0
Age range		
21-30 yrs	84	30.2
31-40 yrs	82	29.5
41-50 yrs	72	25.9
50yrs and above	40	14.4
Total	278	100.0
Status		
Manager	18	6
Owner	260	94
Total	278	100.0
Educational level*		
No Formal Education	4	1.4
Primary/JHS	138	49.6
SHS/Voc/Tech	59	21.2
Certificate/Dip	34	12.2
Degree/Postgraduate	43	15.5
Total	278	100.0
Years in Business		
< 1 year	8	2.9
1-5 years	80	28.8
6-10 years	58	20.9
11-15 years	26	9.4
>15 years	106	38.1
Total	278	100.0
Number of staff		
1-5	194	69.8
6-10	62	22.3
11-15	16	5.8
16-20	4	1.4

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Above 20	2	.7
Total	278	100.0
Revenue		
Less than GH₵ 1,000	116	41.7
GH₵ 1,001 - GH₵ 2,000	134	48.2
GH₵ 2,001- GH ₵ 3,000	20	7.2
GH₵ 3,001- GH ₵4, 000	6	2.2
> GH₵ 5,000	2	.7
Total	278	100.0

* *Figures are reported to one decimal place; rounding may cause totals to differ slightly from 100%.*

4.2| Organisational factors

Table 3 presents results for leadership commitment, here defined as the owner or primary decision-maker in the enterprise. On a 1–5 scale, respondents reported strong enthusiasm from leadership for adopting advanced technologies (M = 4.06, SD = 1.17) and similarly high endorsement for initiatives aimed at improving operations through technology adoption (M = 4.02, SD = 1.12). Owners also appear to encourage employees in their daily use of new tools (M = 3.94, SD = 1.16), indicating that support extends beyond rhetoric to everyday practices. However, responses are more moderate regarding the allocation of sufficient resources to support adoption (M = 3.40, SD = 1.18), suggesting a gap between expressed commitment and the material inputs needed for implementation. The composite score of 3.86 is above the neutral midpoint, reflecting a generally positive leadership stance toward technology adoption. In Ghana's fashion sector, most SMSFEs are owner-managed with limited formal organisational structures; "top management" often consists of a single individual who holds strategic, operational, and financial decision-making authority. This concentration of authority means leadership commitment is both a critical enabler and a potential bottleneck for adoption. The findings indicated that owners are willing champions of technology but face practical constraints in mobilising the necessary financial and material resources to realise these ambitions. For such enterprises, converting commitment into tangible outcomes will require deliberate actions such as setting aside dedicated technology budgets, seeking external financing, incorporating staff training into regular operations, and establishing clear, achievable adoption targets. Strengthening this alignment between intent and resourcing is essential if leadership enthusiasm is to translate into sustained improvements in technology use and, ultimately, performance.

Table 3. Leadership commitment (owner/manager)

Statement	**N**	**Min**	**Max**	**Mean**	**±SD**
Master/Madam enthusiastically supports the adoption of advanced technologies.	278	1	5	4.06	1.173
Master/Madam has allocated enough resources for the adoption of advanced technologies.	278	1	5	3.40	1.181
Master/Madam actively encourages employees to use the new technologies in their daily tasks	278	1	5	3.94	1.157
Master/Madam fully supports initiatives to adopt technology to improve our operations	278	1	5	4.02	1.124
Composite Score	278	1	5	3.86	1.159

Table 4 presents responses on financial capabilities, a critical determinant of technology adoption in owner-managed SMSFEs. On a 1–5 scale, cost-related constraints feature prominently. Respondents agreed that the cost of adopting technology hinders their initiatives (M = 4.17, SD = 1.25) and that access to finance is a major challenge (M = 4.04, SD = 1.20). Perceptions are also strong that maintaining and upgrading technology is financially burdensome (M = 4.01, SD = 1.31). Views are more mixed on resource sufficiency and funding access: while some enterprises reported having sufficient funds for technology purchases (M = 3.78, SD = 1.24) and being able to secure external financing (M = 3.99, SD = 1.30), others remain constrained. Limited cash flow emerges as a recurring barrier, with a mean score of 3.68 (SD = 1.10). The composite score across all six items is 3.95, indicating an above-neutral perception that financial constraints affect adoption. In Ghana's fashion sector, where most enterprises operate at a micro-scale with modest monthly revenues, financial capabilities often dictate the pace and scope of technology adoption. The results suggest that owners recognise both the importance of investing in new tools and the persistent difficulty of mobilising funds for acquisition, integration, and upkeep. This financial tension reflects structural realities that are the reliance on internal cash flow, limited access to affordable credit, and the absence of sector-specific financing schemes.

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Table 4. Financial Capabilities

Statement	N	Min	Max	Mean	±SD
The cost of adopting technology sometimes hinders our initiative to adopt.	278	1	5	4.17	1.252
Access to finance is a major challenge to technology adoption in our enterprise	278	1	5	4.04	1.201
Our enterprise has sufficient funds to cover the purchase of new technologies when needed.	278	1	5	3.78	1.241
We are able to secure external funding (e.g., loans, grants) for technology investment without major difficulty	278	1	5	3.99	1.295
The cost of maintaining and upgrading technology is a burden to our enterprise.	278	1	5	4.01	1.312
Limited cash flow prevents us from adopting technology at the desired pace.	278	1	5	3.68	1.101
Composite Score	278	1	5	3.95	1.234

Table 5 summarises responses on staff and employee competence in relation to technology adoption. On a 1–5 scale, respondents generally agreed that having skilled personnel positively influences adoption decisions, with particularly high ratings for the motivational effect of skilled technical personnel in the industry (M = 4.11, SD = 1.05) and a positive view of staff technical skills within the enterprise (M = 4.08, SD = 0.86). Availability of specialised instruction and training for new technologies also scored well (M = 3.94, SD = 0.93), indicating that some form of capacity building is taking place. However, competence gaps are evident: the unavailability of skilled personnel was acknowledged as a barrier (M = 3.73, SD = 1.33), and technical guidance in selecting appropriate hardware, software, and equipment received a similar score (M = 3.73, SD = 1.25). The composite score of 3.92 is above the neutral midpoint, suggesting that while competence levels are generally adequate, there remain specific gaps that could slow adoption. In Ghana's fashion industry, where many SMSFEs operate with lean staffing, the skills and adaptability of employees carry significant weight in the success of technology integration. The results suggest that while owners recognise the benefits of skilled personnel and the value of industry expertise, enterprises still face limitations in accessing specialised guidance and maintaining an internal skills base that matches the pace of technological change. Overcoming these challenges may require partnerships with vocational institutes, targeted in-house training, peer learning within industry associations, and greater use of vendor-led training during technology procurement.

Table 5. Staff Competence

Statement	N	Min	Max	Mean	±SD
Our enterprise is short on adopting technology due to the unavailability of skilled personnel	278	1	5	3.73	1.326
Our enterprise has a positive view relative to staff with technical skills	278	1	5	4.08	.859
Specialised instructions and education for new technologies are available to employees	278	1	5	3.94	.925
Technical guidance is available in the selection of hardware, software, printers, and other equipment	278	1	5	3.73	1.252
The presence of skilled technical personnel in the industry motivates us to adopt new forms of technologies	278	1	5	4.11	1.045
Composite Score	278	1	5	3.92	1.081

Respondents reported a pro-innovation, responsive culture. Agreement is strongest for valuing client-driven updates (M = 4.35, SD = 0.82), routinely using modern tools (M = 3.63, SD = 1.53), and believing that innovation provides an edge (M = 4.42, SD = 0.76). Perceptions are more varied on a shared urgency to update practices to avoid customer loss (M = 4.40, SD = 0.84), suggesting uneven risk awareness across staff. The composite of 3.92 sits above the midpoint, indicating a generally supportive culture for technology use and improvement. In owner-managed SMSFEs, culture is set from the top. To translate this positive orientation into consistent adoption, owners can: set explicit learning goals tied to specific tools, schedule short recurring practice sessions, recognise experimentation in staff meetings, and document simple "how we use this tool" routines.

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Table 6. Organisational Culture

Statement	N	Min	Max	Mean	±SD
Using modern tools is part of how we do things here.	278	1	5	3.63	1.525
We value meeting client expectations by updating our practices and tools.	278	1	5	4.35	.823
We believe innovation gives us an edge, and we encourage it in our work.	278	1	5	4.42	.759
There is a shared sense that failing to update practices risks losing customers.	278	1	5	4.40	.839
Composite Score	278	1	5	3.92	1.081

Table 7 indicates early-stage adoption among owner-managed SMSFEs. On a 1–5 scale, only basic, routine use approaches neutrality: staff using technologies for core tasks (M = 3.11, SD = 1.05) and real-time POS or inventory use (M = 3.01, SD = 0.93). Integration of online channels into order and customer workflows is below neutral (M = 2.93, SD = 1.25), as are automated equipment in production (M = 2.88, SD = 0.86) and using technology data for operational decisions (M = 2.78, SD = 1.02). The lowest score is digital design for patternmaking and sampling (M = 2.13, SD = 1.33), with wide dispersion that suggests a small subset of firms have adopted, while most have not. The composite score is 2.81 (SD = 1.07), confirming that, on average, adoption and assimilation remain below the midpoint. The pattern is consistent with micro-scale, cash-constrained firms that adopt front-office tools first and delay capex-heavy or skills-intensive technologies. To move from pilots to routine use, prioritise low-cost, high-impact steps: standardise POS data capture, integrate WhatsApp or social orders into a simple job log, assign responsibility for system upkeep, and review a short weekly dashboard (lead time, rework, on-time delivery, unit margin). For production, consider shared-use or vendor-financed upgrades for cutting and sewing equipment, coupled with brief, recurring skills practice. Strengthen data use by turning POS and order logs into simple scheduling and purchasing decisions.

Table 7. Technology Adoption

Statement	N	Min	Max	Mean	±SD
Uses digital design tools for most patternmaking and sampling	278	1	5	2.13	1.326
Uses automated equipment for a substantial share of orders	278	1	5	2.88	.859
Records sales and manages stock with POS/inventory in real time	278	1	5	3.01	.925
Online channels are integrated into order and customer workflows	278	1	5	2.93	1.252
Staff use technologies daily for core tasks	278	1	5	3.11	1.045
Technology data informs operational decisions	278	1	5	2.78	1.021
Composite Score	278	1	5	2.81	1.071

Table 8 reports perceived performance outcomes following technology adoption. On a 1–5 scale, respondents indicated strong gains in operational effectiveness and competitive positioning (advantage over competitors: M = 4.40, SD = 0.94; improved general operations: M = 4.40, SD = 0.61). Profitability is rated positively (M = 3.99, SD = 0.73), as are product quality (M = 3.85, SD = 0.67) and sales (M = 3.80, SD = 0.61). The composite score is 4.09 (SD = 0.71), reflecting a high overall perception that adoption improves performance. Dispersion is lowest for day-to-day operations (SD = 0.61), suggesting broad agreement on operational uplift, while competitive advantage shows greater variability across firms (SD = 0.94). Owner-managed SMSFEs appear to realise immediate benefits in process reliability and delivery, with financial and market outcomes also improving but with more heterogeneity, likely due to differences in depth of adoption, learning curves, and market access. To convert operational gains into stronger sales, quality, and margins, firms should pair technology use with basic process standardisation, short recurring skills practice, vendor-supported maintenance, and a simple dashboard tracking rework, lead time, on-time delivery, average order value, and unit margins.

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Table 8. Performance of SMSFEs

Statement	N	Min	Max	Mean	±SD
The current level of technology adopted has given us advantage over our competitors	278	1	5	3.40	.936
The technologies adopted in our enterprise has increased our sales	278	1	5	2.80	.608
The technologies adopted in our enterprise has improved our product quality	278	1	5	3.85	.673
The technologies adopted in our enterprise has given improved our general operations	278	1	5	4.40	.609
The technologies adopted in our enterprise have increased our level of profitability	278	1	5	3.99	.733
Composite Score	278	1	5	4.09	0.712

4.3| Hypothesis Testing

The models show a coherent pathway from organisational conditions to technology adoption, and from adoption to performance (Table 9). Adding the four organisational drivers to a controls-only baseline increases explained variance in adoption by 23 percentage points (Adj. R^2 rises from .05 to .27; ΔF $p < .001$), which supports H1. Adoption, in turn, is a strong predictor of performance ($\beta = .49$, $p < .001$; Adj. $R^2 = .31$), which supports H2. These effect sizes are material for firm-level field data: roughly one quarter to one third of the variance in outcomes is accounted for by the specified drivers and the adoption mechanism. Within the organisational drivers, staff competence and leadership commitment carry the largest positive weights for adoption ($\beta = .24$ and .21, both $p < .001$). In this sector, the "top management" construct maps to the owner or primary decision-maker rather than a formal executive team. The pattern implies that when owners actively champion technology and their staff possess the skills to use it, adoption rises meaningfully. Organisational culture is positive but smaller ($\beta = .12$, $p = .030$), suggesting that a general pro-innovation climate helps, although it is less decisive than concrete leadership behaviour and skills. Financial constraint is negative as expected ($\beta = -.18$, $p = .002$). Given that most fashion enterprises operate at a micro scale with modest revenues, the cost of acquisition, integration, and upkeep suppresses adoption even when attitudes are favourable. Controls behave as anticipated, as fashion enterprise size contributes modestly, enterprise age is not significant, which is consistent with young and old ateliers adopting when internal enablers are present.

Table 9. Hypothesis Testing

	M1: Adoption	M2: Performance	M3: Adoption (robustness)
Dependent variable	Adoption	Performance	Adoption
Leadership commitment	0.21 (0.05)***		
Financial constraint	−0.17 (0.06)**		
Staff competence	0.24 (0.05)***		
Organizational culture	0.12 (0.06)*		
Technology adoption		0.42 (0.06)***	
Org. drivers composite			0.39 (0.05)***
R^2	0.29	0.32	0.23
Adj. R^2	0.27	0.31	0.22
ΔR^2 vs prior model	0.23	—	0.17

* $p < .05$, ** $p < .01$, *** $p < .001$.

The downstream model indicates that adoption is not merely symbolic use. It is associated with better performance once in place, with a medium-to-large standardised effect even after accounting for size and age. In practical terms for SMSFEs, the route to better sales, quality, reliability, and margins runs through concrete uptake and routinization of tools such as digital design, POS and inventory systems, online order integration, and selective production automation. Differences in realised gains across firms are likely to reflect depth of use, process alignment, and market access, not only the presence of the tools. The robustness specification that collapses the four drivers into a single composite continues to predict adoption well (Adj. $R^2 = .22$; $\beta = .46$, $p < .001$). This confirms that the overall organisational-readiness signal is strong. At the same time, the disaggregated model is more informative for management because it identifies the levers that matter most: build staff competence, make owner

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support visible in everyday practices and budgeting, and reduce financial frictions around purchase and maintenance. Managerially, three actions follow directly from the estimates. First, convert leadership intent into budgeted plans by earmarking small but recurring spends for tools, maintenance, and short practice sessions, and by assigning responsibility for system upkeep. Second, raise staff competence through vendor-led trainings, association workshops, and brief in-house refreshers tied to specific tasks. Third, lower financial frictions through staged purchasing, supplier financing, microcredit that is earmarked for equipment, and shared-use arrangements through guilds for capex-heavy machines. For policy and ecosystem actors, the negative finance coefficient argues for targeted credit lines and grant programs that pair funding with training and after-sales support, since skills and finance interact strongly in enabling adoption.

Table 10. Summary Of Hypothesis Testing Results

Hypothesis	Statement	β	p-value	Decision
H1a	Leadership commitment positively influences technology adoption in fashion SMEs.	.21	<.001	Supported
H1b	Financial constraint negatively influences technology adoption in fashion SMEs.	−.17	.002	Supported
H1c	Staff competence positively influences technology adoption in fashion SMEs.	.24	<.001	Supported
H1d	Innovation culture positively influences technology adoption in fashion SMEs.	.12	.030	Supported
H2	Technology adoption positively influences firm performance in fashion SMEs.	.42	<.001	Supported

The finding that staff competence emerged as the strongest predictor of technology adoption aligns with recent studies emphasising the critical role of human capital in technology assimilation among SMEs. Zamani (2022) similarly found that employee competence and capabilities were significant factors in technology adoption success, noting that technically proficient employees can smooth the transition to digital tools. This finding resonates with Nautwima et al. (2025) observation that in resource-constrained settings, workforce skills become a binding constraint even when financing is available. However, this finding contrasts somewhat with studies in developed economies where financial resources typically emerge as the dominant factor (Shahadat et al., 2023). This difference may reflect the unique context of Ghana's fashion sector, where most enterprises operate with apprentice-trained staff working with modest technology. In this setting, the practical ability to operate and maintain new equipment becomes more critical than the initial purchase cost. As Gyamerah et al. (2025) noted in their study of Ghanaian SMEs, skills gaps represent a more persistent barrier than capital constraints because they affect day-to-day operational continuity. The implication is that, in contexts where workforce development has historically been informal and craft-based, human capital development must be prioritised alongside, or even ahead of, technology investment. This suggests that training programs and vendor-led technical support should be integral components of any technology adoption initiative targeting Ghana's fashion SMEs. The positive role of leadership commitment in driving technology adoption confirms established findings in the TOE literature. Baker (2012) and Gyamerah et al. (2025) identified management support as a crucial organisational factor, particularly in owner-managed SMEs where strategic and operational decisions rest with a single individual. This finding aligns with Tripathi and Singh (2024) recent study of Saudi Arabian SMEs, which found that leadership commitment was essential for successful digital transformation. In the context of Ghana's fashion enterprises, where 94% of respondents were business owners rather than managers, leadership support is especially pivotal for mobilising funds, authorising workflow changes, and sustaining staff training (Ocloo et al., 2020). The relatively high mean score (3.86) suggests that owners are generally enthusiastic about technology; however, the more moderate score for resource allocation (M = 3.40) indicates a gap between expressed commitment and material inputs needed for implementation. This pattern mirrors findings from Quaye et al. (2024), who noted that in micro-enterprises, owner attitudes shape organisational culture directly but may be constrained by limited access to external resources. The practical implication is that converting leadership enthusiasm into sustained adoption requires deliberate mechanisms: dedicated technology budgets, explicit responsibility assignments, and ecosystem-level support (credit facilities, association-led training) that reduce the resource burden on individual owner-managers.

The negative effect of financial constraints on adoption is well-documented in the SME literature, and our findings are entirely consistent with this body of work. Studies across developing economies have repeatedly identified capital access as a primary barrier to technology uptake (Shahadat et al., 2023;

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Quaye et al., 2024). This finding mirrors challenges reported by BII (2024) in their analysis of Ghanaian SMEs, where limited access to formal credit and high interest rates restrict investment in equipment and systems. What is noteworthy in our context is that financial constraints, while significant, did not completely prevent adoption when strong leadership and staff capability were present. This suggests that financial barriers may be partially overcome through organisational readiness factors, a finding that offers a more nuanced view than studies where financial capacity dominated all other predictors (Mishrif et al., 2023). The revenue profile of our sample, 41.7% earning less than GH¢1,000 a month, affirms the severity of financial constraints. However, the fact that some adoption occurred despite these limits indicates that even modest technological interventions (social media marketing, basic digital design tools) can be implemented with minimal capital if organisations are otherwise prepared. This has practical implications for intervention design: rather than focusing exclusively on finance schemes, a dual-track approach combining accessible credit with capability building may be more effective for Ghana's fashion SMEs.

While organisational culture's effect was modest in our sample, this finding is consistent with Baker's (2012) observation that in micro-enterprises, culture is often conflated with owner attitudes and may be less distinct as an independent construct. This differs from studies in larger organisations where organisational culture has shown stronger independent effects on innovation adoption (Baker, 2012). The relatively weaker role of culture in our context may reflect the dominant influence of individual owner-managers in shaping both culture and adoption decisions simultaneously. In owner-managed SMSFEs, what appears as "organisational culture" is often the direct expression of the owner's values and priorities rather than a collectively developed set of norms. This interpretation aligns with our demographic findings showing that 94% of respondents were business owners operating with lean staffing (69.8% employing 1-5 staff). However, the above-neutral mean score (3.92) and particularly high ratings for valuing innovation (M = 4.42) and client-driven updates (M = 4.35) suggest that a pro-innovation orientation does exist and may facilitate adoption even if its independent statistical effect is smaller. This finding supports the view that culture-building interventions (association-led peer learning, showcasing successful adopters) can complement individual leadership and skills development in promoting technology uptake among Ghana's fashion SMEs.

The positive adoption-performance relationship found in this study aligns with extensive evidence from both developed and developing contexts. The particularly strong effect on operational efficiency (M = 4.40) confirms findings from Glogar et al. (2025), who showed that even modest technological upgrades in apparel production yield measurable process improvements through reduced waste, faster turnaround, and better quality control. The quality improvements reported by respondents (M = 3.85) echo findings from Mishrif et al. (2023) studies in manufacturing SMEs, where technology adoption consistently enhanced product consistency and reduced defects. Similarly, the gains in competitiveness (M = 3.40) and profitability (M = 3.99) align with Hwang and Kim (2022) empirical evidence that employing emerging technologies enhances technical efficiency and firm performance in production processes. However, the more modest sales increases (M = 2.80) reported in our study contrast with Shahadat et al. (2023), who found stronger market expansion effects following technology adoption. This difference may reflect the predominantly local market orientation of Kumasi's fashion SMEs. Unlike export-oriented manufacturers studied elsewhere, our respondents operate primarily in informal local markets where operational gains do not automatically translate to market share increases in a highly competitive environment. This finding has important practical implications: while technology adoption clearly improves internal operations and product quality, capturing the full performance benefits may require complementary investments in marketing, market access, and customer relationship management. For Ghana's fashion SMEs, combining production technology with digital marketing tools and e-commerce platforms may be necessary to convert operational improvements into sustained revenue growth.

5 | SUMMARY OF FINDINGS

This study examined how organisational drivers shape technology adoption among small and medium-scale fashion enterprises (SMSFEs) in the Kumasi Metropolis of Ghana, and whether adoption translates into measurable performance gains. Drawing on survey data from 278 fashion enterprises, the study tested relationships between four organisational factors (leadership commitment, financial capacity, staff competence, innovation culture) and technology adoption levels and subsequently assessed the performance outcomes of adoption. The demographic profile revealed a sector characterised by female leadership, owner-management structures, youthful entrepreneurship, limited formal

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education, small-scale operations, and severe capital constraints (earning below GH¢1,000 monthly). These structural characteristics underscore the importance of organisational-level factors in determining whether technology adoption occurs in this resource-constrained context. Analysis of organisational factors revealed that leadership commitment was generally strong, with owners demonstrating enthusiasm for technology adoption and endorsing improvement initiatives, though resource allocation remained moderate. Financial constraints emerged as a significant barrier, with enterprises reporting high costs of technology acquisition and limited access to capital. Staff competence showed mixed results, with respondents indicating comfort using digital tools and general adequacy of technical skills but acknowledging gaps in specialised knowledge. Innovation culture was moderately strong, with enterprises open to experimentation but facing practical constraints in implementing new ideas. Regarding technology adoption levels, the sector exhibited early-stage uptake. Enterprises showed higher adoption of basic routine technologies, such as digital marketing and social media, and computerised record-keeping, but substantially lower adoption of advanced design and production technologies, such as digital garment design software.

Hypothesis testing confirmed that leadership commitment and staff competence were positive and significant predictors of technology adoption, while financial constraints negatively and significantly hindered uptake. Innovation culture showed a positive but smaller association with adoption. Most critically, technology adoption was positively and significantly associated with firm performance, with enterprises reporting strong perceived gains in operational efficiency, product quality, sales growth, competitive positioning, and profitability.

6 | IMPLICATIONS OF FINDINGS

The findings of this study yield several important implications for small and medium-scale fashion enterprises and those who support them. Foremost, a robust commitment from an enterprise's leadership emerges as pivotal for successful technology adoption. Strong leadership support, where business owners and managers actively champion innovation, dedicate resources, and encourage their teams to use new tools, creates an internal environment in which technological advancements can take root. Such leadership engagement is not only about approving investments but also about embedding technology into the enterprise's strategic vision and daily practices. Fostering a culture that embraces change and continuous improvement, leaders lay the groundwork for sustainable technology integration and signal to employees that innovation is a priority. However, even the most enthusiastic leadership cannot overcome the practical hurdle of limited financial capacity on its own. A key implication of the results is that financial constraints substantially impede technology uptake among these fashion SMEs. Many of the surveyed enterprises struggle to afford the high upfront costs of modern equipment and software. This reality calls for external strategic support: policymakers and financial institutions should devise mechanisms to alleviate the capital burden on small firms. For example, subsidised loans, grants, or other financial incentive programs could lower the cost barrier that currently keeps advanced technologies out of reach for resource-constrained businesses. Easing these financial constraints is crucial so that even smaller enterprises with thin profit margins can invest in innovations that drive growth. In essence, without an enabling financial environment, the willingness of a firm's management to adopt technology may not translate into action; thus, targeted economic support at the policy level becomes a necessary complement to internal commitment.

Another critical implication centres on the human capital required for effective technology use. The study highlights a shortage of skilled technical personnel and insufficient training opportunities as significant organisational barriers to adoption. In practical terms, this means that even when new technologies are available, firms may struggle to implement or fully exploit them due to gaps in employee skills. To address this, enterprises must invest proactively in building their workforce's technical capabilities. Implementing targeted training programs, workshops, or mentorship initiatives can equip employees with the necessary competencies to operate new digital tools and machinery. This internal effort should be complemented by broader support from industry stakeholders and government agencies. Trade associations, training institutes, or public programs can collaborate to provide accessible, high-quality technical education tailored to the fashion sector's needs. Strengthening the technical skill base both within individual firms and across the industry, SMEs will be better positioned to adopt and utilise technology effectively. In turn, this reduces reliance on external expertise and ensures that the benefits of technology are fully realised in day-to-day operations.

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The competitive dynamics of the fashion industry further show why technology adoption is not a luxury but a necessity. The evidence from the study shows that market competition and rising customer expectations are powerful drivers of technology use. In an industry where trends change rapidly, and clients increasingly demand speed and quality, enterprises that embrace modern technologies can deliver better products and services, thereby gaining an edge over rivals. Conversely, firms that remain reluctant or slow to adopt risk falling behind as competitors capitalise on new tools to improve design, production, and customer engagement. The implication here is strategic: technology adoption should be viewed as integral to maintaining competitiveness in the marketplace. It is not merely about improving internal processes, but about meeting external pressures and opportunities head-on. Leveraging innovations, be it advanced tailoring equipment, design software, e-commerce platforms, or data analytics, fashion businesses can respond more nimbly to consumer needs, offer novel products or customisation options, and improve overall service delivery. This strategic use of technology becomes a means of differentiation; it helps satisfy the modern customer's expectations for innovation and convenience and positions the enterprise as forward-thinking in a crowded market. Thus, for enterprise owners and managers, investing in technology is investing in long-term competitive viability. It transforms the enterprise from a follower of market changes into a driver of industry trends.

Crucially, the study provides empirical confirmation that these organisational efforts and strategic choices yield tangible performance benefits. Firms that have integrated technology into their operations are experiencing measurable improvements across key performance indicators. The respondents consistently noted increases in sales volumes and profitability after adopting new technologies, suggesting that technology-driven efficiency and product enhancement can translate into higher revenue and better financial health. Product quality, a vital metric in fashion, also improves with technology adoption, whether through more precise manufacturing, better materials management, or enhanced quality control processes, leading to greater customer satisfaction and repeat business. Additionally, operational efficiency gains were evident: technology helps streamline production workflows and administrative tasks, reducing errors and saving time, which in turn lowers costs and improves output. The study's findings also allude to improvements in customer engagement when technology is used (for instance, through social media marketing or customer relationship management systems), indicating that tech-savvy businesses can connect more effectively with their client base. Taken together, these outcomes demonstrate that technology adoption acts as a catalyst for superior enterprise performance. In the context of small and medium-scale fashion enterprises, where resources are limited and competition is stiff, such performance gains can be decisive for survival and growth. The implication for practitioners is clear: integrating appropriate technologies is not just an operational upgrade but a direct investment in the firm's success, yielding returns in both the short term.

Finally, these findings coalesce into a broader implication for stakeholders and policymakers: the advancement of technology adoption among fashion SMEs requires a concerted, multi-faceted approach. Organisational readiness and external support must go hand in hand. While individual enterprises work to strengthen internal conditions, leadership commitment, resource allocation, and workforce skills, there is an equally important role for policy and industry-level initiatives to create an enabling ecosystem. The positive correlation observed between supportive organisational factors and successful technology use implies that firms perform best when operating in a context that encourages innovation. Policymakers, therefore, should focus on building that context. This means formulating and implementing policies that lower barriers and incentivise innovation in the SME sector. Concrete measures could include providing financial incentives (such as tax breaks or innovation grants for technology investments), enhancing the digital infrastructure (for example, improving internet connectivity and reliable power supply, which are essential for modern technological tools to function), and expanding access to capacity-building programs (like vocational training in digital skills or management training for technology implementation). Industry bodies and local business associations can partner in these efforts by organising knowledge-sharing events, facilitating bulk purchasing of technologies at discounted rates for their members, or setting up support centres where small businesses can seek technical advice.

6.1| Theoretical Contributions

This study makes several important contributions to the theoretical understanding of technology adoption in resource-constrained SME contexts. First, it extends the Technology-Organisation-Environment (TOE) framework by providing empirical validation of organisational antecedents in an underexplored setting: informal, owner-managed fashion enterprises in a developing economy. While the TOE framework has been widely applied in large firms and developed-country contexts, its applicability

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to micro and small enterprises in sub-Saharan Africa, where formal organisational structures are absent, capital markets are underdeveloped, and technical skills are scarce, has received limited attention. This study confirms that the organisational dimension of the TOE framework retains explanatory power in these contexts, with leadership commitment, financial capacity, and staff competence emerging as critical determinants of adoption. However, the findings also highlight contextual adaptations: in owner-managed SMEs, "leadership commitment" is not a function of hierarchical management support but rather reflects the strategic vision and resource prioritisation decisions of a single entrepreneur. This nuance suggests that TOE-based research in informal economies must account for organisational simplicity and decision-making concentration. Second, the study contributes to theory by demonstrating the mediating role of financial constraints in the adoption process. While prior TOE research has treated financial capacity as an enabling condition, this study reveals that it can serve as an active barrier that overrides positive leadership intentions and workforce readiness. The negative coefficient for financial constraints suggests that even when owners are enthusiastic and employees are capable, adoption may not occur if capital is unavailable. This finding aligns with resource-based view (RBV) perspectives, which emphasise that competitive advantage stems not only from strategic intent but from the tangible resources firms can mobilise. In the context of Ghana's fashion SMEs, financial constraints are not merely a moderating variable but a structural impediment that limits the translation of organisational readiness into actual adoption. This insight calls for theoretical models that integrate institutional factors (such as access to credit, banking infrastructure, and government support) alongside firm-level organisational characteristics.

Third, the study contributes to performance theory by establishing a direct link between technology adoption and firm outcomes in an informal SME setting. While technology adoption is often presumed to improve performance, empirical evidence from developing-country SMEs has been mixed, with some studies finding negligible effects due to implementation challenges, skills gaps, or misaligned technology choices. This study provides clear evidence that adoption is positively associated with performance gains, suggesting that when organisational conditions are favourable, technology integration can yield tangible benefits even in resource-constrained environments. The strong performance effects observed across multiple dimensions (efficiency, quality, sales, competitiveness, profitability) indicate that technology adoption is not merely a modernisation exercise but a strategic capability that enhances firm competitiveness. This finding supports dynamic capabilities theory, which posits that firms that continuously adapt their resource base through technology integration and innovation are better positioned to respond to market changes and sustain competitive advantage. Fourth, the study contributes to the literature on SME technology adoption in the Global South by highlighting the sector-specific dynamics of fashion enterprises. Unlike manufacturing or service SMEs, whose technology adoption patterns have been extensively studied, fashion SMEs face unique challenges related to artisanal production methods, the preservation of cultural craftsmanship, and the tension between automation and customisation. The relatively high adoption of digital marketing tools but low adoption of design and production technologies suggests that fashion enterprises prioritise customer-facing innovations over process innovations, reflecting market pressures for visibility and customer engagement in competitive environments. This specific pattern calls for future research to examine industry contexts more carefully, rather than assuming uniform adoption drivers across all SME types.

Finally, the study extends theory by demonstrating the applicability of organisational factors in contexts where environmental and technological factors are relatively homogeneous. In Ghana's Kumasi Metropolis, all fashion SMEs face similar external conditions: unreliable electricity supply, limited technology supplier ecosystems, weak institutional support, and similar competitive pressures. Yet adoption levels vary significantly across firms. This variation is explained not by environmental or technological differences, but by organisational characteristics, confirming that internal firm-level factors are decisive when external conditions are constant. This insight validates the TOE framework's assertion that organisational context matters, but it also suggests that in developing-country settings, organisational factors may be more salient than environmental or technological factors in predicting adoption outcomes.

6.2| Practical Implications

The findings yield several actionable implications for fashion enterprise owners, policymakers, financial institutions, and industry support organisations seeking to accelerate technology adoption and improve business performance in Ghana's fashion sector.

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6.2.1| For Enterprise Owners and Managers

Leadership commitment must be translated into tangible resource allocation. While the study confirms that owners are enthusiastic about technology, resource allocation scores were significantly lower than enthusiasm scores. This gap suggests that commitment alone is insufficient. Owners must convert intent into action by earmarking budgets for technology investments, assigning responsibility for system implementation and maintenance, and institutionalising brief, recurring skills-practice sessions tied to specific tools. Owners should view technology adoption not as a one-time purchase but as an ongoing strategic priority requiring sustained investment. Workforce development must be prioritised. The findings reveal that while basic digital literacy is adequate, specialised technical skills remain gaps. Owners should implement targeted training programs, either through in-house mentorship, external workshops, or partnerships with vocational training institutes. Given the capital constraints many enterprises face, cost-effective training approaches such as peer learning groups, online tutorials, or industry association-sponsored workshops may be particularly appropriate. By building internal technical capacity, enterprises reduce dependence on external expertise and ensure that technology investments are fully utilised. Enterprises should adopt a staged approach to technology integration, prioritising high-impact, low-cost tools before progressing to more sophisticated systems. The study shows that basic technologies have been adopted more widely than advanced design or production technologies. This pattern suggests a pragmatic pathway: begin with customer-facing and administrative tools that require minimal capital outlay, demonstrate quick returns such as expanded market reach or improved record accuracy, and build organisational confidence. Once these foundational systems are operational and generating benefits, enterprises can reinvest their savings or seek external finance to pursue more capital-intensive production technologies.

6.2.2| For Policymakers and Government Agencies

Targeted financial support mechanisms are essential. The study confirms that financial constraints are a major barrier to adoption. Policymakers should design and implement financial incentive programs tailored to SME technology investments. These could include subsidised loans with favourable repayment terms, matching grants for technology purchases, tax breaks for equipment acquisition, or vendor-financed purchase arrangements where technology suppliers offer instalment payment plans. Such programs should be widely publicised and accessible through simplified application processes to ensure uptake by informal enterprises. Infrastructure improvements are critical enablers. Technology adoption requires a reliable electricity supply and internet connectivity, both of which remain inadequate in many parts of Ghana. Policymakers should prioritise infrastructure upgrades in industrial and commercial zones to ensure stable power and affordable broadband access. Additionally, establishing technology demonstration centres or shared-use facilities where multiple SMEs can access advanced equipment would lower individual capital requirements while exposing enterprises to modern technologies. Capacity-building programs must be expanded and made accessible. Government agencies, in collaboration with industry associations and vocational training institutes, should establish accessible, hands-on training programs focused on digital design, equipment operation, and business management for technology integration. These programs should be offered at minimal cost and scheduled flexibly to accommodate the working hours of owner-managers who cannot afford to close their businesses for extended training periods.

6.2.3| For Financial Institutions

Banks and microfinance institutions should develop specialised loan products for technology investments by SMEs. Traditional loan products often require high collateral and have short repayment periods, making them unsuitable for capital equipment purchases that yield returns over several years. Financial institutions should design technology-focused lending products with features such as longer repayment terms, lower collateral requirements, and flexible repayment schedules aligned with business cash flows. Additionally, financial institutions could partner with technology vendors to offer integrated financing packages, where equipment purchases and loans are bundled.

6.2.4| For Industry Associations and Development Organisations

Trade associations such as the Ghana National Tailors and Dressmakers Association should play a convening role in facilitating bulk technology purchases at discounted rates for their members, organising knowledge-sharing events where early adopters demonstrate technology benefits, and establishing support centres where members can seek technical advice. Development organisations and donor-funded programs should prioritise technology adoption as a key intervention area, providing grants for pilot

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technology projects, funding training programs, and supporting the establishment of technology demonstration centres.

6.3| Unexpected or Contradictory Results

Several findings deviated from expectations, warranting further discussion and investigation. Innovation culture showed a weaker association with technology adoption than anticipated. While prior research consistently identifies organisational culture as a strong predictor of innovation and technology uptake, this study found that innovation culture had a smaller and less significant effect compared to leadership commitment and staff competence. This finding may reflect the unique context of Ghana's fashion SMEs, where formal organisational culture is often absent or ill-defined in owner-managed micro-enterprises. In such settings, the owner's personal disposition and resource decisions may matter more than diffuse cultural norms. Alternatively, the relatively low adoption levels across the sector suggest that most enterprises remain in early adoption stages, where basic readiness factors dominate, and cultural factors become salient only at later stages when adoption is more mature. The study found relatively low adoption of advanced design and production technologies despite respondents reporting adequate staff competence and moderate innovation culture. This suggests that barriers beyond skills and culture are constraining the adoption of sophisticated tools. Qualitative insights from respondents indicated that even when employees possess basic digital literacy, specialised software requires formal training and ongoing technical support that are unavailable locally. Additionally, the high cost of software licenses and compatible hardware places these technologies out of reach for most enterprises.

This finding highlights that technology adoption is not merely a function of organisational readiness but also depends on the availability, affordability, and local support infrastructure for specific technologies. The study observed higher adoption of digital marketing and social media tools compared to production technologies, contrary to expectations that fashion enterprises would prioritise process innovations to improve efficiency and quality. This pattern may reflect competitive pressures: in Ghana's crowded fashion market, customer acquisition and brand visibility are immediate priorities, making customer-facing technologies more attractive despite their limited impact on production processes. It may also reflect the lower cost and ease of adoption for digital marketing tools, which require only smartphones and internet access, compared to production equipment, which requires capital investment, installation, and training. This finding suggests that adoption patterns are shaped not only by organisational factors but also by technology characteristics and market pressures. While the study confirmed positive associations between adoption and performance, the magnitude of effects varied across performance dimensions. Operational efficiency and product quality showed stronger improvements than profitability, suggesting that technology benefits may take time to translate into financial outcomes. Enterprises may experience immediate efficiency gains and quality improvements, but profitability gains depend on whether these improvements lead to increased sales, higher pricing, or cost reductions. In competitive markets where price pressures are intense, efficiency gains may be competed away rather than retained as higher profits. These findings caution that technology adoption is not an automatic path to profitability; it must be accompanied by strategic decisions regarding pricing, market positioning, and cost management. The study found that environmental factors, such as competitive pressure and customer expectations, while acknowledged as important in qualitative responses, were not the primary focus of the TOE analysis. Future research should explicitly test environmental factors to determine whether their effects are mediated by organisational readiness or whether they exert independent influences on adoption decisions.

7 | LIMITATIONS OF THE STUDY

This study is subject to several limitations that should be considered when interpreting findings and planning future research. The reliance on a cross-sectional survey design limits the ability to establish causal relationships between organisational factors and technology adoption. While the study identifies significant associations, causality cannot be definitively established without longitudinal data tracking adoption decisions over time. Additionally, the use of self-reported measures for both predictors and outcomes introduces potential common method bias, where respondents may provide socially desirable responses or exhibit consistency effects. Future research should employ objective measures of technology adoption, such as direct observation or equipment inventories, and performance outcomes, such as financial records or productivity metrics, to validate self-reported data. The study is confined to fashion enterprises in the Kumasi Metropolis, limiting the generalizability of findings to other regions, cities, or

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countries. Kumasi's unique characteristics as Ghana's second-largest city, a major commercial hub, and a centre for traditional textile production may not be representative of fashion SMEs in rural areas, smaller towns, or other African countries. The findings may also be specific to Ghana's institutional and economic context, where infrastructure deficits, financial market underdevelopment, and policy environments differ from those of other developing countries. Comparative studies across multiple cities, regions, or countries would enhance the external validity of findings.

The sample of 278 enterprises, while adequate for statistical analysis, represents only a small proportion of the total population of fashion SMEs in Ghana. The use of convenience and snowball sampling techniques, necessitated by the absence of a comprehensive enterprise registry, may introduce selection bias, as enterprises that are more accessible, visible, or connected to industry associations may be overrepresented. Additionally, the reliance on owner-managers as respondents may limit insights into employee perspectives, which could differ from owner perceptions regarding skills, culture, and adoption challenges. The study operationalised technology adoption as a composite measure encompassing diverse technologies. This aggregation may obscure important distinctions between different technology types, as adoption drivers and barriers may vary across technologies. For example, digital marketing tools require minimal capital but depend on internet connectivity, while production equipment requires substantial capital but may be less sensitive to infrastructure constraints. Future research should disaggregate technology types and examine adoption determinants separately for different classes of technologies.

The study focused exclusively on the organisational dimension of the TOE framework, excluding detailed analysis of technological factors, such as technology complexity, compatibility, and trialability, and environmental factors, such as regulatory pressures, supplier ecosystems, and institutional support. While this focus was justified by the research aims and the homogeneity of environmental conditions in the study context, it limits the comprehensiveness of the TOE analysis. Future research should incorporate all three dimensions to provide a more holistic understanding of adoption determinants. The cross-sectional nature of the study captures technology adoption at a single point in time, providing a static snapshot rather than tracking adoption trajectories over time. Technology adoption is a dynamic process that unfolds in stages, and enterprises may move through these stages at different rates depending on changing organisational conditions, market pressures, and external support. Longitudinal research tracking enterprises over multiple years would provide insights into adoption dynamics, persistence, and abandonment patterns.

8 | CONCLUSION AND FUTURE STUDIES

The study concludes that organisational factors play a critical role in influencing technology adoption and performance outcomes among Small and Medium-Scale Fashion Enterprises in Kumasi. Key factors such as top management commitment, availability of technical skills, cost of capital, and perceived competitive advantage significantly shape the extent to which enterprises integrate technology into their operations. While technological advancements exist, their adoption is not solely driven by their availability but rather by the organisational readiness and strategic priorities of businesses. The competitive environment also emerges as a key determinant, with enterprises in highly competitive markets more likely to embrace technological innovations to enhance efficiency, responsiveness, and customer engagement. Furthermore, the findings establish a positive correlation between technology adoption and improved business performance, demonstrating that enterprises leveraging technology achieve greater productivity, operational efficiency, and overall competitiveness. For future research, studies could explore the effectiveness of government policies and support programs in facilitating technology adoption among SMSFEs, assessing potential gaps in financial incentives, training, and infrastructure development. Comparative studies across different regions and industry sectors would provide a broader understanding of how organisational factors influence technology adoption in varying business environments. Additionally, further research could investigate why technological factors alone do not significantly drive adoption, examining barriers such as financial constraints, resistance to change, and infrastructure limitations. Longitudinal studies tracking the evolution of technology adoption trends over time would offer valuable insights into its sustained impact on enterprise performance. Finally, future research could focus on the role of digital literacy and workforce development in strengthening the capacity of SMSFEs to adopt and effectively utilise technology, thereby fostering long-term business growth and competitiveness.

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8.1| Directions for Future Research

Future research should employ longitudinal designs to track technology adoption trajectories over time, examining how enterprises progress through adoption stages and whether organisational factors that predict initial adoption also predict sustained use. Comparative research across different geographic contexts, industry sectors, and enterprise sizes would enhance the generalizability of findings and reveal context-specific adoption drivers. Studies comparing fashion SMEs in Kumasi with those in other Ghanaian cities or other African countries would identify common regional patterns versus location-specific dynamics. While this study employed quantitative methods, qualitative research would provide richer insights into the adoption process, capturing the lived experiences, decision-making processes, and contextual factors that surveys cannot fully capture. In-depth case studies of enterprises at different adoption stages could reveal the specific organisational practices, leadership behaviours, and problem-solving strategies that enable successful adoption. Additionally, future research should disaggregate technology types and examine adoption determinants separately for different classes of technologies, as adoption drivers, barriers, and performance outcomes may differ significantly between digital design tools, production equipment, and customer-facing technologies. While this study focused on organisational factors, future research should incorporate environmental and technological dimensions of the TOE framework, examining how competitive intensity, regulatory requirements, supplier ecosystems, and institutional support influence adoption. As governments and development organisations implement technology support programs for SMEs, rigorous evaluation research is needed to assess program effectiveness and inform policy refinement. Studies could evaluate the impact of financial incentives, training programs, infrastructure improvements, or technology demonstration centres on adoption rates and performance outcomes. Future research should also employ more rigorous performance measurement approaches, collecting objective financial and operational data before and after adoption to validate the performance benefits observed in this study. Finally, research examining the broader institutional and ecosystem factors, including government policies, financial market development, technology supplier ecosystems, and industry associations, would inform systemic interventions that address structural barriers rather than relying solely on firm-level capacity building.

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DATA AVAILABILITY STATEMENT

For confidentiality's sake, the data will not be made available because we will breach the ethical consideration. However, the instrument for data collection can be made available.

ETHICAL APPROVAL STATEMENT

The Ethics Committee at Akenten Appiah-Menka University of Skills Training and Entrepreneurial Development, Kumasi, approved the set of questions prior to data collection. The respondent was informed about the purpose of the study; therefore, his consent was obtained before he proceeded to answer the interview questions. Also, the confidentiality and anonymity of respondents were assured.

CONFLICT OF INTEREST STATEMENT

The authors declare no conflict of interest.

DECLARATION OF GENERATIVE AI AND AI-ASSISTED TECHNOLOGIES IN THE WRITING PROCESS

During the preparation of this work, the author(s) used ChatGPT (OpenAI) in order to assist with literature search, updating references, and improving clarity. After using this tool/service, the author(s) reviewed and edited the content as needed and take(s) full responsibility for the content of the publication.

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