

From digital adoption to strategic integration: Amplifying customer experience and marketing performance through synergistic integration of digital marketing and e-commerce supply chains



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Background: The digital transformation imperative has accelerated organisational change, compelling micro-, small- and medium-enterprises (MSMEs) to rapidly integrate digital marketing with e-commerce and supply chain operations.

Aim: This study investigated how the integration of digital marketing strategies with e-commerce supply chain operations enhances customer experience and marketing performance among South African MSMEs in the post-coronavirus disease 2019 (COVID-19) digital economy.

Setting: This study focused on 244 MSMEs in South Africa's four largest cities.

Method: A quantitative design employing confirmatory factor analysis (CFA) and structural equation modelling (SEM) tested six hypotheses examining relationships among digital marketing, e-commerce supply chain, customer experience and marketing performance.

Results: All hypotheses were supported. Digital marketing significantly influenced e-commerce supply chain operations, customer experience and marketing performance ($\beta = 0.89$). E-commerce supply chains significantly affected customer experience and marketing performance. Customer experience has demonstrated a strong influence on marketing performance.

Conclusion: This study extends the diffusion of innovation theory (DOI) by demonstrating how diffusion of innovation attributes – relative advantage, compatibility and observability – manifest in MSME digital adoption within developing economies. The findings of this study reveal that strategic integration, rather than mere adoption, of digital marketing with e-commerce supply chains creates synergistic effects that amplify both customer experience and marketing performance.

Contribution: This study uniquely demonstrates that integrated digital marketing and supply chain digitalisation produce synergistic effects on customer experience and marketing performance, exceeding isolated adoption outcomes – providing empirical evidence that strategic integration, rather than resource intensity, drives competitive advantage for emerging market MSMEs.

Keywords: digital marketing strategies; supply chain operations; customer experience; marketing performance; diffusion of innovation theory; MSMEs.

Introduction

The coronavirus disease 2019 (COVID-19) pandemic precipitated an acute digital transformation imperative, generating unprecedented disruption to established business models and compelling micro, small and medium enterprises (MSMEs) globally to undertake rapid digitalisation amid simultaneous demand volatility, operational constraints and liquidity pressures (Organisation for Economic Co-operation and Development [OECD] 2020; World Health Organization [WHO] 2020). The need to survive required combining previously discrete capabilities – with digital marketing creating customer demand indicators that supply chain systems, improved through AI-powered platforms and forecasting tools, had to fulfil in real-time. (Dwivedi et al. 2020). However, empirical assessment reveals substantial heterogeneity: while some MSMEs achieved

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synergistic benefits through strategic integration, others implemented technologies in fragmented isolation, realising limited returns despite comparable investments. The understanding of what distinguishes successful integration from ineffective fragmentation remains theoretically unresolved and practically consequential.

South Africa exemplifies the digital transformation paradoxes of an emerging economy. Micro, small and medium enterprises constitute critical economic pillars contributing substantially to employment and growth (Kelly-Louw 2024), yet operating within contradictory conditions: accelerating Internet penetration and e-commerce adoption (World Bank 2020) coexist with infrastructure deficiencies, resource constraints and fragmented ecosystems (Chinnapakjarusiri et al. 2024). Digital marketing strategies – social media engagement, search engine optimisation (SEO), content creation – enable market reach expansion (Tiago & Veríssimo 2014), yet effectiveness depends critically on supply chain capabilities fulfilling the marketing-generated demand (Kwarteng-Amaniampong 2024; Lumpkin, Droege & Dess 2002). This interdependence operates bidirectionally: digital marketing generates customer intelligence that informs supply chain decisions, while operational capabilities enable or constrain marketing strategies (AlSondos, Salameh & Engineer 2020; Aravamudhan et al. 2024).

Despite substantial scholarly attention to digital marketing adoption and e-commerce supply chain development as independent research streams, a critical theoretical and empirical lacuna persists: the synergistic mechanisms through which their strategic integration shapes customer experience and marketing performance in resource-constrained contexts remain unexplored. This knowledge deficit assumes particular urgency in post-pandemic business environments in which digital transformation has transitioned from a strategic differentiator to an existential imperative (Dwivedi et al. 2020; Papadopoulos, Baltas & Balta 2022).

Three critical gaps impede advancement in understanding the integration of digital marketing and supply chain digitalisation. Firstly, the current literature treats digital marketing and supply chain digitalisation as separate phenomena, failing to theorise the synergistic mechanisms through which their integration creates value exceeding the sum of independent contributions. This gap is particularly problematic for understanding how resource-constrained MSMEs might leverage integration for competitive advantage (Wube & Atwal 2024).

Secondly, despite conceptual arguments advocating integration, no studies have rigorously validated the structural pathways linking digital capabilities to customer experience and marketing performance. Specifically, research has not systematically examined: (1) whether digital marketing capability catalyses supply chain digitalisation, (2) whether the relative magnitudes through which each

capability influences customer experience, or (3) whether customer experience mediates the relationship between digital capabilities and marketing performance in resource-constrained settings. Finally, the existing frameworks predominantly emerge from advanced economies characterised by mature infrastructure, robust institutional support and abundant resources. Whether integrated digital strategies remain effective under emerging market conditions – including unreliable infrastructure, severe financial constraints and variable digital literacy – lacks empirical investigation. The applicability of advanced-economy findings to resource-constrained contexts remains unvalidated.

This study addresses these gaps by empirically examining how digital marketing integrates with e-commerce supply chains to influence customer experience and marketing performance among 244 South African MSMEs. Through structural equation modelling (SEM), the research validates the integration mechanisms in resource-constrained contexts while extending the diffusion of innovation theory (DOI) from isolated technology adoption to innovation diffusion within integrated organisational systems in which value emerges from synergistic capability combinations rather than discrete technological deployments.

Theoretical review and formulation of hypotheses

Diffusion of innovation

Rogers (1962) developed the DOI theory to explain how innovations – ideas, technologies or products – propagate through social systems over time. Rogers (1962) conceptualises this as communication of innovations through specific channels among social system members. An innovation represents any idea, process, or technology perceived as novel by potential adopters within a given context (Rogers 1962). Rogers (2003) identifies four elements driving diffusion: innovation (novel ideas, technologies or processes perceived as new), communication channels (mechanisms like digital media and word-of-mouth, through which innovation information spreads), time (reflected in S-curve adoption patterns) and social system (networks of individuals and organisations, whose interactions influence adoption decisions). Valente (1996) emphasises the roles of communication channels, while Mahajan, Muller and Bass (1990) document temporal S-curve patterns. Rogers (2003) highlights social system dynamics. Research demonstrates that innovations achieve higher adoption rates when effectively communicated, appropriately timed, compatible with social contexts, aligned with existing values, and addressing specific adopter needs (Moore & Benbasat 1991).

The theory categorises adopters as innovators, early adopters, early majority, late majority and laggards (Rogers 1962; Stone 2023). Rogers (2003) identifies five innovation attributes influencing adoption: relative advantage (perceived superiority over existing solutions), compatibility

(fit with organisational processes and knowledge), complexity (implementation difficulty), trialability (ability to experiment before full commitment) and observability (visibility of benefits). These attributes particularly apply to businesses transitioning from physical to digital operations, in which adoption decisions depend on perceived benefits and system compatibility.

Diffusion of innovation applications spans strategic management, public health, marketing, healthcare, communications, economics, technology and entrepreneurship. Stone (2023) demonstrates how businesses apply DOI to understand consumer adoption of new products or technologies, particularly when launching offerings or entering markets. In South Africa, Choshin and Ghaffari (2017) found that small and medium enterprises applied DOI when adopting digital marketing and e-commerce platforms to enhance supply chain operations.

Despite widespread applicability, DOI faces criticism. Lyytinen and Damsgaard (2001) challenge linear adoption assumptions, noting real-world complexity and non-linearity. Dwivedi et al. (2020) observe that rapid technological change – particularly evident during COVID-19 – causes organisations to bypass traditional stages. Wejnert (2002) critiques the DOI's focus on successful adoption while neglecting failure analysis. Straub (2009) acknowledges the model's utility but highlights how cultural, economic and regulatory factors alter predicted diffusion patterns. However, DOI remains valuable for analysing MSME digital adoption in developing economies because it explains how perceived innovation attributes influence adoption decisions under resource constraints. In South African MSMEs, in which compatibility with existing systems and observable benefits critically influence technology adoption, DOI provides a relevant framework for understanding digital marketing and e-commerce integration. The theory's emphasis on relative advantage and observability particularly resonates with MSMEs seeking evidence-based justification for digital investments. Thus, despite limitations, DOI offers a robust theoretical foundation for examining how digital marketing and e-commerce supply chain integration enhance customer experience and marketing performance.

Digital marketing strategies

Digital marketing represents a paradigm shift from traditional brick-and-mortar approaches, fundamentally altering how businesses create, communicate and deliver value to customers. Chaffey and Ellis-Chadwick (2019) define digital marketing as 'achieving marketing objectives through applying digital technologies and media', while Kannan and Li (2017) conceptualise it as 'an adaptive, technology-enabled process by which firms collaborate with customers and partners to jointly create, communicate, deliver and sustain value for all stakeholders'. These definitions emphasise digital marketing's core components: technological infrastructure, customer-centric engagement, multi-channel integration and value co-creation. For MSMEs, digital

marketing represents not merely a promotional tool but also a strategic capability enabling market access, customer relationship management and competitive differentiation in digitally mediated marketplaces.

Forrester (2023) demonstrates that digital automated models attract and retain customers at one-tenth of the cost of traditional methods. Through platforms like Facebook, LinkedIn, X, Snapchat and Instagram, digital marketing has captured customer attention, increased brand visibility and enhanced engagement. Businesses leverage websites and sophisticated online tactics to market offerings. Digital marketing enables targeted content delivery to specific audiences, potentially increasing sales and revenue (Baltezarevic 2023). Businesses utilise diverse digital platforms – SEO, content marketing, social media marketing, email marketing, mobile marketing, marketing analytics and interactive web experiences – to promote offerings to broad online audiences (Baltezarevic 2023; Kwarteng-Amaniampong 2024).

Digital marketing strategy selection critically influences customer experience quality, with implications for satisfaction, loyalty and business performance (Lemon & Verhoef 2016). In increasingly fragmented digital landscapes, businesses must identify optimal channel combinations to deliver personalised customer experiences. Artificial intelligence's transformative impact on digital marketing channels makes AI-enabled marketing team development a priority for chief marketing officers (Gartner Research 2023). Research demonstrates digital marketing's role in connecting supply chains and improving marketing outcomes. Wang (2020) showed that digital marketing capabilities positively influence organisational performance. Mushi (2024) established that digital marketing adoption plays a vital role in business success. Liu and Chiu (2021) established that supply chain integration and digitalisation – encompassing digital marketing capabilities – exert significant positive effects on marketing performance within the Supply Chain 4.0 paradigm. Aravamudhan et al. (2024) revealed that digital marketing directly impacts consumer purchasing decisions and satisfaction in electronic businesses, from a supply chain perspective.

Digital marketing creates integration value through demand-driven coordination, capability amplification and personalised engagement, improving supply chain precision and customer experience while demonstrating DOI's relative advantage and observability. For South African MSMEs, digital marketing aligns with DOI attributes – cost-effective acquisition, platform compatibility, manageable complexity, trialability and measurable outcomes – accelerating adoption despite resource constraints. These mechanisms enhance supply chain operations, customer experience and marketing performance, supporting DOI theory's prediction that innovations with clear advantages diffuse rapidly in resource-limited contexts, forming the basis for the hypotheses on digital marketing's positive impact. Therefore, the following hypotheses were formulated:

H_1 : Digital marketing strategies have a significant positive influence on e-commerce supply chain.

H_2 : Digital marketing strategies have a significant positive influence on customer experience.

H_3 : Digital marketing strategies have a significant positive influence on marketing performance.

E-commerce supply chain

E-commerce enables businesses of all sizes to exploit global and domestic opportunities. Internet technology and information systems drive e-commerce's emergence and growth (Sun 2022). This sector's rapid expansion has transformed retail operations globally, primarily through technological developments (Rao et al. 2021). Supply chain management facilitates business operations by moving raw materials, information and funds between entities to fulfil customer orders (Pujadi et al. 2020). E-commerce growth has intensified supply chain activity. E-commerce enterprises integrate existing infrastructure with supply chain systems, eliminating intermediaries by establishing networks of organisations, resources, activities and technologies for online product or service delivery (Brown, Johnson & Wilson 2024).

E-commerce technology has enhanced traditional supply chain efficiency and flexibility, improving customer responsiveness (Brown et al. 2024). Supply network participants include manufacturers, suppliers, distributors, shipping providers and financial agents, forming integrated systems (Sun 2022), with the primary goal of enhancing customer experience and marketing performance. Small e-commerce businesses often undervalue the importance of marketing integration. Digital marketing addresses critical areas that overcome online marketing challenges related to brand visibility and capability optimisation (AlSondos et al. 2020). On integrating digital marketing with e-commerce and supply chains, businesses gain better operational control, improve customer interactions and build positive brand images. Multi-channel approaches influence purchasing decisions (Aravamudhan et al. 2024). As digital marketing channels – social media, content marketing, SEO, mobile marketing and e-commerce – proliferate, businesses increasingly recognise the importance of omnichannel fulfilment strategies.

In South Africa, MSMEs encounter distinct challenges that make e-commerce supply chain digitalisation essential. Historically, dispersed population centres and urban–rural gaps limited MSME market reach. Digital supply chains remove these geographic constraints, enabling access without costly physical expansion (Rao et al. 2021). Unstable electricity, inconsistent connectivity and logistics hurdles demand real-time visibility, adaptive routing and proactive communication during disruptions. Furthermore, limited working capital necessitates accurate demand forecasting and inventory optimisation to minimise costs while maintaining service levels (Pujadi et al. 2020). Intense competition from large retailers with omnichannel

capabilities compels MSMEs to differentiate through superior customer experiences, achievable only via integrated digital systems (Brown et al. 2024).

Business owners now employ specialised processes to connect, organise and standardise workflows, enabling real-time inventory tracking and visibility. Effectively managing integrated systems helps customers enjoy uniform, uninterrupted experiences when engaging with businesses (Raunaque, Imam & Raja 2016). Research has examined the relationship among digital marketing, e-commerce supply chains and customer experience. The COVID-19 pandemic transformed MSME marketing, and Respatiningsih (2020) found that e-commerce adoption positively influenced marketing and enhanced MSME competitiveness. Nowicka (2020) identified how digital innovation revolutionises entire customer journeys by affecting interactions not only with individual businesses but also with entire supply chain networks comprising multiple independent businesses. Digital innovation adoption within supply chains demonstrates observability on linking this to DOI theory – as successful early adopters showcase benefits, network effects accelerate diffusion across the supply ecosystem. Ippolitova et al. (2024) discovered that implementing digital marketing strategies reduces supply chain costs. Toni, Goh and Edward (2025) reveal that digital marketing plays a crucial role in promoting supply chain sustainability and enhancing MSMEs' financial and marketing performance. Holloway (2024) concluded that integrating customer feedback into service improvements and building collaborative supplier relationships significantly enhances the customer experience in e-commerce supply chains.

South African MSMEs must digitalise supply chains to overcome geographic fragmentation, infrastructure unreliability, resource constraints and competitive pressure from omnichannel retailers. Digitalisation delivers value through operational reliability, responsive adaptation and cost efficiency – improving delivery accuracy, proactive exception management and inventory optimisation. These benefits demonstrate DOI attributes: relative advantage, compatibility and observability via measurable service improvements like tracking and order accuracy. For resource-constrained MSMEs, these observable outcomes justify adoption, supporting DOI theory's prediction that innovations with clear advantages diffuse rapidly in challenging contexts. Hence, the following hypotheses were formulated:

H_4 : E-commerce supply chain has a significant positive influence on customer experience.

H_5 : E-commerce supply chain has a significant positive influence on marketing performance.

Customer experience

Customer experience has evolved from a transactional concept to a holistic construct encompassing multiple dimensions of customer-firm interaction. Early conceptualisations emphasised physical and emotional touchpoints throughout the value chain (Mascarenhas, Kesavan & Bernacchi 2006), which subsequent

research expanded to include sensory, cognitive, behavioural and relational dimensions (Gentile, Spiller & Noci 2007). Contemporary scholarship defines customer experience as customers' cognitive and affective evaluation of all direct and indirect encounters with a firm throughout the purchase journey (Klaus & Maklan 2013; Lemon & Verhoef 2016). This multi-dimensional view recognises that customer experience encompasses not only product and service interactions but also brand-related touchpoints across multiple channels and over time (Brakus, Schmitt & Zarantonello 2009).

Customer experience serves as a critical driver of behavioural and performance outcomes in contemporary marketing. The construct directly influences customers' commitment and engagement behaviours towards organisations and their offerings (Roy, Gruner & Guo 2022), with these behavioural responses functioning as crucial mediating elements throughout the customer journey, which address increasing complexity and support improved marketing performance (Lemon & Verhoef 2016). This interconnection between experience quality and behavioural outcomes underscores why customer-centric businesses must elevate customer experience to strategic priority status. Effective customer experience management demands a substantial strategic commitment. Organisations must allocate resources to thoroughly analyse diverse customer segment needs – occasionally at individual levels – to enable the personalised service delivery that drives superior experiences (Nuseir et al. 2023). This investment yields significant returns across multiple performance dimensions. Empirical evidence demonstrates that positive customer experiences enhance loyalty (Urdea & Constantin 2021), strengthen brand promise fulfilment and perceived brand authenticity (Ścibor-Rylski, Reducha Ochremiak 2019), and improve both marketing and financial performance through competitive differentiation (Grønholdt et al. 2014). Collectively, these findings establish customer experience as both a strategic imperative and a performance catalyst. For resource-constrained MSMEs, superior customer experience represents a viable differentiation strategy that leverages operational excellence and relationship quality rather than requiring substantial capital investments. The challenge lies in identifying the operational capabilities – particularly digital marketing and supply chain digitalisation, which enable MSMEs to deliver experiences comparable to those of larger competitors while operating under resource constraints.

Customer experience is the key mechanism translating digital capabilities into marketing performance through retention, word-of-mouth amplification, premium positioning and lifetime value gains. While digital systems remain invisible, improved experiences provide tangible proof of innovation benefits. From a DOI perspective, experience serves as the primary observability factor – customers directly perceive faster responses, accurate deliveries and personalised communication. For South African MSMEs, these observable improvements validate technology investments and accelerate adoption through

demonstrated performance rather than theoretical promises. Therefore, the following hypothesis was formulated:

H₆: Customer experience has a significant positive influence on marketing performance.

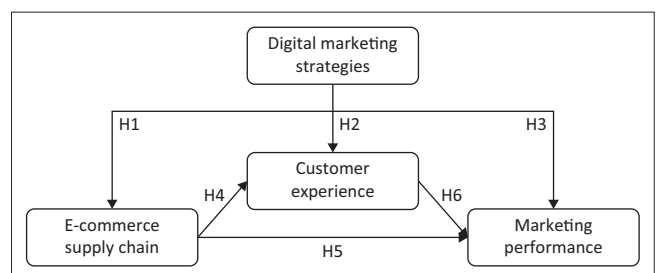
Marketing performance

Respatiningsih (2020) conceptualises marketing performance as an achievement assessment resulting from comprehensive marketing strategy implementation. This encompasses reviewing collective marketing strategy effects on reaching sales targets, enhancing brand reputation, engaging customers and earning returns on investments. A marketing strategy succeeds only if it increases both customer brand perception and customer experience (Dąbrowska & Janoś-Kresło 2019). Providing effective customer support enables businesses to deliver optimal experiences (Sheth, Jain & Aambika 2023). Businesses must establish regular performance data reviews to maintain competitiveness and high market performance (Abubakar & Chille 2023).

Digital marketing has enhanced business–customer interactions and experiences, enabling businesses to design and execute effective digital marketing strategies that provide advantages and improve marketing results (Wang 2020). Using these methods, businesses can create strong content, improve online findability, engage audiences and streamline customer purchasing processes (Zahara et al. 2023). When digital marketing integrates with e-commerce supply chains, it provides a better customer experience, enables rapid market response, introduces innovative products and services, and builds distinctive qualities that improve marketing performance.

From a DOI perspective, successful digital marketing and e-commerce integration represent a complex innovation requiring significant relative advantage to justify adoption. From the perspective of South African MSMEs, marketing performance improvements serve as observable outcomes that validate innovation adoption decisions, potentially accelerating diffusion among peer organisations. Therefore, understanding how digital marketing integration affects marketing performance illuminates DOI mechanisms in the context of a developing economy.

The conceptual model in Figure 1 was developed, drawing upon the literature review.



H, hypothesis.

FIGURE 1: Conceptual model developed from the literature review.

Methods

Population, sample and data collection

This study's population encompassed all MSMEs operating in South Africa's four largest cities: Cape Town, Durban, Johannesburg, and Gqeberha. These cities were selected because they represent major economic hubs with high MSME concentration, advanced digital infrastructure and diverse e-commerce activity, providing representative contexts for examining digital marketing integration in South African MSMEs. In this study, 286 MSMEs were selected, using Singh and Masuku's (2014) sample-size estimation criteria, from an estimated population of 1,000, with a 95% confidence interval and a 5% margin of error. Selection criteria required participation in both the supply chain and the e-commerce platforms. Through stratified random sampling based on proportional city representation, the distribution included Cape Town (89), Durban (65), Johannesburg (78) and Gqeberha (54). Samples were drawn from fashion, toys and hobbies, restaurants and electronics sectors – industries heavily reliant on digital marketing and e-commerce integration. After ethical clearance approval and obtaining of written informed consent, questionnaires were distributed via email to 286 sampled businesses. Respondents included owners and managers possessing a comprehensive knowledge of their businesses' digital marketing and e-commerce operations. During the 3-month data collection period (November 2024–January 2025), 254 questionnaires were returned; however, 10 were eliminated as a result of incompleteness. All 244 completed questionnaires were analysed, yielding an 85% response rate ($244/286 \times 100$), considered adequate for SEM analysis (Hair, Howard & Nitzl 2020). Table 1 summarises these results.

Instrument measurement

A structured questionnaire measured the identified variables: digital marketing, e-commerce supply chain, customer experience and marketing performance. The questionnaire comprised four sections with specific items measuring each construct: 15 items each for digital marketing and customer experience, while e-commerce supply chain and marketing performance used 12 and 10 items, respectively. Digital marketing, e-commerce supply chain and marketing performance employed a five-point Likert scale: 1 (strongly disagree), 2 (disagree), 3 (neutral), 4 (agree) and 5 (strongly agree). Customer experience used a five-point scale: 1 (much worse), 2 (worse), 3 (about the same), 4 (better) and 5 (much better). Digital marketing items were adapted from Kwarteng-Amaniampong (2024), customer experience items from Ntlantsana, Boshoff and Hermann

(2023), and marketing performance items from Grønholdt and Martensen (2006). The instrument was pre-tested with 30 MSMEs (not included in the final sample) to assess clarity, comprehension, and face validity. Based on pre-test feedback, minor wording adjustments improved item clarity. The designed questionnaires were distributed via email.

Confirmatory factor analysis

AMOS v25 software conducted confirmatory factor analysis (CFA) representing four study constructs: digital marketing, e-commerce supply chain, customer experience and marketing performance. Results appear in Table 2. All constructs were evaluated for reliability, composite reliability and average variance extracted. Construct reliability was assessed by evaluating factor loading significance, following the Hair et al. (2020) protocol. Factor loadings ranged from 0.81 to 0.99, exceeding the recommended 0.70 threshold. Both Cronbach's alpha and composite reliability (CR) values exceeded a recommended 0.70, confirming internal consistency reliability.

Average variance extracted (AVE) evaluated convergent validity, with Fornell and Larcker's (1981) recommended threshold of ≥ 0.50 . Average variance extracted results showed all values surpassed 0.50, confirming adequate convergent validity. Several indices assessed the structural equation model fit. The Goodness of Fit (GFI) and Comparative Fit indices (CFI) required values > 0.90 . Root Mean Square Error of Approximation (RMSEA) and Standardised Root Mean Square Residual (SRMR) needed values < 0.08 (Hair et al. 2020). Relative Chi-square (CMIN/DF) required values < 3.0 (Hair et al. 2020). As shown in Table 2, all indices met the criteria, confirming the model fit.

Evaluation of common method bias

Common method bias constitutes a significant measurement concern, representing systematic error variance from the common measurement methods (Kock, Berbekova & Assaf 2021; Podsakoff et al. 2003). Such bias threatens the relationship validity between measures (Podsakoff et al. 2003). When using questionnaires, bias potential exists in item characteristics, measurement context differences, rater effects and respondent attributes. Both procedural and statistical approaches address common method bias (Kock et al. 2021). Procedurally, careful population sampling, questionnaire pre-testing with 30 respondents to assess clarity, respondent debriefing on item interpretation and elimination of ambiguous statements minimised bias.

TABLE 1: Response rate per data collection.

Cities	Questionnaire distributed	Unreturned	%	Returned	%	Incomplete	%	Actual	%
Total	286	32	15	254	89	10	4	244	85
Cape Town	89	-	-	-	-	-	-	-	-
Durban	65	-	-	-	-	-	-	-	-
Johannesburg	78	-	-	-	-	-	-	-	-
Gqeberha	54	-	-	-	-	-	-	-	-

Statistically, a correlation-based marker variable technique employed a socially desirable responding (SDR) scale adapted from Strahan and Gerbasi (1972). This SDR scale was selected because marker variables should lack theoretical

TABLE 2: Confirmatory factor analysis: Cronbach alpha, composite reliability, average variance extracted and factor loadings.

Constructs	Items	Factor loadings
Digital marketing (DM) (CA = 0.96; CR = 0.97; AVE = 0.79)	SMM1	0.82
	SMM2	0.87
	SMM3	0.88
	SMM4	0.82
	CM1	0.89
	CM2	0.81
	CM3	0.82
	CM4	0.86
	SEO1	0.89
	SEO2	0.89
	SEO3	0.86
	EM1	0.88
	EM2	0.90
	EM3	0.84
	EM4	0.84
E-commerce supply chain (ECSC): (CA = 0.96; CR = 0.97; AVE = 0.73)	EC1	0.98
	EC2	0.83
	EC3	0.81
	EC4	0.82
	SC1	0.84
	SC2	0.91
	SC3	0.81
	SC4	0.84
	EC_SC1	0.92
	EC_SC2	0.88
	EC_SC3	0.90
	EC_SC4	0.85
Customer experience (EC): (CA = 0.97; CR = 0.98; AVE = 0.77)	PM1	0.86
	PM2	0.81
	PM3	0.91
	MT1	0.88
	MT2	0.82
	MT3	0.88
	MT4	0.90
	OF1	0.90
	OF2	0.88
	OF3	0.87
	OF4	0.88
	PE1	0.90
	PE2	0.81
	PE3	0.85
	PE4	0.86
Marketing performance (MP): (CA = 0.98; CR = 0.98; AVE = 0.74)	MP1	0.93
	MP2	0.88
	MP3	0.89
	MP4	0.92
	MP5	0.86
	MP6	0.90
	MP7	0.88
	MP8	0.91
	MP9	0.84
	MP10	0.84

Note: Model fit indices: CMIN/DF = 2.29; CFI = 0.91; GFI = 0.92; SRMR = 0.02; RMSEA = 0.04. CA, Cronbach alpha; SMM, social media marketing; CM, content marketing; SEO, search engine optimisation; EM, email marketing; EC_SC, e-commerce supply chain; SC, supply chain; OF, outcome focus; PM, peace of mind; MT, moment of truth; PE, product experience; MP, marketing performance; CMI/DF, relative Chi-square; CFI, comparative fit indices; GFI, goodness of fit; SRMR, standardised root mean square residual; RMSEA, root mean square error of approximation.

relationships with main study variables. Partial correlation analysis was conducted, controlling for the marker variable. Common method bias exists when correlation values differ significantly before and after controlling for the marker variable. Based on the Table 2 results, common method bias was not present, as correlation scores from restricted and unrestricted estimations showed no significant differences.

Discriminant validity

Discriminant validity was calculated by using AVE after establishing convergent validity. This study applied Fornell and Larcker's (1981) criteria. Square roots of AVE values for all reflective constructs exceeded latent variable correlations, confirming discriminant validity (Fornell & Larcker 1981; Lim 2024). As shown in Table 3, the square root of AVE values surpassed the intercorrelation coefficients. Multicollinearity was evaluated by examining correlation matrix coefficients. Correlation coefficients exceeding 0.70 suggest multicollinearity, potentially causing confounding effects and inflated standard errors. This study's highest correlation was 0.61, below the multicollinearity threshold, confirming that no multicollinearity existed. Table 3 displays discriminant validity results.

Ethical considerations

Ethical clearance to conduct this study was obtained from Richfield Graduate Institute of Technology and the Human Research Ethics Committee (No. H22-BMS-018).

Results and discussion

Structural equation modelling analysis using AMOS v25 tested the hypothesised relationships, with results in Table 4. Four demographic variables were included to control for potential confounding effects: age, gender, education and experience. Results indicated that respondents' age ($\beta = 0.09$; p -value < 0.18) and gender ($\beta = 0.04$; p -value < 0.51) exerted positive but statistically insignificant effects on marketing performance. Conversely, educational qualifications ($\beta = 0.76$; p -value < 0.03) and work experience ($\beta = 0.17$; p -value < 0.01) demonstrated significant positive influence on marketing performance. These findings suggest that employees with strong educational backgrounds and extensive experience are better positioned to implement digital marketing strategies that enhance customer interactions, experience and marketing performance.

Table 4 results confirm H_1 , demonstrating that digital marketing strategies positively and significantly influence

TABLE 3: Discriminant validity results for the constructs.

Constructs	1	2	3	4
Digital marketing	0.88	0.54**	0.41**	0.42**
E-commerce supply chain	0.24*	0.85	0.46**	0.68**
Customer experience	0.46**	0.46**	0.87	0.74**
Marketing performance	0.58**	0.56**	0.23*	0.86

Note: $\sqrt{\text{AVE}}$ values are indicated by bold.

**, p -value significant at 1% (0.01); *, p -value significant at 5% (0.05).

TABLE 4: Hypotheses testing results of the constructs from structural equation modelling.

Constructs	Estimate	SE	CR	p-value	Results
DM → ECSC	0.78	0.07	6.84	0.00	Supported
DM → CE	0.94	0.09	10.68	0.00	Supported
DM → MP	0.89	0.59	7.93	0.00	Supported
ECSC → CE	0.67	0.03	1.89	0.01	Supported
ECSC → MP	0.58	0.05	9.05	0.00	Supported
CE → MP	0.88	0.06	14.25	0.00	Supported
AGE → MP	0.09	0.06	1.86	0.18	Not Supported
GEN → MP	0.04	0.08	3.64	0.51	Not Supported
EXP → MP	0.87	0.02	1.86	0.01	Supported
EDU → MP	0.76	0.04	8.54	0.03	Supported

Note: CR = Critical Ratio (*t*-value). $p < 0.05$ indicates statistical significance.

DM, digital marketing; ECSC, e-commerce supply chain; CE, customer experience; MP, marketing performance; EDU, education; EXP, experience; GEN, gender; SE, standard error.

e-commerce supply chain operations ($\beta = 0.78; p < 0.00$). This finding indicates that digital marketing enhances e-commerce supply chain operational efficiency by approximately 78%. From a DOI perspective, this result suggests that digital marketing's relative advantage – particularly its ability to improve information flow, inventory visibility and demand forecasting – drives its integration into supply chain operations. Digital marketing provides observable benefits through enhanced communication across supply chain nodes, improved supplier–customer coordination and real-time responsiveness. For South African MSMEs, this result confirms that digital marketing represents a compatible innovation that integrates seamlessly with existing e-commerce infrastructure, yielding observable operational improvements. The result aligns with Liu and Chiu (2021), who demonstrated that digitalisation and supply chain integration positively impact business performance. However, this study extends that finding by specifically isolating digital marketing's contribution within developing economy contexts, in which resource constraints make observable benefits particularly critical for adoption decisions.

H_2 was confirmed, showing that digital marketing strategies directly and significantly influence customer experience ($\beta = 0.94; p < 0.00$). This substantial effect suggests that digital marketing implementation may enhance the customer experience by enabling more personalised interactions, emotional engagement and value creation throughout customer journeys. This finding reveals that digital marketing's compatibility with customer touchpoints – from awareness through post-purchase – creates seamless, integrated experiences. In DOI terms, digital marketing demonstrates high observability in customer-facing contexts; MSMEs can directly witness improved engagement metrics, response rates and customer satisfaction scores. These observable outcomes validate adoption decisions and potentially accelerate diffusion among peer organisations. The strong coefficient suggests that digital marketing serves as a critical mechanism through which South African MSMEs can overcome resource constraints to deliver enhanced experiences comparable to those from larger competitors. This result extends Lemon and Verhoef's (2016) work by demonstrating digital marketing's customer experience effects specifically within e-commerce supply chain contexts.

The study confirmed H_3 , demonstrating that digital marketing strategies directly and significantly influence the marketing performance of the e-commerce supply chain ($\beta = 0.89; p < 0.00$). This substantial effect suggests that digital marketing adoption may enhance marketing performance through improved targeting, personalised messaging and data-driven decision-making. This finding confirms digital marketing's role as an innovation with a relatively high advantage: it delivers superior outcomes compared to those from traditional marketing methods, at significantly lower costs (Forrester 2023). For South African MSMEs, this result represents a critical success factor – digital marketing enables competitive positioning despite resource limitations. The observable performance improvements – measurable through sales growth, customer acquisition costs and conversion rates – validate adoption and encourage diffusion. This result supports Mushi (2024) and Wang (2020) but extends their findings by demonstrating the effect specifically within integrated e-commerce supply chain contexts, showing that digital marketing delivers enhanced outcomes when embedded within broader digital ecosystems rather than implemented in isolation.

Similarly, H_4 was supported, revealing a direct and significant positive relationship between e-commerce supply chain and customer experience ($\beta = 0.67; p < 0.01$). This finding indicates that e-commerce supply chain operations implementation may enhance the customer experience through improved delivery reliability, order accuracy and service responsiveness. From a theoretical perspective, this outcome validates that e-commerce supply chain integration represents an innovation whose benefits – operational efficiency, inventory visibility, faster fulfilment – are highly observable to customers. In resource-constrained MSME contexts, this finding is particularly significant: it demonstrates that supply chain digitalisation creates tangible, customer-perceptible improvements that justify continued technology investment. The result supports Nowicka's (2020) finding that digital innovation transforms entire customer journeys, not merely business–customer interactions but also entire supply chain network interactions. However, this study advances understanding by quantifying and situating the relationship within DOI theoretical frameworks, explaining why and how supply chain integration diffuses through observable customer experience improvements.

H_5 was confirmed, showing a significant positive influence of e-commerce supply chain on marketing performance ($\beta = 0.58; p < 0.00$). This effect indicates that e-commerce supply chain operations may boost marketing performance through enhanced operational efficiency, cost reduction and service quality. From a DOI perspective, this finding demonstrates that the relative advantage of supply chain digitalisation extends beyond operational benefits to strategic marketing outcomes. Observable improvements – faster delivery, accurate inventory information, seamless returns processing – create competitive advantages that enhance marketing performance. For South African MSMEs, this

outcome validates supply chain integration as a worthwhile innovation investment: such integration delivers multiple benefits across operations and marketing. The result supports Toni et al. (2025) but advances understanding by demonstrating how supply chain integration technologies, provides robust explanatory mechanisms – information flow, coordination and visibility – specifically enhance marketing performance through improved customer value delivery.

Finally, H_6 was confirmed, demonstrating the statistically significant positive influence of customer experience on marketing performance ($\beta = 0.88$; $p < 0.00$). This strong relationship indicates that the adoption and integration of digital marketing by e-commerce supply chain businesses to improve customer experience substantially contributes to overall marketing performance through enhanced satisfaction, loyalty and advocacy. This finding validates that customer experience improvements represent highly observable outcomes that drive business success. From the DOI perspective, businesses that successfully enhance customer experience demonstrate innovation benefits to competitors, potentially accelerating broader market adoption. For South African MSMEs, this result highlights customer experience as a critical mediating mechanism through which digital investments translate into performance outcomes. The result supports Grønholdt et al. (2014) and extends their findings by demonstrating the relationship specifically within integrated digital marketing and e-commerce supply chain contexts, showing that customer experience serves as the critical link connecting digital capabilities to performance outcomes.

Collectively, these findings advance DOI theory by demonstrating how its core attributes – relative advantage, compatibility, complexity, trialability and observability – manifest in MSME digital adoption contexts. The strong relationships among digital marketing, e-commerce supply chain, customer experience and marketing performance reveal that successful innovation adoption depends not merely on single-technology implementation but also on strategic integration, creating synergistic effects. For developing economy MSMEs, in which resources constrain adoption capacity, observable benefits become particularly critical for diffusion – this study demonstrates that digital marketing and e-commerce integration produce such observable outcomes, potentially accelerating broader market transformation.

Implications and conclusion of the study

Theoretical implications

This study advances the digital marketing adoption literature through three significant contributions. Firstly, the study provides empirical evidence for the interconnected relationships between digital marketing and e-commerce supply chain operations – an integration frequently acknowledged but rarely empirically examined, particularly in developing economies (Awan et al. 2021). Unlike previous

studies examining these phenomena separately, this research demonstrates the interactive effects of digital marketing and e-commerce supply chain operations, revealing that integration produces outcomes exceeding isolated implementation – a finding with critical implications for resource-constrained MSMEs. The study bridges digital marketing and supply chain management theories, offering a comprehensive framework explicating their interaction within e-commerce environments. As Verhoef et al. (2021) observe, digital marketing research has typically developed independently from supply chain literature despite growing practical interconnection. This study addresses that gap by demonstrating how digital marketing integration with supply chain operations creates synergistic effects, amplifying customer experience and marketing performance.

Secondly, this study extends DOI theory by elucidating how its core attributes – relative advantage, compatibility, complexity, trialability and observability – manifest specifically in MSME digital adoption contexts within developing economies. Previous DOI applications have primarily focused on single-technology adoption in developed market contexts. This research advances theoretical understanding by demonstrating that: relative advantage in resource-constrained contexts manifests not merely through cost savings but also through capability enhancement enabling competitive parity with larger firms; compatibility becomes particularly critical in developing economies in which technological infrastructure and digital literacy vary substantially, making seamless integration essential for adoption success; observability operates as the primary diffusion accelerator in MSME networks – observable performance improvements, customer experience enhancements and marketing outcomes validate adoption decisions and encourage peer adoption; and innovation adoption in developing economies follows non-linear patterns influenced by network effects, in which early adopters' observable success creates demonstration effects accelerating broader market transformation.

These theoretical contributions explain why digital transformation in MSMEs in a developing economy requires holistic integration strategies rather than piecemeal technology adoption. The findings suggest that DOI theory, when applied to complex innovation bundles rather than discrete technologies, provides robust explanatory power for understanding digital transformation in resource-constrained contexts.

Practical implications

This study offers critical practical insights for South African MSMEs, policymakers and digital platform providers. The findings demonstrate that successful digital transformation requires strategic integration rather than isolated technology adoption. Micro, small and medium enterprises should first prioritise the integration touchpoints with the highest customer impact rather than deploying digital marketing

and e-commerce systems independently. Micro, small and medium enterprises should identify critical customer journey moments in which integrated systems deliver maximum experiential value – for example, linking marketing communication with real-time inventory visibility to prevent overselling, or synchronising promotional campaigns with supply chain capacity to ensure fulfilment reliability. Provision of integration-focused training programmes teaching MSMEs how to strategically connect digital marketing, e-commerce and supply chain systems rather than operating them as discrete tools, thereby maximizing synergistic benefits and enhancing overall business performance.

Micro, small and medium enterprises should leverage observability to accelerate adoption, as the results demonstrate that digital marketing and e-commerce integration produce observable outcomes – improved customer satisfaction, enhanced operational efficiency and increased sales – that validate investment decisions. Hence, MSMEs should systematically track and communicate these observable benefits to stakeholders (employees, suppliers and partners), creating demonstration effects that facilitate broader ecosystem adoption. Policymakers should develop demonstration projects showcasing successful integration examples, creating observable benefits that accelerate broader adoption.

Micro, small and medium enterprises should develop integration capabilities progressively, as resource constraints may prevent simultaneous, comprehensive integration. Micro, small and medium enterprises should therefore adopt staged approaches: begin with high-compatibility, low-complexity integrations (e.g. linking social media marketing with e-commerce platforms), demonstrate observable benefits, and then progressively expand the integration scope as capabilities develop. Facilitation of knowledge-sharing networks that enable MSMEs to learn from peers' integration experiences and leveraging of DOI's social system dimension to accelerate diffusion must be implemented.

Finally, MSMEs should emphasise data-driven customer experience management. The strong relationship between customer experience and marketing performance ($\beta = 0.88$) underscores experience management's critical role. They should leverage digital marketing and e-commerce platforms' data collection capabilities to systematically analyse customer touchpoint experiences, identify improvement opportunities and implement targeted enhancements. Policymakers must ensure data privacy and consumer protection regulations that enable digital integration while safeguarding customer interests, building trust essential for sustainable digital economy development.

Conclusion

This study examined how digital marketing integration with e-commerce supply chain operations influences customer

experience and marketing performance among South African MSMEs. All six primary hypotheses were supported, revealing that strategic integration – not mere adoption – creates superior outcomes. Digital marketing significantly influences e-commerce supply chain digitalisation and customer experience. E-commerce supply chain digitalisation positively affects customer experience and marketing performance. Customer experience demonstrates the strongest direct effect on marketing performance. Among control variables, only experience and education significantly influenced marketing performance, while age and gender showed no significant effects.

This study extends DOI theory to integrated digital adoption contexts in resource-constrained environments. Results demonstrate that observability – manifested through enhanced customer experience – serves as the critical mechanism through which digital capabilities translate into marketing performance. The mediation effect of customer experience ($\beta = 0.88$) indicates that operational digital capabilities must create observable customer value to drive business outcomes, validating DOI theory's emphasis on perceived innovation benefits in adoption decisions.

Micro, small and medium enterprises need not match larger competitors' technology investments. Strategic integration of digital marketing with supply chain digitalisation creates a competitive advantage through superior customer experience delivery. The strong path from customer experience to marketing performance underscores that digital investments must prioritise customer-centric improvements. Managers should focus on integration strategies that make digital enhancements observable and valuable to customers throughout the purchase journey.

Limitations and future research directions

Despite this study's contributions, several limitations warrant consideration. Firstly, the urban-focused sample may limit the generalisability to rural MSMEs, which face distinct infrastructure constraints and digital literacy challenges (Gupta & Bose 2019). Comparative research across different development contexts (urban vs. rural, South Africa versus other African nations and developing versus developed economies) to understand how contextual factors moderate digital marketing and e-commerce integration effectiveness.

Secondly, the cross-sectional design captures relationships at a single time point, precluding causal inference or understanding of temporal dynamics in digital adoption processes. Longitudinal studies tracking MSMEs' digital transformation journeys over time, examining how integration evolves, identifying critical success factors and understanding how DOI mechanisms operate across adoption stages must be investigated.

The quantitative approach, while providing robust relationship validation, does not illuminate contextual factors, implementation challenges, or organisational processes underlying successful integration. Qualitative and mixed-methods studies investigating implementation processes, organisational change requirements and capability development pathways enabling successful integration provide actionable guidance for practitioners. While this study demonstrates that integration produces superior outcomes, it does not identify optimal integration configurations or sequencing strategies for resource-constrained MSMEs. Future research should investigate the roles of specific emerging technologies – particularly artificial intelligence, machine learning and predictive analytics – in enhancing digital marketing and e-commerce supply chain integration. Specifically, research should explore how AI-enabled personalisation, predictive inventory management and automated customer service systems amplify integration benefits for MSMEs. Such studies could examine whether AI adoption follows DOI patterns similar to digital marketing or requires different theoretical frameworks, given its greater complexity.

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CRedit authorship contribution

Emmanuel Kwarteng-Amaniampong: Conceptualisation, Data curation, Formal analysis, Investigation, Methodology, Resources, Validation, Writing – review & editing. Madele Tait: Conceptualisation, Formal analysis, Investigation, Methodology, Validation, Writing – original draft, Writing – review & editing. All authors reviewed the article, contributed to the discussion of results, approved the final version for submission and publication, and take responsibility for the integrity of its findings.

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Data availability

The author declares that all data that support this research article and findings are available in the article and its references.

Disclaimer

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