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Full Length Article

## Digital marketing capability: Its impact on marketing agility and service innovation in the hospitality industry

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## ABSTRACT

The possession of digital marketing capabilities serves as a crucial factor in establishing a competitive advantage among hotels. Despite receiving increasing attention from both practitioners and scholars, there has been a lack of comprehensive scholarly investigation of the direct and indirect impact of digital marketing capabilities on service innovation in the hospitality industry. This paper aims to address this research gap by exploring the mediating role of marketing agility in the link between digital marketing capabilities and service innovation in the context of hospitality. It also explores the mechanism by which digital marketing capabilities may be connected to service innovation. Data were collected from managers using a unique multisource dataset gathered at two points in time. Findings revealed that digital marketing capabilities has a significant direct and indirect impact on service innovation. Marketing agility mediates the link between digital marketing capabilities and service innovation. Furthermore, results of conditional effects revealed that the impact of DMCs on service innovation is more pronounced when the values of technological dynamism and structural flux are higher. Moreover, the post hoc analysis revealed that the relationship between digital marketing capabilities and service innovation doesn't vary between countries. Our study offers meaningful implications for theory and practice.

## 1. Introduction

In an increasingly digital and turbulent business environment, the capacity of firms to sense market changes, seize opportunities, and reconfigure resources has become a central determinant of competitive advantage (Alnawas and Hemsley-Brown, 2019; Eisenhardt and Martin, 2000; Herhausen et al., 2020; Homburg and Wielgos, 2022; Teece, 2007; Teece et al., 1997). Within marketing, these dynamic capabilities manifest through the firm's ability to integrate market knowledge and technology into effective actions that create value (Day, 1994; Srivastava et al., 1999; Vorhies and Morgan, 2005). Such capabilities are particularly vital in the hospitality industry, where rapid shifts in customer preferences and technological advances demand constant innovation in services and customer experiences (Aldossary and Agag, 2026; Homburg and Wielgos, 2022; Hussain and Malik, 2022).

Digital marketing capabilities (DMCs) play different roles in tangible goods versus intangible services. In goods contexts, customers can evaluate attributes prior to purchase and outputs can be inventoried and distributed (Den Hertog, 2000; Homburg and Wielgos, 2022). Services are characterised by intangibility, inseparability, heterogeneity, and perishability, increasing information asymmetry and perceived risk and requiring real time capacity and demand management (Den Hertog et al., 2010). Customers therefore infer quality from digital informational cues, and digital interfaces become part of delivery and value co creation (Den Hertog et al., 2010; Homburg and Wielgos, 2022). Consistent with dynamic capability logic, DMCs should more strongly enable rapid sensing and response routines in service settings (Teece, 2014).

These differences translate into distinct within firm uses across sectors. In goods-oriented manufacturing firms, standardized outputs and

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inventory systems mean DMCs primarily support market sensing, targeting, and channel coordination around discrete purchases (Day, 1994; Morgan et al., 2018; Morgan et al., 2018). Retail similarly sells tangible products, but DMCs are intertwined with assortment, inventory availability, fulfillment, and omnichannel coordination to drive traffic and conversion (Neslin et al., 2006; Verhoef et al., 2021).

Hospitality differs because the core offering is an experience and capacity is perishable; accordingly, DMCs are tightly coupled with service delivery and experience management rather than inventory outcomes (Iranmanesh et al., 2022). In hotels, perceptions evolve across the guest journey, with OTAs, reviews, and social media shaping booking decisions and digital touchpoints shaping in stay interactions and post stay reputation (Agag et al., 2025; Homburg and Wielgos, 2022; Hussain and Malik, 2022; Verhoef et al., 2021). Customization also differs: product customization configures physical attributes before consumption, whereas service personalization is enacted during delivery through real time interaction and process adaptations, linking personalization to service innovation (Barrett et al., 2015; Day, 1994; Morgan et al., 2018; Morgan et al., 2018). Thus, in hotels DMCs support both demand acquisition and dynamic personalization that sustains service innovation and differentiation (Agag et al., 2025).

Service customization also varies across service sectors, depending on customer contact intensity, standardization, and where personalization is enacted. In app mediated platform services in the sharing economy, personalization is largely algorithmic and interface driven, focusing on real time matching, recommendations, and offer optimization (Akter et al., 2022). In full service restaurants, customization is enacted during the encounter through interactive ordering and experience design, increasingly supported by technologies such as smart tables that shape engagement in the service setting (Tian Mu et al., 2026). In digital property and accommodation platforms, customization often centers on personalized search, communication flows, and rapid experimentation across channels, as illustrated by Spotahome where agile marketing routines support tailored acquisition and conversion journeys (Moi and Cabiddu, 2021). Hotels combine these modes: they use data driven personalization before arrival and high contact customization during the stay, which increases coordination demands between marketing and operations. This creates practical challenges such as fragmented customer data across intermediaries and direct channels and difficulty ensuring that personalized promises are delivered consistently across touchpoints, making capability orchestration central to service innovation (Homburg and Wielgos, 2022; Verhoef et al., 2021).

Building on this foundation, digital marketing capabilities (DMCs) have emerged as a crucial subset of marketing capabilities that leverage digital tools, data, and platforms to achieve superior market responsiveness (Tajeddini et al., 2024). DMCs can be defined as a firm's ability to integrate, reconfigure, and deploy digital resources and data-driven processes to sense customer needs, engage with stakeholders, and create new forms of value (Bharadwaj, 2000; Homburg and Wielgos, 2022; Morgan et al., 2018; Morgan et al., 2018; Wielgos et al., 2021). Rooted in the dynamic capability view, DMCs are not merely operational skills but higher-order routines that enable firms to continuously transform their marketing activities in response to technological and market shifts (Teece, 2007; Verhoef and Bijmolt, 2019; Warner and Wäger, 2019).

In the hospitality context, DMCs enable hotels to enhance customer engagement, personalize offerings, and experiment with innovative service designs through social media analytics, mobile applications, and digital platforms (Agag et al., 2025; De Luca et al., 2021). However, despite their growing importance, empirical studies in this domain have largely examined either the direct relationship between digital marketing and performance (e.g., Cortez and Hidalgo, 2022; Homburg and Wielgos, 2022) or individual tools and practices (e.g., Bargoni et al., 2024; Su et al., 2023), providing limited insight into how DMCs lead to improved service innovation outcomes.

Dynamic capability theory suggests that resource deployment alone does not guarantee performance unless mediated by integrative processes that enable firms to act swiftly on insights (Sambamurthy et al., 2003; Teece, 2014). Within marketing, this integrative process is captured by marketing agility, defined as the firm's ability to sense market opportunities or threats and rapidly adjust marketing decisions, campaigns, and resource allocations in response (Kalaiganam et al., 2021; Zhou et al., 2019). Marketing agility is conceptualized as a domain-specific dynamic capability that enables firms to sense market changes, make rapid marketing decisions, and adjust campaigns or offerings in real time (Kalaiganam et al., 2021; Zhou et al., 2019). Unlike organizational agility, which focuses on broader operational or supply-chain responsiveness (Eisenhardt and Martin, 2000; Overby et al., 2006), marketing agility specifically translates digital market insights into timely, customer-centered innovations that enhance service differentiation and responsiveness (Hussain and Malik, 2022).

Although previous research has examined agility in relation to organizational responsiveness and performance (Dubey et al., 2018; Overby et al., 2006), its role as a linking mechanism between DMCs and innovation remains underexplored in the hospitality sector (see Table 1). Hotels that possess robust DMCs may be better positioned to collect real-time market intelligence, but without marketing agility, they may fail to capitalize on these insights for service innovation. Thus, marketing agility may serve as the critical capability that channels digital competencies into innovative service outcomes. Service innovation refers to the development or recombination of new service concepts, delivery systems, client interfaces, and technological options to create customer value (Den Hertog, 2000; Dotzel et al., 2013; Randhawa and Scerri, 2015). In hospitality, service innovation encompasses both front-stage experiences (e.g., personalized digital interactions) and back-stage processes (e.g., real-time analytics and automated service systems) (Barrett et al., 2015). Foundational research emphasizes that innovation in services is highly dependent on organizational learning, customer interaction, and knowledge sharing (Agarwal and Selen, 2009; Bargoni et al., 2024; Edvardsson et al., 2011; Hashim et al., 2023; Su et al., 2023).

Recent empirical work has shown that digital technologies can accelerate service innovation, yet the results remain mixed: while some studies find positive links between digital capabilities and innovation (De Luca et al., 2021; Deb et al., 2022; Iranmanesh et al., 2022; Nan et al., 2025), others highlight that such benefits depend heavily on organizational readiness and contextual conditions (Hussain and Malik, 2022; Verhoef and Bijmolt, 2019). Consequently, the mechanism through which DMCs contribute to service innovation and the conditions under which this relationship strengthens remain unclear. The dynamic capability framework also underscores that capability effectiveness is contingent on environmental and organizational contexts (Eisenhardt and Martin, 2000; Schilke, 2014). Two contingencies are particularly salient in hospitality. First, technological dynamism, defined as the rate and unpredictability of technological change in the environment (Dess and Beard, 1984; Jaworski and Kohli, 1993), shapes how quickly firms must adapt to evolving digital tools, customer expectations, and competitive pressures. Second, structural flux, an internal form of dynamism reflecting the degree of change in organizational structures, leadership, and processes (Vaid et al., 2021), affects a firm's ability to absorb and implement digital transformation. Both conditions can amplify or constrain the translation of DMCs into service innovation. In rapidly changing environments and adaptive organizational structures, DMCs are likely to yield greater innovation benefits by facilitating faster experimentation and implementation. Therefore, prior research establishes the importance of digital marketing for organizational success but often overlooks the mechanisms and contextual moderators that shape its effectiveness in fostering service innovation. Building on dynamic capability theory (Teece, 2007), this study addresses these gaps by examining:

**Table 1**  
Prior research on digital capabilities.

Authors	Focal construct	Research design	Data type	Mediating effects	Moderating effects
Agag et al. (2025)	Social CRM capability: the integration of traditional customer-facing activities, including processes, systems, and technologies with emergent social media applications to engage customers in collaborative conversations and enhance customer relationships.	Quantitative analysis	Primary data (single source)	-	-
Tourky et al. (2026)	Digital platform capabilities: the degree to which a newspaper company has built digital platforms to connect to consumers and to connect to businesses	Quantitative analysis	Primary data (single source)	-	-
Wang et al. (2026)	Social media strategic capability: the ability of firms to integrate their knowledge garnered from social media, resources, and skills with their strategic directions.	Quantitative analysis	Primary data (single source)	-	-
Agag et al. (2026)	Big data volume: a measure of the magnitude of data available to an organization.	Quantitative analysis	Primary data (single source)	-	-
De Pelsmacker et al. (2018)	Digital marketing strategies	Quantitative analysis	Primary data (single source)	-	-
Cenamor et al. (2019)	Digital platform capability: the ability to deploy information and communication technology-based resources in combination with other internal and external resources.	Qualitative analysis	Primary data (single source)	-	-
Ukko et al. (2019)	Managerial capability: managers' abilities to utilize digitality in a business strategy, employees' mindsets and skillsets, as well as the workplace	Qualitative analysis	Primary data (single source)	-	-
Warner and Wäger (2019)	Digital sensing capabilities: sub capabilities relating to digital scouting, digital scenario planning, and digital mindset crafting	Qualitative analysis	Primary data (single source)	-	-
Wielgos et al. (2021)	Digital business capability.	Mixed-methods research	Primary data and secondary data	-	✓
Iranmanesh et al. (2022)	Disruptive digital technologies	Qualitative analysis	Secondary data	-	-
Agag et al. (2025)	Marketing analytics use	Quantitative analysis	Primary data and secondary data	✓	✓
<b>This study</b>	<b>Digital marketing capabilities</b>	<b>Mixed method</b>	<b>Primary data/ Secondary data</b>	<b>✓</b>	<b>✓</b>

**RQ1:** How DMCs contribute to service innovation through marketing agility as a mediating mechanism; and

**RQ2:** When this relationship is strengthened by technological dynamism (external environment) and structural flux (internal organization).

This study makes three key contributions to hospitality and marketing research. First, it extends dynamic capability theory by identifying marketing agility as the core mechanism through which digital marketing capabilities (DMCs) drive service innovation in hotels. Second, it introduces a contingency perspective, demonstrating that the effectiveness of DMCs depends on both technological dynamism and structural flux, reflecting external and internal sources of change. Third, it provides time-lagged, multisource empirical evidence from hotel managers, offering robust insights into how digital capabilities, agility, and innovation interact in practice, thereby bridging theoretical development with actionable managerial implications for the hospitality sector.

The remainder of this paper is structured as follows. [Section 2](#) develops the conceptual framework and presents the study's hypotheses, grounded in dynamic capability theory and prior research on digital marketing, agility, and service innovation. [Section 3](#) details the research methodology, including data collection procedures, sample characteristics, measurement of constructs, and analytical techniques. [Section 4](#) presents the results of the measurement and structural models, followed by tests of mediation and moderation effects. [Section 5](#) discusses the key findings and their theoretical and managerial implications. Finally, [Section 6](#) outlines the limitations of the study and proposes promising directions for future research.

## 2. Literature review

### 2.1. Digital marketing capabilities (DMCs) and firm performance

Research on DMCs shows that digitally enabled routines (data, platforms, analytics) enhance market responsiveness and performance when embedded in coherent marketing processes (Agag et al., 2025; De Luca et al., 2021; Homburg and Wielgos, 2022). In hospitality, DMCs

extend beyond promotion to encompass data-driven personalisation, digital service delivery, and experience co-design across touchpoints (OTAs, review sites, apps), creating the conditions for continuous innovation (Agag et al., 2025; Homburg and Wielgos, 2022; Hussain and Malik, 2022). These studies collectively imply that the value of DMCs is contingent on how firms translate digital sensing into implementable changes in offerings and processes.

### 2.2. Marketing agility as a dynamic capability

Marketing agility has been theorised as a domain-specific dynamic capability that enables firms to seize opportunities under turbulence and to convert market knowledge into timely actions (Eisenhardt and Martin, 2000; Schilke, 2014; Wilden and Gudergan, 2015). In hospitality, where demand variability and service intangibility are pronounced, agility coordinates front-stage (guest experience) and back-stage (operations) adjustments, thereby improving the odds that digital insights culminate in implemented service innovations (Hussain and Malik, 2022).

### 2.3. Service innovation and contextual moderators in hospitality

Service innovation involves novel or recombined service concepts, delivery systems, and client interfaces; its returns depend on environmental and organisational conditions (De Luca et al., 2021; Homburg and Wielgos, 2022). Two moderators are especially salient: technological dynamism (rate/unpredictability of technological change) and structural flux (internal reconfiguration capacity via leadership/role/process change). Prior work links turbulence to stronger dynamic-capability payoffs (Dess and Beard, 1984; Eisenhardt and Martin, 2000; Jaworski and Kohli, 1993; Schilke, 2014), and emerging hospitality research implicates internal adaptability as a facilitator of digital transformation (Homburg and Wielgos, 2022; Verhoef et al., 2021).

Compared with adjacent studies in marketing and hospitality (Agag et al., 2025; De Luca et al., 2021; Homburg and Wielgos, 2022; Hussain and Malik, 2022; Su et al., 2023), our study offers three advances. First,

we articulate and test an agility-mediation logic whereby DMCs (digital sensing) translate into service innovation primarily through marketing agility (seizing), while also allowing for a direct transforming path. Second, we identify boundary conditions (i.e., technological dynamism (external) and structural flux (internal)) that systematically amplify the DMCs → innovation relationship, addressing calls to contextualise dynamic capabilities (Eisenhardt and Martin, 2000; Schilke, 2014; Wilden and Gudergan, 2015). Third, we provide time-lagged evidence from hotels, a service setting where co-production and variability make capability deployment uniquely consequential.

Synthesising these streams, we position DMCs and marketing agility as interlocking, domain-specific dynamic capabilities that enact sensing and seizing, respectively, with service innovation as the transforming outcome. We further argue and test that where firms operate (technological dynamism) and how they are organised (structural flux) shape the size of DMCs’ innovation returns. This integrated, hospitality-specific perspective clarifies how digital capabilities become innovation and when their effects are magnified, thereby extending capability theory in service contexts (Agag et al., 2025; De Luca et al., 2021; Eisenhardt and Martin, 2000; Homburg and Wielgos, 2022; Hussain and Malik, 2022; Schilke, 2014; Verhoef et al., 2021; Wilden and Gudergan, 2015).

2.4. Conceptual framework and development of hypotheses

The conceptual framework drew on dynamic capability theory (Teece, 2007) (see Appendix B) and prior research on digital capabilities in marketing and hospitality setting (e.g., Agag et al., 2025; Homburg and Wielgos, 2022; Verhoef and Bijmolt, 2019; Wielgos et al., 2021) (see Appendix C), marketing agility (see Appendix D), and service innovation (see Appendix E). Fig. 1 shows the proposed model. We argue that DMCs have a direct and indirect impact on service innovation through marketing agility. We also explore the moderating role of internal and external dynamism on these relationships (see Fig. 1).

2.5. Digital marketing capabilities and marketing agility

Digital marketing capabilities (DMCs) in hospitality are evolving beyond online communication into immersive, AI-powered, and data-driven environments that transform customer engagement and innovation. Advances in predictive analytics deepen transforming capabilities (Agag et al., 2025; Homburg and Wielgos, 2022; Zhang et al., 2022). Metaverse marketing broadens DMCs’ sensing scope through virtual

guest interaction and experience simulation (Atshan et al., 2023). AI-driven smart service environments enhance seizing and transforming roles by enabling adaptive, personalised services (Al-Lami et al., 2024). Collectively, these developments extend the sensing–seizing–transforming logic (Teece, 2007; Teece, 2014), positioning DMCs as cross-boundary dynamic capabilities in hospitality.

Digital marketing capabilities enlarge a hotel’s information-processing and orchestration capacity by integrating data, platforms, and analytic routines into market-sensing and rapid iteration cycles. This aligns with dynamic capability micro foundations that enable faster sensing and seizing under change (Aker et al., 2022; Bharadwaj, 2000; Kalaiganam et al., 2021; Li et al., 2021; Morgan et al., 2018; Morgan et al., 2018; Sambamurthy et al., 2003). In hospitality, DMCs reduce coordination frictions across guest facing and back stage touchpoints, thereby improving decision speed and execution quality (Hadjielias et al., 2022; Homburg and Wielgos, 2022; Melián-Alzola et al., 2020; Zhang et al., 2022; Zhou et al., 2019). While general strategic agility or market orientation can support responsiveness, DMCs uniquely provide digital options, codified assets and experimentation routines that compress senserespond cycles. We therefore hypothesize:

H1. Digital marketing capabilities positively relate to marketing agility.

2.6. Digital marketing capabilities and service innovation

Beyond speed, digital marketing capabilities (DMCs) enable hotels to reconfigure and recombine their service components by integrating granular customer insights, modular digital assets, and analytics-driven learning mechanisms. This ability reflects a firm’s transforming function, reconfiguring service concepts, client interfaces, and delivery systems to deliver superior value (Barrett et al., 2015; De Luca et al., 2021; Den Hertog, 2000; Dotzel et al., 2013). DMCs support a data-driven understanding of evolving guest needs, allowing managers to design personalized offerings, digital booking experiences, and seamless service interactions. They also encourage the experimentation and iteration necessary for developing new digital service processes such as mobile check-in or AI-based concierge systems (Homburg and Wielgos, 2022; Hussain and Malik, 2022).

Prior studies demonstrate that digital capabilities become value-relevant only when embedded in routinized marketing and innovation processes that allow firms to translate technological knowledge into deployable offerings (Herhausen et al., 2020; Wang, 2020; Warner and Wäger, 2019; Wielgos et al., 2021). Although digital orientation, learning orientation, and organizational culture also promote

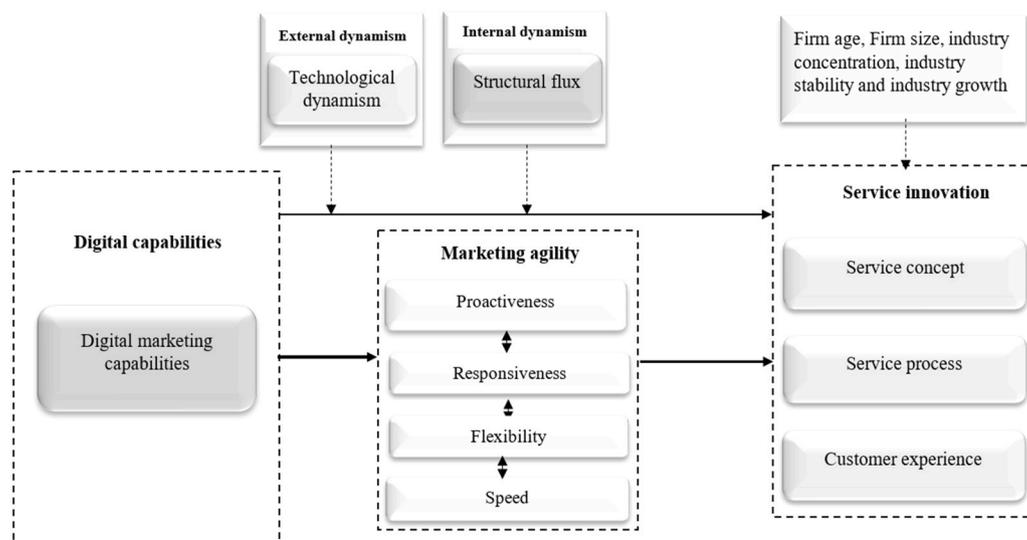


Fig. 1. Research Model.

innovation, DMCs uniquely integrate these facets by combining data infrastructure, analytic insight, and process flexibility, transforming information into implementable novelty. Accordingly:

**H2.** *Digital marketing capabilities positively relate to service innovation.*

### 2.7. Marketing agility and service innovation

Marketing agility captures an organization's ability to sense market changes, make rapid decisions, and implement actions that convert insights into realized innovation. It operationalizes dynamic responsiveness through short test-and-learn cycles, cross-functional collaboration, and fluid resource deployment across marketing, operations, and technology interfaces (Agarwal and Selen, 2009; Brand et al., 2021; Overby et al., 2006; Randhawa and Scerri, 2015; Roberts and Grover, 2012; Tsou and Cheng, 2018; Vickery et al., 2010; Zhou et al., 2019). Agile firms are capable of continuous learning and quick adaptation, which enhances their ability to design, test, and refine new service solutions in response to dynamic customer preferences and technological disruptions (Edvardsson et al., 2011; Kalaigianam et al., 2021).

In the hotel context, marketing agility facilitates synchronization between front-stage guest experiences and back-stage processes such as housekeeping, reservations, and revenue management (Agag et al., 2025; Hussain and Malik, 2022). This alignment allows for rapid prototyping of digital service ideas such as mobile check-in, personalized communication, and AI-assisted concierge services, and seamless scaling of successful innovations across multiple properties (Chasapi, Mavragani, and Agag et al., 2024; Melián-Alzola et al., 2020). Agility also enhances coordination between marketing and operational functions, allowing hotels to experiment, learn, and iterate service improvements in real time (Homburg and Wielgos, 2022; Zhang et al., 2022). Although innovation may also emerge from accumulated slack resources, cross-unit learning, or formal R&D programs (Brand et al., 2021; Randhawa and Scerri, 2015), in highly dynamic and competitive hospitality markets marketing agility serves as the proximate mechanism that transforms market knowledge and creative ideas into timely, value-creating service innovations (Kalaigianam et al., 2021; Zhou et al., 2019). Thus:

**H3.** *Marketing agility positively relates to service innovation.*

### 2.8. The mediating role of marketing agility

Dynamic capability theory emphasizes that sensing opportunities is only the first step in achieving innovation; firms must possess integrative micro foundations that translate sensed opportunities into implemented outcomes (Eisenhardt and Martin, 2000; Teece, 2007; Teece, 2014). Digital marketing capabilities provide such sensing power by generating market intelligence, digital insights, and strategic options, yet these remain unrealized unless complemented by processes that mobilize resources for timely action. Marketing agility constitutes these conversion routines, encompassing rapid decision-making, cross-functional collaboration, iterative experimentation, and decentralized empowerment (Kalaigianam et al., 2021; Moi and Cabiddu, 2021; Sambamurthy et al., 2003). Within hotels, agility enables managers to transform digital knowledge about guest preferences, service feedback, or online trends into concrete innovations such as personalized packages or process redesigns (Agag et al., 2025; Hussain and Malik, 2022).

Empirical evidence suggests that when marketing agility complements digital capabilities, firms achieve superior service performance and adaptability (Neslin et al., 2006; Warner and Wäger, 2019). However, because DMCs also possess intrinsic combinative potential, a partial mediation effect is expected: DMCs can directly enhance service innovation, while agility acts as the dominant mechanism translating digital potential into realized, value-creating innovations.

**H4.** *Marketing agility mediates the positive relationship between digital*

*marketing capabilities and service innovation.*

### 2.9. The moderating role of external and internal dynamism

Technological dynamism refers to the rate and unpredictability of technological change in a firm's external environment (Dess and Beard, 1984; Jaworski and Kohli, 1993). Under conditions of high technological dynamism, firms must continuously sense, experiment, and adapt to emerging digital tools, customer interfaces, and service platforms. Digital marketing capabilities provide the flexibility and analytical precision needed to interpret such rapid technological shifts and translate them into innovative offerings (De Luca et al., 2021; Eisenhardt and Martin, 2000; Wilden and Gudergan, 2015). By enabling real-time data analysis, agile experimentation, and multichannel orchestration, DMCs enhance a hotel's ability to pivot strategies and exploit new digital technologies faster than competitors (Cruz-González et al., 2015; Escribano et al., 2009; Hung and Chou, 2013; Schilke, 2014).

In contrast, when technological change is slow and predictable, fewer digital capabilities are needed, and complex DMC infrastructures may yield diminishing returns. In such stable environments, innovation can rely on established marketing routines rather than ongoing reconfiguration (Li and Liu, 2014; Agag et al., 2025). Although extreme turbulence may introduce coordination costs, the prevailing evidence in dynamic-capability research supports a positive, amplifying effect of technological dynamism on the DMCs–innovation link. Thus:

**H5a.** *Technological dynamism strengthens the positive effect of digital marketing capabilities on service innovation.*

Structural flux refers to the degree of internal dynamism within an organization, encompassing leadership transitions, role redesign, and the reconfiguration of processes and decision structures (Vaid et al., 2021). Moderate structural flux reflects a firm's ability to continually realign internal resources with external demands, thereby strengthening the effect of digital marketing capabilities (DMCs) on service innovation. By allowing flexible team structures, open communication, and decentralized decision-making, structural flux reduces organizational inertia and political resistance that often impede the implementation of digitally driven service changes (Agarwal and Selen, 2013; Felin and Powell, 2016; Homburg and Wielgos, 2022; Teece, 2007; Verhoef et al., 2021).

In the hotel context, structural flux enables the recompositing of cross-functional teams linking marketing, operations, and revenue management to design and execute digital innovations such as mobile booking, contactless check-in, and AI-enabled guest services (Hussain and Malik, 2022; Melián-Alzola et al., 2020). When hotels maintain adaptable internal structures, DMCs can be mobilized more effectively to foster continuous improvement and innovation. However, excessive flux may disrupt coordination or institutional memory, creating an inverted-U relationship between flux and innovation effectiveness an avenue for future inquiry. Thus:

**H5b.** *Structural flux strengthens the positive effect of digital marketing capabilities on service innovation.*

### 2.10. Control variables

To reduce omitted variable bias, our study includes several control factors that were commonly recognized in prior studies in the tourism and hospitality setting. At the firm level, firm size was included in our proposed model. Firm size was measured as the firm's annual revenue and firm age was assessed as the number of years the firm has been in business. At the industry level, we included various control factors, such as industry concentration, industry stability and industry growth (Nath and Mahajan, 2011).

### 3. Method

#### 3.1. Sample and data collection

The United Kingdom hospitality industry provides an ideal empirical setting for examining the relationship between digital marketing capabilities, marketing agility, and service innovation. The UK hotel market is characterised by a highly digitalised operating environment and a competitive mix of international chains and independent properties. According to the UK Hospitality Association (2023), the sector contributes significantly to national GDP and is among the most technologically progressive service industries in Europe. The market is distinguished by extensive use of online travel agencies (OTAs), review platforms (e.g., TripAdvisor, Google Reviews), and meta-search engines (e.g., Trivago, Booking.com) that mediate customer interactions. Hotels in the UK have rapidly adopted customer relationship management (CRM) systems, mobile booking and check-in/out, AI-powered chatbots, and contactless payment technologies, reflecting a mature digital infrastructure that supports both data-driven personalisation and marketing agility. Moreover, the UK’s dynamic tourism demand affected by seasonality, international travel trends, and macroeconomic fluctuations creates a highly volatile market environment, making agility and innovation vital for competitiveness. These features make the UK hospitality sector an appropriate and insightful context for empirically testing the mechanisms proposed in this study.

Our study employed a professional marketing research firm to collect the required data from senior marketing/marketing analytics managers in the hospitality industry in the UK. We targeted senior marketing/analytics managers because they oversee digital channels, analytics, campaign orchestration, and cross-functional marketing operations interfaces in hotels. To limit single-informant bias, (i) we used a time-lagged design with the dependent variable measured six months after predictors and (ii) implemented procedural remedies (assured anonymity, randomized item order, and proximal separation of constructs). We selected six months to (i) reduce CMB via temporal separation and (ii) allow sufficient time for digital-capability deployments and agile routines to manifest as observable service innovations without excessive sample attrition. This horizon aligns with dynamic-capability and service-innovation work where capability changes require months not days to materialize in redesigned service concepts and delivery systems (e.g., Eisenhardt and Martin, 2000; Pavlou and El Sawy, 2011).

The invitations were sent to a random sample of 1500 hotels managers. This marketing firm allows for shorter response times, a more diverse respondent pool, and greater leeway in study design (Goodman and Paolacci, 2017). This company database includes 109,000 hotels across the U.K. Most notably, it has been shown that using an online survey to collect data is generally accepted in the field of business research and results in reliable data (Hong et al., 2017; Hulland and Miller, 2018; Hulland et al., 2018; Kumar and Pansari, 2016). The possibility for bias in the sample was minimized by selecting respondents who were demographically similar to the general population. Furthermore, IP addresses were cross-checked to validate unique respondent identity and prevent duplicate responses from the same panel list, which helped to assure response integrity.

Our sampling strategy was aligned with the structural composition of the UK hospitality industry to ensure representativeness and validity. The sampling frame included a balanced mix of independent hotels and branded chains, reflecting the market’s dual structure. Regional quotas were applied to capture hotels across major UK regions (London, Scotland, Wales, and Northern England), mirroring the national distribution of hotel establishments reported by Sharkasi et al., (2025). Given the UK’s strong digital intermediation, respondents were required to have managerial responsibility for digital marketing or analytics activities, ensuring that participants possessed direct knowledge of the firm’s digital capabilities and innovation initiatives. These design choices align the sample with the technological and organisational realities of the UK

hospitality market, strengthening the contextual validity of the findings.

We employed a two-wave, multisource survey design in the United Kingdom hotel sector to examine how digital marketing capabilities relate to service innovation directly and through marketing agility, and when these effects strengthen under technological dynamism and structural flux. A temporal separation between predictors/mediator (Wave 1) and the outcome (Wave 2) was used to mitigate common-method bias (CMB) and to allow effects to unfold over time. The sampling frame was a professional hospitality research panel comprising 109,000 verified UK hotels. To ensure representativeness, we applied stratified random sampling by hotel size (rooms), category (economy/midscale/upscale/luxury), and UK region. We distributed 1500 invitations to senior marketing or marketing-analytics managers (the informants most knowledgeable about DMCs and marketing processes). Wave 1 (March 2022). Of 1500 invitees, 753 accessed the survey (47.2 %), and 708 provided usable responses after quality checks. Wave 1 captured demographics, firm- and industry-level controls, DMCs, marketing agility, and moderators. Wave 2 (September 2022; +6 months). We re-contacted Wave-1 and obtained 608 matched responses (85.9 % of Wave-1; 40.5 % of invitees). Wave 2 measured service innovation. Table 2 reports the respondent profile; managers averaged 9.5 years firm tenure and rated their DMC knowledge 4.7/5.

#### 3.2. Measures

Our study variables were operationalized and measured using well-established measures adopted from prior research (see Appendix F and Table 3). A pilot with 20 UK hotel managers and 5 marketing academics assessed clarity, content validity, and completion time. Minor wording edits improved sector fit (e.g., specifying “guest journey touchpoints”). Pilot reliabilities were acceptable (Cronbach’s  $\alpha$  range.82–.91), and cognitive-interview feedback supported face and content validity. Pilot outcomes and any edits are summarized in Appendix F.

#### 3.3. Data analysis technique and common method bias (CMB)

This study employed covariance-based structural equation modelling (CB-SEM) using AMOS 22.0. The choice of CB-SEM is theoretically and methodologically justified by the study’s theory-testing orientation, the objective of evaluating global model fit, and the use of reflective latent

**Table 2**  
Participant demographics.

Demographics	Frequencies	
	T1 (N = 753)	T2 (N = 608)
<b>Gender</b>		
Male	53 %	51 %
Female	47 %	49 %
<b>Age</b>		
< 30	11 %	9 %
31–40	23 %	27 %
41–50	28 %	32 %
51–60	24 %	19 %
61 or more	14 %	13 %
<b>Current Job Experience</b>		
Less than a Year	2 %	3 %
1–5 Years	5 %	8 %
6–10 Years	39 %	33 %
11–15 Years	34 %	41 %
16–20 Years	16 %	13 %
More than 20 Year	4 %	2 %
<b>Firm Size</b>		
< 200	5 %	4 %
200–500 employees	18 %	19 %
500–1000 employees	22 %	26 %
1000–3000 employees	32 %	20 %
3000–5000 employees	21 %	26 %
5000 or more employees	2 %	5 %

**Table 3**  
Variables operationalisation.

Variables	Definition	Source
Service innovation	“Service innovation was operationalized using three dimensions of service concept, service process, and customer experience”. “New service concept refers to new ways to organize a solution to customer needs or problems, service process innovation consists of new or enhanced internal systems to deliver services to customers more efficiently, and customer experience innovation captures innovative firm-customer interfaces (i.e., touchpoints) that improve service interactivity and customization”.	(Barrett et al., 2015; De Luca et al., 2021).
Marketing agility	“This study considers agility from a marketing perspective and defines marketing agility as a firm’s ability to proactively anticipate and sense marketing opportunities, and to respond quickly and flexibly to these opportunities to better satisfy customer needs”.	(Zhou et al., 2019)
Digital marketing capabilities	Digital marketing capabilities were operationalized “as a one-dimensional reflective construct that captures seven digital core marketing capabilities: social media marketing, mobile marketing, content marketing, search engine marketing, web analytics, marketing automation, and e-mail marketing”.	Homburg and Wielgos (2022)
Firm size	“Measured as the logarithm of the number of employees at t”.	Hamdy et al. (2024)
Firm age	Firm age was evaluated as “the number of years since establishment”.	Agag et al. (2024)
Prior year performance	“Operationalized as industry-adjusted ROA at t-1”.	(Cobb and Lin 2017; Connelly et al. 2016).
Industry concentration	“Measured as the two-digit SIC Herfindahl index of firm sales at t”.	
Industry growth	“Computed as the two-digit SIC industry’s lagged three-year average of the median sales growth (t - 2, t - 1, t)”.	(Cobb and Lin 2017; Connelly et al. 2016).
Industry stability	“Operationalized as the two-digit SIC industry’s lagged three-year standard deviation of the median sales growth (t - 2, t - 1, t)”.	(Cobb and Lin 2017; Connelly et al. 2016).

constructs supported by a sufficiently large sample size ( $N = 608$ ). CB-SEM is particularly appropriate when the aim is to confirm theoretically derived relationships and assess overall model adequacy rather than to maximise explained variance (Dash and Paul, 2021; Hair et al., 2021; Kline, 2023). To assess the robustness and generalisability of our findings, we additionally estimated a partial least squares (PLS-SEM) specification using SmartPLS 4. The pattern of path coefficients, directions, and significance levels was consistent with the CB-SEM results, indicating that our conclusions are not sensitive to the estimation method. A detailed comparison of the CB-SEM and PLS-SEM results, including effect sizes and explained variance, is presented in Appendix G.

We followed the two-step structural equation modelling (SEM) approach recommended by Kline (2023) and Hair et al. (2021). In the first step, we assessed the measurement model through confirmatory factor analysis (CFA) to ensure construct validity and reliability. Indicators with standardized loadings below 0.70 were removed unless strong theoretical justification supported their retention. Cross-loadings were not permitted across latent constructs. Convergent validity was verified through significant standardized loadings and average variance extracted ( $AVE > 0.50$ ), while discriminant validity was established

using the heterotrait–monotrait ratio ( $HTMT < 0.85$ ) criterion. Model refinement considered modification indices only when they were theory-driven, not data-mined. In the second step, the structural model was evaluated to test the hypothesised relationships among constructs. We reported path coefficients, standard errors,  $R^2$  values, and latent correlations to assess explanatory power and model adequacy. Furthermore, to ensure the stability of the measurement model, we verified configural and metric invariance across the randomly split calibration and validation subsamples used for cross-validation (see Appendix G).

To minimise potential common method bias (CMB), we implemented both procedural and statistical remedies throughout the research process. During data collection, we assured respondents of complete anonymity, clarified that there were no right or wrong answers, and used randomised item ordering to prevent pattern recognition. Additionally, we introduced temporal separation between the measurement of predictor and outcome variables by collecting data across two waves, six months apart, thereby reducing the likelihood of consistency artefacts or common rater effects (Podsakoff et al., 2012). Following data collection, we applied several post-hoc statistical tests to evaluate potential CMB. First, a latent method factor was included in the confirmatory factor analysis; results showed that model fit did not improve materially ( $\chi^2/df = 1.439$ ;  $RMSEA = 0.05$ ;  $SRMR = 0.07$ ;  $CFI = 0.99$ ;  $NFI = 0.96$ ;  $\Delta CFI < 0.01$ ), indicating that CMB was not a significant concern. Second, we conducted a marker-variable analysis using association duration as an unrelated marker. The differences between original and partial correlations were minimal (average  $\Delta r = 0.03$ ,  $p > 0.10$ ), further supporting the absence of systematic bias. Collectively, these procedural and statistical results confirm that common method bias did not materially influence the study’s findings. Moreover, non-response bias was evaluated by contrasting the characteristics of the first to respond with those of the last to respond. Our data set did not suffer from non-response bias (Armstrong and Overton, 1977), as the  $t$ -test showed no statistically significant variance between the two samples.

### 3.4. Cross-validation and model invariance assessment

To enhance the robustness and generalisability of our structural equation modelling (SEM) results, we conducted a random split-sample cross-validation procedure. The full sample ( $N = 608$ ) was randomly divided into two approximately equal subsamples: a calibration sample ( $n = 305$ ) used to estimate model parameters and a validation sample ( $n = 303$ ) used to verify stability. The measurement model demonstrated acceptable fit in both samples (Calibration:  $\chi^2/df = 1.48$ ,  $RMSEA = 0.05$ ,  $SRMR = 0.06$ ,  $CFI = 0.98$ ,  $NFI = 0.95$ ; Validation:  $\chi^2/df = 1.52$ ,  $RMSEA = 0.05$ ,  $SRMR = 0.07$ ,  $CFI = 0.98$ ,  $NFI = 0.94$ ), confirming consistency in the factor structure. Path coefficients, signs, and significance levels remained stable across subsamples, indicating that parameter estimates were not sample-specific. We also tested measurement invariance across the two groups following Kline (Kline, 2023) and Hair et al. (Hair et al., 2021). Results supported configural ( $\Delta CFI = 0.004$ ) and metric invariance ( $\Delta CFI = 0.006$ ), demonstrating that the constructs were measured equivalently in both calibration and validation samples. Collectively, these findings confirm that the model is stable, replicable, and robust across independent subsamples, increasing confidence in the reliability of the reported SEM results.

Prior to model estimation, we assessed the underlying statistical assumptions required for covariance-based SEM. First, univariate normality was examined for all observed variables; skewness and kurtosis values were within acceptable thresholds ( $skew < 2$ ;  $kurtosis < 7$ ) (Kline, 2023). Mardia’s multivariate kurtosis test indicated mild non-normality; therefore, we employed a robust maximum likelihood estimator (MLR) with Satorra–Bentler adjusted  $\chi^2$  statistics and bootstrapped bias-corrected confidence intervals (BCa, 5000 resamples) to ensure the accuracy of standard errors and p-values. Potential outliers were screened using Mahalanobis distance ( $p < .001$ ); identified cases

were reviewed and none exhibited undue influence on parameter estimates. Missing data were minimal (< 2 % per variable) and handled using Full Information Maximum Likelihood (FIML), which provides unbiased estimates under missing-at-random assumptions (Hair et al., 2021). Finally, multicollinearity among constructs was assessed using variance inflation factors (VIFs); all values ranged from 1.05 to 1.42, well below the threshold of 3.0, indicating no multicollinearity concerns. Collectively, these diagnostics confirm that the data satisfy the assumptions necessary for robust SEM estimation and interpretation.

#### 4. Results

##### 4.1. Measurement model

The measurement model has acceptable model fit indices:  $\chi^2 / DF = 1.42$ ; RMSEA = 0.05; SRMR = 0.06; CFI = 0.99; and NFI = 0.95. The validity and reliability of each construct in the model were assessed using Cronbach's alpha (CA) and composite reliability (CR). Variable reliability was inferred based on the fact that all CA and CR estimations

are above 0.70, as reported by Hair et al. (2021). Next, we assessed the convergent validity by examining the item loadings. According to Kline (2023), all of the item loadings presented in Table 4 exhibit statistical significance and surpass the threshold of 0.70, hence indicating the presence of convergent validity. In addition, we took into account the average variance extracted (AVE) as a means of assessing convergent validity at the variable level. The average variance extracted (AVE) values for all constructs exceeded 0.50, as reported by Bagozzi et al. (1991). This suggests that the factors explained over 50 % of the variability observed in the items, hence confirming convergent validity, as suggested by Fornell and Larcker (1981). The square root of the average variance extracted (AVE) was computed and subsequently compared to the correlation between the latent constructs, as described by Fornell and Larcker (1981). Discriminant validity was established as evidenced by the square root of the average variance extracted (AVE) surpassing the inter-construct correlation, as indicated in Table 5.

**Table 4**  
Measurement statistics of construct scale.

Construct/Indicators	Standard Loading	CR	VIF	Cronbach's $\alpha$	AVE	Mean	SD	t-statistic	Skewness	Kurtosis
<b>Service concept innovation (SCI)</b>		0.96	1.307	0.94	0.503					
SCI1	0.95					2.05	0.88	10.13	-1.21	2.15
SCI2	0.98					2.63	0.85	17.12	-1.04	2.33
SCI3	0.93					2.13	0.87	19.27	-1.57	1.93
<b>Service process innovation (SPI)</b>		0.95	1.270	0.93	0.612					
SPI1	0.96					2.28	0.85	16.29	-1.21	2.67
SPI2	0.93					2.41	0.84	24.12	-1.78	2.43
SPI3	0.97					2.69	0.87	19.27	-1.89	1.93
<b>Customer experience innovation (CEI)</b>		0.97	1.329	0.95	0.539					
CEI1	0.97					2.38	0.83	18.27	-1.54	2.12
CEI2	0.94					2.36	0.81	21.24	-1.90	2.37
CEI3	0.95					2.82	0.85	22.38	-1.35	2.54
<b>Digital marketing capabilities (DMC)</b>		0.97	1.439	0.95	0.526					
DMC1	0.94					2.23	0.81	17.23	-1.54	2.23
DMC2	0.93					2.10	0.80	21.36	-1.23	2.73
DMC3	0.97					2.24	0.83	20.12	-1.30	2.03
DMC4	0.98					2.37	0.89	19.45	-1.27	2.31
DMC5	0.93					2.83	0.83	23.29	-1.64	2.73
DMC6	0.98					2.37	0.80	16.47	-1.04	1.83
DMC7	0.95					2.46	0.84	11.20	-1.70	2.37
<b>Proactiveness (PRO)</b>		0.94	1.389	0.93	0.702					
PRO1	0.98					2.57	0.85	13.23	-1.54	2.30
PRO2	0.94					2.38	0.83	29.20	-1.38	2.83
PRO3	0.95					2.40	0.84	18.12	-1.64	2.26
<b>Responsiveness (RSP)</b>		0.94	1.892	0.93	0.589					
RSP1	0.93					2.37	0.88	19.12	-1.53	2.62
RSP2	0.92					2.54	0.80	26.23	-1.27	2.45
RSP3	0.94					2.38	0.84	24.30	-1.28	2.08
RSP4	0.90					3.08	0.87	33.97	-1.26	2.19
<b>Flexibility (FLX)</b>		0.97	1.378	0.95	0.590					
FLX1	0.97					2.23	0.86	20.23	-1.84	2.46
FLX2	0.92					2.67	0.88	27.12	-1.54	2.23
FLX3	0.90					2.08	0.83	16.45	-1.03	1.89
FLX4	0.89					3.02	0.80	13.29	-1.20	2.36
<b>Speed (SPD)</b>		0.96	1.378	0.94	0.627					
SPD1	0.95					2.04	0.83	16.23	-1.32	2.78
SPD2	0.93					2.59	0.85	21.89	-1.56	2.20
SPD3	0.95					2.12	0.88	10.47	-1.93	2.52
SPD4	0.90					2.67	0.85	18.02	-1.27	2.77
<b>Structural flux (STF)</b>		0.95	1.039	0.94	0.619					
STF1	0.94					2.34	0.79	29.12	-1.73	2.72
STF2	0.97					2.12	0.84	20.43	-1.28	2.02
STF3	0.93					2.73	0.82	19.37	-1.94	2.89
STF4	0.90					2.12	0.80	11.26	-1.26	2.19
STF5	0.94					2.73	0.83	10.43	-1.67	2.06
STF6	0.94					2.08	0.82	23.23	-1.02	2.64
<b>Technological dynamism (TCD)</b>		0.96	1.296	0.94	0.612					
TCD1	0.95					2.39	0.83	22.19	-1.83	2.37
TCD2	0.97					2.45	0.82	26.40	-1.49	2.04

**Table 5**  
Descriptive statistics, correlations, internal reliability.

	1	2	3	4	5	6	7	8	10	11
1. SCI	0.709									
2. SPI	0.203	0.782								
3. CEI	0.378	0.402	0.734							
4. DMC	0.518	0.328	0.327	0.725						
5. PRO	0.219	0.299	0.299	0.419	0.837					
6. RSP	0.377	0.218	0.312	0.404	0.400	0.767				
7. FLX	0.420	0.462	0.437	0.272	0.372	0.327	0.768			
8. SPD	0.177	0.300	0.509	0.362	0.292	0.489	0.326	0.791		
10. STF	0.143	0.267	0.236	0.428	0.263	0.312	0.218	0.221	0.786	
11. TCD	0.362	0.237	0.389	0.510	0.316	0.129	0.370	0.209	0.404	0.782
Mean	2.39	2.05	2.73	3.09	2.64	2.15	2.78	2.29	2.65	2.34
Standard Deviation	0.819	0.797	0.803	0.844	0.794	0.832	0.783	0.822	0.743	0.762

4.2. Structural model and hypotheses testing

Table 6 presents the standardized path coefficients for the hypothesised relationships. All hypothesised paths are statistically significant and in the expected direction. Beyond statistical significance, we evaluated the magnitude of effects using standardized coefficients and interpreted them according to Cohen (1988) guidelines, where  $\beta = 0.10$  represents a small,  $\beta = 0.30$  a moderate, and  $\beta \geq 0.50$  a large effect.

The path from digital marketing capabilities (DMCs) to marketing agility ( $\beta = 0.41, p < 0.01$ ) reflects a moderate-to-large effect, indicating that enhanced DMCs substantially improve a hotel’s capacity for rapid sensing and response. The direct effect of DMCs on service innovation ( $\beta = 0.36, p < 0.01$ ) also represents a moderate relationship, suggesting that digital capabilities significantly influence the development of new or improved service offerings. The link between marketing agility and service innovation ( $\beta = 0.42, p < 0.01$ ) is similarly moderate-to-large, underscoring agility’s pivotal role in transforming digital insights into tangible innovation outcomes. It was argued that DMCs have a positive effect on marketing agility (H1). Our analysis revealed a positive relationship between DMCs and marketing agility ( $\beta = 0.41, p < 0.01$ ), demonstrating support for H1. We proposed that DMCs have a positive influence on service innovation (H2). The results show that DMCs were found to have a positive influence on service innovation ( $\beta = 0.36, p < 0.01$ ), indicating support for H2. We also suggested that marketing agility has a positive impact on service innovation (H3). Our analysis shows a positive impact of marketing agility on service innovation ( $\beta = 0.42, p < 0.01$ ), supporting H3.

To test the mediating role of marketing agility in the relationship between digital marketing capabilities (DMCs) and service innovation, we applied a bias-corrected bootstrapping approach (5000 resamples) with 95 % bias-corrected and accelerated (BCa) confidence intervals, following the recommendations of Zhao et al. (2010). This procedure provides a more robust assessment of indirect effects than traditional methods by avoiding normality assumptions and producing more accurate confidence estimates. Results confirm that marketing agility partially mediates the DMCs–service innovation link. The indirect effect of DMCs on service innovation through marketing agility was  $\beta = 0.17$ , with a 95 % BCa CI [0.11, 0.24], excluding zero, indicating a statistically significant mediation. The direct effect of DMCs on service innovation

**Table 6**  
Mediation analysis.

Path	Estimate	T statistics	P-level	95 % Bc CI
<b>Marketing agility mediating effect (MGT)</b>				
Direct effect DMC → SVI	0.360	9.230	0.000	0.201 – 0.109
Indirect effect DMC → SVI	0.107	4.529	0.000	0.161 – 0.108
Total effect DMC → SVI	0.124	6.018	0.000	0.172 – 0.035

Note:  
DMC= Digital marketing capabilities; SVI= Service innovation.

remained significant ( $\beta = 0.36, p < 0.01$ ), consistent with partial mediation rather than full mediation. We also report the Sobel test ( $z = 4.96, p < 0.001$ ), which corroborates the bootstrapped results. Together, these findings confirm that marketing agility serves as a key mechanism through which DMCs translate into enhanced service innovation in hotels. The findings of this investigation are shown in Table 6. According to the findings, marketing agility was found to partially mediate this relationship, demonstrating support for H4.

Our study utilized the method suggested by Hayes (2017) to test the moderating roles of technological dynamism (H5a) and structural flux (H5b) on the relationship between DMCs and service innovation. Table 7 demonstrates the results of the moderating analysis. Our analysis revealed that the interaction between DMCs and technological dynamism on service innovation was significant ( $t = 5.108, p < 0.01$ ), supporting H5a. The results also indicated that the interaction between DMCs and structural flux on service innovation was significant ( $t = 6.702, p < 0.01$ ), supporting H5b. Moreover, Tables 8–10 indicates the results of the conditional effects of technological dynamism and structural flux i.e., ‘at three levels’) on the link between DMCs and service innovation. To further illustrate the moderating roles of technological dynamism and structural flux, we plotted the significant interaction effects using the procedures recommended by Hayes (2017). Figs. 2 and 3 display the nature of these moderations, depicting the relationship between digital marketing capabilities (DMCs) and service innovation at low (−1 SD) and high (+1 SD) levels of each moderator. As shown in Fig. 2, the positive relationship between DMCs and service innovation becomes stronger under high technological dynamism, suggesting that rapidly changing technological environments amplify the innovation benefits derived from digital marketing capabilities. Conversely, when technological dynamism is low, the slope of the relationship weakens, indicating that stable environments offer fewer opportunities for digital transformation-driven innovation. Similarly,

**Table 7**  
Moderating effects of technological dynamism and structural flux.

	b	SE	t
<b>Technological dynamism</b>			
Constant	2.349	0.737	4.230***
Digital marketing capabilities (independent variable)	0.812	0.239	6.412***
Technological dynamism (moderator)	1.229	0.116	8.207***
Interaction term	0.053	0.047	5.108***
<b>Structural flux</b>			
Constant	3.139	0.836	7.283***
Digital marketing capabilities (independent variable)	0.739	0.418	9.320***
Structural flux (moderator)	1.368	0.329	11.134***
Interaction term	0.026	0.062	6.702***

Note:  
b = unstandardized beta; SE = standard error.  
† p < 0.10. \*p < 0.05. \*\*p < 0.01. \*\*\*p < 0.001

**Table 8**  
Conditional effects technological dynamism and structural flux.

	b	SE	t	95 % CI
<b>Technological dynamism</b>				
On digital marketing capabilities				
Low technological dynamism	0.116	0.043	2.128***	(0.128, 0.239)
Average technological dynamism	0.203	0.059	5.129***	(0.172, 0.403)
High technological dynamism	0.429	0.062	8.125***	(0.109, 0.630)
<b>Structural flux</b>				
On digital marketing capabilities				
Low structural flux	0.149	0.053	3.239***	(0.107, 0.348)
Average structural flux	0.318	0.069	6.438***	(0.194, 0.649)
High structural flux	0.526	0.072	12.347***	(0.151, 0.803)

Note:  
b = unstandardized beta; SE = standard error. \*p < 0.05. \*\*p < 0.01. \*\*\*p < 0.001.

**Table 9**  
Robustness checks with the effect of marketing agility on service innovation with digital marketing capabilities removed from our model.

	Service innovation.
Marketing agility	0.291*** (0.043)
<b>Controls</b>	
Age	0.0821 (0.590)
Size	0.070 (0.318)
R&D expenditure	0.094 (0.285)
Prior year performance	0.080 (0.502)
Industry concentration	0.060 (0.713)
Industry growth	0.061 (0.422)
Industry stability	0.091 (0.529)
Constant	4.219*** (0.031)
Overall R2	0.479
- 2 log likelihood	-3104.217

Note: standard errors in parentheses, \*\*\* p < 0.001, \*\* p < 0.01, \* p < 0.05.

Fig. 3 demonstrates that structural flux reflecting internal adaptability and organisational reconfiguration enhances the impact of DMCs on service innovation. At high levels of structural flux, hotels can more effectively translate digital insights into new service designs and delivery processes. These interaction patterns empirically support H5a and H5b, confirming that both external and internal dynamism strengthen the performance effects of digital marketing capabilities.

To clarify the nature and magnitude of the moderation effects, we computed and interpreted conditional effects of digital marketing capabilities (DMCs) on service innovation at representative levels of the moderators (-1 SD, mean, +1 SD). Under conditions of high technological dynamism (+1 SD), the effect of DMCs on service innovation increases substantially: a one-standard-deviation rise in DMCs is associated with an approximate 0.17-unit gain in service innovation, compared with a 0.08-unit gain under low dynamism (-1 SD). This pattern indicates that rapidly evolving technological environments enhance the value derived from digital marketing capabilities, as hotels can more effectively translate new technologies into innovative service designs. Similarly, when structural flux is high, indicating frequent internal adaptation and role reconfiguration, the DMCs-service innovation relationship strengthens. A one-standard-deviation increase in DMCs leads to an approximate 0.19-unit gain in service innovation at

**Table 10**  
Longitudinal models.

	Model 1 Marketing agility (T1)	Model 1 Marketing agility (T2)
Digital marketing capabilities	0.408*** (0.021)	0.519*** (0.016)
Service innovation.	0.052 (0.388)	0.087 (0.414)
<b>Controls</b>		
Age	0.078 (0.277)	0.065 (0.410)
Size	0.057 (0.209)	0.061 (0.314)
R&D expenditure	0.092 (0.610)	0.051 (0.385)
Prior year performance	0.073 (0.559)	0.077 (0.530)
Industry concentration	0.068 (0.446)	0.069 (0.228)
Industry growth	0.067 (0.402)	0.091 (0.469)
Industry stability	0.079 (0.801)	0.075 (0.548)
Constant	5.039*** (0.018)	5.327*** (0.021)
Overall R2	0.351	0.392
- 2 log likelihood	-2893.901	-2915.143

Note: standard errors in parentheses, \*\*\* p < 0.001, \*\* p < 0.01, \* p < 0.05.

high structural flux versus 0.09 at low flux. These examples illustrate that both external dynamism and internal adaptability magnify the innovative potential of DMCs by enabling faster experimentation, implementation, and scaling of new service ideas.

#### 4.3. Robustness and sensitivity analyses

To ensure the stability and generalisability of the findings, we conducted a series of robustness checks and sensitivity analyses, reporting their key outcomes here and providing full statistical details in Appendix G. First, we re-specified the service innovation construct as a second-order latent factor composed of service concept, process, and customer experience innovation dimensions. The pattern and significance of all structural relationships remained consistent with those obtained from the composite specification, confirming construct-level robustness. Second, to examine potential endogeneity concerns, we applied a Gaussian copula approach for the focal predictor (DMCs). The copula term was statistically non-significant (p > 0.10), indicating that endogeneity did not bias the estimated effects. Third, we generated Johnson-Neyman plots to visualise the conditional effects of technological dynamism and structural flux. Both moderations remained positive and significant across most observed values of the moderators, validating the proposed interactions. Fourth, model estimates were stable when firm- and industry-level control variables were alternately removed and reintroduced, suggesting that omitted variable bias is unlikely. Finally, results obtained using PLS-SEM as an alternative estimation technique mirrored those of the CB-SEM model in direction, size, and significance of coefficients, supporting the methodological robustness of our conclusions.

### 5. Discussion and conclusion

#### 5.1. Key findings

The results of this study provide strong empirical and theoretical support for the dynamic capability framework and clarify the mechanisms through which digital marketing capabilities enhance service innovation in the hospitality industry. Grounded in Teece (2007); (2014) sensing-seizing-transforming logic, our findings reveal that

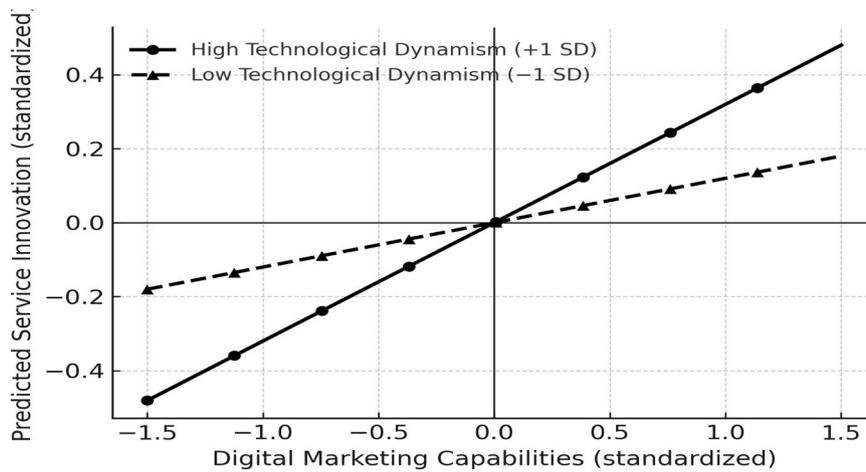


Fig. 2. Interaction between Digital Marketing Capabilities and Technological Dynamism on Service Innovation.

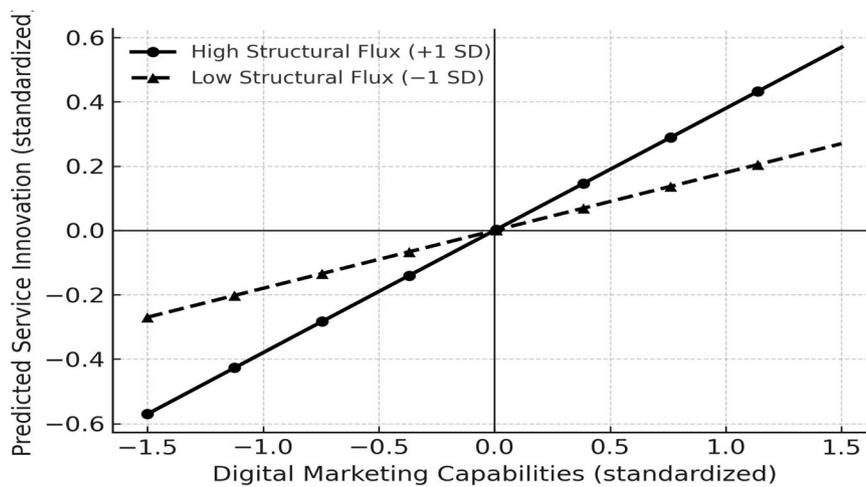


Fig. 3. Interaction between Digital Marketing Capabilities and Structural Flux on Service Innovation.

DMCs act as higher-order capabilities that allow hotels to sense market and technological changes, seize emerging opportunities through marketing agility, and transform resources and processes to deliver innovative service offerings. This relationship highlights that digital resources alone do not create value; rather, it is the combination of knowledge integration, resource orchestration, and dynamic alignment that enables hotels to convert digital insights into meaningful service innovation outcomes.

The analysis demonstrates that DMCs have both direct and indirect effects on service innovation. The direct pathway suggests that digital technologies empower hotels to reconfigure processes, design personalized guest experiences, and implement novel service solutions. The indirect pathway, mediated by marketing agility, indicates that agile marketing routines translate digital intelligence into timely innovation through rapid experimentation and decision-making. The partial mediation observed supports a dual capability mechanism: DMCs drive innovation both through agility (seizing) and through direct transformation (transforming), reinforcing the layered nature of dynamic capabilities (Sambamurthy et al., 2003; Teece, 2007; Teece, 2014).

Our findings also contribute to broader debates in marketing and service innovation by integrating the study within contemporary discussions on digital transformation, agility, and service ecosystems (Barrett et al., 2015; Verhoef et al., 2021). Compared with prior studies that report mixed or weaker links between digital capabilities and innovation (Cortez and Hidalgo, 2022; Iranmanesh et al., 2022; Su et al.,

2023), our results suggest that the strength of this relationship is highly contingent on the service context. Specifically, the intangibility, simultaneity, and heterogeneity of hospitality services require continuous adaptation conditions under which digital marketing and agility capabilities become especially valuable.

To ensure robustness and generalisability, we supplemented our UK-based two-wave data with an exploratory multi-group analysis using an independent sample from Egyptian hotels. The results ( $\Delta\chi^2(71) = 59.879, p = 0.58; CFI = 0.97; RMSEA = 0.05$ ) indicate no significant difference between models with freely estimated and constrained factor loadings, suggesting partial measurement invariance across countries. Although we interpret these findings cautiously, they provide preliminary evidence of structural consistency and encourage future research using larger multi-country datasets to validate cross-national generalisability (Hanelt et al., 2021; Wielgos et al., 2021).

Effect-size interpretation further strengthens the practical meaning of our findings. Standardised coefficients show moderate-to-large effects: DMCs  $\rightarrow$  marketing agility ( $\beta = 0.41$ ), DMCs  $\rightarrow$  service innovation ( $\beta = 0.36$ ), and marketing agility  $\rightarrow$  service innovation ( $\beta = 0.42$ ). These results indicate that improvements in digital and agile capabilities translate into substantial gains in hotels' ability to innovate. The moderating effects of technological dynamism and structural flux confirm that the benefits of DMCs are amplified when hotels operate in rapidly evolving technological environments and maintain flexible internal structures.

Overall, these results advance theoretical and empirical understanding of how dynamic capabilities operate in service contexts. By linking DMCs, marketing agility, and service innovation through a theoretically grounded and empirically validated framework, this study demonstrates that digital transformation success depends not on technology alone, but on how agile marketing processes enable the reconfiguration of resources to create new value.

### 5.2. Theoretical implications

This study makes several important theoretical contributions to the literature on digital marketing capabilities, marketing agility, and service innovation in the hospitality context. While previous studies have examined digital transformation and dynamic capabilities separately (Agag et al., 2025; Homburg and Wielgos, 2022; Hussain and Malik, 2022), few have integrated these perspectives into a unified theoretical framework. Rather than claiming to be the first to explore this relationship, our contribution lies in extending existing work by demonstrating how DMCs and marketing agility jointly operate as interdependent dynamic capabilities that foster service innovation within hotels. Grounded in the sensing–seizing–transforming logic of dynamic capability theory (Teece, 2007; Teece, 2014), our findings reveal that digital capabilities alone do not guarantee innovation outcomes unless complemented by agile marketing routines that enable rapid reconfiguration of resources and knowledge across functions.

First, this study advances the dynamic capability framework by identifying marketing agility as a bridging or integrative capability that connects DMCs to innovation outcomes. Existing research has acknowledged that dynamic capabilities rely on higher-order routines for sensing and seizing opportunities (Eisenhardt and Martin, 2000; Schilke, 2014). Our results show that DMCs perform the sensing role, capturing, processing, and interpreting digital signals, whereas marketing agility operationalises the seizing role by converting digital insights into timely market actions. This “agility mediation logic” refines dynamic capability theory by illustrating how domain-specific capabilities (in marketing) interact with dynamic routines to translate potential into realized innovation. The finding that DMCs also exert a significant direct effect on service innovation suggests that these capabilities can simultaneously serve a transforming function, directly reshaping customer experience and service design. This dual mechanism contributes a richer, layered view of dynamic capabilities, distinguishing between complementary pathways through which firms achieve digital innovation.

Second, our study clarifies boundary conditions for the effectiveness of digital capabilities by showing that the strength of the DMC–innovation relationship depends on both external and internal dynamism. The positive moderating effects of technological dynamism and structural flux support the argument that dynamic capabilities yield greater benefits under conditions of change and uncertainty (Eisenhardt and Martin, 2000; Schilke, 2014). These findings respond to calls in the dynamic capabilities literature to examine contextual contingencies and explain performance heterogeneity across environments. Specifically, technological dynamism intensifies the value of DMCs by requiring faster digital adaptation, while structural flux representing internal adaptability and facilitates the reconfiguration of resources and personnel needed to execute innovation. Together, these insights reveal that capability deployment is most effective when external turbulence aligns with internal flexibility.

Third, by comparing our findings with prior research that reports inconsistent or weaker relationships between digital capabilities and innovation (Cortez and Hidalgo, 2022; Iranmanesh et al., 2022; Su et al., 2023), this study provides contextual explanation for variation across industries. The service-based, high-contact nature of hospitality creates unique conditions such as customer co-production, immediacy, and perishability that amplify the relevance of digital marketing and agility capabilities. These contextual attributes help explain why DMCs in

hospitality generate stronger innovation effects than in manufacturing or B2B settings, where digital tools may be more operationally focused. In this way, our work positions the hospitality sector as an informative testbed for exploring how dynamic capabilities function in environments characterised by continuous service customization and direct customer interaction.

Fourth, we contribute to the broader marketing and service-innovation debates by linking our model to emerging research on digital transformation, market agility, and service ecosystems (Barrett et al., 2015; Verhoef et al., 2021). Our findings highlight that agility is not simply a behavioural attribute but a strategic capability that enables organizations to orchestrate digital technologies, knowledge, and customer insights across the service ecosystem. This perspective advances current theoretical discussions on how firms integrate digital resources and organisational agility to co-create value with customers and partners in dynamic market systems.

Finally, we acknowledge that contextual boundaries and alternative explanations warrant attention. While our primary dataset is drawn from UK hotels, an exploratory cross-country robustness test using Egyptian data (Appendix G) indicates partial measurement invariance and consistent path relationships, suggesting that the conceptual model is not culturally specific. Nevertheless, institutional, technological, and cultural differences likely influence capability deployment, and future research should employ multi-country designs to assess these effects more rigorously. Additionally, other mechanisms such as learning orientation, digital orientation, or market orientation may also drive innovation. Although these factors complement DMCs conceptually, they represent strategic postures rather than dynamic routines; hence, they were not the focus of this capability-based model. Future research could test such competing explanations to further validate and refine the theoretical model proposed here.

In sum, this study refines dynamic capability theory by empirically illustrating how digital marketing capabilities and marketing agility function as interlocking dynamic capabilities that transform sensing into seizing and transforming activities within hospitality firms. It introduces boundary conditions under which these relationships are most effective and integrates insights from the digital marketing and service-innovation literatures to advance theoretical understanding of how firms achieve innovation in technology-intensive service contexts.

### 5.3. Managerial implications

This study offers several important implications for hotel executives seeking to strengthen innovation through digital transformation. First, the results demonstrate that digital marketing capabilities are not just operational tools but strategic enablers of innovation. Managers should therefore view investments in digital marketing as long-term capability building rather than campaign-level spending. For example, Marriott International has developed centralized data analytics platforms that continuously collect and interpret guest data from loyalty programs and mobile apps. These insights allow local properties to design new service packages and personalize experiences in real time. Smaller hotel groups can adopt similar practices by integrating customer-relationship-management (CRM) systems and analytics dashboards that unify online and offline guest data.

Second, the finding that marketing agility mediates the DMC–innovation link highlights the importance of flexible, cross-functional marketing structures. Rather than maintaining rigid approval hierarchies, hotels can foster “agile marketing squads” that experiment with new offers, test digital messages, and iterate quickly based on feedback. For instance, Accor Hotels has implemented digital-innovation labs where marketing, operations, and IT teams co-create campaigns that are launched and refined within weeks instead of months. Independent hotels can emulate this approach by holding short “sprint cycles” to test new booking funnels or guest-communication tools, adjusting strategies in near real time.

Third, the moderating role of technological dynamism suggests that DMCs generate stronger returns in environments of rapid technological change. Hotel managers should monitor emerging technologies such as AI-powered chatbots, virtual concierge apps, and predictive revenue systems and invest selectively in those aligned with their service model. For example, Hilton's AI-based "Connected Room" initiative allows guests to personalize lighting, temperature, and entertainment via mobile devices, illustrating how digital marketing data can merge with service delivery to enhance innovation. Managers operating in less dynamic environments, such as resort destinations with slower tech adoption, can still leverage digital tools to refine guest segmentation or automate post-stay engagement without overinvesting in unneeded technology.

Fourth, the moderating effect of structural flux underscores that innovation thrives when hotels maintain adaptable internal structures. Excessive bureaucracy inhibits the rapid resource reallocation required for agile innovation. Leading chains like CitizenM and Meliá Hotels International periodically rotate managers across digital, marketing, and operations roles to encourage knowledge sharing and reduce organizational inertia. Similarly, hotel managers can promote adaptive structures by delegating decision rights for digital initiatives to property-level teams while maintaining strategic oversight at headquarters.

Fifth, this study highlights three strategic actions for hotel managers. First, develop cross-functional digital-agile teams that unite marketing, IT, and operations to accelerate data-driven decision-making and innovation. Second, invest in adaptive CRM and analytics platforms that integrate real-time customer data, enabling personalised service and responsive marketing. Third, design dynamic marketing playbooks with clear decision rights and contingency protocols to navigate high-flux technological environments. Together, these practices translate digital marketing capabilities and marketing agility into sustained service innovation, helping hotels sense emerging opportunities, seize them rapidly, and reconfigure resources to maintain competitiveness in an increasingly digital marketplace. The prioritisation of digital marketing capability investments should reflect the scale and resource availability of each hotel. Small independent hotels should begin by strengthening data integration and analytics literacy, adopting cost-effective, user-friendly platforms such as Google Analytics, low-code CRM systems, and social media dashboards to enhance agility gradually. In contrast, large hotel chains, which already possess advanced digital infrastructures, should focus on AI-driven personalisation, predictive analytics, and cross-property data orchestration to optimise guest experiences and maintain innovation leadership across markets. These differentiated strategies enable both segments to leverage DMCs effectively according to their digital maturity and resource capacity.

Finally, the combined evidence on DMCs, agility, and contextual dynamism suggests that digital transformation success depends on strategic alignment, not size or budget. Boutique hotels and small groups often outperform larger competitors in innovation precisely because they can pivot faster. For instance, during the COVID-19 recovery phase, smaller independent hotels in the UK leveraged social-media campaigns and contactless check-in systems more swiftly than some global brands, converting agility into new service models. Managers should therefore cultivate a digital mindset across all levels of the organization training staff to interpret analytics, empowering them to test new ideas, and embedding continuous learning as part of daily operations.

#### 5.4. Limitations and future research directions

Certain limitations can be identified in the present study that may serve as valuable insights for guiding future research. First, our study is dependent on data collected through a questionnaire. Though all checks were employed to avoid self-report bias, but the possibility of its existence cannot be ruled out. As a result, future research endeavours could enhance credibility by utilizing case study methods or a time-lagged design to confirm the validity of our findings. The second limitation

pertains to the exclusive evaluation of all variables in this study from the viewpoint of senior managers of hotels in the UK. To enhance comprehensiveness, future research may consider integrating multilevel or multisource sampling methods, providing insights into the focal relationships from various stakeholders within the hotels. Third, our study is limited to hotels in the UK and Egypt, restricting the generalizability of our insights on the relationship between the variables. Business landscapes, cultural nuances, and industry dynamics vary across countries. To improve external validity, future research could replicate our methodology internationally. Additional research could test our proposed model in different context such as restaurants and casinos. This would provide a meaningful insight into the relationships between the study variables in different context. Fourth, although this study provides robust evidence from a two-wave UK sample and an exploratory Egyptian dataset, its generalisability remains context-bound. Differences in digital infrastructure, institutional maturity, and cultural orientation (e.g., power distance and collectivism; Hofstede, 2001) may influence how digital marketing capabilities and agility operate across countries. Future research should extend this model using multi-country samples and incorporate macro-level indicators such as digital readiness indices or cultural dimensions as control variables. Longitudinal or mixed-method approaches could further clarify causal dynamics between digital marketing capabilities, agility, and innovation, while comparative studies across hospitality sub-sectors (e.g., hotels, restaurants, and travel platforms) would enhance understanding of how environmental and organizational factors shape dynamic capability effectiveness. Finally, we acknowledge the absence of objective performance data (e.g., RevPAR, ADR, OTA ratings) due to panel confidentiality, which prevented linking responses to property identifiers. Nonetheless, perceptual measures are appropriate for capturing managerial evaluations of capabilities and innovation (Eisenhardt and Martin, 2000; Morgan et al., 2018). We mitigated potential bias through temporal separation, control variables, and robustness checks. Future research should partner with hotel chains to integrate objective performance indicators with capability and innovation measures.

#### CRediT authorship contribution statement

**Ronnie Figueiredo:** Writing – review & editing, Writing – original draft, Visualization, Validation, Resources, Project administration, Methodology, Investigation, Funding acquisition, Formal analysis, Data curation, Conceptualization. **Gomaa Agag:** Writing – review & editing, Writing – original draft, Visualization, Validation, Supervision, Software, Resources, Project administration, Methodology, Investigation, Formal analysis, Data curation, Conceptualization. **Mohammad Soliman:** Writing – review & editing, Writing – original draft, Visualization, Validation, Software, Methodology, Investigation, Formal analysis, Data curation, Conceptualization. **Anish Yousaf:** Writing – review & editing, Writing – original draft, Visualization, Validation, Software, Resources, Methodology, Investigation, Formal analysis, Data curation, Conceptualization.

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#### Declaration of Competing Interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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## Appendix A. Supporting information

Supplementary data associated with this article can be found in the online version at [doi:10.1016/j.ijhm.2026.104607](https://doi.org/10.1016/j.ijhm.2026.104607).

## Data availability

Data will be made available on request.

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