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Technological Capability and Operational Responsiveness in Telecom Firms

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Abstract

Telecommunications firms must convert technology investments into adaptive capabilities and timely customer-facing operations. Drawing on dynamic capabilities theory, this study examines whether technological capability (TC) is associated with operational response speed (ORS) directly and through dynamic capabilities (DC) and service innovation capability (SIC). A cross-sectional, paper-based survey was administered to managerial employees in four telecommunications companies in Sana'a, Yemen. The analytical file contained 256 complete responses. The model was estimated in SmartPLS 4.1.1.8 using formative composites, a two-tailed bootstrap with 5,000 subsamples, and out-of-sample prediction procedures. All six hypothesized direct paths were positive and statistically significant: TC→DC (β=.747), TC→SIC (β=.496), DC→SIC (β=.352), DC→ORS (β=.314), SIC→ORS (β=.402), and TC→ORS (β=.199). The three focal indirect routes to ORS were also significant: TC→DC→ORS (β=.235), TC→SIC→ORS (β=.200), and TC→DC→SIC→ORS (β=.106), while the direct TC→ORS association remained significant. The model explained 55.9% of the variance in DC, 63.1% in SIC, and 69.7% in ORS. Predictive comparisons showed improvement over an indicator-average benchmark; superiority over a linear benchmark was significant at the latent-variable level overall and for DC and SIC, but not for ORS. The findings are consistent with complementary capability pathways linking technology to operational response. The cross-sectional, single-informant design limits causal interpretation and the generalizability of the findings.

Keywords: Technological Capability, Dynamic Capabilities, Service Innovation Capability, Operational Response Speed, Telecommunications, Yemen, PLS-SEM

1. Introduction

Telecommunications firms operate in a service environment where network infrastructure, software, data, and customer-facing channels shape both the continuity and quality of service. As connectivity use expands and customer expectations evolve, firms must maintain reliable operations while adapting technology and service processes. The International Telecommunication Union's 2024 connectivity assessment notes continued growth in internet use while emphasizing that meaningful and universal connectivity remains uneven, keeping infrastructure, affordability, and service availability central concerns (International Telecommunication Union [ITU], 2024) [18].

These demands are particularly consequential in Yemen. A sector assessment describes telecommunications as economically and socially important while documenting infrastructure damage, difficult operating conditions, and persistent challenges to service quality and connectivity (Fadhl & Sacchetto, 2023) [10]. For operators, these conditions make the ability to sustain existing services and respond to changing demand a practical organizational concern. They also make it important to distinguish the possession of technology from the organizational capability to use it effectively.

Resource-based research has treated information technology capability as an organizational resource that can contribute to firm performance (Barney, 1991; Bharadwaj, 2000) [4, 6]. Yet technology investment alone does not ensure service renewal or faster response. Dynamic capabilities theory (DCT) explains how firms sense change, seize opportunities, and reconfigure resources and routines as environments evolve (Teece, 2007) [40]. Recent reviews likewise caution that technological, IT-enabled, and digital capabilities are often conceptually conflated, which can obscure how technology resources are converted into organizational action (Grego *et al*., 2025) [12].

This study therefore examines technological capability (TC) as the firm's ability to deploy, monitor, and update technologies relevant to its services, and dynamic capabilities (DC) as the adaptive processes through which the firm interprets change and

adjusts resources and routines. Prior research reports positive links between digital capabilities and dynamic capabilities, including evidence that DC can transmit some effects of digital capabilities to business-model innovation (Liu *et al*., 2024) [22]. These findings support the conversion logic but do not establish the full technology-to-response mechanism examined here.

The model also includes service innovation capability (SIC), the repeatable ability to develop or improve services and their delivery, and operational response speed (ORS), the speed of adjusting to customer-demand changes, resolving service problems, and delivering services. Service innovation research recognizes dynamic capabilities as a relevant theoretical lens, while empirical studies in service settings link technology-related capabilities with service innovation (Agarwal & Selen, 2009; Blommerde, 2023; Zhou *et al*., 2025; Yang *et al*., 2025) [1, 7, 54, 51]. However, service innovation and response speed are not interchangeable: Innovation may improve service fit or create faster channels, yet implementation can also add complexity or temporarily slow routine operations (Ojha *et al*., 2021) [27].

The literature reviewed for this study supports several component relationships, but it does not directly establish the complete sequence TC → DC → SIC → ORS in Yemeni telecommunications firms. In particular, the SIC-to-ORS link and the serial indirect effect remain less directly tested than the technology-to-dynamic-capability relationship. This study develops and tests a mechanism-based model in which TC may influence ORS directly and through DC, SIC, and their proposed sequence. It contributes by distinguishing four related but conceptually separate constructs and by testing their direct, parallel indirect, and sequential relationships in a telecommunication setting.

2. Theoretical framework and hypothesis development

2.1 Theoretical foundation

This study draws primarily on dynamic capabilities theory (DCT) to explain how a firm converts technological resources into adaptive organizational action and, ultimately, faster operational responses. DCT distinguishes ordinary capabilities, which enable the firm to perform current activities, from dynamic capabilities, which enable it to sense change, seize opportunities, and reconfigure resources and routines as conditions evolve (Teece, 2007) [40]. Under this logic, technology is an enabling resource base; it does not produce innovation or responsiveness automatically. Its contribution depends on organizational processes that interpret information, mobilize resources, and redesign services and operations.

Recent research supports this conversion logic. Liu *et al*. (2024) [22] found that digital capabilities were positively associated with dynamic capabilities and that dynamic capabilities partially mediated the relationship between digital capabilities and business model innovation. Reviews of digital capability research also warn that technology capability, IT-enabled capability, and digital capability are frequently conflated, weakening theoretical precision (Grego *et al*., 2025) [12]. Accordingly, the present study uses technological capability (TC) for the organization's ability to deploy, monitor, and update technology relevant to its services, rather than treating the construct as a synonym for broad digital transformation.

The proposed model extends DCT in two ways. First, it treats service innovation capability (SIC) as a firm-level capability through which adaptive resources are translated into new or improved services and delivery methods. Second, it examines operational response speed (ORS) as a specific operational outcome: How quickly the firm adjusts to changes in customer demand, resolves customer problems, and delivers services. These constructs are related but should not be treated as interchangeable. Dynamic capabilities concern changing the resource base and routines; SIC concerns repeatable service renewal; ORS concerns the speed of operational response.

Resource-based logic provides the background assumption that technology and related organizational resources can support firm-level advantage (Barney, 1991; Bharadwaj, 2000; Wade & Hulland, 2004) [4, 6, 45]. DCT is the primary explanatory theory in this study because it specifies the processes through which firms sense change, seize opportunities, and reconfigure resources and routines; it therefore explains how technological resources may be translated into service renewal and operational response (Teece, 2007, 2018) [40, 41]. Capability lifecycles and deliberate learning also imply that these processes are built over time and may vary in maturity across firms (Helfat & Peteraf, 2003; Zollo & Winter, 2002) [17, 55].

2.2 Theoretical logic linking the constructs

The model applies DCT as an explanatory theory rather than as a label for every construct. TC represents a technological resource and enabling capability. DC represents the higher-order adaptive mechanism through which the firm senses relevant change, seizes opportunities, and reconfigures resources and routines. SIC represents a service-specific renewal capability that can emerge when adaptive processes are applied to service design and delivery. ORS is the downstream operational outcome. This logic yields the sequence TC → DC → SIC → ORS while allowing TC to affect SIC and ORS directly, and DC to affect ORS directly. A recent systematic review of DCT and global strategy likewise emphasizes the role of sensing, seizing, and resource reconfiguration as mechanisms connecting capabilities with strategic adaptation (Pitelis *et al*., 2024) [29].

The theory also allows contingent or nonpositive effects. Technology may remain underused; inertia, scarce resources, or operating constraints may block reconfiguration. Reconfiguration can disrupt service routines, and innovation can temporarily raise implementation demands. Recent studies therefore treat capability effects as dependent on organizational conditions rather than automatic guarantees (Liu *et al*., 2024; Fu *et al*., 2024) [22, 11]. The model predicts positive effects, but tests them empirically.

2.3 Evidence synthesis for the proposed paths

The proposed model is consistent with dynamic capabilities theory, but its individual paths have different levels of empirical support. The foundational literature distinguishes ordinary routines that sustain current operations from dynamic capabilities that renew the resource base, while later reviews emphasize construct clarity, mechanisms, and context dependence (Teece *et al*., 1997; Eisenhardt & Martin, 2000; Winter, 2003; Helfat & Peteraf, 2003; Schilke, 2014; Schilke *et al*., 2018) [42, 9, 48, 17, 35, 36]. Learning and managerial intervention shape capability development,

so a technology resource should not be treated as a dynamic capability merely because it is advanced (Zollo & Winter, 2002; Teece, 2007, 2018) [55, 40, 41].

Technological capability and dynamic capabilities

The IT and digital-capability literature supports a conversion mechanism in which technological resources contribute to organizational adaptation when they are integrated with information processing, decision making, and reconfiguration. Research links IT capability with organizational agility and customer agility (Lu & Ramamurthy, 2011; Roberts & Grover, 2012) [23, 32], while recent evidence shows digital technology-enabled capabilities operating through market-capitalizing and operational-adjustment agility (Li *et al*., 2022) [21]. A meta-analysis of 72 empirical studies reports an overall relationship between IT capability and agility but also highlights variation by capability type and outcome (Werder & Richter, 2022) [47]. These studies provide convergent, adjacent support for TC → DC; they do not establish the exact construct pair or context in this study.

Technological capability and service innovation capability

Technology can provide infrastructure, data, and channels that broaden the options for service design and delivery. Digital-transformation research nevertheless treats transformation as organizational change that depends on complementary capabilities, rather than a direct consequence of technology acquisition (Vial, 2019; Warner & Wäger, 2019; Hanelt *et al*., 2021; Verhoef *et al*., 2021) [44, 46, 16, 43]. Service innovation frameworks identify technology and digital infrastructure among the resources and capabilities that can support service renewal (den Hertog *et al*., 2010; Akter *et al*., 2023) [8, 2]. Evidence from hotels and other service settings links technology-related capabilities with service innovation outcomes (Zhou *et al*., 2025; Yang *et al*., 2025) [54, 51], and telecom studies show that service-innovation management is a relevant sectoral capability (Taghizadeh *et al*., 2014) [38]. These findings support the proposed direction but differ in constructs and outcomes.

Dynamic capabilities and service innovation capability

The service-innovation literature provides a direct theoretical bridge between adaptation and service renewal. Dynamic capabilities may support service innovation by sensing emerging needs, selecting opportunities, integrating knowledge, and reconfiguring service systems (den Hertog *et al*., 2010; Kindström *et al*., 2013; Janssen *et al*., 2016) [8, 20, 19]. Recent empirical work links dynamic absorptive capacity with service innovation among born-global service firms (Behl *et al*., 2023) [5], while a systematic review concludes that SIC remains conceptually diverse and that its antecedents and dimensions are not yet fully settled (Blommerde, 2023) [7]. A newer framework for AI-powered service innovation likewise treats infrastructure, market understanding, and managerial capability as complementary elements (Akter *et al*., 2023) [2]. Thus, DC is a plausible antecedent of SIC, provided the study distinguishes adaptation routines from service-renewal outcomes.

Dynamic capabilities and operational response speed

Dynamic capabilities may support faster operational responses when sensing and reconfiguration are translated into changed priorities, resources, and routines. Evidence is consistent with this logic: Dynamic capabilities have been associated with operational capabilities and organizational agility (Yi *et al*., 2023) [52], and work on timely responsiveness links sensing, reconfiguration, and innovation types to response outcomes (Ng & Ahmed, 2024) [24]. The operations literature also defines operational responsiveness as a distinct capability, rather than simply a technology resource or an operational practice (Wu *et al*., 2010) [50]. However, adjacent constructs such as agility, flexibility, and responsiveness overlap without being identical. Evidence on operational responsiveness also indicates that effects may depend on market and technological conditions (Sahi *et al*., 2019) [33], so a positive DC → ORS relationship remains an empirical proposition for this setting.

Service innovation capability and operational response speed

Repeated service improvement may shorten delivery steps, create faster customer channels, and remove service bottlenecks. In B2B services, innovation speed and operational flexibility have been studied as sequential capabilities under environmental turbulence (Ojha *et al*., 2021) [27]; related work connects innovation and dynamic capabilities with timely responsiveness (Ng & Ahmed, 2024) [24]. Telecom research in Yemen has examined value innovation and firm outcomes, while not testing the present SIC-to-response-speed path (Hajar *et al*., 2022) [15]. The competing explanation is material: Innovation can raise coordination and implementation demands before it improves routine service speed, and research on dynamic service-innovation capabilities finds contingent rather than uniformly positive performance effects (Zhan *et al*., 2023) [53]. The SIC → ORS path is therefore theoretically plausible but less directly established than the preceding capability relationships.

Direct technological capability and response speed

A direct TC → ORS association is plausible when modern infrastructure, automation, and timely information flows reduce processing and coordination delays. IT-enabled customer agility research provides relevant support for the technology-to-response mechanism (Overby *et al*., 2006; Roberts & Grover, 2012) [28, 32], while IT-capability research shows that organizational agility depends on complementary integration and management capabilities (Sambamurthy *et al*., 2003; Tallon & Pinsonneault, 2011) [34, 39]. The meta-analytic evidence supports an IT capability–agility relationship but also cautions against treating all technology capabilities as equivalent (Werder & Richter, 2022) [47]. Accordingly, the direct path is retained alongside mediated paths to estimate whether technology is associated with ORS beyond the proposed organizational mechanisms.

Mediation and the unresolved serial mechanism

Prior studies support separate portions of the proposed sequence: Digital capabilities can be associated with dynamic capabilities and business-model innovation through a mediating mechanism (Liu *et al*., 2024) [22]; digital capabilities may affect performance through technological capabilities (Heredia *et al*., 2022); and technology-enabled dynamic capabilities can transmit effects through agility to performance (Li *et al*., 2022) [21]. Service research also links technology and service innovation, and dynamic absorptive

capability and service innovation (Behl *et al*., 2023; Zhou *et al*., 2025) [5, 54]. These findings justify testing parallel and serial indirect effects, but they should not be presented as prior proof of TC → DC → SIC → ORS. The complete chain, particularly the operational response-speed outcome in Yemeni telecom firms, remains the study-specific extension.

2.4 Conceptual model

Fig 1 presents the six hypothesized direct relationships (H1–H6), two parallel indirect pathways through dynamic capabilities (DC) and service innovation capability (SIC), and a sequential indirect pathway through DC followed by SIC (H7–H9).

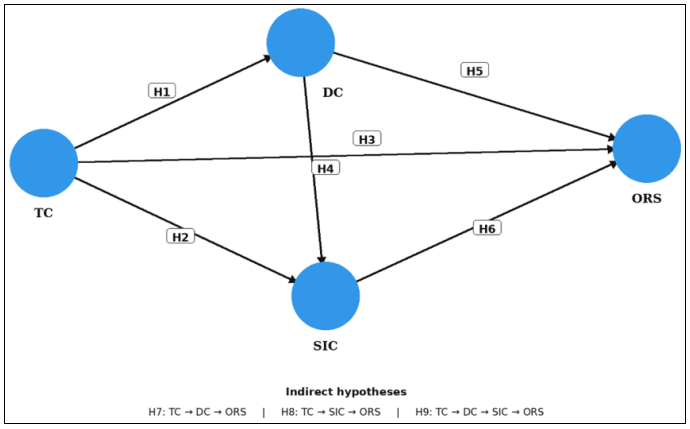

Fig 1: Conceptual model of the hypothesized relationships

Table 1: Construct definitions and retained questionnaire items

Construct	Conceptual definition	Operational focus	Conceptual References
Technological capability (TC)	The firm's organizational ability to deploy, monitor, and update technology and technological infrastructure relevant to its services.	Technology provision, modern infrastructure, scanning and updating technology, keeping pace with technical standards, and acquiring technologies that support service quality.	Lu and Ramamurthy (2011) [23]
Dynamic capabilities (DC)	The firm's higher-order ability to interpret environmental and organizational information and to adapt, integrate, or reconfigure resources and routines in response.	Continuous review, feedback and accumulated knowledge, environmental scanning, monitoring developments, and adaptive managerial response.	Teece (2007) [40]
Service innovation capability (SIC)	The firm's repeatable organizational ability to develop, improve, broaden, or deliver services through novel or substantially improved approaches.	Using capabilities to develop services, offering a broad service range, modifying services as conditions change, innovative delivery, first-of-kind service offering, and continued work-system development.	den Hertog *et al*. (2010) [8]
Operational response speed (ORS)	The speed with which the firm adjusts service operations to customer-demand changes, service-design requirements, waiting-time pressures, and customer problems.	Rapid demand/design response, reduced waiting, rapid problem resolution, and shorter service-delivery time.	Lu and Ramamurthy (2011) [23]

2.5 Construct definitions and operational boundaries

The four constructs are distinguished by their organizational level and function. TC concerns technology resources and their renewal; DC concerns sensing, learning, and reconfiguration; SIC concerns repeated service development and delivery innovation; ORS concerns the speed of customer-facing operational adjustment. The item mapping is shown in Table 1.

2.6 Hypothesis development

2.6.1 Technological capability and dynamic capabilities

Technological capability can strengthen dynamic capabilities by expanding the firm's ability to collect, process, and act on information about technologies, customers, and operating conditions. Modern infrastructure and ongoing technology monitoring can improve the visibility of emerging opportunities and constraints. When managers use these inputs to review routines, allocate resources, and adapt strategy, technological capability becomes an enabler of sensing, seizing, and reconfiguration. Consistent with this mechanism, Liu *et al*. (2024) [22] report a positive association between digital capabilities and dynamic capabilities in a time-lagged survey study.

An important qualification is that technological assets do not themselves constitute dynamic capabilities. A firm may acquire advanced systems yet fail to learn from the information they produce, integrate them into decisions, or reconfigure existing routines. Grego *et al*. (2025) [12] identify conceptual conflation among technology-related capability constructs as a recurring problem in the literature. The proposed positive relationship therefore concerns organizational technological capability as defined here, while allowing the effect to depend on managerial and organizational use of technology.

H1: Technological capability positively influences dynamic capabilities.

2.6.2 Technological capability and service innovation capability

Technology can provide the infrastructure, information, and technical options required to design, modify, and deliver

services. It can facilitate customer-knowledge development, service customization, digital channels, and the coordination of service activities. Empirical evidence in service settings is consistent with this expectation: Zhou *et al*. (2025) [54] found that digital capabilities mediated the positive relationship between digital orientation and service innovation among 320 hotels. Yang *et al*. (2025) [51], using two-wave data from 240 firms, found positive links between digitalization capability, improvisation capability, and digital product and service innovation performance.

The counterargument is that technology can be directed toward efficiency and exploitation without strengthening the firm's capacity to explore or repeatedly renew services. Moreover, digital orientation, digitalization capability, and SIC are not identical constructs. The SIC systematic review found persistent disagreement about SIC's definition, antecedents, and dimensions (Blommerde, 2023) [7]. This study therefore predicts an enabling relationship rather than assuming that technology alone guarantees service innovation; customer knowledge, managerial support, and resource availability may shape the realized effect.

H2: Technological capability positively influences service innovation capability.

2.6.3 Dynamic capabilities and service innovation capability

Dynamic capabilities provide a theoretical mechanism for converting environmental change into service renewal. Sensing helps firms recognize changing needs and opportunities; seizing supports the selection and resourcing of service initiatives; and reconfiguration enables the adjustment of assets, routines, and delivery processes needed to implement them. A systematic review of SIC research identifies dynamic capabilities among the most frequently used theoretical perspectives in firm-level service innovation research (Blommerde, 2023) [7]. In a telecommunications context, Agarwal and Selen (2009) [1] examined dynamic capability building in service value networks as a route to service innovation. Recent work on digital orientation in hotels also places service innovation within a dynamic-capabilities perspective (Zhou *et al*., 2025) [54].

The relationship is not automatic. Firms can sense opportunities but lack the resources or authority to seize them; frequent reconfiguration can also disrupt service routines. Conceptual overlap is a specific measurement risk in this study: Environmental scanning and adaptation items should load on DC, whereas items about the repeated development or renewal of services should represent SIC. The hypothesized relationship is between distinct capabilities, not between two differently named versions of adaptation.

H3: Dynamic capabilities positively influence service innovation capability.

2.6.4 Dynamic capabilities and operational response speed

Dynamic capabilities can improve operational response speed by enabling firms to detect demand changes, revise priorities, reallocate resources, and adjust operating routines before delays accumulate. Evidence adjacent to the focal relationship is provided by Yi *et al*. (2023) [52], who found that dynamic capabilities affected operational capabilities and that technical and marketing capabilities related positively to organizational agility in their SME sample. The broader agility literature likewise treats responsiveness as an important organizational consequence, while documenting substantial variation in definitions, measures, and contexts (Nguyen *et al*., 2025) [25].

However, organizational agility is broader than the response-speed outcome measured here. Dynamic capabilities may change strategic direction without making customer-facing operations faster; centralization, staffing constraints, regulation, or process bottlenecks can also slow execution. The present hypothesis is therefore a context-specific extension: It tests whether adaptive capability is associated with the speed of service operations, rather than presuming that evidence on agility proves an effect on ORS.

H4: Dynamic capabilities positively influence operational response speed.

2.6.5 Service innovation capability and operational response speed

A firm able to repeatedly improve service designs and delivery methods may remove process bottlenecks, introduce faster channels, and adjust its service offer to changing customer requirements. This creates a plausible route from SIC to ORS. Ojha *et al*. (2021) [27], studying 264 B2B service firms, examined the sequential relationship between innovation speed and operational flexibility and highlighted the importance of aligning innovation speed with operational flexibility in turbulent environments.

The evidence is indirect and must be described as such. Innovation speed is not the same as service innovation capability, and operational flexibility is not the same as operational response speed. Innovation can initially add complexity, require training, or divert resources from routine service delivery. In addition, the SIC review identifies outcomes and measurement as unsettled areas (Blommerde, 2023) [7]. This path is consequently a theoretically motivated empirical test and a potential contribution, rather than an already established relationship.

H5: Service innovation capability positively influences operational response speed.

2.6.6 Technological capability and operational response speed

Technological capability may have a direct effect on response speed by enabling timely information flows, automated processing, service monitoring, and faster coordination. The model retains this direct path to determine whether technology contributes to operational speed beyond the effects transmitted through dynamic capabilities and SIC. This distinction matters because a direct effect would suggest that some benefits of technology are realized through operational infrastructure itself, whereas an indirect effect would indicate that organizational adaptation and service renewal are the principal conversion mechanisms.

A competing possibility is that the direct effect will be weak or context dependent. Technology may increase system complexity, require adjustment time, or prioritize exploitation over exploration. Fu *et al*. (2024) [11] reported that digital transformation improved exploitation but negatively affected exploration in their setting;

technological diversity moderated the negative exploration effect. This does not directly test TC and ORS, but it cautions against assuming uniform benefits. The direct path is therefore retained as a testable proposition, not treated as a guaranteed positive result.

H6: Technological capability positively influences operational response speed.

2.6.7 Indirect and sequential effects

The direct hypotheses describe individual links in the proposed mechanism. The following hypotheses test whether the association between TC and ORS is transmitted through one capability or through the proposed sequence. Mediation should be evaluated through the estimated indirect effects and their bootstrap confidence intervals; it should not be inferred solely from the significance of component paths.

Mediation through dynamic capabilities

Technology can provide information and infrastructure, but dynamic capabilities may be required to interpret that information and reconfigure the firm's resources for faster service response. Liu *et al*. (2024) [22] provide empirical support for a related mediation mechanism: Dynamic capabilities partially mediated the relationship between digital capabilities and business-model innovation. Their outcome differs from ORS, so the current hypothesis tests whether the same broad conversion mechanism extends to a customer-facing operational outcome.

H7: Dynamic capabilities mediate the relationship between technological capability and operational response speed.

Mediation through service innovation capability

Technological capability may support service renewal, which may in turn improve the speed or fit of service delivery. Studies in hotels and other firm settings support links between technology-related capabilities and service innovation or service innovation performance (Zhou *et al*., 2025; Yang *et al*., 2025) [54, 51]. They do not establish SIC as the mediator between TC and ORS. H8 therefore specifies a distinct indirect mechanism to be tested, while recognizing that its evidence base is less direct than that for H7.

H8: Service innovation capability mediates the relationship between technological capability and operational response speed.

Sequential mediation through dynamic capabilities and service innovation capability

The sequential mechanism proposes that TC first supports DC, which enables the firm to interpret change and reconfigure resources; DC then strengthens SIC, which converts adaptation into new or improved services and delivery methods; SIC may then contribute to ORS. This sequence integrates the technology-to-adaptation mechanism with the adaptation-to-service-renewal mechanism. Prior research supports components of the chain, including digital capabilities to dynamic capabilities and technology-related capabilities to service innovation, but the full sequential indirect effect on response speed has not been established by the cited studies. Testing this chain is therefore a central theoretical contribution of the proposed model, subject to construct validity and temporal limitations.

H9: Dynamic capabilities and service innovation capability sequentially mediate the relationship between technological capability and operational response speed, such that technological capability influences dynamic capabilities, which influence service innovation capability, which in turn influences operational response speed.

3. Methodology

3.1 Research design and setting

The study used a quantitative cross-sectional survey design. Data were collected from March to July 2026 using structured, paper-based, self-administered questionnaires distributed to eligible managerial respondents in four telecommunications companies operating in Sana'a, Yemen: The Public Telecommunications Corporation (PTC), SabaFon, Yemen Mobile, and YOU. The unit of analysis was the individual respondent, who reported perceptions of organizational capabilities and service operations.

3.2 Population, sampling, and participants

The reported population comprised 723 eligible employees across the four participating companies, and the target sample was 256. The sampling plan was described as proportionate random sampling by company, with random selection from eligible employee lists and representation of managerial levels. The analytic dataset contains 256 respondents: PTC (n=118), SabaFon (n=56), Yemen Mobile (n=29), and YOU (n=53). These are the achieved sample counts.

3.3 Measures and response scale

The questionnaire 25 items were assigned to four constructs: TC (six items), DC (seven), SIC (six), and ORS (six), as shown in Table 1. Responses used a seven-point scale anchored at 1 = "very weak" and 7 = "very strong." Demographic descriptors included company, gender, age group, educational qualification, years of experience, and job title. These variables were used for sample description and were not included as controls in the structural model.

3.4 Data collection and ethics

Participation was voluntary. Before participation, respondents were informed of the study objectives and procedures, confidentiality protections, and their right to decline or withdraw without penalty. Informed consent was obtained from all participants, and no personally identifying information was collected.

3.5 Data preparation and analytical procedure

The analytic dataset contained 256 unique respondent records and 25 measurement indicators. The indicators had no missing values and fell within the 1–7 response range. Descriptive frequencies and percentages were calculated in SPSS. The structural and measurement models were estimated in SmartPLS 4.1.1.8, with all four constructs specified as formative composites. Indicator VIFs and the significance and relevance of outer weights were examined; outer loadings were also considered when weights were nonsignificant. Structural-path inference used a two-tailed bootstrap with 5,000 subsamples. The path model was

assessed using inner VIF, path coefficients, R^2 and adjusted R^2, f^2, and supplementary model-fit indices, following established PLS-SEM reporting guidance (Hair *et al*., 2019) [14]. Out-of-sample predictive performance was assessed using PLSpredict/CVPAT with 10 folds, 10 repetitions, and a fixed random seed. Mediation was evaluated using specific indirect effects and bootstrap confidence intervals (Nitzl *et al*., 2016) [26].

4. Results

4.1 Data screening and respondent profile

Table 2 summarizes the achieved sample. Respondents were predominantly male (97.3%), aged 41–50 years (51.6%), and held a bachelor's degree (74.2%). Most reported 11–20 years of experience (48.4%) or at least 21 years (46.5%). Section heads formed 76.2% of the recorded job titles. The company distribution was PTC 46.1%, SabaFon 21.9%, Yemen Mobile 11.3%, and YOU 20.7%.

Table 2: Respondent characteristics (N = 256)

Characteristic	Category	n	%
Company	Public Telecommunications Corporation (PTC)	118	46.1
	SabaFon	56	21.9
	Yemen Mobile	29	11.3
	YOU	53	20.7
Gender	Male	249	97.3
	Female	7	2.7
Age group	≤30 years	3	1.2
	31–40 years	78	30.5
	41–50 years	132	51.6
	≥51 years	43	16.8
Education	Secondary education	2	0.8
	Post-secondary diploma	9	3.5
	Bachelor's degree	190	74.2
	Master's degree	52	20.3
	Doctorate	3	1.2
Work experience	≤10 years	13	5.1
	11–20 years	124	48.4
	≥21 years	119	46.5
Job title	Section head	195	76.2
	Department manager	39	15.2
	Deputy general manager	8	3.1
	General manager	11	4.3
	Executive/deputy director	3	1.2

The mean construct scores were 5.323 for TC (SD = 0.809), 5.213 for DC (SD = 0.781), 5.285 for SIC (SD = 0.767), and 5.151 for ORS (SD = 0.853), indicating responses above the scale midpoint. These descriptive values do not imply causal effects.

4.2 Formative measurement-model assessment

Table 3 presents the formative measurement results. Outer VIF values ranged from 1.237 to 2.236, below commonly used collinearity warning levels. All outer loadings were statistically significant at $p < .001$. Outer weights were significant for 18 of 25 indicators; nonsignificant weights were observed for TC2, DC3, DC4, ORS4, ORS5, SIC5, and SIC6. These indicators were retained because their outer loadings were statistically significant and their content was considered relevant. Their retention should be interpreted alongside the construct definitions and source-scale evidence.

Table 3: Formative indicator weights, loadings, and collinearity statistics

Indicator	Outer weight	p (weight)	Outer loading	VIF
TC1	0.172	0.001	0.651	1.425
TC2	0.108	0.092	0.697	1.780
TC3	0.257	<.001	0.794	2.140
TC4	0.329	<.001	0.862	2.236
TC5	0.167	0.006	0.660	1.457
TC6	0.286	<.001	0.749	1.518
DC1	0.243	<.001	0.699	1.467
DC2	0.224	<.001	0.738	1.637
DC3	0.151	0.060	0.744	1.885
DC4	0.110	0.111	0.681	1.674
DC5	0.162	0.018	0.686	1.626
DC6	0.167	0.012	0.642	1.493
DC7	0.328	<.001	0.789	1.578
SIC1	0.362	<.001	0.732	1.370
SIC2	0.455	<.001	0.730	1.237
SIC3	0.149	0.004	0.459	1.246
SIC4	0.302	<.001	0.668	1.319
SIC5	0.087	0.321	0.561	1.736
SIC6	0.126	0.086	0.661	2.023
ORS1	0.456	<.001	0.779	1.365
ORS2	0.288	<.001	0.756	1.704
ORS3	0.204	0.004	0.720	1.887
ORS4	0.118	0.089	0.678	1.753
ORS5	0.102	0.121	0.648	1.623
ORS6	0.212	<.001	0.633	1.606

Note. All outer-loading p values were < .001. SmartPLS displays p = .000 as a rounded value; it is reported here as $p < .001$. Nonsignificant outer weights were interpreted with their corresponding loadings and the indicators' content relevance

4.3 Structural model and hypothesis tests

Inner-model VIF values ranged from 1.000 to 2.932. The highest value was for the TC predictor of ORS (VIF = 2.932); this is below the commonly applied 3.3 diagnostic threshold, although close to 3.0. No severe predictor collinearity was indicated. Fig 2 and Table 4 summarize the estimated direct paths and explained variance. All six hypothesized direct effects were positive and statistically significant, supporting H1–H6. TC had its strongest path to DC ($\beta = .747$, $p < .001$; $f^2 = 1.266$). SIC was the strongest direct predictor of ORS ($\beta = .402$, $p < .001$; $f^2 = .197$), followed by DC ($\beta = .314$, $p < .001$; $f^2 = .125$) and TC ($\beta = .199$, $p = .007$; $f^2 = .045$).

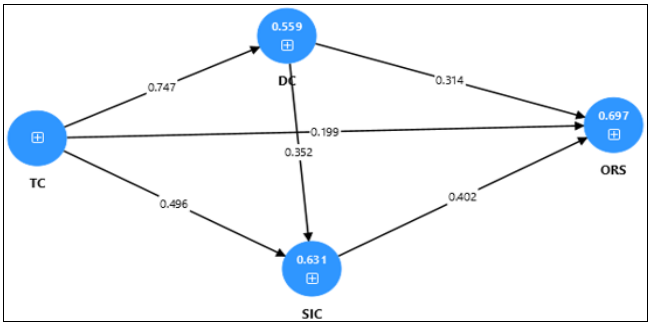

Fig 2: Estimated structural model with standardized path coefficients and R^2

Table 4: Direct structural paths and hypothesis tests

Hypothesis	Path	β	t	p	f²	Decision
H1	TC → DC	.747	26.165	<.001	1.266	Supported
H2	TC → SIC	.496	7.493	<.001	.294	Supported
H3	DC → SIC	.352	5.129	<.001	.148	Supported
H4	DC → ORS	.314	4.725	<.001	.125	Supported
H5	SIC → ORS	.402	5.909	<.001	.197	Supported
H6	TC → ORS	.199	2.706	.007	.045	Supported

The f^2 values indicate a large contribution for TC→DC, a medium contribution for TC→SIC, and small-to-medium contributions for the other paths. In particular, the TC→ORS path was statistically significant but had a small incremental effect size.

4.4 Explanatory power and model fit

As summarized in Table 5, the model explained 55.9% of the variance in DC, 63.1% in SIC, and 69.7% in ORS. Adjusted R^2 values were nearly identical to the unadjusted estimates, suggesting little change after accounting for the number of predictors. The estimated-model SRMR was .044, below the commonly used .08 reference value. The NFI was .878, below the often cited .90 reference value; therefore, model-fit evidence is mixed and is treated as supplementary rather than as the principal basis for model evaluation.

Table 5: Explained variance and estimated model-fit indices

Construct/index	R^2	Adjusted R^2	Value / interpretation
DC	.559	.557	Moderate explanatory power
SIC	.631	.628	Moderate explanatory power
ORS	.697	.694	Moderate-to-high explanatory power
SRMR			.044
NFI			.878

4.5 Indirect effects

Table 6 reports the specific indirect effects. The three focal indirect pathways from TC to ORS were positive and significant. The indirect effect through DC was β = .235 (95% CI [.131, .332], p < .001); the indirect effect through SIC was β = .200 (95% CI [.130, .285], p < .001); and the serial indirect effect through DC and then SIC was β = .106 (95% CI [.051, .168], p = .001). The direct TC→ORS path remained significant (β = .199, p = .007), which is consistent with complementary partial mediation rather than full mediation. Two additional specific indirect paths were significant: TC→DC→SIC (β = .263, 95% CI [.147, .357], p < .001) and DC→SIC→ORS (β = .142, 95% CI [.071, .224], p < .001).

Table 6: Specific indirect effects from bootstrapping

Test	Indirect path	β	t	p	95% bootstrap CI	Decision
H7	TC → DC → ORS	.235	4.558	<.001	.131–.332	Supported
H8	TC → SIC → ORS	.200	5.054	<.001	.130–.285	Supported
H9	TC → DC → SIC → ORS	.106	3.402	.001	.051–.168	Supported
Additional	TC → DC → SIC	.263	4.831	<.001	.147–.357	—
Additional	DC → SIC → ORS	.142	3.523	<.001	.071–.224	—

Confidence intervals are bias-corrected percentile intervals as displayed in the SmartPLS output. The estimates are statistical indirect associations; the cross-sectional design does not establish temporal mediation.

4.6 Out-of-sample predictive assessment

Table 7 summarizes the latent-level CVPAT results. All 19 endogenous indicators had positive Q^2_predict values. PLS-SEM RMSE was lower than the linear-model benchmark for 17 of 19 indicators (one tie and one indicator with higher PLS-SEM RMSE); PLS-SEM MAE was lower for 13 indicators (one tie and five higher). The indicator-level CVPAT comparison showed statistically significant improvement over the linear benchmark for four indicators (DC4, SIC3, ORS3, and ORS6); most other indicator-level differences were nonsignificant. At the latent-variable level, CVPAT showed lower loss than the indicator-average benchmark for DC, SIC, ORS, and overall (all p < .001). Against the linear benchmark, the overall difference was significant (p < .001), as were differences for DC (p = .031) and SIC (p = .009), but not ORS (p = .125). Thus, the model demonstrated predictive improvement over a simple indicator-average benchmark and overall improvement over the linear benchmark, while indicator-level superiority over the latter was limited.

Table 7: Cross-validated predictive ability test (CVPAT) summary

Comparison	Outcome	Average loss difference	t	p
Latent-level vs. indicator average (IA)	DC	−.330	7.268	<.001
Latent-level vs. IA	SIC	−.317	7.161	<.001
Latent-level vs. IA	ORS	−.380	6.518	<.001
Latent-level vs. IA	Overall	−.342	8.605	<.001
Latent-level vs. linear model (LM)	DC	−.023	2.168	.031
Latent-level vs. LM	SIC	−.029	2.649	.009
Latent-level vs. LM	ORS	−.015	1.539	.125
Latent-level vs. LM	Overall	−.022	3.669	<.001

Note: A negative loss difference favors PLS-SEM. SmartPLS values displayed as p = .000 are reported as p < .001. At the indicator level, four of 19 CVPAT comparisons against LM were significant; full indicator diagnostics should be retained as supplementary material if required by the target journal

5. Discussion

This study examined how technological capability is associated with operational response speed through dynamic capabilities and service innovation capability in telecommunications companies in Yemen. The results support the proposed capability-conversion logic: All six direct paths were positive and significant, and the three focal indirect routes to ORS were also significant. The findings are consistent with a model in which technology contributes to faster response both directly and through organizational adaptation and service renewal. They should be interpreted as cross-sectional associations, not as proof that the capabilities temporally cause later response speed.

5.1 Technological capability as an enabler of dynamic capabilities

The strongest structural relationship was TC→DC (β=.747), with a large f^2. This result suggests that, in the sampled firms, respondents who reported stronger technological

infrastructure, monitoring, and updating also tended to report stronger environmental scanning, feedback use, and adaptive managerial response. The pattern is consistent with the idea that technology can supply information and infrastructure for sensing and reconfiguration, but that the organizational capability lies in using those resources rather than merely possessing them (Teece, 2007; Liu *et al*., 2024) [40, 22]. Recent evidence from telecommunications also places dynamic capabilities between technology-related adoption conditions and operational performance, providing sector-adjacent support for this conversion mechanism (Wong & Ngai, 2025) [49].

The result should not be read as showing that technology alone creates adaptability. Both constructs were measured through a single respondent survey, and the strength of the association may partly reflect overlapping perceptions of technology monitoring and environmental sensing. Future work should measure the technology base and dynamic routines with clearer item boundaries, multiple informants, or objective indicators.

5.2 Dynamic capabilities and service innovation

TC was positively associated with SIC (β=.496), and DC was also positively associated with SIC (β=.352). The additional indirect association TC→DC→SIC (β=.263) indicates that technological capability was linked to service innovation capability both directly and through dynamic capabilities. This complements research that treats service innovation as a capability-intensive process requiring knowledge integration and resource reconfiguration (den Hertog *et al*., 2010; Kindström *et al*., 2013; Janssen *et al*., 2016) [8, 20, 19]. It also extends recent evidence on digital capabilities and service innovation in service settings (Zhou *et al*., 2025; Yang *et al*., 2025) [54, 51] to telecom firms in a fragile institutional context.

Because technological resources can enable service renewal, TC and SIC are related in the proposed model; however, they represent distinct domains. TC concerns the availability, monitoring, updating, and acquisition of technology, whereas SIC concerns developing, adapting, and delivering services in new or improved ways. The formative specification preserves these complementary but distinct facets, and indicator relevance was evaluated using the estimated weights, loadings, and item content.

5.3 Operational response speed and complementary mediation

SIC had the strongest direct relationship with ORS (β=.402), followed by DC (β=.314) and TC (β=.199). This ordering is consistent with a mechanism in which a capability to develop and alter services is closely connected to the speed of responding to demand, while adaptive routines and technology provide additional routes. The link between DC and ORS aligns with adjacent research connecting dynamic capabilities to operational capabilities and agility (Yi *et al*., 2023) [52], and with work distinguishing operational responsiveness from technology resources alone (Wu *et al*., 2010) [50]. The positive SIC→ORS path is theoretically plausible but remains less directly established in prior research; it should be presented as an empirical contribution rather than as a settled general law.

The specific indirect effects through DC, SIC, and their sequence were all positive and significant, while the direct TC→ORS path remained significant. This pattern is consistent with complementary partial mediation: Technology appears to have an association with response speed that is not exhausted by the two mediators, while DC and SIC account for additional statistically supported pathways. The serial route (β=.106) supports the proposed ordering TC→DC→SIC→ORS, but cross-sectional data cannot establish that the sequence unfolded over time. The parallel paths should also be interpreted in light of alternative mechanisms, including resource constraints, service complexity, and process bottlenecks that may influence response speed.

5.4 Explanatory and predictive performance

The model explained 55.9% of DC, 63.1% of SIC, and 69.7% of ORS, indicating useful in-sample explanatory power for the endogenous constructs. The PLSpredict and CVPAT results add an out-of-sample perspective. Positive Q^2_predict values and lower loss against the indicator-average benchmark support predictive relevance. However, the comparison with the more conservative linear benchmark was mixed at indicator level: Only four of 19 indicator-level tests were significant, and ORS was not significantly better at latent-variable level. The result should therefore be described as predictive improvement over the naive benchmark and overall improvement against the linear benchmark, not uniformly strong predictive superiority. This follows current recommendations to distinguish explanatory results from predictive comparisons (Shmueli *et al*., 2019; Hair & Alamer, 2022; Ringle *et al*., 2024) [37, 13, 31].

5.5 Contextual interpretation

The study is situated in a sector where technology infrastructure and service delivery are shaped by disruption and institutional constraints. Sector assessments have documented infrastructure, connectivity, and policy challenges that affect the quality and affordability of telecommunications in Yemen (Fadhl & Sacchetto, 2023) [10]. A local study also reported high perceived availability of information technology in the Yemeni telecommunications sector, while examining a different outcome and construct set (Al-Khalid & Al-Kameem, 2023) [3]. In this context, the present results suggest that respondents' perceptions of technology capability coexist with adaptive and service-renewal capabilities. They do not imply that technology upgrades can independently overcome sector-level constraints.

6. Theoretical implications

First, the findings support a dynamic-capabilities explanation of how technology resources may be converted into organizational adaptation and service renewal. The large TC→DC relationship and significant TC→DC→SIC path place sensing, learning, and reconfiguration between technological resources and service innovation, consistent with DCT while retaining the distinction between a resource base and higher-order adaptive routines (Teece *et al*., 1997, 2007; Schilke *et al*., 2018) [42, 40, 36].

Second, the model treats ORS as a specific operational outcome rather than substituting broad firm performance or agility. The significant paths from DC and SIC to ORS, and the significant serial indirect effect, provide an initial empirical test of a capability sequence in a telecommunications setting. The result is a context-specific extension because the full sequence has not been established

by the prior studies reviewed here.

Third, the significant direct and indirect TC→ORS associations indicate complementary routes. This challenges an interpretation in which either infrastructure or organizational adaptation alone explains response speed. At the same time, the cross-sectional design and single-respondent measurement require that this contribution be framed as evidence consistent with the theorized mechanism rather than causal confirmation.

7. Managerial implications

Managers in telecommunications firms should connect technology investment to routines that use technology-generated information. Infrastructure acquisition and updating should be accompanied by regular environmental scanning, feedback review, rapid resource reallocation, and clear authority to adjust service processes. The strong TC→DC association indicates that such conversion processes are central to the proposed model.

Firms should also treat service innovation as an operational capability. New service concepts and delivery channels should be evaluated for their effect on customer waiting time, problem resolution, and response to demand changes. Innovation projects that add complexity without improving delivery speed may weaken the intended operational benefit; staged implementation and monitoring of customer-facing cycle times can help distinguish useful innovation from novelty alone.

Because TC retained a significant direct path to ORS, operational managers should continue to address technology-enabled bottlenecks such as slow information transfer, manual approvals, and fragmented customer-service systems. These practical suggestions are consistent with the observed associations, but the study did not test specific interventions or objective response-time measures.

8. Limitations and future research

Several limitations qualify the findings. First, the cross-sectional design does not establish temporal order or causal mediation. A time-lagged design could measure TC first, adaptive routines and service innovation later, and objective response-speed outcomes subsequently. Second, the outcome is perceived response speed rather than objectively measured response time. Future studies should combine survey measures with service logs, complaint-resolution times, waiting-time data, or system records. Finally, the context is limited to telecommunications firms in Sana'a, Yemen. Replication in other regions, countries, and service sectors could test whether the proposed capability pathway generalizes across regulatory conditions, competitive intensity, and infrastructure quality.

9. Conclusion

This study provides evidence consistent with a pathway from technological capability to operational response speed through dynamic capabilities and service innovation capability in four Yemeni telecommunications companies. All six direct paths and the three focal indirect paths were positive and significant, with the direct technology-to-response path remaining significant. The model showed moderate-to-high explanatory power and predictive improvement over an indicator-average benchmark, while comparisons with a linear benchmark were more qualified. The contribution is a theoretically grounded, context-specific account of how technological resources may be associated with adaptive routines, service renewal, and operational speed. Future research should use verified sampling frames, clearer scale documentation, longitudinal designs, and multi-source or objective operational measures before stronger population or causal claims are made.

10. References

1. Agarwal R, Selen W. Dynamic capability building in service value networks for achieving service innovation. Decision Sciences. 2009; 40(3):431-475. Doi: https://doi.org/10.1111/j.1540-5915.2009.00236.x
2. Akter S, Hossain MA, Sajib S, Sultana S, Rahman M, Vrontis D, *et al*. A framework for AI-powered service innovation capability: Review and agenda for future research. Technovation. 2023; 125:102768. Doi: https://doi.org/10.1016/j.technovation.2023.102768
3. Al-Khalid YMA, Al-Kameem JN. The impact of information technology on enhancing organizational genes in the Yemeni telecommunications sector. Sana'a University Journal of Human Sciences. 2023; 5(1). Doi: https://doi.org/10.59628/jhs.v5i1.530
4. Barney JB. Firm resources and sustained competitive advantage. Journal of Management. 1991; 17(1):99-120. Doi: https://doi.org/10.1177/014920639101700108
5. Behl A, Kamboj S, Sharma N, Pereira V, Salwan P, Chavan M, Pathak AA. Linking dynamic absorptive capacity and service innovation for born global service firms: An organization innovation lens perspective. Journal of International Management. 2023; 29(4):101044. Doi: https://doi.org/10.1016/j.intman.2023.101044
6. Bharadwaj AS. A resource-based perspective on information technology capability and firm performance: An empirical investigation. MIS Quarterly. 2000; 24(1):169-196. Doi: https://doi.org/10.2307/3250983
7. Blommerde T. Service innovation capability: A systematic literature review and research agenda. The Service Industries Journal. 2023; 43(15-16):1197-1227. Doi: https://doi.org/10.1080/02642069.2023.2249830
8. den Hertog P, van der Aa W, de Jong MW. Capabilities for managing service innovation: Towards a conceptual framework. Journal of Service Management. 2010; 21(4):490-514. Doi: https://doi.org/10.1108/09564231011066123
9. Eisenhardt KM, Martin JA. Dynamic capabilities: What are they? Strategic Management Journal. 2000; 21(10-11):1105-1121. Doi: https://doi.org/10.1002/1097-0266(200010/11)21:10/11<1105::AID-SMJ133>3.0.CO;2-E
10. Fadhl S, Sacchetto C. Reforming Yemen's telecommunications sector: Policy options to improve private sector participation and strengthen service delivery. International Growth Centre, 2023. https://www.theigc.org/publications/reforming-yemens-telecommunications-sector
11. Fu L, Wei Y, Li R, Li Y, Liu Z. The effects of digital transformation on exploitation and exploration: Does technological diversity matter? Business Process Management Journal. 2024; 30(7):2684-2707. Doi: https://doi.org/10.1108/BPMJ-05-2024-0337
12. Grego M, Bartosiak M, Palese B, Piccoli G, Denicolai S. Disentangling the "digital": A critical review of

information technology capabilities, information technology-enabled capabilities and digital capabilities in business research. International Journal of Management Reviews. 2025; 27:238-260. Doi: https://doi.org/10.1111/ijmr.12389
13. Hair JF, Alamer A. Partial least squares structural equation modeling (PLS-SEM) in second language and education research: Guidelines using an applied example. Research Methods in Applied Linguistics. 2022; 1(3):100027. Doi: https://doi.org/10.1016/j.rmal.2022.100027
14. Hair JF, Risher JJ, Sarstedt M, Ringle CM. When to use and how to report the results of PLS-SEM. European Business Review. 2019; 31(1):2-24. Doi: https://doi.org/10.1108/EBR-11-2018-0203
15. Hajar MA, Alkahtani AA, Ibrahim DN, Al-Sharafi MA, Alkawsi G, Iahad NA, *et al*. The effect of value innovation in the superior performance and sustainable growth of telecommunications sector: Mediation effect of customer satisfaction and loyalty. Sustainability. 2022; 14(10):6342. Doi: https://doi.org/10.3390/su14106342
16. Hanelt A, Bohnsack R, Marz D, Antunes Marante C. A systematic review of the literature on digital transformation: Insights and implications for strategy and organizational change. Journal of Management Studies. 2021; 58(5):1159-1197. Doi: https://doi.org/10.1111/joms.12639
17. Helfat CE, Peteraf MA. The dynamic resource-based view: Capability lifecycles. Strategic Management Journal. 2003; 24(10):997-1010. Doi: https://doi.org/10.1002/smj.332
18. International Telecommunication Union. Measuring digital development: Facts and figures 2024, 2024. https://www.itu.int/itu-d/reports/statistics/facts-figures-2024/
19. Janssen MJ, Castaldi C, Alexiev AS. Dynamic capabilities for service innovation: Conceptualization and measurement. R&D Management. 2016; 46(4):797-811. Doi: https://doi.org/10.1111/radm.12147
20. Kindström D, Kowalkowski C, Sandberg E. Enabling service innovation: A dynamic capabilities approach. Journal of Business Research. 2013; 66(8):1063-1073. Doi: https://doi.org/10.1016/j.jbusres.2012.03.003
21. Li L, Tong Y, Wei L, Yang S. Digital technology-enabled dynamic capabilities and their impacts on firm performance: Evidence from the COVID-19 pandemic. Information & Management. 2022; 59(8):103689. Doi: https://doi.org/10.1016/j.im.2022.103689
22. Liu L, Cui L, Han Q, Zhang C. The impact of digital capabilities and dynamic capabilities on business model innovation: The moderating effect of organizational inertia. Humanities and Social Sciences Communications, 11, Article 420, 2024. Doi: https://doi.org/10.1057/s41599-024-02910-z
23. Lu Y, Ramamurthy K. Understanding the link between information technology capability and organizational agility: An empirical examination. MIS Quarterly. 2011; 35(4):931-954. Doi: https://doi.org/10.2307/41409967
24. Ng S-P, Ahmed PK. Different types of innovations and dynamic capabilities in achieving timely responsiveness: Some implications for supply chain management. Journal of General Management. 2024; 49(4):247-262. Doi: https://doi.org/10.1177/03063070221123056
25. Nguyen T, Le CV, Nguyen M, Nguyen G, Tran Thi Hong Lien, Nguyen O. The organisational impact of agility: A systematic literature review. Management Review Quarterly. 2025; 75:2709-2757. Doi: https://doi.org/10.1007/s11301-024-00446-9
26. Nitzl C, Roldán JL, Cepeda-Carrión G. Mediation analysis in partial least squares path modeling: Helping researchers discuss more sophisticated models. Industrial Management & Data Systems. 2016; 116(9):1849-1864. Doi: https://doi.org/10.1108/IMDS-07-2015-0302
27. Ojha D, Struckell E, Acharya C, Patel P. Managing environmental turbulence through innovation speed and operational flexibility in B2B service organizations. Journal of Business & Industrial Marketing. 2021; 36(9):1627-1645. Doi: https://doi.org/10.1108/JBIM-01-2020-0026
28. Overby E, Bharadwaj A, Sambamurthy V. Enterprise agility and the enabling role of information technology. European Journal of Information Systems. 2006; 15:120-131. Doi: https://doi.org/10.1057/palgrave.ejis.3000600
29. Pitelis CN, Teece DJ, Yang H. Dynamic capabilities and MNE global strategy: A systematic literature review-based novel conceptual framework. Journal of Management Studies. 2024; 61(7):3295-3326. Doi: https://doi.org/10.1111/joms.13021
30. Podsakoff PM, Podsakoff NP, Williams LJ, Huang C, Yang J. Common method bias: It's bad, it's complex, it's widespread, and it's not easy to fix. Annual Review of Organizational Psychology and Organizational Behavior. 2024; 11:17-61. Doi: https://doi.org/10.1146/annurev-orgpsych-110721-040030
31. Ringle CM, Wende S, Becker J-M. SmartPLS 4 [Computer software]. SmartPLS, 2024. https://www.smartpls.com/
32. Roberts N, Grover V. Leveraging information technology infrastructure to facilitate a firm's customer agility and competitive activity: An empirical investigation. Journal of Management Information Systems. 2012; 28(4):231-270. Doi: https://doi.org/10.2753/MIS0742-1222280409
33. Sahi GK, Gupta MC, Cheng TCE, Lonial SC. Relating entrepreneurial orientation with operational responsiveness: Roles of competitive intensity and technological turbulence. International Journal of Operations & Production Management. 2019; 39(5):739-766. Doi: https://doi.org/10.1108/IJOPM-07-2018-0411
34. Sambamurthy V, Bharadwaj A, Grover V. Shaping agility through digital options: Reconceptualizing the role of information technology in contemporary firms. MIS Quarterly. 2003; 27(2):237-263. Doi: https://doi.org/10.2307/30036530
35. Schilke O. On the contingent value of dynamic capabilities for competitive advantage: The nonlinear moderating effect of environmental dynamism. Strategic Management Journal. 2014; 35(2):179-203. Doi: https://doi.org/10.1002/smj.2099
36. Schilke O, Hu S, Helfat CE. Quo vadis, dynamic capabilities? A content-analytic review of the current

state of knowledge and recommendations for future research. Academy of Management Annals. 2018; 12(1):390-439. Doi: https://doi.org/10.5465/annals.2016.0014
37. Shmueli G, Sarstedt M, Hair JF, Cheah J-H, Ting H, Vaithilingam S, *et al*. Predictive model assessment in PLS-SEM: Guidelines for using PLSpredict. European Journal of Marketing. 2019; 53(11):2322-2347. Doi: https://doi.org/10.1108/EJM-02-2019-0189
38. Taghizadeh SK, Jayaraman K, Ismail I, Rahman SA. A study of service innovation management in the Malaysian telecommunications industry. Global Business and Organizational Excellence. 2014; 34(1):67-77. Doi: https://doi.org/10.1002/joe.21585
39. Tallon PP, Pinsonneault A. Competing perspectives on the link between strategic information technology alignment and organizational agility: Insights from a mediation model. MIS Quarterly. 2011; 35(2):463-486. Doi: https://doi.org/10.2307/23044052
40. Teece DJ. Explicating dynamic capabilities: The nature and microfoundations of (sustainable) enterprise performance. Strategic Management Journal. 2007; 28(13):1319-1350. Doi: https://doi.org/10.1002/smj.640
41. Teece DJ. Business models and dynamic capabilities. Long Range Planning. 2018; 51(1):40-49. Doi: https://doi.org/10.1016/j.lrp.2017.06.007
42. Teece DJ, Pisano G, Shuen A. Dynamic capabilities and strategic management. Strategic Management Journal. 1997; 18(7):509-533. Doi: https://doi.org/10.1002/(SICI)1097-0266(199708)18:7<509::AID-SMJ882>3.0.CO;2-Z
43. Verhoef PC, Broekhuizen T, Bart Y, Bhattacharya A, Dong JQ, Fabian N, *et al*. Digital transformation: A multidisciplinary reflection and research agenda. Journal of Business Research. 2021; 122:889-901. Doi: https://doi.org/10.1016/j.jbusres.2019.09.022
44. Vial G. Understanding digital transformation: A review and a research agenda. The Journal of Strategic Information Systems. 2019; 28(2):118-144. Doi: https://doi.org/10.1016/j.jsis.2019.01.003
45. Wade M, Hulland J. The resource-based view and information systems research: Review, extension, and suggestions for future research. MIS Quarterly. 2004; 28(1):107-142. Doi: https://doi.org/10.2307/25148626
46. Warner KSR, Wäger M. Building dynamic capabilities for digital transformation: An ongoing process of strategic renewal. Long Range Planning. 2019; 52(3):326-349. Doi: https://doi.org/10.1016/j.lrp.2018.12.001
47. Werder K, Richter J. A meta-analysis on the effects of IT capability toward agility and performance: New directions for information systems research. PLOS ONE. 2022; 17(10):e0268761. Doi: https://doi.org/10.1371/journal.pone.0268761
48. Winter SG. Understanding dynamic capabilities. Strategic Management Journal. 2003; 24(10):991-995. Doi: https://doi.org/10.1002/smj.318
49. Wong DTW, Ngai EWT. Impact of artificial intelligence (AI) on operational performance: The role of dynamic capabilities. Information & Management, 62(6), Article 104162, 2025. Doi: https://doi.org/10.1016/j.im.2025.104162
50. Wu SJ, Melnyk SA, Flynn BB. Operational capabilities: The secret ingredient. Decision Sciences. 2010; 41(4):721-754. Doi: https://doi.org/10.1111/j.1540-5915.2010.00294.x
51. Yang C, Zhang L, Ling X. Digitalization capability and digital product and service innovation performance: Empirical evidence from China. Business Process Management Journal. 2025; 31(2):535-555. Doi: https://doi.org/10.1108/BPMJ-02-2024-0075
52. Yi H-T, Oh D, Amenuvor FE. The effect of SMEs' dynamic capability on operational capabilities and organisational agility. South African Journal of Business Management. 2023; 54(1):a3696. Doi: https://doi.org/10.4102/sajbm.v54i1.3696
53. Zhan J, Zhang S, Trimi S. The contingent impacts of dynamic service innovation capabilities on firm performance. Service Business. 2023; 17(4):819-849. Doi: https://doi.org/10.1007/s11628-023-00546-8
54. Zhou D, Kohtamäki M, Peng X, Kong X. How digital orientation impacts service innovation in hotels: The role of digital capabilities and government support. Tourism Economics. 2025; 31(2):221-244. Doi: https://doi.org/10.1177/13548166241255408
55. Zollo M, Winter SG. Deliberate learning and the evolution of dynamic capabilities. Organization Science. 2002; 13(3):339-351. Doi: https://doi.org/10.1287/orsc.13.3.339.2780