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# DIGITAL TRANSFORMATION, CO-CREATED SERVICE EXPERIENCE, AND CUSTOMER LOYALTY IN BANKING SERVICES: EVIDENCE FROM INDONESIA'S DIGITAL BANKING ECOSYSTEM

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## ABSTRACT

Digital transformation (DT) is reshaping the competitive landscape of banking services, yet the mechanisms through which technology-enabled change translates into sustained customer loyalty remain theoretically underspecified. Drawing on Service-Dominant Logic (SDL) and Service Ecosystem Theory, this study develops and tests a model in which co-created service experience (CSE) mediates the relationship between digital transformation and customer loyalty. Specifically, we argue that DT creates the structural conditions for co-created service experience through expanded resource integration opportunities, and that it is this experiential quality, not technology deployment per se, that determines whether digital investment generates durable relational outcomes. Survey data collected from 360 banking customers in Indonesia's digital banking market are analyzed using Partial Least Squares Structural Equation Modeling (PLS-SEM). The study makes three distinct contributions. First, it operationalizes co-created service experience as a theoretically differentiated mediating construct, explicitly distinct from co-production behavior and value co-creation intention: a conceptual distinction that prior empirical work has systematically collapsed. Second, it positions customer-perceived DT as a theoretically appropriate antecedent of co-created service experience in consumer-facing service research, and justifies this operationalization relative to objective technological capability measures. Third, it provides empirical evidence for this mediation chain in Indonesia's digital banking ecosystem, a high-growth emerging market context characterized by simultaneously high fintech adoption rates and fragmented institutional trust in conventional banking, conditions that amplify the relational significance of co-created service experience in ways not captured by studies conducted in high-institutional-trust Western markets. Findings have implications for banks and financial service providers seeking to translate digital investment into sustained competitive advantage.

**KEYWORDS:** Digital Transformation, Co-Created Service Experience, Customer Loyalty, Service-Dominant Logic, PLS-SEM, Digital Banking, Indonesia.

## 1. INTRODUCTION

Digital transformation has become a strategic imperative across service industries, fundamentally reshaping how services are designed, delivered, and consumed. Scholars across disciplines argue that this shift extends well beyond technology adoption to reshape value creation, customer interfaces, and firm performance outcomes (Verhoef et al., 2021). Yet a well-documented paradox persists: large-scale technology investment frequently fails to deliver the customer relational outcomes that organizations expect (Nadkarni & Prügl, 2021). Understanding why this gap exists, and what experiential mechanisms resolve it, is among the most pressing questions in contemporary service research.

In banking and financial services, this question is particularly acute. Digital platforms create new resource-integration opportunities that can build competitive advantage through deeper customer interactions (Paul et al., 2024), but they simultaneously lower entry barriers, intensify competition, and erode the functional differentiation that traditionally sustained loyalty, as argued across the retailing and banking literatures (Shankar et al., 2021). Digital transformation pushes banks toward more malleable, data-rich organizational designs (Hanelt et al., 2021), and the resulting proliferation of digital touchpoints generates both opportunities for value co-creation and risks of value co-destruction when technology misaligns with customer expectations (Vargo & Lusch, 2016). The central theoretical question is therefore not whether DT affects loyalty, but through what experiential pathway it does so, and whether that pathway can be undermined by poor digital design.

This study proposes that co-created service experience is the critical mediating mechanism in this relationship. When digital transformation genuinely enables customers to participate in configuring, shaping, and co-producing the banking service, it generates experiential qualities, including perceived empowerment, a sense of relational reciprocity, and emotional ownership, that translate into durable loyalty. When DT deploys technology without enabling meaningful participation, the loyalty effect is weaker, more transient, and more vulnerable to competitive erosion. Kamalaldin et al. (2020) argue from a relational perspective that digital transformation without co-creation enablement yields structurally weak provider-customer ties, while Reinartz et al. (2019) reason that technology-enabled changes disconnected from customer-facing value enhancements fail to sustain retention. This argument draws on Vargo and Lusch's (2016)

foundational SDL proposition that value is always co-created and realized in use, and that technologies function only as resources whose effects depend entirely on how actors integrate them in context.

Three gaps in the existing literature motivate this study. First, while the relationships between DT and service quality (Mbama & Ezepeue, 2018), between co-creation and loyalty (Auh et al., 2007; Woratschek et al., 2020), and between DT and co-creation intentions (Mostafa, 2020; Hijazi, 2022) have been examined separately, no study has integrated these streams into a model that positions co-created experience, as distinct from co-creation behavior or co-production intention, as the mediator between DT and loyalty. This distinction matters theoretically: co-creation behavior refers to what customers do, whereas co-created service experience refers to the qualitative experiential state that emerges from doing: the difference between participation itself and the felt sense of meaningful participation (Becker & Jaakkola, 2020). Prior studies that operationalize co-creation as behavioral frequency or participatory intention cannot capture this experiential dimension, and therefore cannot test the mediation pathway proposed here.

Second, the construct of co-created service experience remains underspecified as a measurable variable in empirical research. Existing studies operationalize related but distinct constructs, including co-production behavior (Auh et al., 2007), value co-creation intention (Mostafa, 2020), and participation attitude (Casper Ferm & Thaichon, 2021a), but none captures the multidimensional experiential state that SDL theory identifies as the locus of value realization. This gap between theoretical richness and measurement precision limits the field's ability to test mediation models of the kind proposed here, and represents a foundational obstacle to cumulative knowledge-building in this domain.

Third, existing empirical work on DT and loyalty in banking has been conducted primarily in Western, high-institutional-trust contexts (Mbama & Ezepeue, 2018; Mainardes et al., 2020; Tran Xuan et al., 2023), where the baseline conditions for loyalty formation differ systematically from those in emerging markets. Indonesia presents a theoretically significant context for reasons that extend beyond geographic novelty: it combines one of the highest fintech adoption rates in Southeast Asia with historically fragmented institutional trust in conventional banking. In this structural configuration, co-created service experience may be particularly consequential because customers cannot rely on institutional

reputation alone to sustain their relational commitment, and experiential quality therefore functions as the primary loyalty mechanism. Testing the proposed model in this context constitutes a theoretically motivated boundary condition examination, not merely a replication in a new setting.

Accordingly, the objectives of this paper are threefold: to develop and test a model linking digital transformation to customer loyalty through co-created service experience; to operationalize co-created service experience as a construct distinct from co-production behavior and co-creation intention; and to examine whether this mediation chain holds in Indonesia's digital banking ecosystem, a context in which the theoretical conditions for co-created service experience to function as the primary loyalty mechanism are most clearly present. The paper proceeds as follows. Section 2 reviews the three streams of literature, comprising digital transformation in banking, co-created service experience, and customer loyalty, and synthesizes them around the shared theoretical gap. Section 3 develops the theoretical model and four hypotheses. Section 4 presents the research design, measurement approach, and analytic procedures. Section 5 reports the empirical results. Section 6 discusses the theoretical contributions and practical implications, and Section 7 outlines limitations and directions for future research.

## 2. LITERATURE REVIEW

### 2.1. Digital Transformation in Banking and Financial Services

Digital transformation in financial services is widely understood as an organization-wide reconfiguration of strategies, structures, and processes driven by digital technologies: not merely technology adoption, but a fundamental revision of how firms create value, configure customer interfaces, and compete within ecosystems (Nadkarni & Prügl, 2021). In banking and financial services, this reconfiguration manifests most visibly in the displacement of branch-based service delivery by mobile platforms, AI-driven advisory services, and data-rich personalization engines. Hentzen et al. (2021) document through systematic review how AI-enabled digital interfaces are redefining customer-facing service in financial institutions, while Guandalini (2022) shows how DT more broadly reconfigures value propositions and service delivery models through platform-based and data-driven architectures. Servitized, platform-based, and ecosystem-oriented configurations have emerged as

the dominant structural mechanisms through which DT reshapes value creation and competitive differentiation: Ancillai et al.'s (2023) systematic review confirms that DT-driven business model innovation converges on these configurations as dominant patterns, and Payne et al. (2021) propose that digital servitization in particular repositions value co-creation as the central competitive logic in financial service ecosystems.

From a strategic perspective, DT simultaneously lowers entry barriers, enables disintermediation, and brings customer-centric digital interfaces to the forefront as primary competitive touchpoints (Nadkarni & Prügl, 2021). Fintech competition redefines the competitive arena by introducing digital-first service models that challenge traditional banks on speed, convenience, and personalization (Barroso & Laborda, 2022). Verhoef et al. (2021) reason that competitive advantage in this environment flows from a firm's ability to orchestrate ecosystem-wide value creation rather than from product differentiation alone. Yet Calderón-Monge and Ribeiro-Soriano (2023) warn that heavy technology investment without aligned customer-facing capabilities fails to generate the competitive outcomes DT promises, a pattern consistent with the digital paradox documented by Nadkarni and Prügl (2021).

Operationally, DT reconfigures customer-firm interactions through automation, self-service technologies, and digitally mediated encounters that shift customer expectations toward always-on, frictionless, omnichannel service delivery (Chauhan et al., 2022). Homburg et al. (2017) argue that implementing digital strategies spanning multiple touchpoints is a prerequisite for shaping how customers perceive and engage with service across the entire journey, establishing customer experience management as a strategic organizational capability. Digital banking interfaces reshape perceptions of service quality by enabling continuous, personalized, and highly responsive encounters (Hentzen et al., 2021), and omnichannel integration alters service delivery standards and customer performance expectations in ways that have measurable effects on loyalty metrics (Papathomas & Konteos, 2024). Critically, Wielgos et al. (2021) demonstrate that firms' ability to translate technology investments into customer-facing value improvements, rather than merely operational efficiency, is the pivotal variable linking digital capability to customer performance outcomes. Kumar et al.'s (2022) bibliometric analysis of four decades of bank marketing research confirms that digital technologies have progressively reshaped

the field's core thematic concerns, with customer satisfaction, loyalty, and experience management emerging as the dominant outcome constructs across the entire period of DT-related inquiry.

At the ecosystem level, DT restructures service ecosystems by reconfiguring actor roles, institutional arrangements, and value capture mechanisms at micro, meso, and macro levels (Hanelt et al., 2021; Vargo et al., 2022). Favoretto et al. (2022) show that digitalization shifts firms from product-based to service-based digital business models, restructuring the relational architecture of provider–customer relationships in the process. Within financial services, this shift produces both expanded co-creation opportunities and heightened risks of value co-destruction when digital configurations constrain rather than enable customer participation. Hanelt et al.'s (2021) systematic review documents that the failure to align digital configurations with meaningful customer participation is a recurring theme across DT implementations, generating co-destruction rather than co-creation as the dominant outcome.

This body of evidence establishes digital transformation as both a technological and socio-relational phenomenon whose effects on customer outcomes are mediated by experiential and relational mechanisms. Identifying those mechanisms, and operationalizing them with sufficient precision to test mediation empirically, is the central contribution of the present study.

## **2.2. Co-Created Service Experience and Value Co-Creation**

### **2.2.1. Conceptual Foundations and Construct Differentiation**

Value co-creation theory, rooted in SDL, reframes service value as something that emerges from multi-actor resource integration governed by shared institutions, norms, and axioms, positioning customers as active participants in value production rather than passive recipients (Vargo et al., 2022; Vargo & Lusch, 2016). This SDL foundation generates a critical distinction that is often blurred in empirical research: the distinction between co-creation behavior (what customers do), co-creation intention (what customers plan or are willing to do), and co-created service experience (the qualitative experiential state that emerges from participation in value-shaping interactions).

This distinction has significant theoretical and measurement implications. Studies such as Mostafa (2020) and Hijazi (2022) examine the antecedents of

co-creation intention in mobile banking; they are concerned with whether customers want to participate. Studies such as Auh et al. (2007) examine co-production behavior, that is, the extent to which customers actually contribute inputs to the service. Neither stream captures the experiential outcome of that participation: the felt sense of empowerment, relational reciprocity, and in-use value realization that SDL theory identifies as the point at which value is actually created (Vargo & Lusch, 2016). The present study operationalizes this third dimension, co-created service experience, as a distinct construct defined as the customer's subjective perception of having actively shaped the service outcome through meaningful interaction, encompassing the cognitive sense of influence, the emotional sense of ownership, and the social sense of reciprocal engagement.

Becker and Jaakkola (2020) propose that experience is a multidimensional phenomenon spanning cognitive, emotional, behavioral, sensorial, and social dimensions, emerging across the customer journey through both managerial stimuli and customer-initiated processes. Co-created service experience, as theorized here, refers specifically to the subset of experiential states that arise from customer participation in shaping the service: the cognitive sense that one's inputs have influenced the service outcome, the emotional sense of ownership and investment in the service relationship, and the social sense of reciprocal engagement with the provider. This definition aligns with Hollebeek et al.'s (2019) SDL-informed account of customer engagement as operant resource integration, while extending it to capture the experiential quality of that integration rather than merely its occurrence. It is this experiential quality, not behavioral frequency or participatory willingness, that serves as the mediating variable in the present model.

### **2.2.2. Digital Transformation as Enabler of Co-Created Service Experience**

Digitalization intensifies the scope, frequency, and richness of co-creation opportunities by expanding the channels, touchpoints, and interaction modalities available to customers. Online and mobile banking channels allow customers to configure services, share feedback, and co-shape service encounters in ways that were structurally impossible in branch-based banking (Chauhan et al., 2022). Hoyer et al. (2020) argue that digital interfaces allow customers to co-design service journeys and contribute feedback dynamically, which enhances perceived co-ownership of the service experience and blends convenience, personalization, and

participatory design into new experiential configurations. Digital banking channels enable richer, more continuous forms of participation through technology-mediated interaction (Hentzen et al., 2021). Trust, engagement, and participation attitude have been identified as key antecedents of co-creation in retail banking, with social media functioning as a moderating factor (Casper Ferm & Thaichon, 2021a). Online-offline channel interactivity significantly amplifies co-creation behavior by multiplying meaningful touchpoints (Cui et al., 2022).

However, the relationship between digital infrastructure and co-created service experience is not automatic. Hanelt et al. (2021) warn that digital configurations misaligned with customer expectations, or that constrain meaningful participation, risk generating value co-destruction rather than co-creation. Poorly designed digital co-creation contexts erode trust and undermine co-creation outcomes (Moharrak & Mogaji, 2025). Digital tools that overwhelm or constrain customers generate dissatisfaction rather than experiential richness (Grewal et al., 2017). Payne et al. (2021) propose that digital servitization creates the conditions for co-created service experience through personalized digital interactions, self-service interfaces, and adaptive service processes, but only when those conditions genuinely enable rather than simulate customer participation.

This conditionality is theoretically important: it implies that the relationship between DT and co-created service experience is positive in direction but not deterministic in strength. For the purposes of this study, we theorize that higher levels of customer-perceived DT, reflecting a broader and more capable digital service environment from the customer's perspective, are systematically associated with richer co-created service experience, because higher perceived DT expands the resources available for integration and the touchpoints available for meaningful participation.

### 2.2.3. *The Measurement Gap*

Despite the rich conceptual work on value co-creation, co-created service experience remains underspecified as an empirically measurable construct. Becker and Jaakkola (2020) note that experiential states such as perceived empowerment, emotional ownership, and relational reciprocity, the states that distinguish co-created from routine service interactions, are rarely operationalized in empirical work. Landry and Furrer (2023) find through systematic review that the mechanisms

through which co-creation translates into experience quality and broader well-being outcomes remain undertheorized. This gap motivates the operationalization strategy adopted in the present study, which constructs a measurement instrument anchored in the experiential, rather than behavioral or intentional, dimension of co-creation, drawing on but extending prior co-production and co-creation scales.

A specific concern addressed in the operationalization is the boundary between co-created service experience and perceived service personalization. Because personalization is both a feature of digitally transformed service environments (DT) and a potential outcome of co-created engagement (CSE), there is a risk of construct overlap if CSE items are framed predominantly in terms of personalized service receipt. The present operationalization addresses this by anchoring CSE items in the customer's active contribution to the service outcome rather than in the service outcome itself, distinguishing between a DT-adjacent perception that the service is personalized and a CSE-specific perception that one's own inputs shaped the service. This distinction is elaborated in Section 4.4 and reflected in the item wording reported in Table 1.

### 2.3. *Customer Loyalty as a Relational Outcome*

Relationship marketing theory positions loyalty as a long-term relational outcome emerging from repeated value-rich interactions, trust, satisfaction, and commitment (Woratschek et al., 2020). In banking, loyalty is both attitudinal, encompassing preference, identification, and commitment, and behavioral, encompassing continued patronage, resistance to switching, and advocacy (Mbama & Ezepue, 2018). These two dimensions are theoretically related but empirically distinct: a customer may continue using a bank's services for structural reasons, such as switching costs or convenience, while exhibiting low attitudinal commitment, and this distinction has significant implications for the durability of loyalty under competitive pressure.

The evidence consistently shows that co-creation participation strengthens both loyalty dimensions across multiple mechanisms. Auh et al.'s (2007) foundational study demonstrates that customers who co-produce advisory services in financial services exhibit significantly stronger attitudinal and behavioral loyalty when co-production is supported by effective communication, affective commitment, and interactional justice. Social media-mediated co-

creation behaviors have also been shown to drive attitudinal loyalty across customer segments in retail banking (Casper Firm & Thaichon, 2021b). Co-creation behaviors, including feedback, advocacy, and co-design, strengthen relational bonds by producing reciprocal value perceptions (Woratschek et al., 2020). Pansari and Kumar (2017) theorize that engagement behaviors increase switching costs and generate preference for the focal provider, thereby enhancing behavioral loyalty. Community-based co-creation generates loyalty through social embeddedness and relational investment that transcend transactional interactions (Moharrak & Mogaji, 2025).

Digitalization simultaneously enriches and complicates loyalty formation. Customers' loyalty judgments in digital banking are shaped by experiential qualities, including perceived control, enjoyment, and personalization, that extend well beyond functional benefits (Hentzen et al., 2021). Tyrväinen et al. (2020) confirm that personalization and hedonic motivation are significant loyalty drivers in omnichannel retail contexts, demonstrating that the experiential dimensions of digital service are as consequential as its functional dimensions for generating relational commitment. Grewal and Roggeveen (2020) further argue that effective customer journey management across physical and digital touchpoints is central to loyalty formation, and that the holistic coherence of the service experience rather than any single touchpoint determines relational outcomes. Seamless omnichannel integration directly enhances loyalty by generating continuity, trust, and relationship satisfaction (Mainardes et al., 2020; Tran Xuan et al., 2023). Yet the literature on fintech emergence suggests that digitalization weakens traditional loyalty mechanisms by lowering switching barriers and enabling easy multi-homing across providers (Barroso & Laborda, 2022), and platform-based banking disperses customer attention across multiple actors, making loyalty to any single provider more fragile (Payne et al., 2021). This dual dynamic, wherein experience enriches relational commitment while competition erodes functional differentiation, is precisely why co-created service experience becomes the critical differentiating mechanism: it generates the relational depth and emotional investment that purely functional digital service cannot replicate, and it does so through participation-based switching costs rather than merely structural ones.

#### *2.4 Synthesis and Theoretical Gap*

The three streams reviewed above, comprising DT in banking, co-created service experience, and customer loyalty, converge around a shared gap that is both theoretical and methodological. Theoretically, the field has established robust evidence for the DT-service quality relationship, the co-creation behavior-loyalty relationship, and the DT-co-creation intention relationship as separate empirical phenomena (Mbama & Ezepue, 2018; Auh et al., 2007; Mostafa, 2020). What remains absent is an integrative model that positions co-created service experience, as a qualitative experiential state distinct from behavior and intention, as the mechanism through which DT generates loyalty. This absence is consequential: without this mediating construct, the field cannot explain why some digital transformations generate durable loyalty while others, equally sophisticated technologically, do not.

Methodologically, the gap compounds the theoretical one. Because co-created service experience has not been operationalized as a construct distinct from behavioral and intentional measures, the mediation chain proposed here has not been testable with existing instruments. Studies that measure co-production frequency (Auh et al., 2007) or co-creation willingness (Mostafa, 2020) capture antecedents or behavioral expressions of co-creation, but not the experiential state that SDL theory identifies as the point at which value is realized (Vargo & Lusch, 2016). The present study addresses both gaps simultaneously: it theorizes and operationalizes co-created service experience as a distinct construct, and tests its mediating role in the DT-loyalty relationship.

The Indonesian digital banking context adds a third dimension to this contribution. Existing studies in this domain have been conducted predominantly in Western markets where high institutional trust provides a baseline relational foundation that supplements or substitutes for experiential loyalty mechanisms (Mbama & Ezepue, 2018; Mainardes et al., 2020). In Indonesia's market, where institutional trust in conventional banking is historically lower and fintech competition is structurally intense, the theoretical importance of co-created service experience as the primary relational loyalty mechanism is amplified, making the Indonesian context not merely a new setting for replication, but a theoretically motivated context in which the proposed mediation chain is most consequential.

### **3. THEORETICAL MODEL AND HYPOTHESES**

The theoretical model is grounded in SDL and

Service Ecosystem Theory, which together provide two foundational arguments. First, value is always co-created and realized in use; technologies are resources whose effects on customer outcomes depend entirely on how actors integrate them in context (Vargo & Lusch, 2016). Second, digital transformation accelerates institutional change by enabling new resource integration patterns and actor connectivity across service ecosystems (Vargo et al., 2022), but this acceleration generates experiential value for customers only when institutional arrangements genuinely enable meaningful participation. Together, these arguments imply that the DT-loyalty relationship is not purely direct but is experientially mediated: DT creates the structural conditions for co-created service experience, and co-created service experience generates the relational depth that sustains loyalty. Four hypotheses are derived from this theoretical foundation and developed in turn below.

From an SDL perspective, digital transformation restructures the resource integration landscape available to banking customers. Schweidel et al. (2022) argue that digital platforms extend actor-to-actor connectivity by enabling data-driven, personalized service interaction at scale. Digital interfaces, self-service tools, and personalized dashboards shift co-creation from traditional branch interactions to distributed, technology-mediated exchanges across mobile and web channels (Hentzen et al., 2021). Effective customer journey design, characterized by touchpoint coherence, goal-enabling structures, and responsiveness to customer intent, directly enhances experience quality and attitudinal outcomes (Kuehnl et al., 2019). Ease of use, responsiveness, security, and interactivity function as antecedents to co-creation in mobile banking (Mostafa, 2020). Kamalaldin et al. (2020) further argue that digital transformation deepens customers' involvement in configuring their own service experiences through continuous, technology-mediated resource integration.

Critically, the relationship between DT and co-created service experience is positive but conditional. DT creates the structural conditions for richer co-created service experience, through expanded touchpoints, personalization infrastructure, and self-service capabilities, but only translates into experiential richness when digital design genuinely enables rather than simulates customer participation. Technology-centric implementations that fragment customer journeys or constrain participation generate value co-destruction (Hanelt et al., 2021), and technology-enabled process changes without

customer-facing value enhancements are argued to produce inferior experiential outcomes (Reinartz et al., 2019). From the customer's perspective, higher perceived DT, reflecting a broader and more capable digital service environment, should systematically generate richer co-created service experience because it expands the resources available for integration and the touchpoints available for meaningful participation.

H1: Customer-perceived digital transformation is positively associated with co-created service experience.

SDL and relationship marketing theory converge on the argument that co-created service experiences are the proximal relational driver of loyalty. When customers experience their inputs as genuinely shaping the service outcome, the defining quality of co-created service experience as theorized here, they develop cognitive, emotional, and behavioral bonds that passive service consumption cannot generate. Auh et al. (2007) demonstrate this empirically in financial services: customers who co-produce advisory services exhibit significantly stronger attitudinal and behavioral loyalty, particularly when co-production is supported by communication, affective commitment, and interactional justice. Extending this finding across service sectors, Cossío-Silva et al. (2016) show through structural equation modeling that value co-creation has a significant positive effect on attitudinal loyalty, which in turn drives behavioral loyalty, establishing a sequential co-creation-loyalty mechanism that operates independently of industry context. Harmeling et al. (2017) further theorize that firm-initiated efforts to motivate and empower customer engagement contributions generate measurable loyalty outcomes through reciprocal value exchange, positioning co-creation enablement as a deliberate relational investment. Value co-creation moderates the experience-loyalty relationship such that co-creating customers generate stronger loyalty dispositions than passive consumers (Anshu et al., 2022).

The mechanisms linking co-created service experience to loyalty are multiple and mutually reinforcing. Co-created service experiences generate emotional engagement, trust, and reciprocity that foster advocacy, repeat usage, and durable relational bonds (Woratschek et al., 2020). Zollo et al. (2020) confirm that co-creation experiences spanning social sharing, feedback, and active participation generate emotional engagement and brand-related behavioral intentions that translate into loyalty. At the platform level, De Oliveira Santini et al.'s (2020) meta-analysis of customer engagement in social media shows that

engagement behaviors consistently generate positive attitudinal and behavioral outcomes, reinforcing the argument that co-created experience is a generative mechanism for loyalty across digital contexts. Engagement behaviors, including feedback, advocacy, and co-design, increase switching costs and generate preference for the focal provider (Pansari & Kumar, 2017). Ecosystem-based co-creation generates social value and reinforces commitment to the focal provider through social embeddedness and relational investment (Moharrak & Mogaji, 2025). Co-created experiential quality is the mechanism through which DT generates measurable loyalty outcomes in banking (Papathomas & Konteos, 2024). In a digital banking context specifically, Levy (2022) finds that experiential psychological engagement with digital banking platforms mediates the effect of brand attachment on bank loyalty, confirming that it is the quality of the interactive, experiential relationship with digital service features that cultivates loyalty rather than passive service consumption alone. Kumar et al. (2019) argue that it is the quality of co-creation, not merely its frequency, that generates the relational depth needed to sustain loyalty over time.

H2: Co-created service experience is positively associated with customer loyalty.

Beyond the experiential pathway, DT also exerts a direct effect on loyalty through mechanisms that operate independently of active customer co-creation. Verhoef et al. (2021) argue that digitally transformed banks improve the core service utility for customers by reducing search costs, improving accessibility, and increasing service consistency across channels. Digital banking channels generate direct loyalty effects by improving functional service quality, perceived value, and overall customer satisfaction (Mbama & Ezepue, 2018). In digital service contexts more broadly, Molinillo et al. (2021) find that perceived value generated through digital service quality significantly increases loyalty intentions, confirming that customers' functional appraisal of digital service environments has a direct bearing on their relational commitment. Reinartz et al. (2019) reason that technology-enabled personalization, data analytics, and friction reduction directly link digital capability to customer retention. In banking specifically, Lee and Li (2023) demonstrate empirically that digital channel affordances, including anytime-anyplace connectivity and interactivity, strengthen customer-brand identification and brand loyalty, providing direct evidence that DT-driven channel capabilities generate loyalty through structural rather than

purely experiential pathways. Schweidel et al. (2022) suggest that as digital ecosystems mature, customers accumulate data-based relationships that generate structural switching costs reinforcing loyalty over time. Favoretto et al. (2022) show that DT transforms provider-customer relationships into continuous service flows rather than episodic transactions, deepening customer dependence on the focal provider's digital infrastructure.

Testing the direct effect of DT on loyalty (H3) alongside the mediated pathway (H1 and H2) is theoretically necessary because it allows the study to assess whether co-created service experience fully or only partially mediates the DT-loyalty relationship. Full mediation would imply that all loyalty-relevant effects of DT operate through experiential co-creation, which would constitute strong evidence for the SDL proposition that technology's relational effects are entirely experientially mediated. Partial mediation would imply that DT also generates loyalty through structural utility pathways that bypass co-created service experience, a finding consistent with the existence of both experiential and functional loyalty drivers in digital banking. Both outcomes carry distinct theoretical and managerial implications.

H3: Customer-perceived digital transformation is positively associated with customer loyalty.

Vargo and Lusch's (2016) foundational SDL proposition, that technologies are resources whose effects on customer outcomes depend on how actors integrate them in context, implies that the relationship between DT and loyalty is not purely direct but is experientially mediated. Vargo et al. (2022) argue that digital investments that fail to engage customers as resource-integrating partners risk generating value co-destruction through institutional misalignment, complexity, or perceived intrusiveness. DT initiatives that do not translate into improved customer experiences fail to generate the loyalty outcomes that organizations expect (Papathomas & Konteos, 2024). Becker and Jaakkola (2020) propose that experience is a dynamic, multilevel phenomenon spanning cognitive, emotional, behavioral, and social responses; it is this experiential totality, not technology deployment per se, that shapes relational outcomes such as loyalty. Oertzen et al. (2018) further clarify through systematic conceptual review that the outcomes of co-creation for customers are multiple and mutually reinforcing, encompassing hedonic, social, cognitive, and pragmatic benefits that collectively constitute the experiential states underlying loyalty and other relational outcomes. It is this configuration of co-

created experiential benefits, not any single dimension, that generates the depth of relational investment that distinguishes co-created from passively consumed service experiences.

The mediating role of co-created service experience is further supported by the argument that where DT is implemented without co-creation enablement, loyalty remains weak despite technological sophistication (Kamalaldin et al., 2020), and that DT without customer-facing experiential enhancement fails to generate the relational depth that sustains loyalty (Reinartz et al., 2019). Co-created service experiences build relational depth, encompassing trust, identification, and commitment, that sustains loyalty beyond what passive service consumption generates (Woratschek et al., 2020). Empirically, Roy et al. (2019) demonstrate in a smart servicescape context that co-created experience, operationalized across cognitive, hedonic, social, and pragmatic dimensions, generates significant positive effects on brand equity and behavioral intentions, confirming that co-created experiential states function as mediating mechanisms between service environment characteristics and relational outcomes. In a hospitality context, Wu and Gao (2019) find that customer co-creation behaviors strengthen emotional customer experience, which in turn produces favorable loyalty-related outcomes, providing cross-sector empirical support for the argument that co-creation generates experiential mediating states rather than merely behavioral outputs. Value co-creation amplifies the experience-loyalty pathway because participation deepens relational investment and increases switching costs (Anshu et al., 2022).

H4: Co-created service experience mediates the relationship between customer-perceived digital transformation and customer loyalty.

The four hypotheses constitute a mediation model in which co-created service experience is the central experiential mechanism linking digital transformation to customer loyalty, with a direct DT-loyalty pathway retained to assess the completeness of mediation. Figure 1 presents the conceptual model.

[Figure 1: Conceptual Model, to be inserted upon completion of data analysis. The model depicts Digital Transformation as the exogenous construct, Co-Created Service Experience as the mediator, and Customer Loyalty as the endogenous construct, with direct paths corresponding to H1 (DT to CSE), H2 (CSE to CL), and H3 (DT to CL), and an indirect path corresponding to H4 (DT to CSE to CL).]

## 4. METHOD

### 4.1. Research Design

This study adopts a quantitative, cross-sectional survey design to examine how customer-perceived digital transformation shapes customer loyalty through co-created service experience in digital banking services. A survey approach is appropriate for capturing customers' evaluations of technology-enabled services, their co-created service experience, and loyalty-related intentions, which are inherently latent constructs best modeled as interrelated perceptual variables rather than behavioral observations. The proposed relationships are tested using Partial Least Squares Structural Equation Modeling (PLS-SEM), which is particularly suited to prediction-oriented research with complex models containing multiple mediating pathways and latent constructs (Hair et al., 2019).

We acknowledge that cross-sectional data preclude causal inference in the strict sense; the hypothesized directional relationships are theoretically motivated and empirically testable as associations, but longitudinal or experimental designs would be required to establish temporal precedence. This limitation is acknowledged explicitly in Section 7 alongside directions for future research that could address it.

### 4.2. Research Context: Indonesia's Digital Banking Ecosystem

Indonesia provides a theoretically motivated context for this study, not merely a convenient sampling location. As the fourth most populous country in the world and one of Southeast Asia's fastest-growing digital economies, Indonesia has experienced rapid digital banking transformation under a distinctive structural condition: high fintech adoption rates coexisting with historically fragmented institutional trust in conventional banking. The Financial Services Authority reports that digital banking transaction volumes have grown substantially in recent years, driven by accelerating smartphone penetration and competitive pressure from digital-native financial service providers. Major Indonesian banks, including BCA, BRI, Mandiri, and BNI, have implemented extensive digital transformation initiatives spanning mobile banking, AI-driven services, and omnichannel integration, while fintech platforms such as GoPay, OVO, and Dana compete directly for digital financial engagement.

This context is theoretically significant for two compounding reasons. First, in environments where

institutional trust in banks is historically fragile, experiential quality functions as the primary relational basis for loyalty: customers cannot rely on brand reputation or institutional credibility alone to sustain their commitment, which amplifies the theoretical importance of co-created service experience as the mechanism through which loyalty is built and maintained. Second, the intensity of fintech competition in Indonesia means that functional parity between digital service providers is rapidly approached, making experiential differentiation, including the sense that the service is genuinely shaped by customer participation, more consequential for loyalty than in markets where incumbent institutions face less competitive pressure. Together, these conditions create a context in which the proposed mediation chain is particularly consequential, making Indonesia a theoretically demanding rather than permissive environment in which to test the model.

### 4.3. Sampling and Data Collection

The target population comprised Indonesian banking customers who regularly interact with digital service platforms, including mobile banking applications and web-based portals. Respondents were required to have used their primary bank's digital service within the previous six months to ensure that evaluations of perceived DT, co-created service experience, and loyalty reflect actual recent interactions rather than hypothetical assessments.

Data were collected via a self-administered structured questionnaire distributed through two complementary channels: online distribution via WhatsApp messaging networks and direct offline distribution in person. This dual-mode approach was designed to maximize response diversity across demographic and behavioral segments, and to reduce the risk of platform-specific response biases that could arise from relying exclusively on digital distribution. A non-probability purposive sampling strategy was employed, targeting adult banking customers who satisfied the digital usage criterion. A total of 360 valid responses were collected.

This sample size is justified on the basis of a priori power analysis using G\*Power 3.1. Specifying a medium effect size ( $f^2 = 0.15$ ), a significance level of  $\alpha = 0.05$ , a target statistical power of 0.80, and a maximum of three predictors in the most complex structural equation, the minimum required sample is  $n = 138$ . Under the more conservative power criterion of 0.95, the minimum rises to  $n = 227$ . The achieved sample of 360 therefore provides power substantially exceeding conventional thresholds for the detection

of medium effect sizes, the effect magnitudes theoretically anticipated on the basis of the prior related literature reviewed in Section 2. The sample additionally satisfies Hair et al.'s (2019) recommendation of a minimum of ten observations per indicator for the most complex construct in the model, and comfortably exceeds the ten-times rule of thumb for PLS-SEM applications. No claim is made regarding power for small effect sizes ( $f^2 = 0.02$ ), for which a minimum of  $n = 395$  would be required at  $\alpha = 0.05$  and power = 0.80; the present sample is sized to detect effects of the magnitude that theory and prior research indicate are plausible.

### 4.4. Measures

All latent constructs are measured using multi-item reflective scales adapted from validated instruments, with wording tailored to the Indonesian digital banking context. All items are rated on a five-point Likert-type agreement scale ranging from 1 (strongly disagree) to 5 (strongly agree). Table 1 presents all measurement items with their source constructs.

Digital Transformation (DT) is operationalized as customers' perception of the extent to which their primary bank has digitized its service interfaces, processes, and interactions in ways that are accessible, integrated, and responsive. Customer-perceived DT, rather than objective technological capability assessed at the firm level, is the theoretically appropriate operationalization for a study focused on customer-level outcomes, because it is the customer's subjective experience of the digital service environment, not the bank's technology portfolio, that shapes co-creation opportunity and experiential quality (Wielgos et al., 2021; Papathomas & Konteos, 2024). Items reflect perceptions of digital channel breadth and accessibility, cross-platform integration, service responsiveness, and technology-enabled convenience, adapted from scales in the digital banking and omnichannel service literature (Hentzen et al., 2021; Mbama & Ezepue, 2018). Personalization capability is deliberately excluded from the DT scale to preserve discriminant validity from the CSE construct, which captures the experiential outcome of participation rather than the technological capacity that enables it.

Co-Created Service Experience (CSE) is operationalized as customers' perception of the qualitative experiential state arising from their active participation in shaping the banking service, encompassing the cognitive sense that their inputs have influenced the service outcome, the emotional sense of ownership and investment in the service

relationship, and the social sense of reciprocal engagement with the provider. This operationalization is explicitly distinct from co-production behavior (the frequency of participatory actions; Auh et al., 2007), co-creation intention (willingness to participate; Mostafa, 2020), and perceived service personalization (the outcome of technology-enabled customization, which is a feature of the DT construct). Items are anchored in the customer's active contribution to the service rather than in the service outcome itself: specifically, in whether the customer perceives that their engagement has shaped what they receive, rather than whether the service happens to be personalized. This distinction is maintained consistently across all CSE items to minimize construct overlap with DT. Items are adapted from co-creation and co-production scales validated in financial service

contexts (Auh et al., 2007; Woratschek et al., 2020) and from customer experience research (Becker & Jaakkola, 2020), with modifications to capture the experiential rather than behavioral or outcome dimension.

Customer Loyalty (CL) is measured using items capturing both attitudinal and behavioral dimensions, including intention to continue using the bank's digital services, willingness to recommend the bank to others, preference for the focal provider over alternatives, and resistance to switching. This dual-dimensional operationalization captures both the emotional commitment (attitudinal) and the behavioral persistence (behavioral) that constitute durable loyalty in service contexts (Woratschek et al., 2020). Items are adapted from validated loyalty scales in the banking and digital service literature (Woratschek et al., 2020; Mainardes et al., 2020).

**Table 1: Measurement Items.**

| Construct                     | Code | Item                                                                                             | Source                                      |
|-------------------------------|------|--------------------------------------------------------------------------------------------------|---------------------------------------------|
| Digital Transformation        | DT1  | My bank provides a wide range of digital services that are easy to access                        | Mbama & Ezepe (2018)                        |
|                               | DT2  | My bank's digital channels are well-integrated across platforms (app, web, ATM)                  | Mbama & Ezepe (2018)                        |
|                               | DT3  | My bank's digital services respond quickly and accurately to my needs                            | Mbama & Ezepe (2018)                        |
|                               | DT4  | My bank's digital services are continuously updated and improved                                 | Papathomas & Konteos (2024)                 |
|                               | DT5  | My bank's digital services make it easy for me to manage my finances independently               | Mbama & Ezepe (2018)                        |
|                               | DT6  | My bank's digital infrastructure is reliable and consistently available                          | Mbama & Ezepe (2018)                        |
| Co-Created Service Experience | CSE1 | I feel that my input and feedback actively shape the banking services I receive                  | Auh et al. (2007); Woratschek et al. (2020) |
|                               | CSE2 | My interactions with my bank feel collaborative rather than one-directional                      | Woratschek et al. (2020)                    |
|                               | CSE3 | I feel a sense of ownership over my service experience because I have contributed to shaping it  | Developed from Becker & Jaakkola (2020)     |
|                               | CSE4 | When I engage with my bank, I feel that my contributions meaningfully influence what I receive   | Auh et al. (2007)                           |
|                               | CSE5 | The service I experience reflects my active participation, not just the bank's standard offering | Woratschek et al. (2020)                    |
|                               | CSE6 | I experience my relationship with my bank as a genuine two-way partnership                       | Auh et al. (2007)                           |
| Customer Loyalty              | CL1  | I intend to continue using my bank's digital services in the future                              | Woratschek et al. (2020)                    |
|                               | CL2  | I would recommend my bank's digital services to people I know                                    | Mainardes et al. (2020)                     |

|  |     |                                                                                |                          |
|--|-----|--------------------------------------------------------------------------------|--------------------------|
|  | CL3 | I prefer my bank over other banking alternatives available to me               | Woratschek et al. (2020) |
|  | CL4 | I would remain with my bank even if a competitor offered slightly better terms | Mainardes et al. (2020)  |
|  | CL5 | I feel genuinely committed to maintaining my relationship with this bank       | Woratschek et al. (2020) |

#### 4.5. Translation and Pretesting

Scale items were translated from English to Indonesian using a standard forward-backward translation procedure. Items from validated instruments were first translated into Indonesian by a bilingual researcher with expertise in marketing and financial services, then back-translated into English by an independent bilingual translator with no access to the original English items. Discrepancies between the original and back-translated versions were reviewed and resolved through discussion and consensus revision. Items were then evaluated for content relevance and wording appropriateness by three subject-matter experts in digital banking and consumer behavior, who were asked to assess whether each item captures the intended theoretical construct in the Indonesian banking context and whether the wording is natural and unambiguous for Indonesian banking customers. Pretesting with 30 participants drawn from the target population verified item clarity, comprehension, and response time. Minor wording adjustments were made based on expert feedback and pretest responses, with no items deleted at this stage.

#### 4.6. Common Method Bias Mitigation

Because all constructs are measured from the same respondents at the same time point using the same instrument, common method variance (CMV) represents a potential threat to the accuracy of construct correlations and structural estimates (Podsakoff et al., 2003). Several procedural and statistical strategies were implemented to mitigate and assess this threat.

Procedurally, the questionnaire separated predictor (DT), mediator (CSE), and outcome (CL) items into distinct, clearly labeled sections with separate introductory instructions. Psychological separation text was inserted between sections to reduce the salience of any perceived relationship between constructs. Items were ordered so that DT items appeared first, CSE items in the middle, and CL items last, consistent with the hypothesized causal sequence and with recommendations for temporal

and psychological separation in cross-sectional survey designs (Podsakoff et al., 2003). Respondents were explicitly informed at the outset that there are no correct answers and that all responses are anonymous and used solely for research purposes.

A theoretically unrelated marker variable, measuring respondents' satisfaction with public transportation services, a domain entirely unconnected to digital banking, was included in the questionnaire. This marker variable will be used in post-hoc statistical assessment of CMV using the marker variable technique (Lindell & Whitney, 2001; Podsakoff et al., 2003), in which the marker variable's correlation with study constructs is used to estimate the proportion of observed correlations attributable to method variance. Additionally, Harman's single-factor test will be conducted by submitting all items to an unrotated principal component analysis; if a single factor accounts for the majority of total variance (exceeding 50%), CMV is flagged as a potential concern and partial correlation procedures controlling for the marker variable will be applied. These post-hoc assessments will be reported in the Results section.

### 5. DATA ANALYSIS

Data analysis employs PLS-SEM using SmartPLS 4, following the two-stage methodological protocol established for prediction-oriented models with complex mediation structures and reflective latent constructs in marketing and service research (Hair et al., 2019).

Stage 1: Measurement model assessment. Internal consistency reliability is evaluated using Cronbach's alpha ( $\alpha$ ) and composite reliability (CR), with values above 0.70 taken as evidence of adequate reliability (Hair et al., 2019). Convergent validity is assessed through indicator outer loadings and average variance extracted (AVE), with loadings above 0.70 and AVE above 0.50 taken as evidence of adequate convergence. Discriminant validity is assessed using both the Fornell-Larcker criterion, in which the square root of each construct's AVE should exceed its correlations with all other constructs, and the heterotrait-monotrait ratio of correlations (HTMT),

with values below 0.85 taken as evidence of discriminant validity (Henseler et al., 2015). The more conservative 0.90 threshold is applied where constructs are conceptually proximate. Given the theoretical proximity between DT and CSE noted in Section 2.2.3, HTMT assessment between these two constructs is treated as a critical validity check, and the stricter 0.85 threshold is applied. Items with outer loadings below 0.70 or problematic cross-loadings will be considered for removal, provided that removal does not compromise theoretical coverage of the construct domain.

Stage 2: Structural model assessment. Multicollinearity among predictor constructs is checked using variance inflation factors (VIF), with values below 3.3 taken as evidence of acceptable collinearity (Hair et al., 2019). The explanatory power of the model is assessed through the coefficient of determination ( $R^2$ ) for co-created service experience and customer loyalty. Effect sizes ( $f^2$ ) are calculated to assess the contribution of each predictor construct, with values of 0.02, 0.15, and 0.35 corresponding to small, medium, and large effects, respectively (Cohen, 1988). Predictive relevance is assessed using

Stone–Geisser  $Q^2$  via blindfolding, with  $Q^2 > 0$  indicating that the model has predictive relevance for the endogenous construct.

Hypotheses are tested using bootstrapping with 5,000 resamples, consistent with Hair et al.'s (2019) recommendations for robust inference in PLS-SEM. Bootstrapped path coefficients, t-values, and 95% bias-corrected confidence intervals are reported for direct effects (H1, H2, H3) and the indirect effect (H4). For mediation assessment, the indirect effect of DT on CL through CSE is calculated as the product of the DT-to-CSE and CSE-to-CL path coefficients. Full mediation is indicated if the direct DT-to-CL path is non-significant when the mediator is included in the model; partial mediation is indicated if both the direct and indirect paths are statistically significant. The variance accounted for (VAF) statistic is also reported to characterize the proportion of the total DT-to-CL effect that operates through the mediating pathway, with VAF above 80% indicating full mediation, VAF between 20% and 80% indicating partial mediation, and VAF below 20% suggesting that mediation is not present (Hair et al., 2019).

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