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When logic meets emotion: Dual pathways shaping omnichannel banking brand equity

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Abstract

Aim/purpose – Grounded in the stimulus–organism–response (S–O–R) framework, this study examines the relationships among integration quality (INQ), perceived seamlessness (PSE), perceived utilitarian (PUE) and hedonic (PHE) experiences, customer–bank engagement (CBE), and brand equity in omnichannel banking.

Design/methodology/approach – A cross-sectional survey was conducted with 285 active bank customers in Indonesia who used at least two service channels. Respondents were selected using non-probability purposive sampling. Data were collected via self-reports and analyzed using partial least squares structural equation modeling (PLS-SEM) in SmartPLS 4. A disjoint two-stage approach was used to estimate higher-order reflective-formative constructs.

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Findings – The results suggest asymmetric patterns across the experiential pathways. INQ is positively associated with PUE but is not significantly related to PHE. In contrast, PSE is positively associated with both PUE and PHE, with a relatively stronger association observed for PHE. INQ is also positively associated with PSE. Both PUE and PHE are positively associated with CBE, with PHE exhibiting a relatively stronger association. CBE, in turn, is positively associated with brand equity, operationalized through preferential loyalty.
Research implications/limitations – The findings provide additional evidence for applying the S–O–R framework to omnichannel banking by examining cognitive and affective experiential pathways. They indicate asymmetric associations between utilitarian and hedonic experiences, CBE, and brand equity. The relatively stronger association of PHE with CBE suggests the potential relevance of affective mechanisms in this context. However, the study relies on a cross-sectional design, single-source self-reported data, non-probability purposive sampling, and context-specific measurement refinement, which constrains causal inference and limits the generalizability of the findings.
Originality/value/contribution – This research contributes to the omnichannel and digital banking literature by providing empirical evidence of asymmetric associations among PUE, PHE, CBE, and brand equity in a developing-country setting. By positioning INQ and PSE as complementary customer-perceived stimuli, the study offers context-specific insight into how affective pathways may play a relatively more prominent role in relation to brand equity, operationalized through preferential loyalty, in omnichannel banking.

Keywords: Omnichannel banking, integration quality, perceived seamlessness, utilitarian experience, hedonic experience, customer–bank engagement.
JEL Classification: M31, M37, G21, L86.

1. Introduction

Amid the post-pandemic digital economy, banks are accelerating digital transformation initiatives that reshape operational capabilities and service delivery (Zhu & Jin, 2023). In this context, sustaining long-term brand equity depends not only on technological efficiency but also on customers' evaluations of trust, service consistency, and relational value (Hafez, 2021; Mainardes et al., 2020). As banking continues to digitalize, differentiation increasingly depends on how effectively service interactions are translated into stronger relational and brand outcomes (Al Karim et al., 2024; Kitsios et al., 2021). Concurrently, digital transformation is redefining how financial institutions organize and deliver customer-facing services (Papathomas & Konteos, 2024). In omnichannel environments, where customers engage across multiple interconnected touchpoints, this transformation is accompanied by heightened expectations for responsive and seamless service experiences (Chang & Li, 2022; Massi et al., 2023). In the banking context, integrated service quality across channels has been associated

with stronger relationship quality and brand equity, highlighting the importance of service consistency and cross-channel coherence (Mainardes et al., 2020; Sreejesh, 2024). As customers increasingly move between physical branches, mobile applications, and digital platforms, maintaining seamless cross-channel integration becomes increasingly important for sustaining coherent brand experiences (Mainardes et al., 2020; Massi et al., 2023).

The response to these competitive and experiential challenges has driven banks to move beyond fragmented multichannel configurations toward more fully integrated omnichannel strategies (Buckley & Feldman, 2024). This shift reflects a progression from isolated service points toward integrated customer journeys that maintain brand cohesion and a consistent experience across all touchpoints (Andika et al., 2024). In banking, where service interactions carry high functional expectations and substantial emotional weight, lapses in continuity can directly undermine trust, a core pillar of brand equity (Gerea et al., 2021; Mainardes et al., 2020). Accordingly, omnichannel represents a structural reconfiguration of customer journeys intended to preserve continuity and relational coherence across interactions (Neslin, 2022; Uribe-Linares et al., 2023).

The effectiveness of omnichannel banking depends not only on technological integration but also on how customers evaluate their experiences across channels, both functionally and emotionally (Tran Xuan et al., 2023b). Evidence from multiple sectors suggests that customers' perceptions of these experiences play a pivotal role in determining the effectiveness of omnichannel strategies (Saghiri et al., 2017; Shi et al., 2020). From this perspective, customer experiences – both utilitarian (PUE) and hedonic (PHE) – are not merely immediate interactional responses but function as distinct antecedents of customer–bank engagement (CBE), reflecting customers' cognitive, emotional, and relational connection with the brand (Brodie et al., 2011; Hollebeek, 2011; Rodríguez-Ardura et al., 2024). In service contexts such as banking, engagement can be understood as a key relational mechanism through which experiential evaluations are translated into stronger relational preferences and sustained customer commitment, thereby linking customer experience to brand equity (Hafez, 2021; Peña García et al., 2026). When customers perceive their cross-channel experiences as consistent and valuable – both functionally and affectively – these evaluations can strengthen relational connections by fostering emotional affinity and reinforcing positive brand perceptions. However, prior research has often treated these experiential dimensions as a unified construct, offering limited insight into how cognitive and affective evaluations may operate through distinct psychological pathways (Rodríguez-Ardura et al., 2024; Żyminkowska, 2019). Consequently, it remains unclear how different service-related perceptions shape CBE

processes and, ultimately, brand equity within integrated banking environments, particularly as customers navigate multiple channels in ways that simultaneously engage both rational assessments and emotional responses.

Within this context, experiential pathways are shaped by specific cross--channel service evaluations that function as their underlying stimuli. Integration quality (INQ) and perceived seamlessness (PSE) have been widely recognized as pivotal customer-perceived evaluations of cross-channel service experience in omnichannel settings. Empirical evidence across diverse sectors – including electronics (Asare et al., 2022), and grocery and fashion (Salvietti et al., 2025) – suggests that customers' perceptions of well-coordinated and seamlessly integrated channels enhance their experiences and contribute to sustained competitive advantage. In banking, customers' perceptions of integrated service channels have been associated with more positive experiences and more consistent interactions across touchpoints (Asante et al., 2024; Mainardes et al., 2020), positioning integration as a core element of omnichannel strategy (Sreejesh, 2024). PSE has also been identified as a critical customer-perceived factor influencing customer experiences in online environments (Gao & Jiang, 2024; Massi et al., 2023). However, although INQ and PSE have been examined independently, little research has examined their joint and sequential roles within a unified stimulus–organism–response (S–O–R) framework, particularly in financial services where functional reliability and emotional reassurance coexist (Gao & Jiang, 2024). Given their demonstrated relevance across industries (Riaz et al., 2022; Sharma & Fatima, 2024; Shen et al., 2018), further investigation is needed to clarify how customers' perceptions of cross-channel integration and seamlessness jointly shape experiential pathways, CBE, and brand-related outcomes in banking contexts.

Taken together, these gaps highlight the need for a comprehensive model grounded in the S–O–R framework by positioning INQ and PSE as key customer-perceived stimuli within omnichannel service environments. These evaluations operate sequentially within the S–O–R process, yielding three organism components – PUE, PHE, and CBE – that together capture customers' cognitive, affective, and relational responses. In this framework, both experiential dimensions contribute to engagement, which is positioned here as a central relational mechanism linking customer perceptions to brand equity outcomes in banking contexts. By integrating stimulus differentiation, dual experiential pathways, and relational mediation within a unified model, the study extends prior research that has largely examined these elements in isolation. In doing so, it offers a more nuanced understanding of how customers' perceptions of omnichannel service environments translate into brand-related outcomes in banking contexts.

2. Literature review and hypotheses development

2.1. Omnichannel in retail banking

Digital transformation has reshaped banking service paradigms, integrating physical and digital channels into adaptive, responsive, and value-driven ecosystems (Diener & Špaček, 2021; Shi et al., 2020). Unlike multichannel systems that operate in silos, where service channels function independently with limited coordination or information sharing, omnichannel strategies unify all touchpoints from mobile banking applications to physical branches within a cohesive and integrated architecture. This integration enables customers to switch channels seamlessly while maintaining informational continuity and service consistency (Mainardes et al., 2020; Zhou et al., 2020). Beyond improving operational efficiency, it enhances convenience, accessibility, and the relevance of personalized services (Carbó-Valverde et al., 2024).

Growing expectations for smooth, flexible, and connected experiences demand stronger cross-channel coordination (Chang & Li, 2022; Khalid, 2024). Consequently, omnichannel strategies have become central to global digital transformation in financial institutions (Bueno et al., 2024). However, developing markets face persistent challenges – including system fragmentation, infrastructure gaps, and limited digital literacy – that risk creating disjointed experiences and undermining brand credibility and appeal (Bueno et al., 2024; Moreno-Menéndez et al., 2025).

Success in omnichannel banking relies not only on technology but also on orchestrating cohesive services that align with customers' channel preferences and interaction patterns (Muthaffar et al., 2024; Quach et al., 2022). Cross-channel consistency fosters deeper emotional and cognitive engagement, which, in turn, provides an important psychological foundation for brand equity (Rahman et al., 2025; Sreejesh, 2024). Building on this perspective, prior research indicates that customer experience and engagement are closely intertwined in omnichannel environments and are relevant to downstream relational outcomes (Al Karim et al., 2024; Rahman et al., 2025).

2.2. Stimulus–organism–response framework

The S–O–R framework, introduced by Mehrabian and Russell (1974), provides a robust foundation for explaining how environmental cues influence internal psychological states and, in turn, shape behavioral outcomes. Unlike technology

adoption models such as the technology acceptance model (TAM) or the unified theory of acceptance and use of technology (UTAUT), which focus primarily on rational evaluations underlying initial adoption decisions (Ul Islam et al., 2020), the S–O–R framework incorporates both cognitive and affective dimensions (Hollebeek et al., 2023). This broader perspective is particularly suitable for examining ongoing customer journeys in omnichannel digital banking. In such contexts, interactions occur continuously across interconnected touchpoints, including mobile applications, ATMs, contact centers, social media platforms, and physical branches (Hamouda, 2019).

Within the S–O–R framework, stimuli are customers' interpretations of service-related cues in the service environment. In omnichannel banking, customers continuously interpret and evaluate multiple service interfaces, generating perception-based stimuli that shape their subsequent psychological responses. This study conceptualizes two primary stimuli: INQ and PSE. Both constructs are well established in the omnichannel literature as key dimensions of customers' evaluations of cross-channel service experiences, capturing their subjective assessments of the service environment across channels.

INQ is conceptualized as perceived INQ, defined as customers' subjective evaluation of how well their primary bank aligns information, processes, and service interactions across channels (Alzaydi, 2024; Shen et al., 2018). Importantly, this construct captures customers' perceived cross-channel consistency rather than the bank's underlying technological integration. When integration is perceived as strong, customers experience clarity of information, minimal redundancy, and operational coherence, whereas inconsistencies across channels may create confusion and weaken trust in the institution (Riaz et al., 2022). In this sense, INQ represents a customer-perceived evaluative stimulus that shapes subsequent psychological responses.

Conceptually, INQ shapes customers' perceptions of cross-channel coherence, thereby underpinning a seamless experience. When customers perceive strong cross-channel alignment, transitions between service interfaces are more likely to be experienced as smooth and coherent (Addae et al., 2025; H. N. Nguyen, 2021). Therefore, INQ is expected to enhance PSE in omnichannel environments.

PSE represents a related but distinct evaluation. It captures customers' evaluative judgment of how seamless cross-channel interactions are experienced during service journeys (Shen et al., 2018). In line with the S–O–R framework, PSE is conceptualized as a stimulus that reflects customers' evaluative judgments of cross-channel continuity, rather than as an internal affective state or a behavioral outcome. Whereas INQ assesses coordination, PSE reflects whether interactions feel smooth, uninterrupted, and coherent throughout the service

journey. Prior research indicates that seamless cross-channel experiences enhance overall evaluations and stimulate CBE (Chang & Li, 2022; Hossain et al., 2020). In the present model, PSE is expected to influence CBE indirectly through PUE and PHE. Perceptions of seamlessness are associated with reduced cognitive effort and operational friction, strengthening utilitarian evaluations (e.g., efficiency and task effectiveness). It also fosters comfort and positive affect, thereby enhancing hedonic experience (Tran Xuan et al., 2023b). Together, these two stimuli provide a comprehensive account of how customers appraise and experience omnichannel banking environments.

The organism component of the S–O–R framework represents internal psychological mechanisms that transform perceived stimuli into evaluative and affective states. This study examines three organism constructs: PUE, PHE, and CBE. PUE reflects rational assessments of service performance, including efficiency, speed, and informational accuracy (Chen et al., 2020). PHE captures emotional responses such as enjoyment, comfort, and satisfaction during service interactions (Huber et al., 2018). Although utilitarian and hedonic experiences may reinforce one another (Hollebeek et al., 2023; Zeba et al., 2021), they are conceptually distinct and therefore analyzed separately to clarify their individual contributions. Positive PUE and PHE are expected to intensify customers' cognitive and emotional investment in the brand, thereby fostering greater customer engagement.

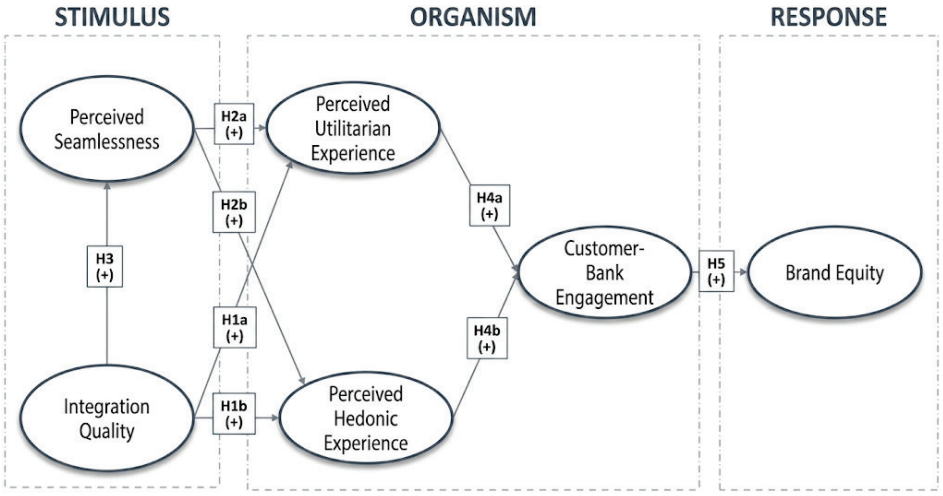
CBE is conceptualized as a higher-order organism-level engagement construct that captures the depth of customers' relational involvement with the brand, encompassing cognitive, emotional, and behavioral expressions (Brodie et al., 2011; Hollebeek, 2011; Salem & Alanadoly, 2024). Within the S–O–R framework, engagement is primarily treated as an internal relational state that develops from customers' evaluative experiences and precedes more stable outcome-level responses, such as loyalty. In this sense, CBE reflects how customers think about, feel toward, and remain mentally connected with the bank, without representing a discrete outcome-level behavior. However, some indicators capture self-reported expressions of engagement intensity in ongoing interactions.

In the context of digital banking, this relational involvement evolves cumulatively through repeated interactions across channels, shaping customers' psychological investment over time (Levy, 2022; Moliner-Tena et al., 2019). Patterns of use – such as more frequent or sustained engagement with a focal bank's omnichannel services – can be seen as expressions of this underlying involvement. Within the S–O–R sequence, CBE is conceptualized as an intervening relational mechanism that links experiential evaluations to brand-related outcomes. It captures how internal relational states are reflected in ongoing interactions without collapsing into loyalty at the level of outcomes.

The response component in this study is operationalized as brand equity, measured through preferential loyalty. Preferential loyalty refers to customers' sustained preference for a particular bank even when alternative providers are available (Yoo & Donthu, 2001). This conceptualization extends beyond mere repeat usage because it captures both cognitive evaluation and affective commitment (Hafez, 2021). In digital banking environments characterized by low switching barriers and growing competition from fintech firms and neo-banks, preferential loyalty represents a critical indicator of durable brand strength (Ho et al., 2025; T. T. C. Nguyen, 2021).

Overall, the proposed model conceptualizes INQ and PSE as customer-level stimuli that shape utilitarian and hedonic experiences. These experiences are expected to foster CBE, which in turn is linked to stronger brand equity (Figure 1). This structure ensures theoretical coherence between the S–O–R framework, the perception-based operationalization of constructs, and the individual-level unit of analysis adopted in this study.

Figure 1. Research model



Source: Authors' own elaboration based on the theoretical framework and literature review.

2.3. Integration quality and customer experience

INQ reflects customers' evaluations of the coherence of service interactions across channels. As a customer-level perceptual evaluation within the S–O–R framework, INQ functions as a stimulus that triggers subsequent cognitive appraisals of cross-channel consistency. By reducing perceived procedural ambigu-

ity and duplication of effort, INQ enhances the efficiency, accuracy, and transactional convenience inherent in PUE (Mainardes et al., 2020; Tran Xuan et al., 2023b). At the same time, when customers perceive interactions as coordinated and predictable across channels, uncertainty and frustration are minimized, fostering a sense of control and comfort that contributes to PHE (Chen et al., 2020). Empirical evidence across service contexts suggests that perceived channel integration enhances both functional evaluations and experiential responses by reinforcing the perception of a unified and reliable service system (Buckley & Feldman, 2024; Quach et al., 2022). In the context of digital banking, where transactions frequently span multiple interfaces, customers' perceptions of integration are particularly salient in shaping their evaluations of service outcomes. Accordingly, INQ is expected to influence both utilitarian and hedonic dimensions of customer experience. Based on this reasoning, the following hypotheses are proposed:

H1a: INQ positively affects PUE in omnichannel banking services.

H1b: INQ positively affects PHE in omnichannel banking services.

2.4. Perceived seamlessness and customer experience

PSE refers to customers' evaluations of seamless cross-channel interactions when moving across service channels. As a customer-perceived evaluation of cross-channel interactions, PSE captures whether cross-channel transitions are experienced as smooth, uninterrupted, and coherent throughout the service journey (Shen et al., 2018). When customers perceive high seamlessness, cross-channel friction is reduced, lowering cognitive effort and enabling faster task completion. This process strengthens perceptions of efficiency and functional effectiveness that underpin PUE (Chandna & Ubba, 2025; Im & Ha, 2018). At the same time, uninterrupted and predictable transitions foster feelings of control, comfort, and emotional reassurance, thereby enhancing PHE (Barwitz & Maas, 2018; Shen et al., 2018). Empirical evidence in omnichannel contexts indicates that perceptions of seamless cross-channel interactions are associated with lower uncertainty and disruption across touchpoints, reinforcing both functional and affective evaluations (Mainardes et al., 2020; Tran Xuan et al., 2023b). Within the S–O–R framework, PSE thus functions as a stimulus that shapes both utilitarian and hedonic experiential responses in omnichannel banking. Drawing on the above theoretical arguments and empirical evidence, the following hypotheses are formulated:

H2a: PSE positively affects PUE in omnichannel banking services.

H2b: PSE positively affects PHE in omnichannel banking services.

2.5. Integration quality and perceived seamlessness

INQ is conceptually positioned as an antecedent to PSE in the context of omnichannel banking. When customers perceive that information, processes, and interactions are consistently aligned across digital and physical channels, cross-channel transitions are less likely to be perceived as fragmented or disjointed. Instead, customers cognitively integrate these interactions into a coherent service journey, which strengthens their perception of continuity across touchpoints (Buckley & Feldman, 2024). In other words, INQ reduces the salience of channel boundaries and supports the experience of fluid movement within the service ecosystem. Prior research in omnichannel environments indicates that higher perceived channel integration enhances customers' perceptions of cross-channel unity and continuity (Shen et al., 2018; Zhang et al., 2018). Empirical studies in banking contexts further confirm that INQ significantly predicts stronger PSE during service interactions (Andika et al., 2024; Tran Xuan et al., 2023b). Taken together, these theoretical arguments and empirical findings suggest that customers who perceive greater cross-channel integration are more likely to perceive service transitions as seamless. Based on this reasoning, the following hypothesis is proposed:

H3: INQ positively affects PSE in omnichannel banking services.

2.6. Customer experience and customer–bank engagement (CBE)

CBE represents a higher-order organism-level engagement construct that develops from customers' evaluative experiences with a service provider. Within the S–O–R framework, PUE contributes to engagement through cognitive mechanisms. When customers appraise their banking interactions as efficient, reliable, and instrumental in achieving their goals, they develop sustained cognitive involvement and attentional focus, reinforcing CBE. Such rational evaluations reinforce perceptions of competence and value, thereby strengthening customers' willingness to maintain an active relational orientation toward the institution (Bozkurt et al., 2022). In this way, utilitarian experience fosters engagement by solidifying customers' confidence in the brand's functional performance.

PHE, by contrast, enhances CBE through affective pathways. Emotional responses such as enjoyment, comfort, and satisfaction deepen customers' emotional attachment to the brand and intensify their sense of relational closeness with it (Kang, 2019; Wang & Ramasamy, 2023). Positive affect not only enriches the immediate interaction but also contributes to the formation of enduring

relational bonds that characterize engagement (Tran Xuan et al., 2023a). Empirical evidence suggests that PUE and PHE represent complementary yet distinct drivers of CBE formation (Rodríguez-Ardura et al., 2024). These cognitive and affective responses shape customers' internal relational states and may be expressed through ongoing interaction patterns within the service context. Based on this reasoning, the following hypotheses are proposed:
H4a: PUE positively affects CBE in omnichannel banking services.
H4b: PHE positively affects CBE in omnichannel banking services.

2.7. Customer–bank engagement and brand equity

Brand equity represents the added value consumers perceive in relation to a brand, shaping preference, loyalty, and long-term competitiveness (Keller, 2020). Within this framework, CBE is key in establishing enduring relationships between consumers and brands (Andika & Anisah, 2025; Tran Xuan et al., 2023a). CBE reflects the depth of customers' cognitive, emotional, and relational connections to the brand, reinforcing trust, preference, loyalty, and willingness to recommend it (Brodie et al., 2011; Hollebeek, 2011). Accordingly, CBE is treated as an engagement mechanism that precedes brand-related outcomes, rather than as an outcome-level preference in its own right. When consumers exhibit greater engagement, they tend to maintain closer relationships with the brand and report more favorable loyalty-related outcomes (Gao & Huang, 2021; Tran Xuan et al., 2023a). Related research suggests that engagement-related mechanisms and integrated service quality are associated with stronger brand--related outcomes, although evidence examining this relationship specifically within omnichannel banking remains limited (Akter et al., 2024; Al Karim et al., 2024). Based on this empirical evidence and the identified research gap, the following hypothesis is proposed:
H5: CBE in omnichannel banking services positively affects brand equity.

3. Research methodology

3.1. Survey design and measurement development

This study employed a quantitative, descriptive, cross-sectional design to examine perception-based constructs and their structural relationships at a single point in time. A cross-sectional design is appropriate because the study assesses customers' current perceptions and the relationships among the latent constructs

at one point in time. The research context is highly relevant given the rapid expansion of mobile banking, internet banking, and Quick Response Code Indonesian Standard (QRIS) payments in Indonesia, which together form an increasingly integrated and complex omnichannel service ecosystem within the national banking industry (Andika et al., 2024; Christian et al., 2024).

The study population consisted of Indonesian bank customers who used omnichannel services. Due to the lack of a complete population frame, this study employed non-probability purposive sampling, which is suitable for examining experience-based constructs requiring specific respondent exposure (Mainardes et al., 2020). At the same time, because respondents were selected based on relevance rather than probability, the resulting sample is better understood as providing analytically useful evidence from qualified users than as a basis for broad population-level inference. Inclusion criteria required respondents to use at least two banking service channels – whether physical (e.g., branch offices or ATMs) or digital (e.g., mobile banking or call centers) – and to be at least 17 years of age. A screening question confirmed that respondents were customers of banks offering omnichannel services; responses indicating otherwise were automatically excluded.

To ensure alignment between the theoretical framework and the unit of analysis, respondents were first instructed to identify the bank they use most frequently. The questionnaire explicitly directed them to answer all subsequent items with reference to that selected institution. The survey included the following instruction: "Please identify the bank you use most frequently. When answering the following statements, please refer specifically to this bank." In the questionnaire, the phrase "this bank" referred explicitly to the bank each respondent identified at the beginning of the survey. Respondents were instructed to anchor all evaluations to the selected institution when answering the questionnaire items. Accordingly, all constructs were operationalized as individual-level evaluations of a specific bank, anchored in respondents' selected bank. Although respondents evaluated different banking institutions, institutional variation was not explicitly modeled, as the study's theoretical focus is on customer-level perceptual mechanisms within the S–O–R framework, with emphasis on individual evaluations rather than firm-level performance comparisons. Consequently, cross-bank differences were not explicitly controlled in the structural model. The research design was therefore explicitly structured at the individual level, ensuring that all constructs represent subjective evaluations of a single, self-identified banking institution.

The minimum sample size was determined using an a priori power analysis in G*Power (version 3.1.9.7) based on a linear multiple regression model (fixed model, R^2 deviation from zero). The parameters used were a power level of 0.90,

a significance level of 0.05, a medium effect size ($f^2 = 0.15$), and five predictors. An *a priori* power calculation indicated a minimum sample requirement of 123 respondents (Cohen, 1988; Hair et al., 2010). Linear multiple regression was used as a conservative proxy, in accordance with established SEM guidelines, to estimate the minimum sample size for structural modeling. The target sample size was set above this threshold to account for potential data screening and to enhance estimation precision.

The research instrument was developed from six primary constructs, grounded in a strong theoretical foundation from studies on omnichannel service and digital consumer behavior. The constructs were selected based on a conceptual framework mapping customer experience into three main domains: service integration, experiential seamlessness, and customer-brand relationships. INQ was operationalized as a second-order construct consisting of service choices through multiple channels (ISC), service information transparency (IIT), content consistency (ICC), and process consistency (IPC), adapted from Sousa and Voss (2006). Consistent with the theoretical framing, INQ captures customers' evaluations of the perceived integration of service channels in their primary bank.

The formation of PSE, a second-order construct, comprises the dimensions of task ability (STA), content ability (SCO), interaction ability (SIA), cognitive ability (SCA), and emotional ability (SEA), adapted from Shen et al. (2018). Omnichannel CBE encompasses cognitive, emotional, and behavioral dimensions of engagement, as outlined by Tran Xuan et al. (2023a). In addition, PUE and PHE were each measured using three items (Tran Xuan et al., 2023b), while brand equity was assessed with three items representing preferential loyalty, adapted from Hafez (2021) and Yoo & Donthu (2001).

All measurement scales were adapted using a back-translation procedure involving professional translators and academic researchers to ensure semantic equivalence across languages and cultural contexts. The translated items were subsequently reviewed by marketing scholars to confirm their content relevance and conceptual clarity. All items were measured using a four-point Likert-type scale (1 = strongly disagree; 4 = strongly agree), with a forced-choice format to reduce neutral responses and encourage more discriminating evaluations in perception-based assessments. The detailed measurement items for each construct are presented in Table 2, while Appendix reports the survey anchoring instruction and response scale used in the study.

Data collected via a Google Forms-based online questionnaire enabled broad geographical coverage across various regions in Indonesia. Before the primary distribution, the instrument was pilot-tested with 30 respondents to assess readability, clarity of instructions, and item interpretation. Feedback indi-

cated that all items were well understood, and no major revisions were necessary. The primary distribution was conducted from March to June 2024 via social media, personal networks, and relevant digital communities. The online distribution strategy enabled a broad geographic reach, although it may have increased representation among digitally active users. Of the 308 responses collected, 23 were eliminated for failing to meet the inclusion criteria or for being identified as outliers. This rigorous screening process resulted in 285 valid responses for analysis, a sample size substantially exceeding the *a priori* calculation.

The questionnaire also gathered demographic information, including gender, age, education level, monthly income, bank used, service channels accessed, and region of residence. These variables were used for sample profiling and descriptive analysis. Overall, the research design was structured to maintain consistency between the theoretical framework, measurement operationalization, and analytical procedures.

Participation in the online survey was voluntary; informed consent was obtained before participation, and responses were collected anonymously and treated confidentially.

3.2. Data analysis

Data analysis was conducted in three interconnected stages: descriptive analysis, measurement model evaluation, and structural model testing. Descriptive analysis was performed using IBM SPSS Statistics (v. 25) to profile respondents' demographics and examine the distribution of each indicator using skewness and kurtosis. An assessment utilizing a ±2 threshold for skewness and kurtosis (Hair et al., 2022) revealed that two constructs exceeded this range, indicating departures from multivariate normality. This does not pose a problem for partial least squares structural equation modeling (PLS-SEM), which does not assume normality and relies on nonparametric bootstrapping for significance testing. This condition, combined with the presence of reflective–formative constructs in the model, supports the use of variance-based PLS-SEM, which is designed to provide stable parameter estimates when data distributions are imperfect (Hair et al., 2022; Henseler et al., 2016).

The estimation procedure in PLS-SEM assumes that individual observations are independent and identically distributed (i.i.d.), consistent with standard practice in variance-based structural modeling (Sarstedt et al., 2021). As a fixed--effects approach, PLS-SEM does not incorporate random effects and is considered robust to violations of multivariate normality (Rigdon, 2016). Instead, it

employs nonparametric resampling through bootstrapping to estimate the precision and stability of path coefficients, without relying on strict distributional assumptions (Henseler et al., 2016). Because the present study relies on non-probability purposive sampling, the resulting estimates are best understood as sample-based evidence of the structural relationships among the focal constructs. They should therefore be interpreted with caution when considering broader population-level inference. This distribution-free nature makes PLS-SEM particularly suitable for analyzing complex models with both reflective and formative constructs, especially when the underlying data deviate from normality (Hair et al., 2022).

The measurement and structural models were tested using SmartPLS 4. The choice of PLS-SEM was based on the characteristics of the research model, which includes six latent constructs – three higher-order reflective–formative and three lower-order reflective – and structural relationships involving multiple paths. Following Hair et al. (2022), this approach is appropriate for predictive models with mixed measurement types, as the evaluation procedures are aligned with the nature of each construct: reflective constructs were assessed using indicator reliability, internal consistency reliability (composite reliability (CR) $\geq$ 0.70), convergent validity (average variance extracted (AVE) $\geq$ 0.50), and discriminant validity (heterotrait–monotrait ratio (HTMT) $\leq$ 0.85–0.90), while formative constructs were evaluated through multicollinearity testing (variance inflation factor (VIF) $\leq$ 3.3) and the significance and relevance of indicator weights (outer weights and outer loadings). This approach offers flexibility in handling varying indicator contributions, ensures stable estimates in complex models, and aligns the analysis with both the data characteristics and the research objectives.

4. Research results

4.1. Profile of the sample

The study involved 285 respondents, with a balanced gender composition (49.82% male and 50.18% female). The sample was predominantly young (59.65% aged 17-26 years) and 29.82% aged 27-42 years. Most respondents held a diploma or bachelor's degree (40.70%), followed by postgraduate qualifications (32.28%) and high school education (27.02%). Students constituted the largest occupational group (53.33%), followed by lecturers or teachers (22.11%) and private-sector employees (11.23%). Regarding the bank most frequently used by respondents, Bank Rakyat Indonesia accounted for 46.3% of the sample, followed by Bank Central Asia (12.3%), Bank Syariah Indonesia (11.9%), Bank

Mandiri (11.6%), and Bank Negara Indonesia (11.2%), with the remainder distributed across other institutions. ATMs (44.56%) and mobile banking (37.19%) were the most frequently used service channels, and the reported frequency of omnichannel usage was relatively evenly distributed across channels. A detailed breakdown of respondent characteristics is presented in Table 1.

Table 1. Profile of respondents (n = 285)

Category	Subcategory	Frequency	Percentage (%)
Gender	Male	142	49.82
	Female	143	50.18
Age (years)	17-26	170	59.65
	27-42	85	29.82
	43-58	24	8.42
	>58	6	2.11
Educational level	High School	77	27.02
	Diploma/bachelor's	116	40.70
	Master's/doctoral degree	92	32.28
Current employment status	Student	152	53.33
	Self-employed	20	7.02
	Private employee	32	11.23
	ASN/TNI/POLRI	5	1.75
	Lecturer /teacher	63	22.11
	Other	13	4.56
Most frequently used bank	Bank Rakyat Indonesia (BRI)	132	46.3
	Bank Central Asia (BCA)	35	12.3
	Bank Mandiri	33	11.6
	Bank Syariah Indonesia (BSI)	34	11.9
	Bank Negara Indonesia (BNI)	32	11.2
	Bank CIMB Niaga	5	1.8
	Bank Tabungan Negara (BTN)	4	1.4
	Other	10	3.5
Most frequently used banking channel	ATM	127	44.56
	Internet banking	30	10.53
	Mobile banking	106	37.19
	Social media bank	4	1.40
	Branch offices	18	6.32
Frequency of using omnichannel banking services	Often	76	26.67
	Sometimes	71	24.91
	Rarely	75	26.32
	First time	63	22.11
Total		285	100

Note: "First time" refers to respondents' first use of a specific omnichannel service combination during the reference period. It does not refer to first-time use of banking channels in general. All respondents had prior experience using at least two banking service channels, in accordance with the study's inclusion criteria.

Source: Authors' own elaboration based on survey data.

4.2. Common method bias (CMB)

Because all variables were measured using self-reported responses collected at a single point in time, common method bias (CMB) represents a potential concern. To mitigate this risk, both procedural and statistical remedies were implemented in accordance with established methodological recommendations (Podsakoff et al., 2012).

At the procedural stage, several preventive measures were implemented prior to data collection. Participation in the survey was voluntary and anonymous, thereby reducing evaluation apprehension and social desirability bias. Respondents were informed that there were no right or wrong answers and were encouraged to provide honest evaluations. All items were formulated using neutral and non-leading wording to minimize acquiescence bias. Although items were grouped by construct to enhance clarity and reduce respondent confusion, no explicit information regarding the hypothesized relationships among constructs was disclosed. These design features aimed to reduce respondents' tendency to provide systematically consistent responses in line with perceived research expectations (Bartell & Spyridakis, 2012; Podsakoff et al., 2012).

Following data collection, statistical analyses were conducted to further evaluate the potential influence of CMB. First, Harman's single-factor test was performed using an unrotated exploratory factor analysis (Harman, 1960). The first factor accounted for 46.52% of the total variance, which is below the commonly referenced threshold of 50%. Second, full collinearity VIFs were calculated for each latent construct in the PLS-SEM model (Kock et al., 2021). All inner VIF values ranged from 1.000 to 3.274, remaining below the 3.3 threshold recommended for detecting potential common method bias in variance-based structural models (Kock, 2017).

Although statistical diagnostics such as Harman's single-factor test have well-recognized limitations and cannot fully rule out common method variance (Podsakoff et al., 2003), combining procedural safeguards with multiple statistical checks reduces the likelihood that CMB materially inflates the observed relationships. Therefore, while CMB cannot be eliminated in single-source designs, it is unlikely to threaten the validity of the study's conclusions.

4.3. Evaluation of measurement models

The disjoint two-stage approach was employed to estimate higher-order reflective–formative constructs (Type II) based on respondents' perceived evaluations of their selected bank. Consistent with the S–O–R framework, all constructs are

specified at the individual level to capture customers' internal evaluative and relational states, not objective service characteristics or observable behavioral outcomes. Separating the evaluation of first-order and second-order constructs allows for more controlled testing, reduces estimation complexity, and minimizes the risk of inflated loadings (Hair et al., 2022; Sarstedt et al., 2019). All first-order constructs were analyzed as reflective in the first stage to ensure their reliability and validity. The latent scores obtained in this stage were then used as formative indicators to form the second-order constructs in the subsequent stage.

4.3.1. First-order measurement model assessment

The evaluation of the first-order constructs covered three key aspects: internal reliability, convergent validity, and discriminant validity. The results of the first-order measurement model assessment are presented in Table 2. The retained first-order constructs demonstrate satisfactory internal consistency and convergent validity. Initial results indicated that all constructs met internal reliability and convergent validity criteria. However, discriminant validity testing using the HTMT is more sensitive than the Fornell–Larcker approach (Henseler et al., 2015), indicating a potential lack of discriminant validity.

Table 2. First-order measurement model assessment

Construct (source)	Measurement items	Loading	CR	AVE
1	*2*	*3*	*4*	*5*
Brand equity (Hafez, 2021; Yoo & Donthu, 2001) (reflective)	BE1. I tend to choose this bank's services even when the quality is similar to other banks'.	0.88	0.93	0.815
	BE2. This bank remains the best option even when other banks offer comparable services.	0.927		
	BE3. I feel a sense of closeness and personal commitment to this bank.	0.901		
Customer–bank engagement (CBE) (Tran Xuan et al., 2023a) (reflective–formative)	ESC (social connection)		0.889	0.8
	ESC1. I use this bank's omnichannel services more frequently than those of other banks.	0.878		
	ESC2. I spend more time using this bank's omnichannel services than those of other banks.	0.911		
	EEP (enthused participation)		0.929	0.867
	EEP1. I feel positive when interacting with this bank.	0.932		
	EEP2. Interacting with this bank makes me feel happy.	0.931		
	ECA (conscious attention)		0.918	0.788
	ECA1. This bank's omnichannel services often come to mind.	0.88		
	ECA2. I think about this bank whenever I use its omnichannel services.	0.913		
	ECA3. This bank's omnichannel services make me want to learn more about it.	0.869		

Table 2 cont.

1	*2*	*3*	*4*	*5*
Perceived seamlessness (PSE) (Shen et al., 2018) (reflective–formative)	SCA (cognitive ability)		0.897	0.813
	SCA1. My understanding of transactions remains consistent after switching channels.	0.893		
	SCA2. I can complete transactions accurately after switching channels.	0.91		
	SCC (cross-channel content ability)		0.903	0.7
	SCC1. My transaction experience feels smooth and well-connected across all channels.	0.83		
	SCC2. I am not confused when selecting services across different channels.	0.831		
	SCC3. I can access the same information when moving to a new channel.	0.819		
	SCC4. I can easily locate information I previously viewed after switching channels.	0.866		
	SEA (emotional ability)		0.935	0.877
	SEA1. My level of satisfaction remains consistent after switching channels.	0.937		
	SEA2. My level of liking for the service remains consistent across channels.	0.937		
	STA (task ability)		0.936	0.879
	STA1. I can transfer transactions smoothly between channels.	0.936		
	STA2. I can complete transactions seamlessly when moving between channels.	0.939		
Integration quality (INQ) (Sousa & Voss, 2006) (reflective–formative)	ISC (service choices through multiple channels)		0.886	0.722
	ISC1. I can access this bank's services through various channels.	0.833		
	ISC2. I can choose how to conduct transactions (e.g., online, via a mobile app, or at a branch).	0.873		
	ISC3. I can obtain information from this bank through any channel I choose.	0.843		
	IIC (integration consistency)		0.899	0.691
	IIC1. The information I receive is the same regardless of the channel I use.	0.823		
	IIC2. My communications are addressed regardless of the channel used.	0.805		
	IIC3. My service experience is consistent whether I use a branch, Internet banking, or mobile banking.	0.892		
	IIC4. This bank's services remain consistent across all channels	0.801		
	IIT (service information transparency)		0.903	0.823
	IIT1. I am aware of the various services offered by this bank.	0.908		
	IIT2. I understand the differences between online services and in-branch services.	0.907		
Perceived hedonic experience (PHE) (Tran Xuan et al., 2023b) (reflective)	PHE1. I feel satisfied with this bank's integrated services.	0.907	0.93	0.817
	PHE2. Using this bank's services makes me feel happy.	0.901		
	PHE3. I feel comfortable using this bank's services across multiple channels.	0.904		

Table 2 cont.

1	*2*	*3*	*4*	*5*
Perceived utilitarian experience (PUE)	PUE1. This bank's services provide me with substantial benefits.	0.845	0.904	0.758
	PUE2. This bank's services help me save time.	0.912		
(Tran Xuan et al., 2023b)	PUE3. I feel supported when using this bank's services.	0.854		
(reflective)				

Source: Authors' own elaboration using SmartPLS analysis.

Specifically, two pairs of constructs recorded HTMT values exceeding the conservative threshold of 0.90: ICC and IPC within INQ, and SIA and SCO within PSE. Although originally conceptualized as distinct dimensions, closer theoretical examination suggests substantial conceptual overlap in the context of omnichannel banking. In highly regulated financial service environments, informational consistency and procedural consistency are operationally intertwined, as standardized systems integrate content delivery and transaction processes across channels. Consequently, customers may perceive these aspects as a unified evaluation of cross-channel coherence rather than as separate dimensions (Shen et al., 2018; Sousa & Voss, 2006).

Similarly, SIA and SCO both reflect customers' perceived continuity in their understanding, access, and navigation of information across channels. Although the original scale conceptualizes these dimensions as distinct, their empirical distinction may be context-dependent. In the present study, respondents did not clearly differentiate between interactional and informational continuity when evaluating their omnichannel banking experiences, which may explain their empirical proximity. Although prior research has successfully distinguished these dimensions in other settings (Tran Xuan et al., 2023a), the current findings suggest that their perceptual separation may vary across samples and contextual conditions.

The merging decision was made after inspecting the HTMT results and is therefore data-driven; however, it was treated as a context-specific measurement refinement rather than as a theoretical redefinition of the constructs. This adjustment does not invalidate the original conceptual distinctions but ensures that the measurement model satisfies discriminant validity requirements within the present sample. The original dimensional structure remains theoretically valid and may be retained in other empirical contexts. Following the recommendations of Hair et al. (2022) and Henseler et al. (2015), ICC and IPC were combined into integration consistency (IIC), while SIA and SCO merged into a single dimension labeled cross-channel content ability (SCC). This re-specification improves

discriminant validity while preserving theoretical coherence and contextual relevance. The re-specification was completed at the measurement model stage, before structural model estimation. No structural relationships were modified as a result of this re-specification.

After the merging process, discriminant validity was re-evaluated using the HTMT index, and the results are presented in Table 3. All HTMT values were below the 0.90 threshold, indicating adequate discriminant validity. Re-assessment of internal reliability and convergent validity, as reported in Table 2, also produced indicator outer loadings ranging from 0.805 to 0.939, CR values between 0.886 and 0.936, and AVE values between 0.691 and 0.879. All of these values exceed the recommended thresholds (outer loading > 0.70; CR > 0.70; AVE > 0.50) (Hair et al., 2019), confirming that the first-order constructs are both valid and reliable. These results indicate that respondents consistently evaluated their cross-channel experiences with the selected bank across all measured dimensions.

Table 3. Discriminant validity assessment (HTMT)

Constructs	ESC	ECA	SCA	SEA	SCC	STA	ISC	IIC	IIT	EEP
ESC	–									
ECA	0.858	–								
SCA	0.681	0.606	–							
SEA	0.661	0.533	0.843	–						
SCC	0.626	0.544	0.836	0.713	–					
STA	0.416	0.377	0.638	0.483	0.844	–				
ISC	0.506	0.512	0.684	0.585	0.799	0.753	–			
IIC	0.676	0.59	0.849	0.716	0.888	0.737	0.82	–		
IIT	0.587	0.561	0.711	0.599	0.861	0.727	0.853	0.895	–	
EEP	0.732	0.77	0.729	0.673	0.713	0.59	0.698	0.705	0.701	–

Source: Authors' own elaboration using SmartPLS analysis.

4.3.2. Second-order measurement model assessment

Second-order constructs were specified as reflective–formative (Type II) and estimated using the disjoint two-stage approach. In the second stage, latent variable scores derived from the validated first-order constructs were used as formative indicators of their respective higher-order constructs. The results of the second-order measurement model assessment, including multicollinearity diagnostics (VIF), outer weights, and their statistical significance, are presented in Table 4. Because formative measurement requires assessing multicollinearity among indicators, VIFs were examined to ensure that collinearity did not bias weight

estimation. As reported in Table 4, all VIF values were below the conservative threshold of 3.3, indicating the absence of critical multicollinearity issues and supporting the adequacy of the formative specification (Hair et al., 2022; Sarstedt et al., 2019).

Table 4. Second-order measurement model assessment

Second-order constructs	First-order constructs	VIF	Weights	*t*-values
Customer–bank engagement (CBE)	ESC. Social connection	2.005	0.419	6.153***
	EEP. Enthused participation	1.885	0.572	8.096***
	ECA. Conscious attention	2.361	0.147	2.015*
Perceived seamlessness (PSE)	SCA. Cognitive ability	2.398	0.231	2.631**
	SCC. Cross-channel content ability	3.099	0.428	5.17***
	SEA. Emotional ability	2.062	0.236	2.550*
	STA. Task ability	2.13	0.28	4.049***
Integration quality (INQ)	ISC. Service choices through multiple channels	2.16	0.29	3.469**
	IIC. Integration consistency	2.48	0.563	6.752***
	IIT. Service information transparency	2.473	0.255	2.722**

Note: *p < .05; **p < .01; ***p < .001.

Source: Authors' own elaboration using SmartPLS analysis.

The relevance and contribution of each formative dimension were evaluated based on the magnitude and statistical significance of the outer weights reported in Table 4, estimated via bootstrapping with 5,000 resamples. All outer weights were positive and statistically significant ($p < 0.05$), indicating that each dimension contributes meaningfully to the formation of its higher-order construct. In formative measurement models, outer weights represent the relative contribution of each dimension to the composite construct; therefore, statistically significant weights indicate the relevance of retaining all specified dimensions within the present model configuration (Sarstedt et al., 2019). No formative dimensions exhibited non-significant weights; accordingly, no further re-specification was required at the higher-order level.

Specifically, within the CBE construct, all three dimensions (ESC, ECA, and EEP) contributed positively and significantly (Table 4), with EEP showing the largest weight (0.572), indicating that affective enthusiasm represents the strongest formative driver of overall CBE in this context. Collectively, these dimensions reflect different manifestations of customers' underlying engagement state, encompassing how they think about, feel toward, and remain dispositionally oriented toward the bank within an ongoing relationship. In this specification, the social connection dimension is interpreted as a self-reported relational expression of engagement intensity within an ongoing customer–bank relation-

ship, rather than as a direct representation of outcome-level behavior. Although the weight of ECA was comparatively smaller, its statistical significance indicates that conscious attention remains a meaningful, albeit less dominant, component of engagement formation in omnichannel banking.

For PSE, all four dimensions (SCA, SCC, SEA, and STA) contributed significantly (Table 4), with SCC exhibiting the highest relative weight (0.428), suggesting that clarity and continuity of content across channels play a central role in shaping PSE. Within INQ, IIC displayed the largest weight (0.563) (Table 4), underscoring the importance of consistent cross-channel information and service processes in forming customers' overall perceptions of INQ.

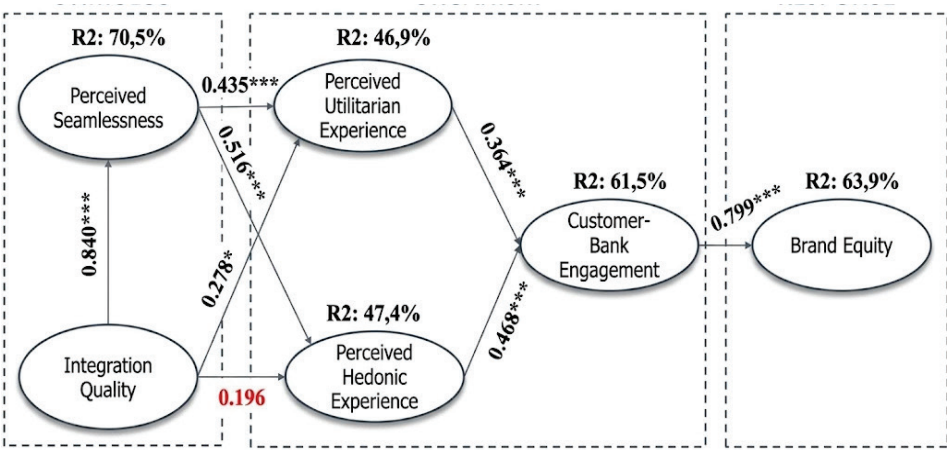
Taken together, these results, as summarized in Table 4, support the statistical adequacy of the reflective–formative higher-order constructs within the present model specification. All formative dimensions exhibit significant and positive weights, confirming their meaningful contribution to the formation of the respective higher-order constructs. These results reflect the measurement structure observed in the present sample, including the context-specific refinements applied at the first-order level. They, therefore, should be understood as empirical support for the specified model configuration.

4.4. Structural model

The structural model was evaluated in accordance with the guidelines of Hair et al. (2019). Path coefficients were tested using bias-corrected and accelerated (BCa) bootstrapping with 5,000 subsamples. A two-tailed significance test at the 5% level (critical t = 1.96) was applied to assess the hypothesized relationships among constructs. Bootstrapping provides robust estimates of standard errors and confidence intervals without relying on distributional assumptions.

In addition to examining path significance, the coefficient of determination (R^2) was used to assess the model's explanatory power, with values of 0.25, 0.50, and 0.75 indicating weak, moderate, and substantial levels of explanatory power, respectively (Hair et al., 2019). Figure 2 provides a visual summary of the estimated relationships, while the detailed structural model results are presented in Table 5.

Figure 2. Structural model



Note: *p < .05; ***p < .001.

Source: Authors' own elaboration based on the SmartPLS 4 structural model results.

Table 5. Structural model hypothesis testing

Hypothesis/path		Original sample	*t* value	Decision	2.5% CI LL	97.5% CI UL
H1a	INQ → PUE	0.278	2.275*	Supported	0.022	0.501
H1b	INQ → PHE	0.196	1.610	Not supported	−0.05	0.433
H2a	PSE → PUE	0.435	4.075***	Supported	0.24	0.663
H2b	PSE → PHE	0.516	4.532***	Supported	0.3	0.746
H3	INQ → PSE	0.840	42.79***	Supported	0.798	0.876
H4a	PUE → CBE	0.364	4.504***	Supported	0.202	0.522
H4b	PHE → CBE	0.468	5.662***	Supported	0.307	0.631
H5	CBE → Brand equity	0.799	32.981***	Supported	0.753	0.848

Note: LL = lower limit; UL = upper limit; *p < .05; ***p < .001.

Source: Authors' own elaboration based on SmartPLS 4 bootstrapping results.

The results indicate that INQ is positively related to PUE (β = 0.278; p < < 0.05), supporting H1a. However, its relationship with PHE is not statistically significant (β = 0.196; p > 0.05), thereby rejecting H1b. In contrast, PSE is positively associated with both PUE (β = 0.435; p < 0.001) and PHE (β = 0.516; p < < 0.001), supporting H2a and H2b.

Furthermore, INQ is strongly associated with PSE (β = 0.840; p < 0.001), supporting H3. Both PUE (β = 0.364; p < 0.001) and PHE (β = 0.468; p < 0.001) are positively related to CBE, supporting H4a and H4b. Finally, CBE shows a strong positive relationship with brand equity (β = 0.799; p < 0.001), supporting H5.

The R^2 values indicate moderate to substantial explanatory power for brand equity (0.639), CBE (0.615), and PSE (0.705), while PHE (0.474) and PUE (0.469) show moderate explanatory levels. Overall, the structural model demonstrates satisfactory explanatory capability within the proposed S–O–R framework.

5. Discussion

The findings suggest that INQ is positively associated with PUE but is not significantly associated with PHE. This pattern aligns with prior research indicating that customers' perceptions of channel integration are closely linked to efficiency, reliability, and transactional convenience (Mainardes et al., 2020; Tran Xuan et al., 2023b). However, it diverges from findings in more experiential retail settings, where integration often correlates with affective responses (Chen et al., 2020). From an S–O–R perspective, INQ appears to be more strongly aligned with the cognitive appraisal pathway than with the affective pathway. Customers primarily evaluate cross-channel alignment in functional terms, emphasizing clarity and operational reliability. In the context of digital banking, where transactions are closely associated with accuracy, security, and risk minimization, this emphasis on functional performance may help explain the absence of a significant hedonic relationship.

In contrast, PSE is positively associated with both PUE and PHE, with a stronger association with PHE. This finding is broadly consistent with prior work by Shen et al. (2018) and Tran Xuan et al. (2023b), which similarly reported that customers' perceptions of smooth cross-channel transitions are associated with lower friction and greater emotional comfort. From an S–O–R perspective, this pattern may be interpreted as consistent with the view that perceptions of seamlessness function as a stimulus that shapes both cognitive evaluations and affective responses. Unlike INQ, which is evaluated primarily in terms of coordination across channels, PSE reflects how smoothly those channels connect during service transitions, which helps explain its relevance to both utilitarian and hedonic responses. This pattern may be particularly salient among digitally active users, for whom frequent channel switching underscores the importance of smooth, uninterrupted service experiences.

The results further show that INQ is positively related to PSE. This finding is consistent with prior research indicating that perceived alignment and coordination across channels are associated with stronger perceptions of seamlessness across touchpoints (Andika et al., 2024; Li & Gong, 2024; Zhang et al., 2018).

Within this study, INQ and PSE can be understood as sequential evaluative stages, with INQ reflecting customers' assessments of cross-channel alignment and PSE capturing how smoothly that alignment is experienced during service transitions. The relatively strong relationship between the two constructs points to a close empirical connection in this context. This pattern suggests that perceived integration plays an important role in shaping seamless experiences, as coordinated service systems tend to reduce perceived cross-channel fragmentation. This pattern may also be influenced by the sample composition, including a significant representation of respondents from one bank (46.3%), which could shape how integration and seamlessness are jointly evaluated.

The findings further suggest that both PUE and PHE are positively associated with CBE, with PHE showing a somewhat stronger association. This result is consistent with prior findings indicating that emotional value is often more closely linked to engagement than purely functional benefits (Rodríguez-Ardura et al., 2024; Singh & Milan, 2025). Within the S–O–R model, this pattern aligns with the proposition that affective states may serve as important organismic mechanisms linking customer-perceived service stimuli to relational outcomes. Although functional efficiency remains important, emotional resonance appears more closely linked to customers' cognitive involvement and attachment to the bank, and is reflected in more sustained omnichannel interactions. Although engagement may be reflected in customers' ongoing interaction patterns, these expressions are interpreted as manifestations of underlying relational involvement rather than as outcome-level behaviors. This tendency may be especially salient in a sample such as this one, composed largely of younger, more digitally engaged respondents, for whom emotional differentiation may be more relevant in shaping engagement.

Finally, CBE is also positively associated with brand equity, with a relatively strong relationship observed in the present sample. This finding is broadly consistent with prior research suggesting that engagement-related mechanisms are associated with stronger brand-related outcomes (Akter et al., 2024; Al Karim et al., 2024). Within the S–O–R framework, CBE may be interpreted as an organism-level relational link that connects utilitarian and hedonic evaluations to brand-related outcomes. Rather than emerging solely from efficient service delivery, brand equity appears more closely linked to customers' accumulated cognitive, emotional, and interaction-based engagement with the bank. These interpretations should be understood as reflecting the characteristics of the present sample – drawn from multiple banks, with a substantial concentration of responses from one institution and a predominance of younger and student respondents – rather than as uniform patterns across the banking sector as a whole.

6. Conclusions

6.1. Summary of findings

This study synthesizes evidence on how INQ and PSE operate within the S–O–R framework in omnichannel banking. The findings suggest that INQ is primarily associated with the cognitive pathway, as evidenced by stronger utilitarian evaluations of service efficiency and reliability, without significantly influencing PHE. In contrast, PSE appears to be associated with both cognitive and affective pathways, with a stronger association with PHE and a positive association with PUE. These experiential dimensions are, in turn, associated with CBE within the present sample to varying degrees, with PHE showing the stronger association. CBE, in turn, may be interpreted as an intervening relational mechanism linking utilitarian and hedonic evaluations to brand equity, operationalized as preferential loyalty. Overall, the results suggest that, within the context of this study, brand equity is associated not only with customers' perceptions of cross-channel integration and seamlessness but also with the positive utilitarian and affective evaluations associated with these perceptions. These patterns likely reflect the specific characteristics of the present sample, which was drawn from multiple banks but featured substantial representation from a single institution alongside a demographic predominance of younger, student respondents. In addition, given the use of non-probability purposive sampling, the findings are best interpreted as sample-based evidence rather than as a basis for broader population-level inference.

This study offers several theoretical contributions. First, it advances the application of the S–O–R framework in omnichannel banking by clarifying how INQ and PSE, as conceptually related customer-level stimuli, may be interpreted as contextually differentiated without implying strict separation. Second, it contributes to the customer experience literature by providing evidence of asymmetric associations across cognitive and affective experiential pathways, suggesting that PHE may show a relatively stronger association with CBE than PUE, which in turn relates to brand equity. Third, it offers a clearer view of CBE as an organism-level engagement construct that links utilitarian and hedonic service evaluations to loyalty outcomes in digital banking contexts.

6.2. Theoretical contribution

First, this study advances the application of the S–O–R framework in omnichannel banking by offering a more nuanced account of how customer-perceived evaluative stimuli are processed within the organism stage. Rather than treating

stimuli as operating uniformly, the study points to a more differentiated reading of how customer-perceived evaluative stimuli are processed, in which conceptually related perceptions – such as INQ and PSE – can be associated with different cognitive and affective pathways. This perspective extends conventional S–O–R logic by suggesting that stimuli may differ not only in intensity but also in the psychological processes they activate, offering a more granular view of how customers interpret complex service environments.

Second, the study contributes to customer experience theory by clarifying the asymmetric functioning of utilitarian and hedonic evaluations at the organismic level. While both dimensions are relevant, the findings indicate that affective evaluations may play a comparatively stronger role in shaping deeper relational responses. This extends prior S–O–R applications by showing that organismic mechanisms do not operate as uniformly weighted mediators but rather as context-sensitive processes whose relative influence varies with the nature of the service experience. In this way, the study offers a more differentiated understanding of how cognitive and affective evaluations jointly shape engagement.

Third, the study refines the conceptual role of CBE within the S–O–R sequence by positioning it as a higher-order organism-level construct that captures the consolidation of cognitive and affective experiences into a relational state. Engagement is therefore understood not as a discrete behavioral outcome, but as an emergent condition reflecting how customers internalize and sustain their interaction with the brand over time. This perspective extends the explanatory logic of S–O–R by clarifying how experiential evaluations are translated into brand-related outcomes through an intermediate relational mechanism, thereby providing a more integrative account of how perception-based stimuli, experiential evaluations, and relational responses are linked in digital financial service contexts.

6.3. Practical implications

The findings suggest that banks may benefit from distinguishing between efforts to strengthen customers' perceptions of cross-channel integration and efforts to enhance customers' perceptions of seamlessness when designing omnichannel strategies. Given that INQ aligns closely with utilitarian evaluations, banks may prioritize aligning information architecture, process standardization, and cross-channel data consistency to enhance perceived reliability and transactional clarity. In this regard, integration efforts may also address discrepancies in service rules, pricing information, and transaction records across digital and physical interfaces, as customers in this study tend to evaluate alignment on efficiency and operational accuracy.

Because PSE is associated with both PUE and PHE, with a relatively stronger association with the affective dimension, banks may also benefit from going beyond structural coordination and paying closer attention to how service transitions are experienced across channels. This may involve reducing friction during channel switching, maintaining continuity across touchpoints, and improving the consistency with which customer histories and preferences are recognized. In this context, customers' perceptions of seamlessness may be understood not only as a consequence of technical connectivity but also as an outcome of service design that minimizes cognitive effort while supporting emotional comfort.

Given that PHE shows a relatively stronger association with CBE than PUE in this study, banks may consider incorporating more emotionally resonant elements into their omnichannel ecosystems. To foster deeper relational involvement, financial institutions may benefit from incorporating more human-centered features – such as personalized communications and context-sensitive service recommendations – that extend beyond mere functional utility. By balancing operational efficiency with thoughtfully designed emotional reinforcement moments, banks may be better positioned to make transactional touchpoints more meaningful throughout the customer journey.

Finally, because CBE is positively associated with preferential loyalty, managerial efforts may usefully focus on sustaining relational depth over time. Loyalty initiatives may therefore extend beyond transactional rewards to include ongoing interaction, recognition, and perceived relational value. By strengthening customers' perceptions of cross-channel integration, supporting seamless transitions, and cultivating emotionally engaging interactions, banks may be better positioned to foster the conditions for durable brand equity in increasingly competitive digital environments.

6.4. Limitations and suggestions for future research

Despite its contributions, this study has several limitations that offer avenues for further inquiry. First, the reliance on a cross-sectional, single-source, self-reported design, combined with non-probability purposive sampling, precludes the establishment of temporal or causal inferences and constrains the generalizability of the findings. These features indicate that the estimated structural relationships should be understood as sample-based evidence rather than as a basis for broad population-level generalization. In this context, the use of non-probability sampling also implies that the assumption of independent and identically distributed (i.i.d.) observations underlying PLS-SEM estimation may not be fully met, further underscoring the need for caution when interpreting statistical

inference beyond the studied sample. Omnichannel experiences may develop cumulatively as customers repeatedly interact across touchpoints. Longitudinal or panel-based designs, combined with probability-based sampling where feasible, could provide deeper insight into the temporal dynamics of experiential evaluations and relational outcomes while strengthening the basis for broader statistical inference.

Second, although respondents were instructed to evaluate the bank they use most frequently, the sample comprised customers of multiple banks, and institutional-level heterogeneity was not explicitly modeled. Accordingly, the findings should be interpreted as reflecting customer perceptions within a mixed-bank sample rather than as institution-specific conclusions or broad generalizations about the banking sector as a whole. As a result, potential differences in organizational characteristics, such as technological maturity, service architecture, or market positioning, may have influenced the strength of the observed structural relationships without being formally accounted for in the analysis. To address this limitation, future studies should employ multigroup or multilevel modeling approaches that explicitly incorporate institutional variation into the analytical framework. Such designs would enable researchers to determine whether the effects of INQ, PSE, and experiential pathways on CBE and brand equity differ systematically across banking contexts.

Third, the sample includes a relatively high proportion of younger and digitally active respondents, particularly students. This demographic composition may bias the findings toward the perceptions of digitally engaged users and may not fully reflect the broader bank customer population. Future research should therefore employ more demographically diverse samples, including older customer segments and individuals with varying levels of digital literacy, to examine whether the proposed experiential and engagement mechanisms operate consistently across different customer groups.

Fourth, although the proposed model assumes sequential mediation within the S–O–R framework, the study primarily focused on direct path estimates. Future research could extend the model by explicitly testing indirect and serial mediation effects to strengthen and clarify the psychological mechanisms linking customer-perceived stimuli to brand equity. These limitations also highlight the importance of carefully distinguishing customers' evaluations, such as INQ and PSE, from subsequent experiential and relational responses, thereby ensuring theoretical clarity in applying the S–O–R framework.

Fifth, the robust relationship between INQ and PSE suggests conceptual proximity in customers' perceptions of cross-channel integration and seamlessness, despite their distinct theoretical roles as structurally and experientially oriented stimuli. Subsequent studies may refine measurement distinctions or explore alternative model specifications to further disentangle these constructs.

Finally, this study did not incorporate perceived digital security or privacy concerns, which may be important in financial service contexts. Integrating customers' perceptions of digital security as an additional stimulus could enhance understanding of how risk-related evaluations interact with experiential pathways in shaping engagement and loyalty.

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Conflict of interest

The authors declare that there is no conflict of interest.

Authors contributions

Nurwiyanta Nurwiyanta – 45% (research concept and design, data analysis and interpretation, writing the article, critical revision of the article).
Andika Andika – 30% (collection and/or assembly of data, data analysis and interpretation, final approval of the article).
Kartinah Kartinah – 25% (collection and/or assembly of data, writing the article).

Ethics statement

This study involved human participants and was conducted as an anonymous, minimal-risk online survey. Participation was voluntary, and informed consent was obtained before respondents accessed the questionnaire. Respondents were informed about the purpose of the study, the voluntary nature of participation, and the anonymous and confidential treatment of their responses. No personally identifiable information was collected. Respondents could discontinue participation before submitting the questionnaire. The study included bank customers aged at least 17 years who used at least two banking service channels. Respondents aged 17 years were eligible to participate in accordance with the local research and banking-service context. According to applicable institutional and national regulations at the Faculty of Economics and Business, Janabadra University, Yogyakarta, Indonesia, formal ethical approval was not required for this type of anonymous survey research. All responses were used solely for academic research purposes.

Data availability statement

The data supporting the findings of this study are available from the corresponding author upon reasonable request.

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Appendix. Survey anchoring instruction and response scale

Before answering the measurement items, respondents were asked to identify the bank they used most frequently. They were then instructed to answer all subsequent statements with reference to this selected bank. The instruction shown to respondents was as follows: "Please identify the bank you use most frequently. When answering the following statements, please refer specifically to this bank." The bank selection item was used to anchor respondents' evaluations and for descriptive profiling only. All measurement items reported in Table 2 were assessed using a four-point Likert-type scale, where 1 = strongly disagree and 4 = = strongly agree.