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What drives consumer engagement in live streaming commerce? A socio-technical systems and trust configuration approach

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Abstract

Purpose – While live-streaming e-commerce serves as a dynamic catalyst for consumer engagement behavior (CEB), existing research often examines drivers in isolation, overlooking their complex interdependence. This study bridges that gap by examining how socio-technical attributes and trust in both products and streamers interact to produce high vs low CEB.

Design/methodology/approach – Grounded in socio-technical systems theory, this research employs fuzzy-set qualitative comparative analysis (fsQCA) to map the complex causal pathways shaping engagement. We analyzed how configurations of seven socio-technical elements (expertise, humor, beauty, warmth, passion, personalization and interactivity) alongside trust-transfer mechanisms shape CEB live-streaming e-commerce.

Findings – The fsQCA results reveal that high CEB primarily emerges from configurations where streamer warmth and expertise synergize with platform interactivity and strong trust in products. Conversely, the absence of both social and technical cues leads reliably to user disengagement and low CEB.

Originality/value – This study advances socio-technical systems theorizing in live-streaming commerce by introducing a configurational explanation of customer engagement, demonstrating equifinality and functional substitution among social cues, platform affordances and trust conditions. It further identifies trust gatekeeping as an asymmetric causal principle, showing that trust functions as a critical enabling factor in high-engagement pathways and that its absence can nullify otherwise strong socio-technical bundles.

Keywords Live-streaming e-commerce, Socio-technical systems, Consumer engagement behavior, Trust in products and streamers, fsQCA

Paper type Research article

1. Introduction

By integrating real-time product showcases with reciprocal interaction, live-streaming commerce is rapidly reconfiguring Indonesia's retail landscape into a socially immersive and operationally agile marketplace (Zhang *et al.*, 2024). In these sessions, streamers present items, converse with viewers and facilitate instant purchases, producing an experiential, "in-the-moment" mode of shopping (Chang *et al.*, 2024; Hsu and Hu, 2024; Luo *et al.*, 2023). Since the COVID-19 period, uptake in Indonesia has accelerated markedly, with live-streaming sales estimated at about US$4.89bn in 2022 (Jakpat, 2022; Dailysocial, 2022). The scholarly significance of this growth lies not merely in revenue, but in the organizational task of synchronizing human and technological resources at scale: alignment between streamer signals and platform affordances cultivates trust and active engagement, whereas

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misalignment dampens participation. Indonesia is thus a salient empirical setting for this study, given its expansive, mobile-centric digital economy and swift normalization of social and live-streaming commerce, which together make it well suited for probing socio-technical foundations of trust and engagement in online retail (Christa, 2024; Antara, 2024; Intimedia, 2025; Annur, 2024).

One global implication of this study is that the socio-technical trust–engagement configurations observed in Indonesia are likely applicable to other emerging markets and global live-stream platforms. Because platforms such as TikTok Live and Shopee Live rely on the same interplay between streamer cues and platform affordances, the patterns identified here can inform trust-building and consumer engagement behavior (CEB) optimization beyond the Indonesian context.

Notwithstanding the sector's momentum, the literature has yet to offer a fully integrated explanation of how socio-technical systems simultaneously generate trust and, through it, shape CEBs. Much prior work models streamer attributes and platform features as independent, linear antecedents of trust or engagement, leaving unresolved which combinations of social cues, technical affordances and trust facets are required – or sufficient – for distinct CEB outcomes (Luo *et al.*, 2024; Wang *et al.*, 2024; Yuan *et al.*, 2025; Chen *et al.*, 2024). Engagement is also frequently conceptualized in a limited way, while the broader multidimensionality of CEB (influencing, augmenting, mobilizing and co-developing) has rarely been examined through a configurational lens (Zhang *et al.*, 2022a, b; Wongkitrungrueng and Assarut, 2020). Consequently, both scholarship and practice still lack a clear account of how socio-technical ingredients and trust transfer jointly produce high versus low engagement within live-streaming ecosystems.

In response, this study advances three research questions. RQ1 asks how seven socio-technical elements – expertise, humor, beauty, warmth, passion, personalization and interactivity – together with trust in products and streamers, differentiate high from low CEB in live-streaming e-commerce. Extending this focus, RQ2 identifies which effective configurations of these socio-technical elements and trust dimensions yield high CEB, whereas RQ3 isolates the counter-configurations that reliably lead to low CEB.

Trust functions as a socio-technical outcome emerging from human–technology interaction in live-streaming commerce. In this setting, streamer cues (e.g. warmth, expertise, passion) represent the social subsystem, while platform affordances (e.g. personalization and interactivity features) form the technical subsystem that shapes how those cues are received and acted upon. Accordingly, explaining trust requires examining how these two subsystems jointly operate within the live-streaming episode.

From a methodological standpoint, most existing studies have relied on symmetric SEM frameworks, which are not well-suited to uncovering the non-linear, equifinal and asymmetric patterns typical of socio-technical interactions (Luo *et al.*, 2024; Wang *et al.*, 2024; Yuan *et al.*, 2025; Chen *et al.*, 2024). Empirical evidence is also inconsistent regarding whether social or technical drivers are more influential in trust transfer and downstream engagement across live-streaming contexts (Shih *et al.*, 2024; Zhang *et al.*, 2022a, b). Because socio-technical systems theory (STS) anticipates reinforcement, substitution or conflict between social and technical resources, additive modeling may obscure these joint effects. Accordingly, we adopt fuzzy-set qualitative comparative analysis (fsQCA) to examine how specific bundles of streamer characteristics, platform affordances and trust dimensions co-produce – or inhibit – CEB and to reveal multiple pathways to the same outcome.

Anchored in this configurational logic, the study evaluates how the seven socio-technical elements, operating alongside trust-transfer mechanisms, function as antecedents of CEB in live-streaming environments (Chang *et al.*, 2024; Luo *et al.*, 2024; Ma, 2024). The asymmetric fsQCA approach enables us to chart distinct routes toward high engagement and, equally, toward disengagement, thereby offering a more realistic understanding of engagement formation and clearer strategic cues about which socio-technical combinations should be emphasized or avoided.

This study contributes theoretically by extending STS through modeling interaction patterns (reinforcement, substitution and conflict). Methodologically, it introduces fsQCA as a valuable approach to engagement research. Practically, the findings offer actionable guidance for platform design aimed at achieving sustained CEB.

2. Literature review

2.1 Prior research and gaps identification

Prior live-streaming research largely links success to trust in products and streamers; however, it rarely clarifies how particular socio-technical ingredients combine to build that trust and to trigger the full spectrum of CEB. Luo *et al.* (2024) identify product-information quality, interaction quality, credibility, review consistency and emotional contagion as separate drivers of impulse buying and CEB, while Wang *et al.* (2024) stressed social presence for virtual streamers, yet overlooked platforms' affordances. Other work is similarly partial: Wongkitrungrueng and Assarut (2020) show that utilitarian, hedonic and symbolic value foster trust-led CEB but omit socio-technical detail; Yuan *et al.* (2025) model attractiveness without trust or CEB; and Chen *et al.* (2024) analyze viewer–streamer interaction but overlook technical features and CEB's four facets (augmenting, co-developing and influencing, mobilizing).

Findings across this literature often contradict – Shih *et al.* (2024) argue social cues chiefly build streamer trust, whereas Zhang *et al.* (2022a, b) find both social and technical cues matter – because almost all studies rely on symmetric, additive models (e.g. SEM) that assume linear, independent effects. Such models cannot detect the two configurational properties implied by socio-technical theory: equifinality (different bundles of social, technical and trust factors can achieve the same engagement outcome) and functional substitution (one cue, such as passion, can compensate for the absence of another, such as humor).

To ground our variable set conceptually, we blend the stereotype-content model (Fiske *et al*., 2018) and affordance theory (Nambisan *et al*., 2017). Integrating stereotype-content (warmth–competence) with affordance theory allows us to theorize trust as both socially signaled and technologically scaffolded – a dual-process view absent in prior models. Streamer cues – beauty, warmth, humor, passion and expertise – function as affective or competence signals that elicit social trust, while personalization and interactivity, enabled by AI recommendation engines and low-latency protocols, constitute technical trust affordances. Their joint presence or absence forms coherent socio-technical "formulas" that viewers evaluate when deciding whether – and how – to engage across CEB's four dimensions.

Existing evidence is predominantly Asia-centric, producing mixed cue effects across cultures and underscoring the need for theory-driven, generalizable models. While our empirical setting is Indonesia, the socio-technical mechanisms under investigation – particularly personalization and interactivity – are increasingly central to global live-commerce ecosystems. Western platforms such as Amazon Live, TikTok Shop US and YouTube Shopping actively integrate these affordances through AI-powered product curation, real-time audience interaction and immersive video-commerce features, highlighting the broader applicability of our framework beyond the Asian context. Thus, rather than a context-bound model, our framework proposes universally applicable socio-technical trust dynamics. Addressing these gaps, we employ fsQCA to examine how seven socio-technical elements (expertise, humor, beauty, warmth, passion, personalization and interactivity) configure with trust in products and streamers to produce high or low CEB in Indonesian live-commerce. The configurational lens captures asymmetric, compensatory patterns overlooked by linear approaches and furnishes marketers with actionable guidance for orchestrating socio-technical resources to cultivate sustained engagement. All prior studies and identified gaps are exhibited in Table 1.

To further strengthen the positioning of our study, we explicitly map our contribution against three leading streams of literature. First, the customer engagement literature (Brodie

Table 1. Previous studies and gaps

Author(s)	Context	Key dimensions	Method	Principal findings	Noted research gap/Contribution
Wongkitrungrueng and Assarut (2020)	Live-streaming e-commerce	Utilitarian, hedonic, symbolic values; trust in products; trust in streamers; CEB	SEM	Utilitarian and hedonic values boost trust in products; symbolic value enhances trust in streamers and CEB. Product trust elevates seller trust, which in turn increases customer engagement	Relies on SEM; omits socio-technical factors and multi-faceted CEB constructs
Luo *et al.* (2024)	Live-streaming e-commerce	Product-information and interaction quality, streamer credibility, review consistency, resonant contagion, CEB, impulse buying	SEM	Information quality, interaction quality, credibility, review consistency and resonant contagion jointly raise CEB and impulse purchases	Uses SEM; does not examine trust constructs explicitly
Wang *et al.* (2024)	Live-streaming e-commerce	Integrity, ability, benevolence, predictability, trust, social presence, purchase intention, enjoyment, similarity	SEM	Social presence heightens trust but solely predicts purchase intention toward virtual streamers; enjoyment and similarity also enhance purchase intention	SEM focus; overlooks technical affordances and CEB outcomes
Yuan *et al.* (2025)	Live-streaming e-commerce	Authenticity, value similarity, parasocial interaction, attractiveness, experience memory, inertia, product-quality perceptions, flow, continuous watching, purchase intention	SEM	Product/streamer attractiveness mediates between characteristics and experience memory; sequential mediation (attractiveness → memory → inertia) influences behavior	Employs SEM; does not analyze trust or CEB dimensions

(*continued*)

Table 1. Continued

Author(s)	Context	Key dimensions	Method	Principal findings	Noted research gap/Contribution
Chen *et al.* (2024)	Live-streaming e-commerce	Viewer–streamer and viewer–viewer interaction; trust in streamers, products, co-viewers; purchase intention	SEM	Both interaction types build trust in streamers and co-viewers; these trusts flow to product trust and purchase intention	SEM approach; technical factors and CEB facets remain unexplored
Present study	Live-streaming e-commerce	Beauty, warmth, expertise, humor, passion; interactivity; personalization; trust in products and streamers; four CEB facets	fsQCA	High CEB arises when rich social cues, adaptive platform features and at least one trust dimension co-occur; identical bundles must be present to avert low CEB	Introduces fsQCA; offers a configurational view of socio-technical–trust synergies driving CEB

Source(s): Authors' own work

et al., 2011; Hollebeek *et al.*, 2014) emphasizes cognitive, emotional and behavioral engagement processes, primarily in brand or community contexts. Our work extends this stream by illustrating how socio-technical interactions in live-streaming commerce shape engagement outcomes through distinct patterns of reinforcement, substitution and conflict between subsystems. Second, the digital trust literature (Gefen, 2000; Pavlou, 2003) highlights the role of institutional structures and technology features in fostering trust. We advance this perspective by showing how both streamer attributes and platform affordances operate as socio-technical antecedents of trust, configured in ways that move beyond additive models. Third, parasocial interaction research (Horton and Richard Wohl, 1956; Labrecque, 2014) examines one-sided psychological bonds with media figures. We situate parasocial bonds within the social subsystem of live-streaming commerce, demonstrating how they interact with technical mechanisms to influence trust and consumer stickiness. By integrating these perspectives, our study not only dialogues with but also extends foundational scholarship on engagement, trust and parasocial interaction, while offering a socio-technical systems lens that captures their interplay in digital commerce.

2.2 Socio-technical systems theory

The STS, developed by Bostrom and Heinen (1977), underscores the interdependence of social and technical components in driving information-systems performance (Chang *et al.*, 2024; Shih *et al.*, 2024). Within live-streaming commerce, STS offers a critical lens for understanding how synchronous social interaction and advanced technical features jointly cultivate engagement and trust (Chang *et al.*, 2024; Ji *et al.*, 2025; Zhang *et al.*, 2022a, b). Social dynamics arise through direct streamers–viewers exchanges and peer-chat participation, creating immediacy and community (Jiang *et al.*, 2025; Guo *et al.*, 2022). In parallel, seamless streaming, product visualization and instant feedback mechanisms enhance interactivity and sustain attention (Ji *et al.*, 2025; Zhang *et al.*, 2022a, b). Empirical works highlight the need to integrate these elements, reinforcing their collective impact on consumer behavior and platform outcomes (Chang *et al.*, 2024). Personalization delivered by AI engines and ultra-low-latency protocols exemplifies how technical resources augment social cues, illustrating STS interdependence in contemporary live-commerce marketplaces.

Building on Bostrom and Heinen's STS perspective that focuses on the interdependence and joint optimization of social and technical subsystems (Bostrom and Heinen, 1977), the authors propose a three-pattern typology as an explicit, context-sensitive elaboration of STS for live-streaming e-commerce. To be explicit: Bostrom and Heinen lay the conceptual groundwork (interdependence and joint design), but they do not enumerate the three empirical patterns we test here. The reinforcement/substitution/conflict typology is therefore our conceptual refinement of STS tailored to live-streaming platforms, grounded in STS logic and informed by recent empirical work showing asymmetric and compensatory relations between social cues and platform affordances in digital commerce. Operationally: (1) Reinforcement: the concurrent presence of rich social cues (e.g. warmth, humor) and robust technical affordances (e.g. low-latency chat) amplifies trust and engagement. (2) Substitution: a strong social cue can compensate for a weaker technical feature – or vice-versa – still producing high engagement. (3) Conflict: a missing or malfunctioning technical element (e.g. excessive lag) can negate even highly attractive social cues, resulting in disengagement. These patterns operationalize the interdependence posited by Bostrom and Heinen, clarify resource-orchestration logic and ground the configurational propositions tested in this study.

In line with the STS theory, we further refine the notion of subsystem interactions by distinguishing among substitution, reinforcement and conflict as three theoretically distinct configurations. Substitution occurs when one subsystem (e.g. platform affordances) compensates for the weakness or absence of the other (e.g. streamer cues), ensuring functional continuity despite imbalance. Reinforcement reflects the reinforcing interplay of subsystems, where both social and technical elements align to enhance trust beyond the contribution of either alone. Conflict, in contrast, arises when overlapping functions of the two subsystems provide surplus but non-essential support, meaning that the presence of one element is sufficient while the other becomes non-critical. By articulating these distinctions, we move beyond the classical joint-optimization premise of STS to a typology of interaction patterns that captures a broader range of dynamics in live-streaming commerce. The configurational logic of STS aligns naturally with fsQCA's emphasis on conjunctural causation and equifinality. We argue that substitution, complementarity and redundancy represent conceptually unique mechanisms that shape consumer trust and engagement and our configurational approach (fsQCA) is particularly well-suited to empirically disentangle these mechanisms.

Applications of STS theory have primarily examined social factors such as active control, synchronization and two-way communication alongside technical aspects like personalization and visibility. However, research remains divided on their interplay: some studies attribute consumer behavior solely to social influences (Shih *et al.*, 2024), whereas others highlight combined effects (Chang *et al.*, 2024). Addressing this gap, our study simultaneously investigates five social dimensions – expertise, humor, beauty, warmth and passion – and two technical dimensions – personalization and interactivity – to deliver a holistic STS test. This comprehensive perspective reconciles prior inconsistencies and identifies the bundles most likely to foster consumer trust and sustained engagement.

These mappings reflect the dual-process model of engagement, where affective cues (beauty, humor) trigger emotional contagion and cognitive cues (expertise, warmth) foster co-creation-oriented behaviors. Beauty in a streamer's appearance directly shapes purchase decisions (Zheng *et al.*, 2023). Humor fosters enjoyment and social bonding (Hou *et al.*, 2020), while passion, conveyed through visible enthusiasm, builds trust (Chen *et al.*, 2009). Expertise evidences knowledge and elevates credibility in online shopping (Hsieh, 2023; Li and Peng, 2021), and warmth, displayed via sincerity and friendliness, reinforces trustworthiness (Zhang *et al.*, 2022a). On the technical side, interactivity enables synchronous engagement and personalization tailors content to individual preferences, jointly enhancing product confidence

(Zhang *et al.*, 2022a). Grounded in STS, we treat these seven attributes as a mutually reinforcing system.

2.3 Customer engagement behavior (CEB)

CEB comprises voluntary, non-transactional actions rooted in a consumer's emotional and psychological ties to a brand – sharing experiences, advocating products or providing feedback (Guo *et al.*, 2022; Wongkitrungrueng and Assarut, 2020). Live-streaming heightens CEB's relevance because real-time interaction lets viewers converse directly with streamers and other shoppers, shifting them from passive observers to co-participants. Such immediacy builds relational bonds and brand loyalty; trust in streamers and products becomes pivotal in guiding purchase decisions (Qiu *et al.*, 2021; Shih *et al.*, 2024; Yang *et al.*, 2023).

Building on Shih *et al.* (2024), we conceptualize four mutually reinforcing CEB dimensions – augmenting, co-developing, influencing and mobilizing – that trace a consumer's journey from mere usage to collaborative value co-creation. Trust operates on two fronts: streamer trust, generated through charisma, expertise and authenticity, anchors viewers to the unfolding brand narrative, while product trust assures functional quality and symbolic fit, sustaining longer-term commitment. Drawing on social-presence, affective-contagion and credibility theories, we map specific streamer cues onto each dimension: beauty and humor heighten positive effect, encouraging viewers to repost clips (augmenting) and recommend streams to peers (influencing); passion magnifies emotional contagion, spurring collective calls-to-action (mobilizing); expertise and warmth build cognitive and relational trust, eliciting constructive feedback and idea sharing (co-developing) while reinforcing mobilization. Yet these cue-to-behavior pathways materialize only when strengthened by technical affordances such as personalization and low-latency interactivity – a synergy our configurational analysis seeks to unpack for scholars and practitioners alike.

CEB is modeled as a multidimensional construct consisting of augmenting, co-developing, influencing and mobilizing (Hollebeek *et al.*, 2019). In this study, the four behaviors are treated as equally important manifestations of consumer engagement, consistent with prior literature that conceptualizes them as parallel, non-hierarchical dimensions of value co-creation. Within the fsQCA framework, each behavior is calibrated as a condition that can be either present or absent in different causal configurations. Presence indicates that the specific engagement behavior meaningfully contributes to co-created value (e.g. mobilizing through word-of-mouth), whereas absence denotes that the pathway to high engagement can still emerge through other behaviors or antecedents (functional substitution). This approach aligns with the socio-technical systems perspective, which emphasizes equifinality – multiple distinct combinations of behaviors and system elements can yield high engagement outcomes. Together, these dimensions form a holistic behavioral manifestation of engagement, contingent on the trust and socio-technical synergies theorized in the next section.

2.4 Trust

Trust in both streamers and products is pivotal in driving CEB within live-streaming contexts because it links brand promises to lived viewer experience (Shih *et al.*, 2024; Jiang *et al.*, 2025; Chong *et al.*, 2023). Trust in streamers derives from their perceived authenticity, domain expertise and capacity to cultivate relational rapport, while trust in products hinges on reliability, quality and congruence with consumer expectations. Trust transfer occurs when credibility built through social cues (e.g. warmth, expertise) extends to evaluations of product quality, reinforcing purchasing confidence. Despite its salience, prior research often isolates these dimensions, neglecting their synergistic impact on CEB (Zhang *et al.*, 2022a; Wongkitrungrueng and Assarut, 2020). Our study addresses this oversight by integrating social attributes (e.g. warmth, expertise) with platform-side technical features (e.g. personalization, low-latency interactivity) to model how trust is co-constructed. This holistic lens underscores the dynamic interplay between human and transactional elements, revealing their joint influence on engagement intensity and behavioral outcomes in live streaming. By advancing multidimensional trust framework, we equip streamers, platforms and marketers with empirically grounded strategies to strengthen viewer confidence and deepen consumer–brand relationships.

2.5 Proposition development

Integrating trust-transfer mechanism with CEB under the STS framework, this study extends prior work on live-streaming commerce. Earlier research connected STS constructs to flow (Ji *et al.*, 2025), continuance intention (Zhang *et al.*, 2022a, b) and stickiness (Chang *et al.*, 2024), yet most efforts assessed variables independently. While Guo *et al.* (2022) showed socio-technical factors elevate behavioral intention, and Shih *et al.* (2024) tied them to higher CEB; however, their symmetric models overlooked interdependence. We adopt fsQCA to expose equifinal pathways, demonstrating that distinct bundles of social and technical cues can yield similar engagement outcomes, a refinement of linear models cannot capture. This approach reveals how different combinations of viewer and platform features jointly shape engagement.

Specifically, we analyze five streamer attributes – beauty, expertise, warmth, passion and humor – alongside two platform features – personalization and interactivity – and two trust loci (in products and in streamers). By mapping how these nine elements coalesce into either favorable or unfavorable configurations, we offer marketers diagnostic guidance for tailoring content, technology and talent. Crucially, we theorize compensatory bundles; a salient social cue may offset a missing technical affordance and vice versa, making engagement a joint function of the entire socio-technical palette. Unlike Chang *et al.* (2024) or Chen *et al.* (2024), whose contexts differed and whose models remained additive, our live-stream-specific approach clarifies how to orchestrate resources for sustained viewer involvement.

Bostrom and Heinen's (1977) STS theory asserts that an information system thrives only when its technical and social components function together effectively. In live-streaming e-commerce, engagement therefore hinges on the alignment of a streamer's skills with platforms design. Prior studies noted isolated impacts – for instance, how expertise or interactivity alone lifts trust (Zhang *et al.*, 2022a, b; Luo *et al.*, 2024) – but seldom explored multilateral interactions. While STS traditionally assumes "joint optimization," implying that social and technical subsystems must be maximized simultaneously to succeed, we posit compensatory optimization patterns within digital contexts. We argue that a salient social cue may offset a missing technical affordance and vice versa. For example, humor and warmth can deepen emotional connection only when reinforced by engine-driven personalization; conversely, technical sophistication may lose potency without credible human cues. High CEB thus emerges from synergistic socio-technical-trust constellations rather than any single element. This introduces the concept of functional substitution, grounding Proposition 1:

Proposition 1. High CEB arises not from any single socio-technical or trust element alone, but from synergistic constellations of these elements acting jointly.

Conversely, STS theory implies that failure typically arises from the concurrent absence of several foundational components; individual shortcomings can often be compensated for by other strengths. For instance, although lacking streamer warmth diminishes interpersonal appeal, high interactivity and robust product trust may still preserve engagement. This perspective echoes Shih *et al.* (2024), who found that low CEB stems from the combined absence of socio-technical and trust resources rather than any single deficit. Building on this, compensatory logic, we posit a mirror-image claim concerning disengagement, formalized as Proposition 2.

Proposition 2. Low CEB similarly results not from isolated weaknesses but from the concurrent absence of multiple socio-technical and trust elements. All research propositions are exhibited in Figure 1.

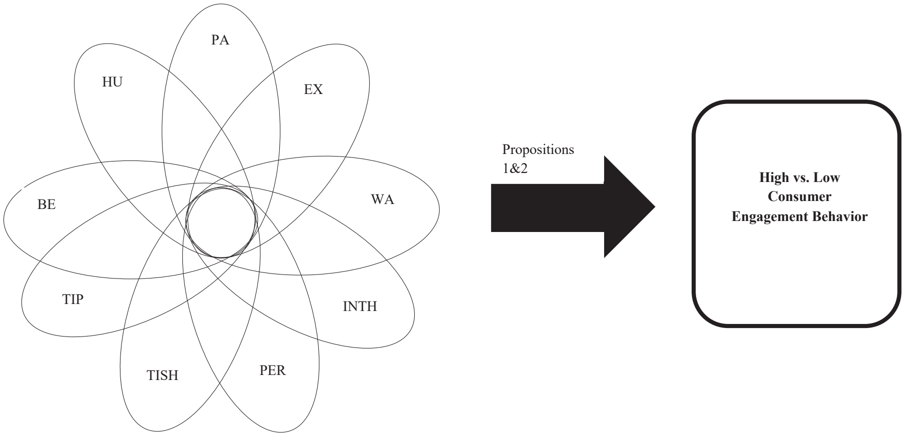

Figure 1. Configuration path from STS and trust transfer to CEB. Note: BE = Beauty, HU = Humorous, PA = Passion, EX = Expertise, WA = Warmth, IN= Interactivity, PE = Personalization,. TIS = Trust in Streamers and TIP = Trust in Products

3. Methods

3.1 Operationalization and measurement items

This study assesses nine latent constructs: five streamer attributes (beauty, humor, passion, expertise and warmth); two platform attributes (interactivity and personalization): two loci of trust (in products and in streamers); and four customer-engagement behaviors (augmenting, co-developing, influencing and mobilizing). Item wording was adapted from well-validated scales – e.g. humor from Hou *et al.* (2020) and interactivity from Zhang *et al.* (2022a, b) – and re-contextualized to live-commerce. A seven-point Likert format (1 = strongly disagree, 7 = strongly agree) captured response variance and facilitated fuzzy-set calibration. A pilot test with 30 Indonesian viewers confirmed face validity; Cronbach's α for all constructs exceeded 0.85, attesting to internal consistency. Appendix lists every item, source and loading, thereby enhancing transparency and replicability. To further establish construct validity, we conducted exploratory factor analysis (EFA) to confirm dimensionality, followed by confirmatory factor analysis (CFA) to assess convergent and discriminant validity. Results showed that all standardized factor loadings were above 0.70, composite reliabilities (CR) exceeded 0.80 and average variance extracted (AVE) values were greater than 0.50, consistent with Fornell and Larcker's (1981) recommendations. These results provide strong evidence that the measures are both reliable and valid for subsequent fsQCA analysis.

3.2 Sampling technique and data collection procedure

A cross-sectional online survey captured viewer perceptions of trust transfer and CEB. Purposive, non-probability sampling ensured that respondents (a) were at least 20 years old, (b) possessed a high-school education or higher and (c) had watched or purchased via Indonesian live-streaming apps in the past six months. The instrument – hosted on Google Forms – circulated for four months (June–September 2024) through Twitter, Facebook, WhatsApp, Instagram and LINE to maximize reach. Three sections screened eligibility, recorded demographics and measured focal constructs with the seven-point scale described above. After cleaning for straight-lining and completion time, 682 useable responses remained, providing a robust dataset for configurational analysis.

3.3 Analysis technique

Our analytic choice is driven by three linked motivations – a theoretical motive, an empirical motive and a methodological motive – that together make fsQCA the most appropriate method for the research questions we pose. *Theoretical motivation.* The STS theory foregrounds interdependence, non-additive fit and multiple ways to achieve system performance. Our research question explicitly asks which configurations (bundles) of social cues, technical affordances and trust produce high versus low CEB. That configurational logic – equifinality (multiple distinct routes to the same outcome), functional substitution (one resource compensating for another) and causal asymmetry – is central to STS and therefore requires a method able to identify multiple, context-dependent sufficient conditions simultaneously.

Empirical motivation. Prior live-streaming studies report inconsistent findings (some studies emphasize social cues, others platform affordances), suggesting that average, symmetric effects do not fully capture the phenomenon. fsQCA permits discovery of distinct, empirically observable "recipes" that can explain why different studies find different drivers – precisely the empirical puzzle we set out to resolve. *Methodological motivation.* fsQCA operationalizes set-theoretic causal logic: it identifies combinations of conditions that are sufficient (and tests necessity) for an outcome, accommodates medium-N datasets and supports fuzzy calibration of perceptual data (Likert items) into membership scores – features that match our data ($N = 682$) and theoretical aims.

This study applies fsQCA using the 4.1 software by Ragin (2023) to examine CEB and trust-transfer mechanisms. fsQCA is uniquely suited to uncover equifinality and functional substitution – that is, different bundles of antecedents can yield the same outcome and one element can compensate for the absence of another – relationships that additive methods such as SEM cannot detect (Rasoolimanesh *et al.*, 2021). Unlike traditional methods that seek a single optimal model, fsQCA allows for identifying multiple configurations that lead to high or low consumer engagement. This approach efficiently captures non-linear relationships that standard statistical techniques like SEM might overlook (Satar *et al.*, 2024; Pappas and Woodside, 2021). To construct the fsQCA model, the study followed a structured process, beginning with data calibration, followed by truth table creation, configuration identification, robustness testing and result interpretation.

The first step involved calibrating raw data into fuzzy-set membership scores, transforming 7-point Likert scale responses into values between 0 and 1. Following Pappas and Woodside (2021), full membership at "6," intermediate membership at "4," and full non-membership at "2". This calibration was applied to streamer characteristics, platform features, trust in products and streamers and CEB. Next, the study generated a truth table to analyze all possible combinations of conditions leading to high or low CEB. The table included streamer attributes, platform features and trust mechanisms, with configurations evaluated based on consistency scores. Configurations exceeding the 0.75 consistency threshold (Pappas and Woodside, 2021) were considered sufficient for explaining CEB outcomes.

The analysis identified multiple pathways leading to high and low CEB. For high engagement, three distinct configurations emerged, with one combination – including beauty, warmth, passion, expertise, interactivity, personalization and trust in products – achieving a consistency score of 0.973. This indicates that when creators invest heavily in technical infrastructure (e.g. interactivity and personalization) and product trust, they can still drive strong engagement even if certain interpersonal attributes, such as warmth, are weaker. Conversely, when warmth is combined with high interactivity, the engagement pathways reveal that social rapport can substitute for missing technical Polish, demonstrating the flexible routes creators may pursue. Thus, the consistency values not only signal robust configurational sufficiency but also highlight actionable insights for practitioners regarding how technical and social resources interplay in shaping consumer engagement.

In contrast, low engagement resulted from configurations where key engagement bundles were absent, with one pathway showing a consistency score of 0.951. This suggests that when both trust dimensions (in products and in streamers) and social cues such as humor or passion are missing, even strong technical affordances cannot compensate, leading to disengagement. In other words, the absence of trust acts as a veto condition that nullifies the impact of other attributes, underscoring its non-negotiable role in sustaining viewer participation. These insights move beyond technical metrics by illustrating why certain creators or platforms fail despite adequate infrastructure.

To ensure model robustness, the dataset was split into two equal groups. This robustness is corroborated by a hold-out predictive validity test (consistency ≥0.976), underscoring the statistical strength of our configurations. A subsample of 341 participants was used to generate configurations, while the remaining 341 formed a holdout sample for predictive validity testing. The results confirmed the reliability of the solutions, with consistency values exceeding 0.97 across both samples.

Finally, the study interpreted these findings to provide theoretical and practical insights. High CEB was consistently linked to the presence of key relational-technical dynamics, even when trust in streamers was absent. Conversely, disengagement occurred when multiple critical elements were missing, emphasizing the importance of a comprehensive approach to fostering engagement in live streaming e-commerce.

4. Results

4.1 Sample profile

Of the 682 valid respondents, 56.45% were female and 43.55% male, confirming women's stronger affinity for live-stream shopping. A slim majority (57.48%) reported single status, implying greater schedule flexibility and impulse-buy propensity than the 42.52% who were married. Gen Z dominates the sample: 46.33% were younger than 20, mirroring their comfort with interactive, video-rich commerce. Platform preferences were uneven: Shopee led (44.13%), trailed by Tokopedia (23.90%) and Lazada (16.13%); Bukalapak (12.46%), TikTok (2.05%) and Facebook (1.32%) lagged, hinting at strategic gaps. Educationally, 34.02% held bachelor's degrees and 28.59% completed high school, suggesting a moderately educated, tech-savvy cohort. Together, these demographics contextualize subsequent trust-and-engagement analyses and are summarized in Table 2.

4.2 Validity and reliability assessment

4.2.1 Common method variance. To mitigate CMV, three *ex ante* safeguards were embedded in the survey: anonymity assurances, spatial separation of predictor-/outcome blocks and randomized item order. Ex-post diagnostics corroborated their effectiveness. Harman's single-factor test in SPSS 26 revealed the first component accounted for only 16.57% of variance – far below the 50% warning level (Baumgartner and Weijters, 2021). Kock's full-collinearity check likewise produced variance-inflation factors between 1.235 and 2.567, under the conservative 3.30 benchmark. Combined procedural and statistical evidence, therefore, suggests CMV does not threaten the validity of the forthcoming configurational findings.

Convergent validity was assessed via indicator loadings; all 40 items loaded ≥0.71, exceeding the 0.70 rule-of-thumb. Reliability was equally robust: Cronbach's α ranged from 0.85 to 0.93, composite reliability ranged from 0.87 to 0.94 and AVE values all surpassed 0.55 (Hair *et al.*, 2017). These metrics, detailed in Table 3, confirm that each latent construct captures substantial shared variance while maintaining internal coherence.

Discriminant validity passed both the Fornell–Larcker and HTMT hurdles. Each construct's $\sqrt{AVE}$ exceeded its inter-construct correlations and all HTMT ratios fell below 0.85 (Henseler *et al.*, 2015). Cross-loadings likewise showed items loading highest on their intended factors. Tables 4 and 5 document these checks, jointly confirming that constructs are conceptually and empirically distinct.

Table 2. Sample demographics

Measure	Category	F	%
Gender	Male	297	43.55
	Female	385	56.45
Marital status	Single	392	57.48
	Married	290	42.52
Age group	≤20 years old	316	46.33
	21–30 years old	119	17.45
	31–40 years old	155	22.73
	41–50 years old	50	7.33
	≥51 years old	42	6.16
Educational background	High school and equivalent	195	28.59
	Diploma’s degree	161	23.61
	Bachelor’s degree	232	34.02
	Master’s degree	81	11.88
	Doctoral degree	13	1.91
Livestreaming used	Shopee	301	44.13
	Tokopedia	163	23.90
	Lazada	110	16.13
	Bukalapak	85	12.46
	Tiktok	14	2.05
	Facebook	9	1.32

Note(s): F = Frequency
Source(s): Authors’ own work

4.3 Calibration selection and truth table

This study applies fsQCA to identify configurations that lead to high and low CEB. This method analyzes how these factors interact within the research framework. Following Pappas and Woodside (2021), the 7-point Likert scale was calibrated into three categories: full membership at “6,” a crossover points at “4,” and full non-membership at “2.” This process converts raw data into fuzzy scores ranging from “0” (low) to “1” (high), allowing a nuanced analysis of e-satisfaction conditions. The fuzzy scores were then processed through a truth table to identify condition combinations linked to high or low e-satisfaction. Tables 6 and 7 summarize the calibration results, offering insights into the factors shaping e-satisfaction.

The analysis reveals three critical configurations leading to high CEB. The third configuration, where beauty (BE), warmth (WA), passion (PA), expertise (EX), interactivity (INT), personalization (PER) and trust in products (TIP) are present while trust in streamers (TIS) is “do not care,” demonstrates a high consistency score of 0.973. This highlights the combined significance of these socio-technical elements in driving CEB. Similarly, the sixth configuration, which includes BE, PA, EX, WA, INT, PER, TIS and TIP as present while humor (HU) is “do not care,” achieves a consistency of 0.977, indicating the reinforcing impact of these factors on engagement. The seventh configuration, involving HU, PA, WA, EX, PER, INT, TIS and TIP as present while BE is “do not care,” achieves the highest consistency score of 0.991, underscoring the versatility of these elements in fostering high CEB.

For low CEB, the analysis identifies two notable configurations. The first configuration, where HU, WA, PA, EX, INT, PER, TIS and TIP are absent while BE is “do not care,” results in low engagement with a consistency score of 0.951. The second configuration, where BE, PA, EX, WA, INT and PER are present, but TIS and TIP are absent, also leads to low engagement with a consistency score of 0.867. These findings underscore the predictive power of the data in mapping configurational pathways for CEB outcomes, demonstrating the appropriateness

Table 3. Convergent validity and reliability

Constructs	Items	FL	CA	CR	AVE
Augmenting	AB1	0.797			
	AB2	0.792	0.705	0.835	0.628
	AB3	0.789			
Beauty	BT1	0.811			
	BT2	0.893	0.711	0.84	0.639
	BT3	0.76			
Co-developing	CB1	0.841	0.703	0.851	0.741
	CB2	0.881			
Expertise	EP1	0.806			
	EP2	0.856	0.751	0.858	0.668
	EP3	0.788			
Humorous	HR1	0.817			
	HR2	0.917	0.828	0.897	0.744
	HR3	0.851			
Influencing	IB1	0.858	0.733	0.851	0.741
	IB2	0.863			
Interactivity	IT1	0.754			
	IT2	0.834			
	IT3	0.776	0.799	0.869	0.624
	IT4	0.794			
Mobilizing	MB1	0.915	0.809	0.913	0.84
	MB2	0.918			
Passion	PS1	0.818			
	PS2	0.875	0.764	0.864	0.68
	PS3	0.777			
Personalization	PZ1	0.763			
	PZ2	0.813			
	PZ3	0.748	0.781	0.858	0.603
	PZ4	0.78			
Trust on products	TP1	0.791			
	TP2	0.796	0.711	0.823	0.608
	TP3	0.751			
Trust on streamers	TS1	0.745			
	TS2	0.813	0.779	0.857	0.6
	TS3	0.762			
	TS4	0.778			
Warmth	WR1	0.741			
	WR2	0.881	0.816	0.879	0.646
	WR3	0.831			
	WR4	0.753			

Note(s): FL: Factor Loading ≥0.7; CA: Cronbach’s Alpha ≥0:7; CR: Composite Reliability ≥0:7; AVE: Average Variance Extracted ≥0.5

Source(s): Authors’ own work

of the dataset for identifying both favorable and unfavorable engagement patterns in live streaming contexts.

4.4 Analysis of necessary condition

Necessity tests (consistency ≥0.90; coverage ≥0.50) revealed that each of the nine focal conditions – five social attributes, two technical affordances and two trust loci – qualifies as individually necessary for high CEB, underscoring the stringent resource bundle required in Indonesia’s live-commerce market. No single factor, however, met necessity thresholds for

Table 4. Fornell–Larcker criterion and HTMT

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)
Augmenting (1)	*0.793*												
Beauty (2)	0.486 (0.675)	*0.799*											
Co-developing (3)	0.745 (0.780)	0.459 (0.660)	*0.861*										
Expertise (4)	0.553 (0.755)	0.514 (0.705)	0.496 (0.704)	*0.817*									
Humorous (5)	0.510 (0.658)	0.591 (0.778)	0.450 (0.606)	0.615 (0.778)	*0.863*								
Influencing (6)	0.710 (0.745)	0.427 (0.612)	0.679 (0.600)	0.435 (0.620)	0.400 (0.540)	*0.861*							
Interactivity (7)	0.562 (0.738)	0.551 (0.727)	0.501 (0.686)	0.723 (0.847)	0.602 (0.734)	0.456 (0.628)	*0.790*						
Mobilizing (8)	0.679 (0.896)	0.340 (0.428)	0.629 (0.860)	0.378 (0.481)	0.356 (0.430)	0.692 (0.541)	0.394 (0.485)	*0.916*					
Passion (9)	0.496 (0.664)	0.565 (0.769)	0.465 (0.651)	0.717 (0.819)	0.682 (0.856)	0.449 (0.631)	0.689 (0.878)	0.357 (0.447)	*0.824*				
Personalization (10)	0.621 (0.824)	0.538 (0.719)	0.569 (0.786)	0.686 (0.891)	0.598 (0.739)	0.528 (0.729)	0.794 (0.812)	0.463 (0.570)	0.671 (0.858)	*0.776*			
Trust on Products (11)	0.689 (0.841)	0.484 (0.688)	0.650 (0.690)	0.600 (0.835)	0.534 (0.705)	0.609 (0.756)	0.626 (0.819)	0.528 (0.705)	0.589 (0.808)	0.636 (0.860)	*0.779*		
Trust on Streamers (12)	0.728 (0.832)	0.523 (0.691)	0.656 (0.678)	0.634 (0.823)	0.545 (0.670)	0.610 (0.847)	0.690 (0.864)	0.574 (0.713)	0.591 (0.754)	0.708 (0.896)	0.790 (0.825)	*0.775*	
Warmth (13)	0.575 (0.744)	0.550 (0.717)	0.534 (0.718)	0.739 (0.824)	0.626 (0.752)	0.454 (0.613)	0.757 (0.798)	0.419 (0.504)	0.670 (0.839)	0.735 (0.851)	0.603 (0.799)	0.644 (0.795)	*0.804*

Note(s): The diagonal and italic values are the square roots of AVE; The values in the parentheses represent HTMT value with <0.85 is strong, <0.90 moderate and <0.95 weak
Source(s): Authors' own work

Table 5. Cross-loadings matrix

	AU	BT	CD	EXT	HMR	INL	INT	MBL	PSS	PZ	TP	TS	WR
AB1	*0.797*	0.413	0.594	0.473	0.443	0.561	0.468	0.512	0.397	0.478	0.569	0.560	0.472
AB2	*0.792*	0.411	0.586	0.451	0.447	0.590	0.502	0.579	0.449	0.540	0.569	0.629	0.494
AB3	*0.789*	0.325	0.593	0.386	0.311	0.535	0.355	0.519	0.323	0.452	0.493	0.534	0.394
BT1	0.394	*0.811*	0.383	0.342	0.409	0.367	0.397	0.294	0.391	0.384	0.364	0.403	0.435
BT2	0.458	*0.893*	0.452	0.457	0.511	0.428	0.502	0.382	0.502	0.484	0.435	0.489	0.494
BT3	0.296	*0.678*	0.241	0.437	0.506	0.199	0.417	0.099	0.465	0.421	0.356	0.348	0.381
CB1	0.617	0.373	*0.841*	0.405	0.388	0.545	0.386	0.487	0.375	0.482	0.528	0.519	0.421
CB2	0.664	0.416	*0.881*	0.448	0.389	0.621	0.472	0.589	0.424	0.498	0.589	0.607	0.494
EP1	0.425	0.386	0.381	*0.806*	0.475	0.346	0.537	0.254	0.553	0.515	0.470	0.489	0.574
EP2	0.502	0.488	0.463	*0.856*	0.555	0.411	0.629	0.383	0.629	0.592	0.528	0.563	0.633
EP3	0.425	0.379	0.366	*0.788*	0.473	0.305	0.605	0.282	0.572	0.572	0.470	0.499	0.604
HR1	0.393	0.474	0.293	0.507	*0.817*	0.278	0.447	0.234	0.507	0.470	0.408	0.403	0.464
HR2	0.467	0.533	0.423	0.543	*0.917*	0.386	0.532	0.346	0.608	0.544	0.491	0.510	0.577
HR3	0.453	0.519	0.434	0.542	*0.851*	0.362	0.571	0.330	0.642	0.529	0.477	0.490	0.570
IB1	0.603	0.368	0.553	0.370	0.355	*0.858*	0.387	0.587	0.382	0.448	0.531	0.510	0.374
IB2	0.620	0.367	0.616	0.380	0.335	*0.863*	0.398	0.604	0.390	0.461	0.517	0.540	0.407
IT1	0.408	0.416	0.367	0.565	0.487	0.315	*0.754*	0.256	0.560	0.616	0.467	0.521	0.667
IT2	0.529	0.517	0.471	0.626	0.538	0.448	*0.834*	0.412	0.621	0.663	0.565	0.608	0.673
IT3	0.417	0.375	0.370	0.551	0.413	0.346	*0.776*	0.287	0.492	0.581	0.473	0.513	0.515
IT4	0.411	0.421	0.366	0.538	0.457	0.320	*0.794*	0.276	0.496	0.645	0.465	0.529	0.529
MB1	0.623	0.302	0.587	0.360	0.322	0.618	0.357	*0.915*	0.315	0.402	0.489	0.516	0.365
MB2	0.621	0.321	0.565	0.333	0.331	0.651	0.365	*0.918*	0.338	0.446	0.479	0.536	0.403
PS1	0.368	0.467	0.349	0.574	0.614	0.337	0.593	0.303	*0.818*	0.551	0.458	0.440	0.540
PS2	0.478	0.522	0.458	0.605	0.587	0.436	0.615	0.381	*0.875*	0.612	0.529	0.548	0.610
PS3	0.368	0.403	0.332	0.595	0.490	0.325	0.494	0.186	*0.777*	0.492	0.463	0.466	0.500
PZ1	0.467	0.402	0.416	0.533	0.498	0.387	0.662	0.320	0.522	*0.763*	0.482	0.518	0.567
PZ2	0.578	0.492	0.558	0.582	0.493	0.535	0.675	0.488	0.611	*0.813*	0.573	0.639	0.610
PZ3	0.425	0.401	0.358	0.505	0.430	0.350	0.541	0.275	0.457	*0.748*	0.447	0.498	0.530
PZ4	0.438	0.362	0.410	0.502	0.430	0.341	0.575	0.326	0.476	*0.780*	0.458	0.527	0.571
TP1	0.521	0.322	0.505	0.486	0.448	0.424	0.446	0.374	0.429	0.483	*0.791*	0.593	0.469

(*continued*)

Table 5. Continued

	AU	BT	CD	EXT	HMR	INL	INT	MBL	PSS	PZ	TP	TS	WR
TP2	0.578	0.458	0.573	0.507	0.450	0.531	0.563	0.484	0.521	0.555	*0.796*	0.694	0.508
TP3	0.505	0.338	0.429	0.404	0.345	0.461	0.442	0.365	0.416	0.439	*0.751*	0.545	0.428
TS1	0.511	0.360	0.450	0.480	0.390	0.409	0.491	0.368	0.433	0.523	0.594	0.745	0.509
TS2	0.647	0.469	0.596	0.548	0.474	0.567	0.625	0.545	0.553	0.613	0.663	*0.813*	0.595
TS3	0.514	0.362	0.456	0.460	0.357	0.447	0.521	0.417	0.421	0.506	0.569	*0.762*	0.420
TS4	0.567	0.414	0.512	0.468	0.458	0.445	0.483	0.426	0.408	0.541	0.614	*0.778*	0.454
WR1	0.439	0.393	0.379	0.585	0.470	0.332	0.564	0.302	0.524	0.570	0.474	0.458	0.741
WR2	0.568	0.507	0.545	0.665	0.591	0.469	0.673	0.456	0.626	0.672	0.572	0.612	0.881
WR3	0.436	0.450	0.408	0.596	0.498	0.351	0.592	0.307	0.523	0.566	0.464	0.508	0.831
WR4	0.380	0.406	0.357	0.514	0.437	0.280	0.602	0.251	0.461	0.542	0.409	0.476	0.753

Note(s): AU, Augmenting; BT, Beauty; CD, Co-Developing; EXT, Expertise; HMR, Humorous; INL, Influencing; INT, Interactivity; MBL, Mobilizing; PSS, Passion; PZ, Personalization; TP, Trust in Products; TS, Trust in Streamer

Source(s): Authors' own work

Table 6. Truth table for high CEB

Antecedents for high CEB											
BE	HU	PA	EX	WA	INT	Per	TIS	TIP	Cases	Outcome for high CEB	Raw consistency
1	1	1	1	1	0	1	1	1	4	1	0.997
1	0	1	1	1	1	1	1	1	5	1	0.994
1	1	1	1	0	1	1	1	1	5	1	0.993
1	1	1	1	1	1	1	1	0	6	1	0.993
0	1	1	1	1	1	1	1	1	6	1	0.987
1	1	1	1	1	1	1	0	1	8	1	0.977
1	1	1	1	1	1	1	1	1	446	1	0.977
1	0	0	0	0	0	0	0	0	3	1	0.964
0	0	0	0	0	0	0	0	0	3	1	0.961

Note(s): BE=Beauty, HU = Humorous, PA = Passion, EX = Expertise, WA = Warmth, INT = Interactivity, PER = Personalization, TIS = Trust in streamers and TIP = Trust in Products

Source(s): Authors' own work

Table 7. Truth table for low CEB

Antecedents for low CEB											
BE	HU	PA	EX	WA	INT	Per	TIS	TIP	Cases	Outcome for low CEB	Raw consistency
1	0	0	0	0	0	0	0	0	3	1	0.961
0	0	0	0	0	0	0	0	0	3	1	0.955
1	1	1	1	1	1	1	1	0	6	0	0.768
1	1	1	1	1	1	1	0	1	8	0	0.751
1	1	1	1	1	0	1	1	1	4	0	0.738
1	1	1	1	0	1	1	1	1	5	0	0.722
1	0	1	1	1	1	1	1	1	5	0	0.7
0	1	1	1	1	1	1	1	1	6	0	0.689
1	1	1	1	1	1	1	1	1	446	0	0.225

Note(s): BE = Beauty, HU = Humorous, PA = Passion, EX = Expertise, WA = Warmth, INT = Interactivity, PER = Personalization, TIS = Trust in streamers and TIP = Trust in Products

Source(s): Authors' own work

low CEB, implying that disengagement is configurational: several deficits must coincide before viewers switch off. Table 8 summarizes these metrics.

4.5 fsQCA findings

The findings in Table 10 reveal how socio-technical factors influence high and low CEB in live-streaming e-commerce, using thresholds of 0.75 for consistency and 0.50 for coverage (Pappas and Woodside, 2021). For high CEB, three equifinal configurations (p3, p6 and p7) with an overall coverage of 0.856 and consistency of 0.964 support Proposition 1, demonstrating that no single socio-technical factor or trust dimension is sufficient, yet *different bundles can achieve the same outcome*. Notably, configuration p6 attains high engagement even when humor is absent ("do not care"), showing that passion and interactivity *functionally substitute* for humor – direct evidence of the compensatory logic theorized in Proposition 2. These patterns can be explained through dual-process perspectives, where heuristic cues such as streamer warmth and passion (System 1) operate in tandem with systematic cues like expertise and product trust (System 2) to reinforce engagement. The

Table 8. Analysis of necessary conditions

Configuration	For high CEB Consistency	Coverage	For low CEB Consistency	Coverage
Beauty	*0.927*	*0.918*	0.938	0.204
~Beauty	0.196	0.935	0.623	0.652
Humorous	*0.925*	*0.916*	0.926	0.201
~Humorous	0.194	0.922	0.615	0.644
Passion	*0.939*	*0.914*	0.932	0.2
~Passion	0.178	0.922	0.598	0.683
Expertise	*0.938*	*0.922*	0.93	0.201
~Expertise	0.188	0.925	0.641	0.694
Warmth	*0.931*	*0.93*	0.92	0.202
~Warmth	0.201	0.92	0.684	0.688
Interactivity	*0.938*	*0.928*	0.93	0.203
~Interactivity	0.194	0.927	0.671	0.704
Personalization	*0.946*	*0.935*	0.918	0.2
~Personalization	0.19	0.913	0.703	0.743
Trust in streamers	*0.936*	*0.953*	0.898	0.201
~Trust in streamers	0.216	0.906	0.795	0.731
Trust in products	*0.946*	*0.944*	0.912	0.2
~Trust in products	0.198	0.911	0.745	0.0754

Note(s): a. Threshold for necessary condition with consistency >0.90 and coverage >0.50
b. Italicized values are a necessary condition with both high consistency and coverage
Source(s): Authors' own work

coexistence of affective and cognitive pathways demonstrates how socio-technical affordances activate both intuitive and deliberative processing, thereby amplifying consumer stickiness.

In each high-CEB solution, at least one socio-technical condition (e.g. humor in p6 or trust in streamers in p3) is labeled "do-not-care." This status means the condition is neither required nor prohibited; its influence is subsumed by the other core conditions in that particular formula. Rather than indicating statistical insignificance, such neutrality reflects the fsQCA principle of *functional substitution*: when passion, warmth and interactivity are strong, the incremental contribution of humor becomes redundant. This so-called p6 as passion-personalization substitution path strategy for marketers, where passion (social system) and personalization (technical system) are the most influential factors on high satisfaction, in this sense, based on their highest score on necessary condition analysis.

Similarly, configuration p2 shows that even with an otherwise rich socio-technical bundle, the absence of *both* trust elements is enough to suppress CEB – highlighting that trust acts as a non-negotiable linchpin. These examples illustrate how fsQCA treats ostensibly "insignificant paths" as context-dependent, compensatory or neutral, offering deeper behavioral insight than a symmetric test of path coefficients would allow.

For low CEB, configurations P1 and P2, with an overall coverage of 0.641 and consistency of 0.868, confirm Proposition 2, indicating that the absence of any single socio-technical factor or trust dimension does not independently lead to disengagement. Instead, the simultaneous absence of warmth, passion, expertise, humor, interactivity, personalization, trust in streamers and trust in products (in P1) or both trust dimensions (in P2) results in low CEB. The high consistency of P1 (0.951) underscores the compounded impact of these omissions. Thus, failure emerges from a *bundle of absences*, mirroring the bundling logic for success. The absence of both trust elements aligns with trust transfer theory, as consumers who cannot transfer confidence from the streamer to the product disengage regardless of other positive cues. This illustrates that, under cognitive processing models, the lack of a foundational trust anchor interrupts both heuristic and systematic evaluation, leading to withdrawal from the engagement process.

Building on the fsQCA analysis in Table 9, this study provides visual illustrations of configurations predicting high and low CEB. Figure 2 highlights configuration p3 for high CEB, where beauty, humor, warmth, expertise, passion, interactivity, personalization and trust in products are present, with trust in streamers marked as “do not care.” This combination achieves a consistency of 0.973 and coverage of 0.786. Figure 3 depicts configuration p6, where beauty, warmth, expertise, passion, interactivity, personalization, trust in streamers and trust in products are present, with humor as “do not care,” yielding a consistency of 0.977 and coverage of 0.790. These figures visualize the principle of equifinality: distinct but overlapping bundles drive equally strong engagement. The XY plots further illustrate that cases with high levels of the identified causal conditions consistently cluster in the upper-right quadrant, reinforcing the sufficiency of these configurations for high CEB. This visual evidence strengthens confidence in the configurational solutions derived from fsQCA.

Figure 4 illustrates configuration p1, predicting low CEB, characterized by the absence of humor, warmth, expertise, passion, interactivity, personalization, trust in products and trust in streamers, with beauty marked as “do not care.” This configuration achieves a consistency of 0.951 and coverage of 0.405. Figure 5 presents configuration p2, where low CEB arises despite the presence of most socio-technical factors, but both trust elements are “do not care,” yielding a consistency of 0.867 and coverage of 0.458. The overall solution consistency of 0.916 validates Proposition 2, underscoring that disengagement stems from a configurational void rather than a single missing antecedent.

4.6 Model robustness testing

To validate the robustness of the fsQCA solution models, this study employs a predictive validity approach following Pappas and Woodside (2021). The initial dataset was split into two equal groups: a subsample ($N = 341$) and a holdout sample ($N = 341$). The subsample was subjected to fsQCA analysis, progressing from the construction of the truth table to the identification of configuration solutions, as detailed in Table 10. The analysis yielded an

Table 9. Configuration for “high” and “low” CEB

Configuration	High e-satisfaction P3	P6	P7	Low e-satisfaction P1	P2
Beauty (BE)	★	★	–	–	•
Humorous (HU)	★	–	★	⊗	•
Passion (PA)	★	★	★	⊗	•
Expertise (EX)	★	★	★	⊗	•
Warmth (WA)	★	★	★	⊗	•
Interactivity (INT)	★	★	★	⊗	•
Personalization (PER)	★	★	★	⊗	•
Trust in streamers (TIS)		★	★	⊗	⊗
Trust in products (TIP)	★	★	★	⊗	⊗
Raw Coverage	0.786	0.79	0.131	0.405	0.588
Unit Coverage	0.012	0.015	0.001	0.053	0.236
Consistency	0.973	0.977	0.991	0.951	0.867
Overall solution coverage	*0.856*			*0.641*	
Overall solution consistency	*0.964*			*0.868*	
Proposition	*Pr. 1 confirmed*			*Pr. 2 confirmed*	

Note(s): “•” shows presence conditions, “⊗” shows absence conditions and “blank space” indicates “don’t care” condition. “★” indicates a necessary condition in high CEB

Source(s): Authors’ own work

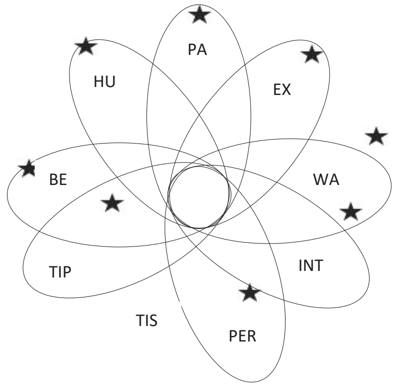

Figure 2. Path 3 contributes to high CEB (consistency = 0.973 and coverage = 0.786). Note: The solid ellipse represents the "presence" condition. The dotted ellipse represents the "absence" condition. No ellipse represents the "do not care" condition

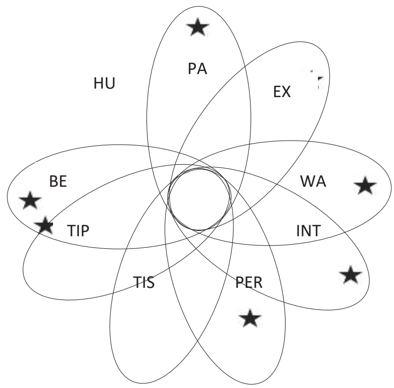

Figure 3. Path 6 contributes to high CEB (consistency = 0.977 and coverage = 0.790). Note: The solid ellipse represents the "presence" condition. The dotted ellipse represents the "absence" condition. No ellipse represents the "do not care" condition

overall solution consistency of 0.963 and solution coverage of 0.854, indicating a reliable model. We defined 0.963 as a "high" consistency threshold because it exceeds the conventional benchmark values (e.g. 0.75 as acceptable, 0.90 as strong) commonly used in set-theoretic analysis (Ragin, 2009; Schneider and Wagemann, 2012). In fsQCA, consistency measures the degree to which cases sharing a given condition also display the outcome, and values above 0.90 are generally considered to represent strong sufficiency. Therefore, reporting a threshold of 0.963 indicates that the identified causal configuration demonstrates a very robust empirical relationship, beyond what is typically expected in configurational research. The subsample consistency value (>0.80) closely aligns with the original sample values of 0.964 and 0.868, as shown in Table 9, thereby confirming the stability and predictive strength of the solution models. To further ensure robustness, we conducted permutation tests, which yielded consistent results with the original solutions, thereby ruling out random associations. Additionally, alternative calibration thresholds were tested, and the core patterns of causal conditions remained stable, confirming the reliability of the findings across different specifications.

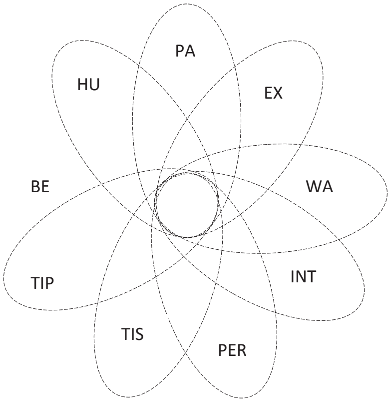

Figure 4. Path 1 contributes to low CEB (consistency = 0.951 and coverage = 0.405). Note: The solid ellipse represents the “presence” condition. The dotted ellipse represents the “absence” condition. No ellipse represents the “do not care” condition

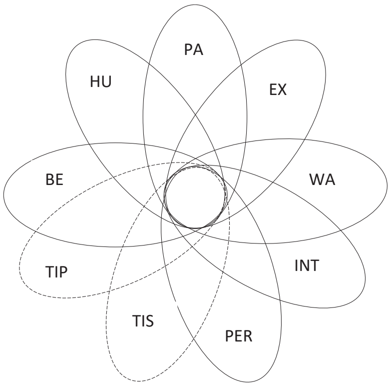

Figure 5. Path 2 contributes to low CEB (consistency = 0.867 and coverage = 0.588). Note: The solid ellipse represents the “presence” condition. The dotted ellipse represents the “absence” condition. No ellipse represents the “do not care” condition

Table 10. Sufficient condition of consumer engagement behavior from subsample (*N* = 341)

Solutions	Raw coverage	Unique coverage	Consistency
S1: HUR*PAS*EXP*WAR*INT*PES*TIS*TIP	0.796	0.022	0.971
S2: BEA*HUR*PAS*EXP*WAR*INT*PES*TIP	0.786	0.012	0.969
S3: BEA*HUR*PAS*EXP*WAR*INT*PES*TIS	0.789	0.015	0.973

Note(s): Solution coverage 0.854
Overall solution consistency 0.963
Source(s): Authors’ own work

The holdout samples were further analyzed using the XY Plot graph method available in the fsQCA software. Three solutions (s1, s2 and s3) were tested against the holdout samples to generate XY plots and consistency values. The results, displayed in Figures 6, 7, and 8, reveal

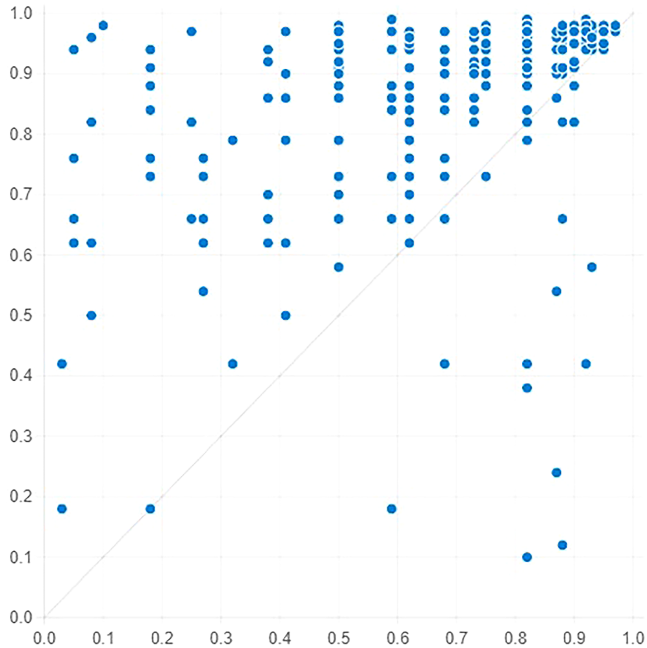

Figure 6. S1: HUR*PAS*EXP*WAR*INT*PES*TIS*TIP. Consistency 0.977; coverage 0.788

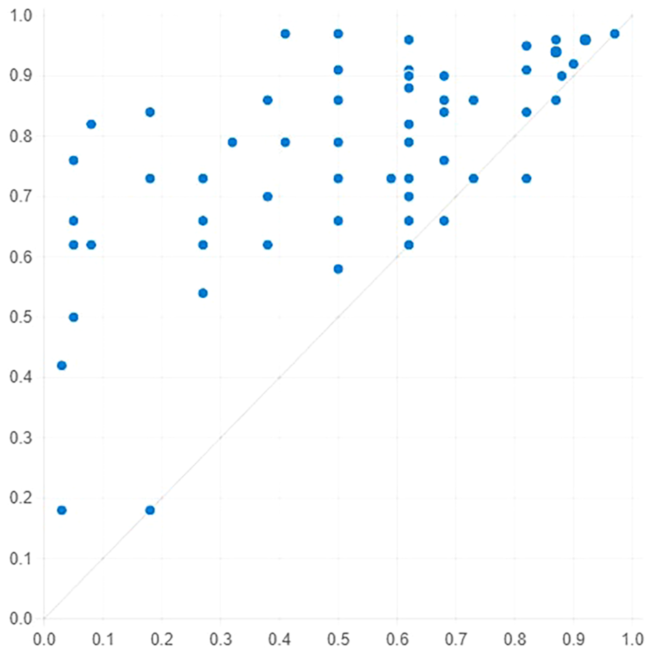

Figure 7. S2: BEA*HUR*PAS*EXP*WAR*INT*PES*TIP. Consistency 0.976; coverage 0.785

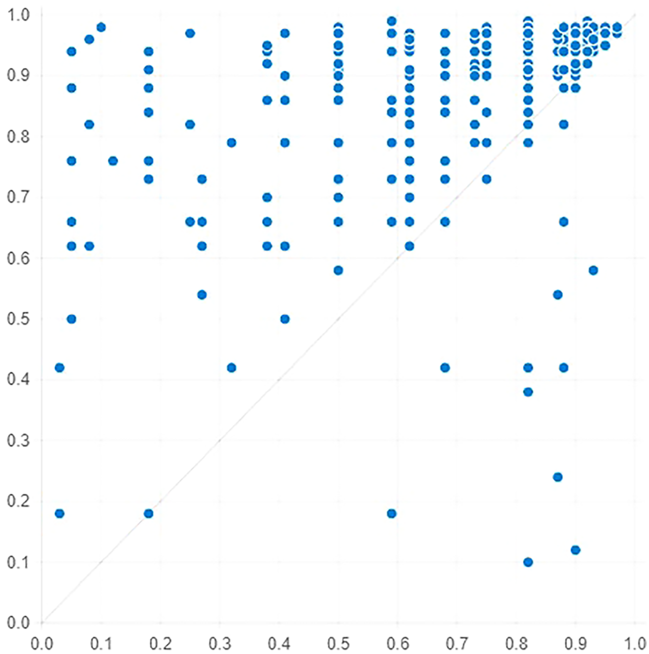

Figure 8. S3: BEA*HUR*PAS*EXP*WAR*INT*PES*TIS. Consistency 0.977; coverage 0.782

consistency values of 0.977 for solution 1, 0.976 for solution 2 and 0.977 for solution 3. These high consistency values indicate that even when the data is analyzed randomly, the results remain robust. This confirms the high predictive validity of the solution models, demonstrating their reliability and suitability for predicting consumer engagement behavior in live streaming e-commerce.

5. Discussion

This study delves into the complexities of CEB in live streaming by identifying socio-technical factors and trust-transfer mechanisms that either foster or hinder engagement. Employing fsQCA, the results uncover three equifinal configurations (p3, p6, p7) leading to high CEB and two configurations resulting in low CEB. The findings underscore the significance of combining socio-technical factors – beauty, humor, passion, warmth, expertise, interactivity and personalization – with trust in products and streamers, rather than relying on any single factor. Configuration p6, for example, attains high CEB even when humor is “do not care,” demonstrating the substitution pattern, where passion × interactivity compensate for low humor. This aligns with Proposition 1, which posits that high CEB is produced by bundles of factors and that different bundles can yield the same outcome. Specifically, configurations that incorporate these factors exhibit high consistency, affirming their effectiveness in driving engagement. Configuration p3 illustrates the reinforcement pattern, where the simultaneous presence of all social and technical cues amplifies trust and engagement.

Conversely, the analysis of low CEB confirms Proposition 2, which suggests that the absence of a single socio-technical factor or trust element is insufficient to cause disengagement. Instead, low CEB arises from the simultaneous absence of warmth, passion, expertise, humor, interactivity, personalization and trust in products and streamers. Configuration p2 demonstrates a third pattern – conflict: although several social and technical cues (e.g. beauty, interactivity) are present, the lack of both trust elements neutralizes their positive effects, leading to disengagement. This highlights the critical moderating role of trust in live-streaming e-commerce. By integrating socio-technical systems and trust transfer, this study advances a more holistic understanding of CEB compared to conventional linear models, which often focus narrowly on either social, technical or trust elements.

This study's fsQCA results, therefore, challenge the additive assumptions of prior SEM-based research. First, they reveal equifinality: multiple, distinct socio-technical–trust bundles deliver equally high engagement. Second, they evidence compensatory sufficiency: the presence of one element (e.g. passion) can offset the absence of another (e.g. humor). Third, they expose conflict, whereby missing trust elements can negate otherwise favorable social-technical conditions. Such interaction patterns extend STS by demonstrating that social and technical resources can reinforce, substitute for or undermine one another. In traditional STS research, "fit" often implies a linear and static alignment between social and technical subsystems. Under fsQCA logic, however, our study reconceptualizes STS fit as a dynamic, configurational alignment in which multiple combinations of social, technical and trust factors can jointly produce the same behavioral outcome. This means that fit is not about achieving a single optimal alignment, but about recognizing equifinality and compensatory substitution across different resource bundles. Such a reconceptualization shifts the focus from one-size-fits-all alignment to a flexible understanding of how socio-technical elements coalesce differently to sustain consumer engagement in live-streaming commerce.

Comparable research in service management and information systems has also demonstrated the value of fsQCA in uncovering complex, configurational paths to behavioral outcomes (e.g. Pappas and Woodside, 2021; Silalahi *et al*., 2025). By situating our findings within this growing body of configurational research, our study reinforces the argument that fsQCA provides theoretical leverage beyond traditional symmetric models by capturing equifinality, functional substitution and causal asymmetry. This comparative positioning underscores how our work not only applies fsQCA to live streaming commerce but also extends its use to the domain of socio-technical trust transfer, offering a fresh angle that complements prior applications in digital engagement and consumer decision-making. Consequently, managerial efforts can flexibly emphasize different resource mixes – or ensure that critical trust cues are not missing – to reach comparable engagement goals, an insight not captured by linear models.

6. Implications for research (theory) and practice

6.1 Implications for theory

By weaving STS theory, the stereotype-content model and affordance theory into one framework, we slot each variable into a clear conceptual niche and demonstrate how those niches interlock to generate CEB. Specifically, STS explains the structural interdependence between human and system components, SCM classifies the specific signal types transmitted by streamers (affective vs cognitive) and affordance theory specifies the technical mechanisms enabling those signals. Their integration creates a multi-level framework linking micro-cues to macro-engagement outcomes.

Under this integrated lens, STS (Bostrom and Heinen, 1977) treats streamer cues as social subsystems and platform features as technical subsystems whose impact depends on mutual fit. Mapping beauty, humor, warmth, passion and expertise onto stereotype-content dimensions clarifies the affective versus cognitive signals each cue sends (Fiske *et al*., 2018). Personalization and interactivity, viewed through affordance theory (Nambisan *et al*., 2017), become AI-enabled action possibilities that cut informational and temporal friction. Our fsQCA results reveal that these subsystems do not act additively but combine into configurational "formulas": for example, high passion plus high interactivity offsets missing humor (configuration p6), reframing STS "fit" as adaptive and contingent rather than static alignment. By modeling CEB dimensions as equally weighted and allowing for their presence or absence in configurational pathways, our study demonstrates that different engagement behaviors may substitute for one another in value co-creation, advancing both engagement theory and socio-technical systems research.

Besides, our findings enrich established literature by extending engagement theory (Brodie *et al*., 2011; Hollebeek *et al*., 2014) through a socio-technical lens, advancing digital trust research (Gefen, 2000; Pavlou, 2003) with a configurational perspective and integrating parasocial interaction (Horton and Richard Wohl, 1956; Labrecque, 2014) into socio-technical dynamics. This reinforces the relevance of our contribution not only to STS theory but also to broader conversations in engagement, trust and consumer–media relationships.

A second contribution is the discovery of "trust gatekeeping," an asymmetric causal principle that reconciles inconsistent live-stream findings. In every high-CEB solution, at least one trust dimension (product or streamer) is present, yet neither suffices alone; in low-CEB solutions, their joint absence is pivotal. Trust, therefore, functions as a critical enabling factor: it may not be sufficient on its own to generate engagement, but its absence can nullify even the strongest socio-technical bundle. Equifinality also emerges – three distinct social-technical-trust constellations (p3, p6, p7) deliver equally strong CEB – suggesting multiple strategic routes to success. These insights extend STS by adding equifinality, asymmetric necessity and resource vetoes; enrich stereotype-content theory by showing warmth and competence cues swap roles only under certain technical affordances; and expand affordance theory by revealing that platform features oscillate between core and peripheral status depending on social and trust context. Collectively, we offer a multitheoretic, configurational map that future scholars can use to study digital-commerce phenomena that elude linear models and to theorize boundary conditions without assuming linear, additive effects.

6.2 Implications for live streaming practice

This study provides clear, actionable strategies for live-streaming managers, platforms and streamers to enhance CEB by leveraging socio-technical systems and trust transfer. Unlike prior prescriptions that list "best practices" in isolation, our guidance is extracted directly from the three high-engagement fsQCA recipes (p3, p6 and p7) and the two low-engagement voids (P1 and P2). Consequently, every recommendation is tied to a specific, empirically validated configuration – demonstrating which levers matter together and when resource substitution is feasible.

(1) Visual Strategies

Visual and behavioral cues are not one-size-fits-all; instead, streamers should adopt specific archetypes based on their natural strengths to maximize engagement. The findings underscore the critical role of combining attributes like beauty, humor, passion, expertise, warmth, personalization and interactivity with trust in streamers and products. Platforms should prioritize investments in high-resolution cameras, professional lighting and visually appealing backgrounds to elevate visual appeal, fostering viewer confidence and encouraging extended engagement (Guo *et al*., 2022). Streamers must incorporate humor to create a relaxed, engaging atmosphere, as witty interactions increase session memorability and drive repeat engagement (Johnson, 2024). However, configuration p6 shows that when humor talent is scarce, platforms and streamers can strategically emphasize passion and to sustain engagement – an efficiency insight not documented in earlier studies. Streamers can strategically incorporate humor to enhance memorability and repeat engagement.

Beyond this substitution principle, our findings offer further actionable guidance for platforms and streamers. Platforms can design training programs and recommendation algorithms that encourage creators to emphasize their strongest attributes rather than conforming to a uniform style. Real-time analytics dashboards should be developed to track the relative performance of engagement cues, enabling streamers to adapt dynamically if one attribute (e.g. humor) is less effective. Finally, recognizing equifinality, platforms can strategically adopt segmented strategies rather than one-size-fits-all approaches: some audiences engage most with humor, while others resonate more with expertise or warmth, implying that AI-enabled personalization can tailor promotion strategies accordingly.

To make these findings more actionable, we distilled the fsQCA configurations into a typology of streamer roles that managers and platforms can readily apply. This typology consists of three archetypes: (1) Charismatic Trust Builders (similar to "Charismatic Hosts"), who rely on humor, warmth and passion to anchor trust transfer and create socially engaging experiences even when technical sophistication is limited; (2) Technical Demonstrators (similar to "Technocrat Streamers"), who emphasize interactivity, personalization and product trust, using platform features and transparent demonstrations to compensate for weaker social charisma; and (3) Balanced Performers, who holistically combine social cues and technical Polish, offering the most versatile pathway to strong consumer engagement. By framing our configurations into these roles, we translate abstract socio-technical dynamics into actionable models that platforms can recognize, train and benchmark against, ensuring that talent development and recommendation strategies align with distinct engagement pathways.

(2) Trust Mechanisms

Trust functions as a "gatekeeper" in live commerce; its presence is a prerequisite for engagement, while its absence nullifies even the richest socio-technical features. The discovery of "trust gatekeeping" underscores that both product and streamer trust are indispensable. Platforms must reinforce visible signals such as product guarantees, certifications and streamer verification systems. Expertise and warmth are non-negotiable for streamers aiming to build trust and loyalty. Regular training is essential for streamers to gain in-depth product knowledge, enhancing credibility and professionalism (Luo *et al.*, 2024). Personal interactions, such as addressing viewers by name and engaging with their comments, foster a sense of connection and loyalty among the audience (Shih *et al.*, 2024). Passion can be demonstrated through storytelling and personal anecdotes, creating authentic sessions that captivate viewers and sustain their interest (Zhang *et al.*, 2024).

Trust in products can be reinforced through transparent demonstrations, real customer reviews and stringent quality control. Open discussions about product limitations further enhance credibility and reliability (Shih *et al.*, 2024).

(3) Ethical and Consumer Protection

Ethical and consumer-protection implications matter because high engagement can be harmful if trust safeguards are absent. Responsible design ensures CEB growth remains sustainable rather than exploitative. Our configurational evidence indicates that enhancing CEB must be paired with ethical and consumer-protective live-streaming design. Trust is not only an engagement driver but an ethical boundary: the low-CEB voids show that when trust in both the streamer and product is absent, engagement collapses, signaling higher exposure to manipulative persuasion and post–purchase regret. Therefore, platforms should implement feasible safeguards as routine quality standards aligned with TQM values of transparency, reliability and fairness. In practice, these can be achieved, (1) by requiring an on-screen prescribed label and brief verbal labeling on the opening of streams (transparency), (2) by just having simple verification badges on the streamers and uniform product-guarantee icons (reliability) and (3) by basic consumer-welfare features already common in digital platforms – such as purchase-limit reminders for first-time buyers, optional spending alerts for younger users and an easy one-tap "report misleading claim" button reviewed by moderators (fairness). Embedding these ethical safeguards into the socio-technical bundle ensures engagement grows through responsible means and remains sustainable over time.

(4) Platform Investments

High consumer engagement relies on a seamless technical infrastructure that reduces friction and enables scalable personalization. Technologically, every high-CEB configuration features ultra-low-latency interactivity and AI-driven personalization; hence, investment in 5G edge servers, recommender engines and real-time analytics is imperative for global scalability, a nuance absent in earlier managerial guides. Platforms must ensure interactivity and personalization to retain user engagement. Integrating real-time features like Q and A sessions, live chats and polls strengthens streamer-viewer connections and encourages prolonged platform use (Zhang *et al.*, 2022a). Data-driven personalization enables platforms to tailor content to individual preferences, making viewers feel valued and driving deeper engagement (Zheng *et al.*, 2023).

(5) Global Adaptations

Engagement drivers vary across cultural contexts and economic constraints, requiring localized rather than universal strategies. Socially, the high-CEB recipes reveal that warmth-plus-interactivity encourages viewers to co-create content and establish supportive micro-communities, which NGOs and rural artisans can leverage for real-time cause marketing and community-based branding. While our recommendations derive from Indonesian data, the underlying "recipes" are transferable – with adaptation – to other regions. For example, in East Asia (e.g. China's Taobao Live), visual aesthetics such as beauty and cuteness (萌 *meng*) are culturally salient; in North America, authenticity and expertise play a stronger role due to consumer skepticism toward influencer promotions; and in the EU, stricter regulations on disclosure and quality seals elevate the importance of compliance cues. These patterns align with Hofstede's cultural dimensions, where collectivist, high-context societies emphasize relational warmth and aesthetics, while individualist and high-uncertainty-avoidance contexts prioritize transparency, compliance and expertise (Hofstede, 2011; de Mooij, 2019). Thus, socio-technical bundles must be tuned to cultural and regulatory regimes rather than applied as universal prescriptions. Economically, the documented equifinality lowers entry barriers: sellers that lack funds for professional comedians can still achieve high CEB via the passion-interactivity path, broadening participation in the creator economy.

To avoid low CEB, the consistent presence of socio-technical attributes and trust factors is essential. The absence of warmth, passion, expertise, humor, interactivity, personalization and trust simultaneously leads to disengagement. Streamers must blend professionalism with enthusiasm and humor while maintaining authenticity. Platforms must ensure their technical features function seamlessly and prioritize product quality assurance. By framing these recommendations around our configurational evidence – rather than generic best practices – we provide managers with a decision map that indicates which resource bundles to assemble given their current strengths and constraints, thereby advancing practice beyond what prior linear studies could offer.

All previous studies' comparison to the present work's practical implications and direction are exhibited in Table 11. In contrast, the comparative performance of configuration p6 vs p3 under different cultural/regulatory regimes is exhibited in Table 12.

7. Originality/value

This study makes three main contributions. First, it advances socio-technical systems theorizing in live-streaming commerce by shifting explanation from net-effects to configurational causality. Using fsQCA, we show that CEB emerges through multiple equally effective pathways (equifinality) rather than a single "best" set of drivers. Second, the findings demonstrate functional substitution among engagement resources: certain social cues and platform affordances can compensate for the absence of others (e.g. passion and interactivity can offset limited humor in one high-engagement configuration), reframing socio-technical "fit" as flexible and context-dependent. Third, we identify trust gatekeeping as an asymmetric causal principle, showing that trust functions as a critical enabling factor in

Table 11. Previous studies vs the present work's practical implications and direction

Study	Managerial recommendation (practical implication)	Reported implementation challenge	Addresses RQ1?*	Addresses RQ2?*	Addresses RQ3?*
Shih *et al.* (2024)	Urge streamers to answer viewer questions swiftly and courteously	Multitasking burden: content creation, technical setup and large-volume chats stretch limited communication skills	✔	–	–
Luo *et al.* (2024)	Advise streamers to deliver accurate, engaging product explanations grounded in expert knowledge	Tight response windows, uneven expertise and divergent viewer expectations	✔	–	–
Zheng *et al.* (2023)	Suggest platforms offer personalized service menus and differentiated programme formats	Excessive customization choices risk overwhelming both hosts and audiences, degrading experience quality	✔	–	–
Zhang *et al.* (2022a)	Recommend advanced control tools (zoom, comment blocking) to heighten user autonomy	Feature incompatibility across devices may erode viewing satisfaction	✔	–	–
Zhang *et al.* (2024)	Encourage streamers to catalyze peer-to-peer interaction among viewers	Many viewers remain passive; a few purchase-oriented users dominate chat	–	–	–
Guo *et al.* (2022)	Form a specialized team to curate product assortments and craft informative scripts	Budgetary limits and managerial skill gaps constrain team formation	✔	–	–
Present study	Provide configuration-specific roadmaps linking social cues, platform affordances and trust to four CEB facets	Demonstrates how compensatory bundles can offset missing resources, widening strategic options	✔	✔	✔

Note(s): * ✔ = study covers the research question; – = not addressed
Source(s): Authors' own work

high-engagement pathways and that its absence can nullify otherwise strong socio-technical bundles. In other words, trust may not be sufficient by itself to generate engagement, but its absence can undermine even strong socio-technical configurations. Collectively, these contributions provide a clearer configurational account of how social cues, technical affordances and trust conditions jointly shape engagement in live-streaming commerce.

8. Conclusion and limitations

This study investigates how socio-technical systems and trust in products and streamers contribute to high and low CEB in live streaming. By employing fsQCA, the findings reveal distinct configurations leading to high and low CEB. For high CEB, the simultaneous presence of beauty, expertise, warmth, passion, personalization, interactivity, humor, trust in streamers and trust in products emerges as essential. Conversely, to mitigate low CEB, live streaming must ensure the presence of the same socio-technical and trust elements. These insights provide a comprehensive understanding of the intricate interplay of engagement bundles, offering practical strategies for enhancing engagement in live streaming environments.

Table 12. Comparative performance of configuration p6 vs p3 under different cultural/regulatory regimes

Configuration	Key features	Stronger performance in	Weaker performance in	Managerial implications
p6 (Humor absent, but Passion × Interactivity strong + Trust)	Relies on passion and interactivity compensating for low humor	Collectivist, interactive cultures (e.g. Southeast Asia) where engagement thrives on shared enthusiasm and synchronous communication	Highly regulated markets requiring formal trust signals beyond passion	Invest in interactivity tools, highlight streamer expertise and localize passion-driven appeals
p3 (All socio-technical cues present, Trust in streamers "do not care")	Relies on broad cue reinforcement across visual, affective, and cognitive dimensions	High-regulation contexts (e.g. EU) where redundancy in cues reassures compliance and trust	Low-bandwidth or resource-constrained markets where providing all cues is infeasible	Emphasize multi-cue consistency and regulatory compliance in communication

Our findings extend existing theoretical frameworks by demonstrating that trust transfer within live streaming commerce is not only a matter of interpersonal influence but also deeply embedded in socio-technical dynamics. Specifically, the integration of interaction, identification, synchronicity and vicarious expression into the trust transfer process refines current trust-based models by highlighting how these dimensions collectively shape consumer stickiness behaviors such as visit duration and retention. This contributes to a more nuanced understanding of trust transfer, suggesting that consumer engagement in live streaming cannot be fully explained by traditional trust models alone but requires a socio-technical lens that acknowledges the interplay between technological affordances and social relationships. Thus, the study revises prior frameworks by positioning socio-technical dimensions as mediating mechanisms in the trust–behavior link, offering a fresh perspective that advances both trust theory and live streaming commerce literature.

Despite its contributions, this study has limitations. First, we employed purposive, non-probability sampling, which restricts the representativeness of the findings. While this approach was appropriate for targeting active users of live-streaming commerce, it inevitably constrains the extent to which our results can be generalized to the broader consumer population. Second, our data collection was limited to Indonesian consumers. Although Indonesia represents a theoretically meaningful context – characterized by exceptionally high mobile penetration, rapid digital adoption and its status as one of the world's leaders in social commerce – future research should extend this study by conducting comparative analyses across different markets or consumer segments. Such cross-contextual work would help validate the robustness of our findings and further illuminate cultural or market-specific dynamics in socio-technical interactions within live-streaming commerce.

Third, our research design employed a cross-sectional approach, which restricts the ability to observe how socio-technical and trust configurations evolve over time. Future studies could employ methodological innovations such as longitudinal fsQCA to capture temporal shifts in consumer engagement or dynamic configurational tracking to monitor how specific bundles of social, technical and trust elements strengthen, weaken or recombine as live-streaming ecosystems mature. These approaches would offer richer insights into the stability, adaptation and evolution of engagement-driving configurations, thereby advancing the methodological frontier of configurational research in digital commerce.

Appendix

Table A1. Operationalization and measurement of variables

Variables	Definition	Measurement items	Source
Beauty (BE)	A seller's facial appearance and plays a crucial role in influencing consumer behavior and sales outcomes	(1) The streamer is beautiful (handsome) (2) The streamer is very attractive physically (3) The streamer is very good-looking	McCroskey and McCain (1974), Guo *et al.* (2022)
Humor (HU)	The ability to make people find you funny or enjoyable which strengthens social connections	(1) The streamer is funny (2) The streamer is humorous (3) The streamer is amusing	Guo *et al.* (2022), Hou *et al.* (2020)
Passion (PA)	An emotional state combined with cognitive and behavioral elements that reflect high personal value and strong positive activation)	(1) The streamer's face lit up when he/she talks (2) The streamer has energetic body movements (3) The streamer talks with a varied tone and pitch	Chen *et al.* (2009), Guo *et al.* (2022)
Expertise (EX)	A streamer's experience, knowledge and achievements in selling products through live streaming	(1) The streamer is expert (2) The streamer seems to have experience with live streaming sales (3) The streamer appears to possess considerable expertise in the field of live streaming	Hsieh (2023), Wu *et al.* (2018), Li and Peng (2021)
Warmth (WA)	Pleasantness, which includes liking meaning good intention of that person and is shown by sincerity, kindness, moral, trustworthiness and friendly manner	(1) The streamer is very warm (2) The streamer is sincere (3) The streamer is friendly (4) The streamer is trustworthy	Zhang *et al.* (2022a, b), Fiske *et al.* (2018), Guo *et al.* (2022)
Interactivity (INT)	The mutual exchange of emotions and content between streamers and customers, reflecting the depth of their engagement	(1) The streamers were happy to communicate with viewers (2) The streamers actively responded to viewer questions (3) The streamers answered viewer questions and requests promptly (4) The streamers provided relevant information based on viewer inquiries	Zhang *et al.* (2022a), Kang *et al.* (2021), Xue *et al.* (2020)
Personalization	The ability to deliver tailored products or services to consumers	(1) Streamers in live streaming shopping provide information on alternative products I intend to buy (2) Streamers help identify my product needs (3) Streamers assist in determining which product attributes best fit my preferences (4) Streamers offer personalized product recommendations based on my requirements	Chou and Nguyen (2023), Zhang *et al.* (2022a, b)

(*continued*)

Table A1. Continued

Variables	Definition	Measurement items	Source
Trust in products (TIP)	The expectation that sellers will act ethically and responsibly by offering good-quality products (Zhang *et al.*, 2022a, b).	(1) I expect the products I order from live streaming to match my expectations (2) I believe I will be able to use the products as demonstrated (3) I trust that the products I receive will be the same as those shown during live streaming	Zhang *et al.* (2022a, b), Gefen *et al.* (2003)
Trust in streamers (TIS)	The degree to which consumers perceive them as credible and reliable in offering quality products without exploitation	(1) I believe in the information that the streamer provides through live streaming (2) I can trust the streamer on live streaming (3) I believe that streamer on live streaming is trustworthy (4) I do not think that streamer on live streaming would take advantage of me	Zhang *et al.* (2022a, b)
Augmenting (AU)	How consumers actively share their knowledge experiences and time to help other customers gain better insights	(1) I will share my relevant knowledge by posting comments in the e-commerce live streaming (2) I will share my previous experience by posting content in the e-commerce live streaming (3) I will contribute my time and skills to the live streaming shopping	Japutra *et al.* (2022), Shih *et al.* (2024)
Co-developing (CD)	The contribution that the consumer shows in terms of knowledge, skill and effort to support the development of products or services	(1) If necessary, I will provide my ideas for the improvement of live streaming shopping (2) If necessary, I will give my opinions on the development of new services for live streaming shopping	Li and Han (2021), Shih *et al.* (2024)
Influencing (INL)	The consumer's role in influencing other consumers through their perceptions, knowledge or preferences toward the products	(1) I will use my experience to influence other people's views of live streaming shopping (2) I will spend my time and skills to increase other people's awareness and understanding of live streaming shopping	Li and Han (2021), Shih *et al.* (2024)
Mobilizing (MBL)	The actions of consumers in mobilizing other consumers in using services or products	(1) I would encourage others to buy the products recommended by the streamers and (2) I will persuade my relatives and friends to buy the products from live streaming shopping	Japutra *et al.* (2022), Shih *et al.* (2024)

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