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Developing and validating a scale to assess customer experience during the order fulfillment process in the e-commerce context

Desarrollar y validar una escala para evaluar la experiencia del cliente durante el proceso de cumplimiento de pedidos en el contexto del comercio electrónico

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ABSTRACT

This study develops and validates a novel multidimensional scale for assessing customer experience during the order fulfillment process in e-commerce, addressing the lack of measurement tools focused on the post-purchase stage. While prior research has mainly examined operational metrics such as delivery speed or service quality, it often neglects the emotional and experiential dimensions of fulfillment. Drawing on experiential marketing theory, this study proposes a comprehensive framework that integrates both functional (e.g., accuracy, tracking) and emotional (e.g., enjoyment, smoothness) components of the customer experience. The research was conducted in two stages —pretest and full-scale validation— based on a survey of 385 online consumers in Russia. This empirical context, representing a large and fast-growing digital market, offers valuable insights beyond traditional Western-centric studies. Using Partial Least Squares Structural Equation Modeling (PLS-SEM), the analysis revealed six key dimensions of the fulfillment experience: convenience, enjoyment, smooth delivery, parcel tracking, communication support, and the accuracy and condition of the delivered product. This study contributes to customer experience literature by positioning order fulfillment as a critical experiential touchpoint in the post-purchase stage. Beyond its theoretical value, the validated scale offers a practical diagnostic tool for e-commerce providers seeking to enhance service quality and customer satisfaction across diverse market contexts.

Keywords: Customer experience, Order fulfillment process, E-commerce, Scale development, Post-purchase stage, Retail industry, Emerging markets.

R E S U M E N

Este estudio desarrolla y valida una nueva escala multidimensional para evaluar la experiencia del cliente durante el proceso de cumplimiento de pedidos en el comercio electrónico, abordando la carencia de instrumentos de medición centrados en la etapa poscompra. Mientras que investigaciones previas han analizado principalmente indicadores operativos, como la velocidad de entrega o la calidad del servicio, a menudo se han pasado por alto las dimensiones emocionales y experienciales del cumplimiento. Basándose en la teoría del marketing experiencial, este estudio propone un marco integral que integra tanto componentes funcionales (p. ej., exactitud, seguimiento) como emocionales (p. ej., disfrute, fluidez) de la experiencia del cliente. La investigación se llevó a cabo en dos etapas —pretest y validación a gran escala— mediante una encuesta a 385 consumidores en línea en Rusia. Este contexto empírico, que representa un mercado digital amplio y de rápido crecimiento, ofrece perspectivas valiosas más allá de los estudios tradicionalmente centrados en Occidente. Utilizando Modelado de Ecuaciones Estructurales por Mínimos Cuadrados Parciales (PLS-SEM), el análisis reveló seis dimensiones clave de la experiencia de cumplimiento: conveniencia, disfrute, fluidez en la entrega, seguimiento del paquete, soporte de comunicación y exactitud y estado del producto entregado. Este estudio contribuye a la literatura sobre experiencia del cliente al posicionar el cumplimiento de pedidos como un punto de contacto experiencial crítico en la etapa poscompra. Más allá de su valor teórico, la escala validada ofrece una herramienta práctica de diagnóstico para que los proveedores de comercio electrónico mejoren la calidad del servicio y la satisfacción del cliente en diversos contextos de mercado.

Palabras clave: Experiencia del cliente, Cumplimiento de pedidos, Comercio electrónico, Desarrollo de escalas, Etapa poscompra, Industria minorista, Mercados emergentes.

1. INTRODUCTION

The rapid development of digital technologies continues to transform consumer behavior and business operations, with e-commerce representing one of the most dynamic and fast-growing phenomena in the global economy (Astete-Meza *et al.*, 2025; Hanafizadeh *et al.*, 2017; Verhoef *et al.*, 2021; Vrhovac *et al.*, 2023). Global online retail sales are projected to grow from $4.248 trillion in 2020 to $7.391 trillion by 2025 (SOAX, 2025), with emerging markets showing particularly rapid adoption. In these contexts, structural, infrastructural, and behavioral conditions create unique challenges and opportunities, reinforcing the need to reassess conventional assumptions about customer experience in online retail environments.

While much academic attention has been devoted to pre-purchase and purchase stages, the post-purchase phase remains relatively underexplored, particularly in e-commerce settings (Cao *et al.*, 2018; Javed & Wu, 2020). One key component of this phase is order fulfillment, commonly defined in logistics literature as a set of operational activities ensuring that goods are delivered accurately, efficiently, and at the lowest possible cost (Loate *et al.*, 2017; Nguyen *et al.*, 2018). However, this functionalist view overlooks the experiential nature of customer interactions during this stage. With rising customer expectations, intensified competition, and the rise of omnichannel strategies, order fulfillment is becoming more than a backend operation —it is now a critical experiential touchpoint in shaping brand perceptions, trust, and long-term loyalty (Klein & Popp, 2022; Pine & Gilmore, 2011; Xiao *et al.*, 2018).

Despite these developments, few studies have conceptualized the order fulfillment process through a customer-centric lens, and validated measurement instruments remain scarce. Existing frameworks primarily focus on functional performance indicators such as delivery speed, accuracy, or cost, but fail to capture the emotional and perceptual aspects of how consumers experience the receipt of their orders (Vakulenko *et al.*, 2019; Vrhovac *et al.*, 2023). Moreover, most empirical studies have been conducted in developed markets, with limited attention to emerging economies, where the contextual specificity of fulfillment logistics may significantly shape customer experience (Nguyen *et al.*, 2018; Olsson *et al.*, 2022).

This study aims to reframe the understanding of customer experience during the order fulfillment process by extending existing conceptualizations of this stage beyond its traditional treatment as a purely logistical and functional domain. Drawing on experiential marketing theory and a review of existing measurement scales, the study positions order fulfillment as a critical but underexplored touchpoint in the post-purchase phase. It develops and validates a multidimensional measurement scale that captures how customers experience this stage in e-commerce, considering both operational and emotional factors. In doing so, the study also seeks to generalize and contextualize existing knowledge toward emerging markets, using Russia as an empirical setting to highlight how fulfillment experiences are shaped by localized digital, logistical, and institutional conditions.

This research contributes to the academic literature by advancing the conceptualization of customer experience in the post-purchase phase—an area that remains comparatively underdeveloped. By integrating insights from marketing and logistics, the study proposes a shift from viewing order fulfillment as a set of operational tasks to recognizing it as a rich site of experiential value co-creation. The proposed scale captures how customers perceive and feel during the fulfillment process, bridging the gap between functional service delivery and emotional engagement. In doing so, the study not only provides a theoretically grounded measurement instrument but also offers a practical tool for e-commerce firms seeking to enhance customer experience in a strategically critical phase of the online shopping journey.

2. LITERATURE REVIEW

2.1. Customer Experience at the Post-Purchase Stage: A Literature Perspective

Customer experience (CE) has become a key area of strategic focus for retailers, especially in the context of digital transformation and omnichannel commerce. As firms can no longer compete solely on price or product features, the ability to deliver a seamless, memorable, and emotionally engaging experience has emerged as a significant differentiator (Olsson *et al.*, 2022; Verhoef *et al.*, 2015). The concept of CE was first introduced by Holbrook and Hirschman (1982), who argued that consumer behavior is not exclusively determined by rational evaluations but also by symbolic, emotional, and hedonic aspects of consumption. This experiential perspective was later formalized by Schmitt (1999), who conceptualized customer experience as a holistic construct encompassing sensory, emotional, cognitive, behavioral, and relational dimensions.

Over time, the notion of CE has evolved into a multidimensional concept that captures customer responses across multiple channels and touchpoints (Brakus *et al.*, 2009; Lemon & Verhoef, 2016). According to Lemon and Verhoef (2016), the customer journey comprises three main stages —pre-purchase, purchase, and post-purchase— each of which can significantly influence overall satisfaction, brand trust, and behavioral outcomes. While considerable attention has been devoted to pre-purchase activities (e.g., website design, advertising) and purchase interactions (e.g., checkout experience, sales assistance), the post-purchase phase has received comparatively less scholarly attention (Cao *et al.*, 2018; Javed & Wu, 2020).

The post-purchase stage encompasses various customer-firm interactions that occur after the transaction, such as delivery, returns, after-sales service, and follow-up communication (Verhoef *et al.*, 2009). These touchpoints can significantly shape customer perceptions of reliability, responsiveness, and emotional connection, and may even determine whether a one-time buyer becomes a loyal customer (Homburg *et al.*, 2015; Meyer & Schwager, 2007). As omnichannel retailing becomes the norm, managing post-purchase experiences presents new challenges and opportunities. The growing complexity of customer journeys and the proliferation of digital touchpoints have intensified the need for firms to understand how value is co-created during and after the purchase (Schrotenboer *et al.*, 2022; Vakulenko *et al.*, 2019).

Importantly, recent studies emphasize that CE is not merely the sum of service quality indicators but a subjective and emotionally charged process shaped by consumer expectations, cultural contexts, and affective responses (Becker & Jaakkola, 2020; Waqas *et al.*, 2021, Gahler *et al.*, 2023). This perspective is rooted in experiential marketing theory, which posits that consumers seek immersive, affective, and memorable interactions rather than just utilitarian value (Pine & Gilmore, 2011; Schmitt, 1999). While experiential marketing has primarily been applied to brand experiences, in-store design, or pre-purchase digital interactions (Brakus *et al.*, 2009), its relevance to the post-purchase stage —particularly logistics and fulfillment— remains underexplored.

2.2. Order Fulfillment as a Customer Experience Touchpoint

The order fulfillment process —typically defined as the set of operational activities involved in receiving, processing, packing, and delivering a customer order— has traditionally been viewed as a logistics function aimed at achieving efficiency, accuracy, and cost optimization (Lin, 1996; Loate *et al.*, 2017). From this perspective, the customer is treated as the recipient of service outputs rather than an active participant in the fulfillment experience.

However, recent research suggests that the fulfillment process constitutes an important stage of the customer journey that can influence both satisfaction and behavioral intentions (Nguyen *et al.*, 2018; Olsson *et al.*, 2022). The rise of e-commerce, particularly in omnichannel contexts, has increased the frequency and complexity of fulfillment-related interactions, making them central to the overall perception of service quality (Klein & Popp, 2022; Xiao *et al.*, 2017). As consumers increasingly expect fast, transparent, and seamless deliveries, their experience during fulfillment —including emotional reactions such as enjoyment or anxiety— becomes a relevant subject for empirical investigation (Vakulenko *et al.*, 2019; Vrhovac *et al.*, 2023).

A growing body of literature has explored specific touchpoints within the fulfillment process. For example, convenience refers to the perceived ease, flexibility, and time-saving aspects of the delivery process (Jiang *et al.*, 2013; Seiders *et al.*, 2007). Unlike efficiency, which typically focuses on cost reduction or operational optimization, convenience is centered on the customer and primarily reflects minimizing perceived effort from the customer's perspective. The ability to track deliveries in real time has been linked to increased feelings of control and reassurance (Esper *et al.*, 2003; Vrhovac *et al.*, 2023). Communication support —such as updates, customer service accessibility, and responsiveness— plays a role in reducing perceived uncertainty and fostering emotional engagement (Alkhalifah, 2022). The accuracy and condition of received products remain core elements, but they alone do not capture the full spectrum of fulfillment-related perceptions (Wahab *et al.*, 2023; Zhong *et al.*, 2021). Delivery accuracy involves adherence to the time window the customer selects and the correct configuration of the order, ensuring that the consumer receives the exact product ordered (Zhong *et al.*, 2021). The order's condition is determined by preserving all the product's properties and original quality after delivery (Wahab *et al.*, 2023).

Functional elements are increasingly complemented by emotional and perceptual dimensions. Drawing on affective experience theory and the hedonic consumption framework (Holbrook & Hirschman, 1982), enjoyment can stem from the anticipation of delivery or the unboxing moment itself (Klaus & Maklan, 2013; Vakulenko *et al.*, 2019). Unlike satisfaction, which is a cognitive evaluation of expectations vs. outcomes, enjoyment is an emotional state triggered during or immediately after the fulfillment encounter. Similarly, the concept of smooth delivery refers not just to timeliness but to how effortless and coordinated the entire process feels to the customer —echoing the importance of perceived flow in service encounters (Rose *et al.*, 2012; Vrhovac *et al.*, 2023). Unlike delivery reliability, which focuses on whether an order is fulfilled accurately and on time (Mentzer *et al.*, 2001; Rao *et al.*, 2011).

Researchers have also examined the role of visual appeal —such as the aesthetics of delivery packaging, the appearance of delivery personnel, or the condition of the delivery vehicle or parcel locker— as potential contributors to the fulfillment experience (Olsson *et al.*, 2022; Vrhovac *et al.*, 2023). While more subjective and difficult to quantify, these sensory and emotional responses form part of a broader experiential logic aligned with Schmitt's (1999) theory of experiential marketing.

Table 1 summarizes key studies that have identified experiential factors relevant to the order fulfillment process, organizing them by construct and corresponding references.

Table 1
Existing academic literature on factors of customer experience during the order fulfillment process

Factor	Sources
Convenience	Seiders *et al.* (2007), Jiang *et al.* (2013), Vakulenko *et al.* (2019), Vrhovac *et al.* (2023)
Enjoyment	Klaus & Maklan (2013), Olsson *et al.* (2022), Vakulenko *et al.* (2019), Vrhovac *et al.* (2023)
Visual appeal	Olsson *et al.* (2022), Vrhovac *et al.* (2023)
Smooth delivery	Klein, Popp (2022), Rose *et al.* (2012), Vrhovac *et al.* (2023)
Parcel tracking	Arıkan *et al.* (2023), Esper *et al.* (2003), Vakulenko *et al.* (2019), Vrhovac *et al.* (2023)
Communication support	Alkhalifah (2022), Vrhovac *et al.* (2023)
Accuracy and condition	Vakulenko *et al.* (2019), Vrhovac *et al.* (2023), Wahab *et al.* (2023), Zhong *et al.* (2021)

Source: Compiled by the authors.

2.3. Existing Scales for Measuring Customer Experience in the Context of Order Fulfillment

Several customer experience (CE) measurement scales have been developed across different domains, each offering distinct conceptual emphases and contextual applications. For example, the EXQ (Experiential Quality) scale developed by Kuppelwieser and Klaus (2021) captures experiential value in general service settings and includes dimensions such as product experience, peace of mind, outcome focus, and moments of truth. While it emphasizes emotional and holistic aspects of service experience, it does not address delivery- or logistics-related interactions.

In another context, Gupta (2016) introduced a Customer Experience Quality (CEQ) scale adapted from service quality models. This framework includes reliability, personalization, customer delight, and interaction quality, offering a blend of emotional and functional dimensions. However, it was designed for general service environments and does not specifically address the e-commerce delivery process.

In the online retail setting, Kumar and Anjaly (2017) developed a post-purchase CE scale that includes dimensions such as customer support, return process, and delivery speed. Their work focuses on post-transactional customer service but does not isolate the order fulfillment experience from broader service interactions.

Garg *et al.* (2014) proposed a CE scale tailored to the banking industry, capturing dimensions like interaction experience, emotional experience, and brand experience. Although rich in emotional content, its application is limited to the financial services context and lacks relevance for logistics-intensive sectors such as e-commerce.

In the domain of delivery logistics, Olsson *et al.* (2023) investigated customer experience in unattended last-mile delivery services. Their model includes aspects such as waiting time, predictability, and convenience, with an emphasis on the final step in the fulfillment process. However, it does not address earlier stages such as order processing or parcel tracking, which may also shape customer perceptions.

Together, these scales provide a useful foundation for understanding the multidimensional nature of customer experience, including both functional and affective elements. However, their scope and focus vary widely depending on industry context, purchase stage, and mode of delivery. Table 2 provides a comparison of key characteristics across these studies.

Table 2
Comparison of Existing Scales for Measuring Customer Experience in the Context of Order Fulfillment

Study	Focus Context	Key Dimensions	Post-Purchase Specific?	Emotional Dimension?	Delivery/ Fulfillment Focus?	Emerging Market?
Gupta (2016)	General services	Reliability, Personalization, Delight	×	Partial	×	×
Kumar & Anjaly (2017)	Online retail	Customer Support, Problem Handling, Returns	✓	×	×	×
Garg *et al.* (2014)	Banking	Interaction, Emotional, Brand Experience	×	✓	×	×
Kuppelwieser & Klaus (2021)	General CE (EXQ)	Product Experience, Peace of Mind, Moments of Truth	×	✓	×	×
Olsson *et al.* (2023)	Last-mile delivery	Predictability, Waiting Time, Unattended Delivery	✓	✓	✓ (limited to delivery)	×

Source: Compiled by the authors.

2.4. Conceptual Model and Scale Development

This study defines customer experience during the order fulfillment process as a multidimensional construct that reflects both functional and emotional responses elicited during the delivery of online purchases. Grounded in experiential marketing theory (Holbrook & Hirschman, 1982; Schmitt, 1999), this perspective positions fulfillment as a critical experiential touchpoint within the post-purchase phase of the customer journey. Rather than viewing order delivery as a purely operational process, the model integrates sensory, affective, and cognitive dimensions that shape how customers perceive and evaluate their interactions with retailers.

Although traditionally conceptualized as a logistical sequence emphasizing speed, accuracy, and cost efficiency (Lin, 1996; Loate *et al.*, 2017; Mentzer *et al.*, 2001), the fulfillment process increasingly plays a role in shaping overall customer experience. Recent studies have shown that various aspects —such as emotional anticipation, perceived control, visual impressions, and communication responsiveness— contribute meaningfully to how customers experience delivery and post-purchase service (Olsson *et al.*, 2022; Vakulenko *et al.*, 2019; Vrhovac *et al.*, 2023).

Building on these insights, the model proposed in this study incorporates seven distinct yet interrelated dimensions. Convenience refers to the ease and flexibility of receiving a parcel and how well the process aligns with the customer's lifestyle (Jiang *et al.*, 2013; Seiders *et al.*, 2007). Enjoyment captures the emotional gratification and positive anticipation associated with receiving a delivery (Klaus & Maklan, 2013; Vakulenko *et al.*, 2019). Visual appeal accounts for the aesthetic perception of couriers, delivery vehicles, and pickup locations, as noted in recent explorations of sensory aspects in last-mile logistics (Olsson *et al.*, 2022; Vrhovac *et al.*, 2023). Smooth delivery reflects the perceived flow and simplicity of the delivery process, including how coordinated and frictionless the experience feels (Klein & Popp, 2022; Rose *et al.*, 2012). Parcel tracking highlights the importance of transparency and the customer's sense of control over the delivery (Arıkan *et al.*, 2023; Esper *et al.*, 2003). Com-

munication support refers to the availability and responsiveness of delivery-related communication, including multichannel customer service (Alkhalifah, 2022; Vrhovac *et al.*, 2023). Finally, accuracy and condition measure whether the product arrives complete, undamaged, and as expected (Wahab *et al.*, 2023; Zhong *et al.*, 2021).

These dimensions were synthesized into a theoretical framework in which customer experience is modeled as a second-order reflective construct formed by seven first-order dimensions. This conceptualization guided the development of the measurement scale and provided the basis for empirical validation. Figure 1 presents the structure of the proposed model.

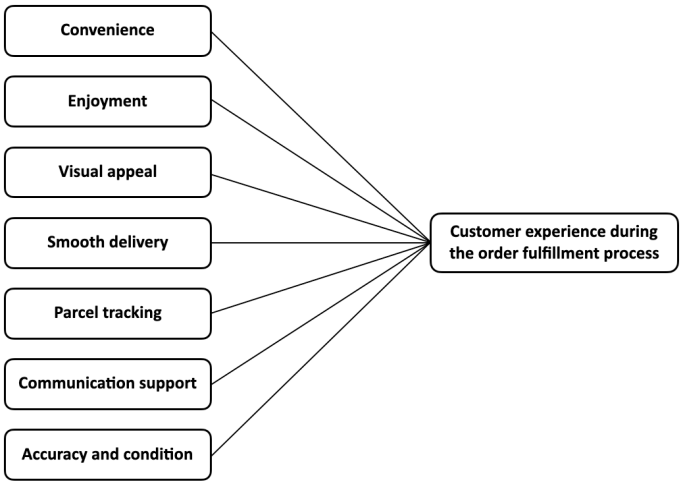

Figure 1
A theoretical model of the factors shaping the customer experience during the order fulfillment process
Source: Compiled by the authors.

3. METHODOLOGY

3.1. Research Design

This study employs a quantitative research design (Creswell & Creswell, 2017) to explore factors shaping customer experience during order fulfillment. The research follows a two-phase structure. First, a preliminary pre-test was conducted to refine the theoretical model and measurement items. Second, a full-scale consumer survey was carried out, and the resulting data were used to validate the model.

The study uses Partial Least Squares Structural Equation Modeling (PLS-SEM) as the main analytical method. PLS-SEM is widely used in marketing and consumer behavior research due to its suitability for handling non-normal data distributions, moderate to small sample sizes, reflective and formative constructs, and complex model structures (Hair *et al.*, 2019; Richter *et al.*, 2016; Shmueli *et al.*, 2019). It is also particularly effective for predictive modeling and for studies aimed at theory building in early-stage research (Sarstedt *et al.*, 2022). These features make PLS-SEM an appropriate choice for evaluating the newly developed scale and assessing the latent structure of the customer experience construct.

3.2. Sampling and Data Collection

The empirical study was conducted in April 2024 using a structured online survey administered to a consumer panel in Russia, an emerging e-commerce market. A third-party data provider was commissioned to recruit participants based on predefined screening criteria to ensure sample relevance and data quality. To qualify for inclusion, respondents had to be at least 18 years old and have made at least one online purchase that involved delivery (either by courier or pick-up point) within the last six months. Quotas were applied to achieve a balanced sample across gender, age, and education levels.

The choice of Russia as the empirical setting was motivated by its status as one of the largest and fastest-growing e-commerce markets among emerging economies. Its rapid digitalization, logistical diversity, and evolving consumer behavior make it a valuable context for examining customer experience during order fulfillment. Moreover, focusing on a digitally evolving market allows the study to extend current conceptualizations of customer experience beyond Western-centric settings (Vakulenko *et al.*, 2019; Yuen *et al.*, 2019).

The final sample consisted of 385 valid responses. The demographic characteristics of the respondents are summarized in Table 3. The sample included both male (48%) and female (52%) participants, with a wide distribution across age groups and income levels. Over 60% of the participants held higher education degrees, and the majority belonged to the most active e-commerce user segments —individuals aged 25–44. All participants were residents of Moscow or the Moscow region, a metropolitan area with high online shopping penetration and advanced last-mile delivery infrastructure.

Table 3
Sample descriptive statistics

Variable	Value labels	Count	Share in the sample
Gender	Male	184	48%
	Female	202	52%
Total		385	100%
Age group	18-24	47	12%
	25-34	90	24%
	35-44	107	28%
	45-54	78	20%
	Above 55	63	16%
Total		385	100%
Disposable income	Low	0	0%
	Low-to-medium	0	0%
	Medium	142	37%
	Mid-to-high	209	54%
	High	36	9%
Total		385	100%

Variable	Value labels	Count	Share in the sample
Education	Incomplete secondary education	27	7%
	Secondary education	70	18%
	Initial Vocational Education	14	3%
	Secondary Vocational Education	28	7%
	Higher education	237	62%
	Other	9	3%
Total		385	100%

Source: Compiled by the authors.

3.3. Measurement Scale

The initial measurement instrument was developed based on a comprehensive review of prior literature on customer experience, service quality, and e-commerce fulfillment, with particular reference to experiential marketing theory (Schmitt, 1999). This framework emphasizes the multidimensional nature of experience, encompassing both emotional and functional components of customer–firm interactions. The scale items were adapted and expanded from previously validated constructs (e.g., Klaus & Maklan, 2013; Vakulenko *et al.*, 2019; Vrhovac *et al.*, 2023) to reflect the unique context of digitally mediated fulfillment processes.

The resulting questionnaire was structured into three sections. The first section included control questions to screen for respondent relevance (e.g., "Have you ordered products online with delivery in the past 6 months?"). The second section contained the items corresponding to the proposed dimensions of customer experience during the fulfillment process —including convenience, enjoyment, parcel tracking, smooth delivery, communication support, and accuracy and condition of the order. Each construct was measured using multiple items on a five-point Likert scale (1 = "strongly disagree" to 5 = "strongly agree"). The third section collected demographic information.

The original version of the instrument was developed in English and subsequently adapted to Russian using a back-translation procedure. Two bilingual experts independently translated and retranslated the scale to ensure semantic and conceptual equivalence, and minor adjustments were made to reflect linguistic and cultural norms relevant to the Russian e-commerce context (Boateng *et al.*, 2018).

3.4. Analytical Procedure

This study followed a multi-step analytical procedure to validate the proposed measurement model for customer experience during the order fulfillment process. The process included expert-based content validation, a pretest to refine the initial model, and a full-scale survey analyzed using Partial Least Squares Structural Equation Modeling (PLS-SEM).

In line with best practices in scale development (Boateng *et al.*, 2018), the study first employed qualitative validation by consulting five domain experts —three academic researchers and two senior e-commerce professionals— who reviewed the initial pool of items. Their feedback helped ensure conceptual relevance, language clarity, and alignment with the fulfillment experience in the e-commerce context. Based on their suggestions, several items were refined before launching the pretest phase.

The pretest, conducted with a subsample of 100 participants, allowed for an initial assessment of item performance and construct structure. Exploratory and confirmatory factor analyses were used to eliminate weak items and clarify dimensional structure prior to the main data collection.

After refining the instrument, the main survey data (N = 385) were analyzed using PLS-SEM, a method particularly suited to early-stage theory development, complex models with hierarchical constructs, and non-normal data distributions (Hair *et al.*, 2019; Shmueli *et al.*, 2019). The software SmartPLS v4 was used to estimate the measurement and structural models, evaluating internal consistency, convergent validity, discriminant validity, and overall model fit.

To address the potential for common method bias, several procedural remedies were implemented during the survey design, including anonymity assurances, neutral wording, and randomization of item order across constructs. A post hoc statistical test using Harman's single-factor method was also conducted; the first unrotated factor accounted for less than 35% of the total variance, suggesting that common method bias was unlikely to significantly influence the results (Podsakoff *et al.*, 2003).

4. RESULTS

4.1. Preliminary Analysis and Scale Refinement

The scale development process began with a preliminary test on a sample of 100 respondents. Cronbach's alpha coefficients for most constructs exceeded the commonly accepted threshold of 0.7, indicating acceptable internal consistency. However, two constructs —"convenience" (α = 0.694) and "smooth delivery" (α = 0.611)— showed borderline reliability and were refined through item reduction. Specifically, items with factor loadings below 0.7 were eliminated to improve reliability metrics. The revised scale showed improved internal consistency across all constructs (Table 4).

Table 4
Path coefficients and factor loadings of measured items after preliminary testing

Construct	Outer Loadings	Item	Factor Loading
Convenience (CONV)	0.603	CONV1	0.712
		CONV2	0.899
		CONV3	0.759
		CONV4	0.704
		CONV5	0.721
Accuracy and condition(ACCON)	0.676	ACCON1	0.861
		ACCON2	0.839
		ACCON3	0.838
		ACCON4	0.801

Construct	Outer Loadings	Item	Factor Loading
Communication support(COMSUP)	0.618	COMSUP1	0.825
		COMSUP2	0.882
		COMSUP3	0.916
Enjoyment (ENJ)	0.650	ENJ1	0.952
		ENJ2	0.953
		ENJ3	0.883
		ENJ4	0.865
Parcel Tracking (PTRACK)	0.684	PTRACK1	0.900
		PTRACK2	0.868
		PTRACK3	0.899
		PTRACK4	0.824
		PTRACK5	0.811
Smooth delivery (SMDEL)	0.807	SMDEL1	0.925
		SMDEL2	0.870
		SMDEL3	0.704

Source: Compiled by the authors.

During this stage, the construct "visual appeal" was also excluded due to its weak empirical contribution. It exhibited low outer loadings and a poor path coefficient (0.129), suggesting limited explanatory power. While it was conceptually interesting, its ambiguity and lack of statistical robustness led to its removal. The conceptual implications of this decision are discussed further in Section 5.

4.2. Final Model Estimation

The refined model was validated using a full dataset of 385 responses. PLS-SEM was conducted using SmartPLS v.4. All six retained constructs demonstrated strong outer loadings, confirming indicator reliability (Table 5). Outer loadings represent the reflective relationships between the second-order construct (customer experience) and its first-order dimensions. Factor loadings at the item level also exceeded 0.7 for most items, indicating strong indicator reliability.

Table 5
Outer loadings from second-order construct (EXP) to first-order dimensions, and item-level factor loadings

Construct	Outer Loadings	Item	Factor Loading
Accuracy and condition (ACCON)	0.687	ACCON1	0.798
		ACCON2	0.797
		ACCON3	0.802
		ACCON4	0.770
Communication support (COMSUP)	0.721	COMSUP1	0.900
		COMSUP2	0.902
		COMSUP3	0.862
Convenience (CONV)	0.688	CONV1	0.823
		CONV2	0.865
		CONV3	0.774
		CONV4	0.883
		CONV5	0.800
Enjoyment (ENJ)	0.639	ENJ1	0.904
		ENJ2	0.907
		ENJ3	0.881
		ENJ4	0.869
Parcel tracking (PTRACK)	0.781	PTRACK1	0.782
		PTRACK2	0.786
		PTRACK3	0.806
		PTRACK4	0.752
		PTRACK5	0.719
Smooth delivery (SMDEL)	0.732	SMDEL1	0.801
		SMDEL2	0.815
		SMDEL3	0.768

Note: Outer loadings represent the reflective relationships between the second-order construct (Customer Experience) and its first-order dimensions. Factor loadings refer to indicator reliability at the item level.

Source: Compiled by the authors.

The model included six dimensions: accuracy and condition, convenience, enjoyment, parcel tracking, communication support, and smooth delivery. All first-order constructs significantly contributed to the second-order construct "customer experience," with outer loadings above 0.6. The R-square and adjusted R-square values for the first-order constructs further confirmed that the second-order construct accounted for substantial variance in each of the dimensions (Table 6).

Table 6
Measurement model validation (R-square and R-square adjusted)

	R-square	R-square adjusted
ACCON	0.472	0.472
COMSUP	0.519	0.519
CONV	0.473	0.472
ENJ	0.409	0.408
PTRACK	0.609	0.609
SMDEL	0.536	0.535

Notes: ACCON = Accuracy and condition, COMSUP = Communication support, CONV = Convenience, ENJ = Enjoyment, PTRACK = Parcel tracking, SMDEL = Smooth delivery.

Source: Compiled by the authors.

Figure 2 presents a visual representation of the validated model, including path relationships and R-square values. A full list of the finalized measurement items used in the validated model is provided in Appendix A.

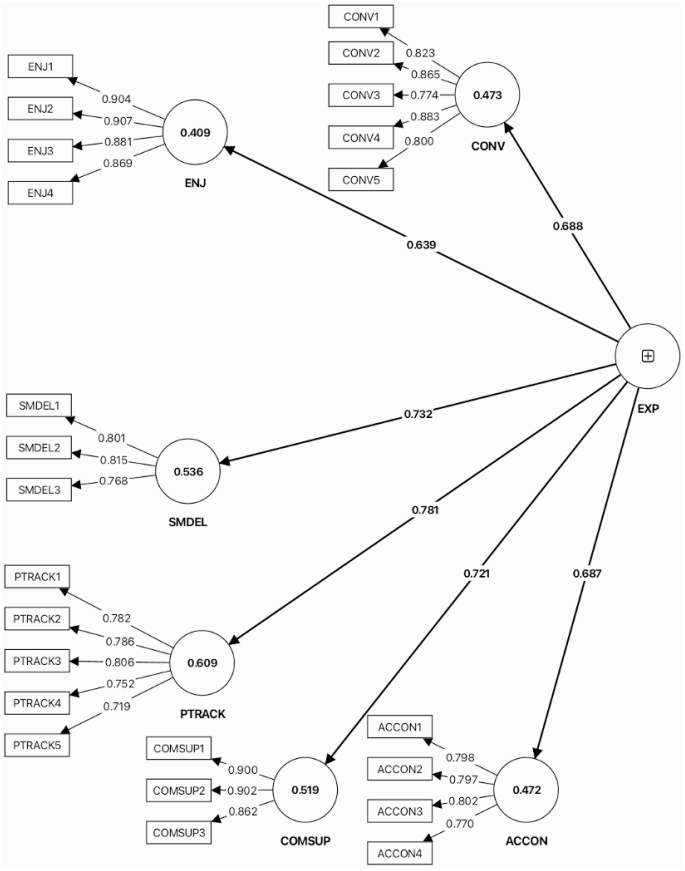

Figure 2
Structural equation model

Notes: CONV = Convenience, ENJ = Enjoyment, SMDEL = Smooth delivery, PTRACK = Parcel tracking, COMSUP = Communication support, ACCON = Accuracy and condition, EXP = Customer experience during the order fulfillment process. R-square values are presented in circles.

Source: Compiled by the authors.

To assess overall model fit, we used two commonly accepted indices in PLS-SEM: the Standardized Root Mean Square Residual (SRMR) and the Normed Fit Index (NFI). The SRMR value based on correlations was 0.072 and the SRMR based on partial covariances was 0.059, both of which are below the conservative threshold of 0.08. The NFI was 0.914, exceeding the benchmark of 0.90, indicating acceptable model fit. These results jointly support the structural adequacy of the proposed model (Henseler *et al.*, 2016).

4.3. Reliability and Validity Assessment

Construct reliability was confirmed through Cronbach's alpha and Composite Reliability (CR), with all values exceeding the 0.7 threshold (Table 7). Convergent validity was assessed using the Average Variance Extracted (AVE), with values above 0.5 for all constructs, indicating that the constructs explained a substantial portion of the variance in their indicators.

Table 7
Measurement model validation (Cronbach's alpha, Composite reliability, and AVE)

	Cronbach's alpha	Composite reliability (rho_a)	Composite reliability (rho_c)	Average variance extracted (AVE)
ACCON	0.802	0.804	0.871	0.627
COMSUP	0.866	0.868	0.918	0.789
CONV	0.886	0.890	0.917	0.689
ENJ	0.913	0.916	0.939	0.793
PTRACK	0.83	0.831	0.879	0.592
SMDEL	0.709	0.711	0.837	0.632

Notes: ACCON = Accuracy and condition, COMSUP = Communication support, CONV = Convenience, ENJ = Enjoyment, PTRACK = Parcel tracking, SMDEL = Smooth delivery.

Source: Compiled by the authors.

Discriminant validity was verified using both the Heterotrait-Monotrait (HTMT) ratio and the Fornell-Larcker criterion. All HTMT values were below the threshold of 0.85, and the square root of the AVE for each construct exceeded its correlations with other constructs (Tables 8 and 9), confirming discriminant validity.

Table 8
Measurement model validation (Discriminant validity)

	ACCON	COMSUP	CONV	ENJ	EXP	PTRACK	SMDEL
ACCON							
COMSUP	0.57						
CONV	0.448	0.324					
ENJ	0.242	0.376	0.387				
EXP	0.794	0.782	0.775	0.715			
PTRACK	0.494	0.567	0.376	0.548	0.874		
SMDEL	0.631	0.669	0.571	0.343	0.89	0.601	

Notes: ACCON = Accuracy and condition, COMSUP = Communication support, CONV = Convenience, ENJ = Enjoyment, PTRACK = Parcel tracking, SMDEL = Smooth delivery.

Source: Compiled by the authors.

Table 9
Measurement model validation (Fornell-Larcker criteria)

	ACCON	COMSUP	CONV	ENJ	EXP	PTRACK	SMDEL
ACCON	0.792						
COMSUP	0.481	0.888					
CONV	0.381	0.285	0.830				
ENJ	0.212	0.338	0.352	0.89			
EXP	0.687	0.721	0.688	0.639	0.580		
PTRACK	0.433	0.513	0.345	0.475	0.781	0.769	
SMDEL	0.483	0.523	0.458	0.284	0.732	0.492	0.795

Notes: ACCON = Accuracy and condition, COMSUP = Communication support, CONV = Convenience, ENJ = Enjoyment, PTRACK = Parcel tracking, SMDEL = Smooth delivery.

Source: Compiled by the authors.

5. DISCUSSION

This study proposed and validated a novel measurement scale to assess customer experience during the order fulfillment process in e-commerce. Unlike traditional logistics service quality models, which tend to focus on operational metrics such as delivery reliability and timeliness, this study places equal importance on the emotional and experiential aspects of the order fulfillment process. The validated scale consists of six factors —accuracy and condition, enjoyment, parcel tracking, smooth delivery, communication support, and convenience— which collectively reflect how consumers perceive the post-purchase phase as a multifaceted, experience-laden interaction.

The findings build on and extend prior conceptualizations of customer experience. In line with the experiential marketing theory (Schmitt, 1999), which emphasizes the role of emotional, sensory, and behavioral responses in shaping consumer value, the scale highlights the emotional intensity of the fulfillment stage —traditionally considered merely logistical. The inclusion of enjoyment, for instance, operationalizes the hedonic aspects of delivery anticipated by early experiential scholars (Holbrook & Hirschman, 1982) but rarely formalized in fulfillment research.

The construct of accuracy and condition, widely reflected in prior logistics service quality models (e.g., Mentzer *et al.*, 2001; Rao *et al.*, 2011), continues to be a foundational dimension in the post-purchase phase. Similarly, parcel tracking and communication support —as discussed by Vakulenko *et al.* (2018, 2019) and Alkhalifah (2022)— are validated as essential elements that reduce uncertainty and increase transparency during last-mile delivery.

Smooth delivery, drawing on the "flow" and "seamlessness" themes introduced in recent user experience studies (e.g., Vrhovac *et al.*, 2023; Klein & Popp, 2022), captures customers' desire for low-friction and predictable service. This reflects a shift from operational definitions (e.g., on-time delivery) toward subjective perceptions of effortlessness, consistent with the experiential paradigm.

Convenience, long recognized in service marketing literature (Seiders *et al.*, 2000; Berry *et al.*, 2002), is confirmed as a relevant factor in shaping fulfillment experience, especially when linked to control and flexibility in delivery options.

In contrast, the visual appeal dimension —proposed in prior studies (e.g., Vrhovac *et al.*, 2023) and included in our initial item pool— was excluded during scale refinement. Its exclusion aligns with the conceptual critique that sensory aesthetics, while meaningful in retail or product design contexts (Brakus *et al.*, 2009), may be peripheral in function-driven, standardized delivery environments, particularly when mediated through third-party logistics or contactless methods.

5.1. Theoretical Contributions

This research contributes to the academic marketing literature by advancing the understanding of customer experience during the post-purchase stage —an area that has traditionally received less attention compared to pre-purchase or purchase interactions (Holbrook & Hirschman, 1982; Lemon & Verhoef, 2016). Building on experiential marketing theory (Pine & Gilmore, 2011; Schmitt, 1999), the study reconceptualizes order fulfillment as an experiential touchpoint that encompasses not only logistical efficiency but also emotional resonance.

While previous models of customer experience have often emphasized brand interaction, digital interfaces, or service quality (Brakus *et al.*, 2009; Homburg *et al.*, 2015), this study expands the conceptual boundaries by including the fulfillment process as an integral and measurable component of the customer journey. The findings support the growing view that post-purchase activities contribute meaningfully to customer perceptions and behavioral outcomes (Becker & Jaakkola, 2020; Waqas *et al.*, 2021).

The validated measurement scale incorporates both operational elements (e.g., accuracy, parcel tracking, convenience) and emotional components (e.g., enjoyment, smooth delivery, communication support), offering a dual-lens approach that reflects how customers experience this stage in digitally mediated retail environments. This duality aligns with the experiential marketing perspective, where value emerges from customers' cognitive, affective, and relational responses across all stages of interaction (Brakus *et al.*, 2009; Schmitt, 1999).

Furthermore, the model was validated in the context of a large and complex emerging market, contributing to the geographic and contextual extension of CE theory. This allows for a more inclusive understanding of how fulfillment experience is shaped by local market conditions and evolving consumer expectations.

5.2. Practical Implications

The findings of this study have relevant implications for e-commerce retailers, logistics providers, and digital service designers seeking to enhance customer experience in the post-purchase stage. By identifying six distinct dimensions —accuracy and condition, enjoyment, parcel tracking, smooth delivery, communication support, and convenience— the study offers actionable insights for improving customer satisfaction and long-term loyalty through more meaningful and responsive fulfillment strategies.

Ensuring delivery accuracy and condition requires investment in quality control, packaging reliability, and last-mile partner accountability. Firms may implement verification steps such as real-time tracking, proof of delivery, or customer confirmation mechanisms to minimize order errors and product damage. Meanwhile, communication support can be strengthened by offering multichannel interfaces —including chatbots, messaging apps, and social media— combined with proactive updates such as delivery notifications or delay alerts. Such features not only reduce uncertainty but also contribute to emotional engagement and perceived reliability.

The factors of smooth delivery and parcel tracking both emphasize the importance of control and flow in the fulfillment process. Smooth delivery —encompassing timing precision and seamless handover— can be enhanced through advanced route planning, flexible time slot selection, and convenient alternatives like parcel lockers or contactless drop-offs. At the same time, user-friendly, real-time tracking solutions embedded in mobile apps or integrated into messaging platforms ensure visibility across the delivery journey and help manage customer expectations.

In terms of enjoyment, companies may design the unboxing moment as a positive and emotionally rewarding experi-

ence through elements such as personalized packaging, surprise samples, or thank-you notes. Even simple aesthetic enhancements may elevate perceptions of care and delight. Enhancing convenience, meanwhile, involves offering flexible delivery options —such as time window choices, rescheduling features, or integration with calendars and smart home systems— to reduce perceived effort and increase repurchase intention.

Beyond business practice, the proposed scale may also be of value to policymakers and consumer protection agencies, providing a validated tool for assessing service quality in online retail. As post-purchase logistics become more central to the digital economy, establishing clear benchmarks for experiential fulfillment could inform regulatory standards and best-practice guidelines.

5.3. Limitations and Future Research Directions

While this study provides a validated framework for understanding customer experience during e-commerce order fulfillment, several limitations open avenues for future research. Methodologically, the cross-sectional design prevents observation of how customer experience may evolve over time. A longitudinal approach could offer insights into how fulfillment perceptions change with repeated use, seasonal cycles, or shifts in service quality. Additionally, the study employed a quantitative survey-based design; future research could integrate qualitative methods such as in-depth interviews or diary studies to capture symbolic meanings, emotional responses, and situational nuances that are not easily reflected in structured survey items. Combining methodological approaches may help uncover hidden drivers of fulfillment experience and better reflect the complexity of consumer behavior.

Contextually, the focus on Russia as an empirical setting — although justified by its status as a fast-growing and digitally evolving e-commerce market— limits the external generalizability of the findings. Consumer expectations and logistical challenges may differ across markets with varying degrees of digital infrastructure, cultural norms, and delivery ecosystems. Therefore, the model would benefit from cross-cultural validation across both developed economies (e.g., United States, Germany) and other emerging markets (e.g., Brazil, India). Additionally, future studies could consider industry-specific variations by applying the scale across diverse product categories such as grocery, fashion, electronics, or pharmaceuticals, where fulfillment expectations may differ substantially.

From a conceptual standpoint, further work could explore emerging variables that may influence fulfillment experience. Although this study identified six key dimensions, additional factors relevant to current e-commerce trends —such as perceived sustainability of delivery, the role of predictive technologies, or the use of hyper-personalized services— could become salient in the near future. Furthermore, the construct of visual appeal was excluded from the final model due to weak empirical performance and conceptual ambiguity. However, this factor may merit further investigation in contexts where brand aesthetics, courier presentation, or packaging design play a symbolic or experiential role — particularly in luxury retail or fashion logistics. In sum, this study offers a foundation for a more holistic exploration of the fulfillment experience and encourages continued theoretical and empirical refinement in this growing field of research.

6. CONCLUSIONS

This study set out to reframe the understanding of customer experience during the order fulfillment process in e-commerce by developing and validating a multidimensional measurement scale grounded in experiential marketing theory. While prior research has typically approached this stage from a functionalist perspective centered on logistics performance, our work conceptualizes order fulfillment as a critical experiential touchpoint within the broader post-purchase phase of the customer journey.

The proposed scale captures six key dimensions that shape how consumers interpret and respond to order fulfillment interactions: accuracy and condition, parcel tracking, communication support, enjoyment, smooth delivery, and convenience. These dimensions reflect both functional and emotional aspects of the experience and were derived through a rigorous process involving expert validation, pretesting, and empirical testing using PLS-SEM.

The study makes three main theoretical contributions. First, it advances academic understanding of the post-purchase stage by integrating customer-centric and experiential views into the study of fulfillment. Second, it provides a validated instrument that can be applied in future research and industry practice to assess and enhance customer experience at this critical stage. Third, by using Russia as an empirical context, the study offers insights into how fulfillment experiences are formed in digitally evolving markets, where infrastructural and behavioral conditions differ from those in developed economies.

Beyond its theoretical contribution, the study offers practical guidance for e-commerce firms, logistics providers, and digital platform managers seeking to enhance customer satisfaction, loyalty, and service differentiation through the post-purchase stage. The validated scale can serve as a diagnostic tool for identifying strengths and weaknesses in order fulfillment performance from the customer's perspective. Additionally, policy makers and regulators involved in consumer protection and digital commerce may benefit from the study's insights when developing standards for delivery quality and transparency.

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APPENDIX A

Measurement Scale of the customer experience during the order fulfillment process

Item	Question
Convenience (Vakulenko *et al.*, 2019; Vrhovac *et al.*, 2023)	
CONV1	I consider delivery of goods to be a convenient alternative to shopping in a physical store.
CONV2	I perceive delivery as a convenient alternative to in-store shopping.
CONV3	I think ordering and receiving delivery requires less effort than going to the store.
CONV4	I choose delivery because I can select a convenient way to receive or pick up my order.
CONV5	I choose delivery because I can select a convenient time to receive or pick up my order.
Enjoyment (Vakulenko *et al.*, 2019; Vrhovac *et al.*, 2023)	
ENJ1	I look forward to receiving my ordered items.
ENJ2	I look forward to the delivery moment.
ENJ3	I feel happy when meeting the courier or picking up my order.
ENJ4	I enjoy ordering delivery.
Visual Appeal (Vrhovac *et al.*, 2023)	
VISAP1	The appearance of the delivery person is important to me.
VISAP2	Visual impression during delivery matters to me.
VISAP3	The appearance of the delivery vehicle is important to me.
VISAP4	The appearance of the pickup location is important to me.
Smooth Delivery (Vrhovac *et al.*, 2023)	
SMDEL1	Receiving online orders is easy for me.
SMDEL2	When someone delivers my order, the process is simple.
SMDEL3	Communicating with delivery personnel is easy for me.
SMDEL4	I do not care who delivers my orders.
Parcel Tracking (Vakulenko *et al.*, 2019; Vrhovac *et al.*, 2023)	
PTRACK1	I would like to know where my parcel is during delivery.
PTRACK2	I enjoy tracking my deliveries.
PTRACK3	I check the status of my parcel during delivery.
PTRACK4	I believe the delivery process is transparent.
PTRACK5	I usually have all the necessary information about my delivery.
Communication Support (Vakulenko *et al.*, 2019)	
COMSUP1	If I lack information about my delivery, I can usually get it quickly.
COMSUP2	I can usually get delivery information via multiple channels (app, messenger, social media, website, etc.).
COMSUP3	I can communicate with the company about my delivery across multiple channels simultaneously.
Accuracy and Condition (Vakulenko *et al.*, 2019)	
ACCON1	My delivery usually arrives on time.
ACCON2	My order is usually delivered to the correct address or pickup point.
ACCON3	I usually receive exactly what I ordered.
ACCON4	My order usually arrives in good condition.