

## THE TEMPORAL DYNAMICS OF CUSTOMER JOURNEY EMOTIONS: A CONTINUOUS-TIME MODELING APPROACH

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### Abstract

This article examines the temporal dynamics of customer journey emotions and proposes a continuous-time modeling approach to better understand how emotions evolve throughout the customer experience. Traditional customer journey models often rely on static, stage-based representations that fail to capture the continuous and interconnected nature of emotional responses. Drawing on a narrative literature review across marketing, psychology, and data science, this study highlights the importance of viewing emotions as dynamic trajectories shaped by ongoing interactions. Key findings emphasize the role of emotional peaks, troughs, critical moments, and lag effects in influencing overall customer perceptions and behavioral outcomes. The study introduces a continuous-time modeling framework that integrates customer interactions as inputs, emotional state changes as processes, contextual and psychological factors as mediators, and outcomes such as satisfaction and loyalty. Additionally, moderating factors including customer characteristics, interaction channels, timing, and external context are identified as crucial in shaping emotional dynamics. The article contributes theoretically by integrating temporal perspectives with customer experience research and offers practical insights for real-time monitoring and adaptive experience design. Future research should focus on empirical validation and the application of advanced analytics to capture real-time emotional changes in customer journeys.

**Keywords:** *Customer journey; emotional dynamics; continuous-time modeling; customer experience; temporal analysis*

### INTRODUCTION

The increasing importance of customer experience management has become a defining feature of modern marketing, as organizations shift their focus from transactional interactions to holistic and continuous engagement with customers. In highly competitive and digitally connected markets, delivering superior customer experiences is no longer optional but a key determinant of differentiation and long-term success (Witell et al., 2020). Companies invest heavily in mapping and optimizing customer journeys to ensure consistent and meaningful interactions across multiple touchpoints. Within this context, understanding not only what customers do but also how they feel throughout their journey has gained significant importance. Customer experience is now widely recognized as an emotional as well as a functional process. As a result, emotions have become central to the study and management of customer journeys (Rizvi & Popli, 2021).

Emotions play a critical role in shaping customer perceptions, decisions, and behaviors across different stages of the journey. Positive emotions such as satisfaction, excitement, and trust can enhance engagement and foster loyalty, while negative emotions such as frustration or disappointment can lead to disengagement and churn. Importantly, these emotional responses are not static but evolve continuously as customers interact with a brand over time (Grewal & Roggeveen, 2020). Each touchpoint contributes to an ongoing emotional trajectory that influences overall experience evaluation. This dynamic nature of emotions suggests that understanding customer behavior requires a temporal perspective. Therefore, capturing how emotions fluctuate and interact across time is essential for effective customer experience management (Becker & Jaakkola, 2020). Despite the recognized importance of

emotions, many existing models of the customer journey rely on static and stage-based frameworks that fail to capture the continuous and evolving nature of emotional experiences. Traditional approaches often segment the journey into discrete stages, such as awareness, consideration, and purchase, treating emotions as isolated snapshots rather than dynamic processes. While these models provide useful structure, they oversimplify the complexity of real-world customer interactions (Hodgkinson et al., 2021). They do not account for emotional carryover, feedback loops, or the influence of past experiences on current perceptions. As a result, these models may overlook critical insights into how customer experiences develop over time. This limitation highlights the need for more advanced approaches that incorporate temporal dynamics into the analysis of customer emotions (Becker et al., 2020).

In response to these challenges, this article aims to examine the temporal dynamics of customer journey emotions and propose a continuous-time modeling approach. By integrating insights from marketing, psychology, and data modeling, the study seeks to provide a more nuanced understanding of how emotions evolve throughout the customer journey. The proposed approach emphasizes the continuous and interconnected nature of emotional experiences, moving beyond static representations. It also aims to offer a framework for capturing real-time emotional changes and their impact on customer outcomes. In doing so, the article contributes to both theoretical and practical discussions on customer experience management. Ultimately, it seeks to provide a foundation for more dynamic, responsive, and emotionally intelligent marketing strategies.

## **LITERATURE REVIEW**

### **Customer Journey and Experience**

Traditional customer journey models have long been conceptualized as linear and stage-based processes, typically divided into phases such as awareness, consideration, purchase, and post-purchase. These models provide a structured way for organizations to understand and manage customer interactions across different touchpoints (Rehman et al., 2026). By segmenting the journey into discrete stages, marketers can design targeted strategies for each phase and measure performance accordingly. However, such models often assume a predictable and sequential progression, which does not fully reflect the complexity of real-world consumer behavior. Customers today interact with brands across multiple channels and may move back and forth between stages rather than following a fixed path (Manthiou et al., 2020). As a result, traditional models may oversimplify the dynamic nature of customer experiences.

In response to these limitations, there has been a shift toward more dynamic and nonlinear conceptualizations of the customer journey. Modern approaches recognize that customer interactions are fluid, iterative, and influenced by a wide range of contextual factors (Rekettey et al., 2020). Consumers may engage with brands through multiple touchpoints simultaneously, creating complex and interconnected experiences. This perspective emphasizes the importance of understanding the journey as an evolving process rather than a static sequence of stages. It also highlights the need to account for feedback loops, real-time interactions, and the cumulative effects of past experiences (M. Sykora et al., 2022). By adopting a more dynamic view, organizations can better capture the richness and variability of customer journeys. This shift lays the foundation for integrating temporal and emotional dimensions into customer experience analysis (Wu & Gan, 2025).

### **Role of Emotions in Customer Behavior**

Emotions play a fundamental role in shaping customer behavior, influencing how individuals perceive, evaluate, and respond to brand interactions. Emotional responses often act as key drivers of satisfaction, loyalty, and decision-making, sometimes even outweighing rational considerations (Prentice & Nguyen, 2020). Positive emotions such as joy, trust, and excitement can enhance customer engagement and strengthen relationships with brands. Conversely, negative emotions such as frustration, anxiety, or disappointment can lead to dissatisfaction and churn. These emotional reactions are often triggered by specific touchpoints, such as service encounters or product experiences (Keyser et al., 2020). Understanding these emotional drivers is therefore essential for managing customer experiences effectively. It allows organizations to design interactions that foster positive emotional outcomes. In addition to individual emotional responses, the trajectory of emotions over time is equally important. Customer journeys are characterized by sequences of emotional highs and lows that collectively shape overall experience evaluation (Tyrväinen et al., 2020). Positive emotional trajectories, where favorable experiences accumulate over time, can lead to strong brand attachment and loyalty. In contrast, negative trajectories may result in declining satisfaction and eventual disengagement. Importantly, certain moments, such as emotional peaks or critical incidents, may have a disproportionate impact on overall perceptions. These dynamics highlight the

importance of analyzing not only isolated emotions but also their evolution across the journey (M. D. Sykora et al., 2022). By understanding emotional trajectories, organizations can better anticipate and manage customer responses.

### **Temporal Perspectives in Marketing**

Time has increasingly been recognized as a critical dimension in understanding consumer behavior and marketing processes. Customer experiences unfold over time, and the timing, sequence, and duration of interactions can significantly influence outcomes. For example, the order in which touchpoints occur or the time gaps between interactions can affect how customers perceive and remember their experiences (Filiari et al., 2022). Temporal factors also play a role in shaping expectations, satisfaction, and decision-making processes. Despite this, many traditional marketing models treat time as a secondary or implicit variable rather than a central focus. This limitation restricts the ability to fully capture the dynamic nature of consumer behavior. Incorporating temporal perspectives allows for a more comprehensive understanding of how experiences develop and change (Diener et al., 2020).

A key distinction in temporal analysis is between discrete-time and continuous-time approaches. Discrete-time analysis examines events at specific intervals or stages, often simplifying complex processes into manageable segments. While useful, this approach may overlook subtle changes and interactions that occur between time points. In contrast, continuous-time analysis treats time as a fluid and uninterrupted dimension, allowing for the modeling of ongoing changes and processes (Sengoz, 2024). This approach is particularly relevant for studying emotions, which can fluctuate rapidly and continuously. Continuous-time models provide a more accurate representation of real-world dynamics, capturing both gradual trends and sudden shifts. As such, they offer a promising framework for advancing the study of customer experiences (Khatoon & Rehman, 2021).

## **METHODOLOGY**

This study adopts a narrative literature review as its research design to explore the temporal dynamics of customer journey emotions and the application of continuous-time modeling approaches. A narrative approach is particularly appropriate for this topic due to its interdisciplinary nature, which spans marketing, psychology, and data science. Unlike systematic reviews, which follow rigid protocols and exhaustive search strategies, the narrative method allows for greater flexibility in selecting and synthesizing diverse sources. The review draws on academic journal articles from marketing, psychology, and data science, as well as relevant industry insights that provide practical perspectives on customer experience management. This combination of sources ensures a comprehensive understanding of both theoretical developments and real-world applications. By integrating insights across disciplines, the study aims to develop a holistic perspective on how customer emotions evolve over time.

The inclusion criteria for the selected literature are based on relevance to key themes such as customer journeys, emotional dynamics, and temporal or continuous-time modeling. Only sources that contribute meaningful insights into these areas are included, ensuring that the analysis remains focused and coherent. A thematic synthesis is employed as the primary analytical approach, allowing the identification of recurring patterns, concepts, and relationships across the literature. This method enables the organization of findings into key themes that support the development of a conceptual framework. However, the study is subject to limitations due to its non-systematic scope, which may introduce selection bias and limit the comprehensiveness of the review. Despite these limitations, the narrative approach provides valuable interpretive insights and facilitates a deeper understanding of complex and evolving phenomena. Ultimately, this methodology supports the integration of diverse perspectives to advance the study of customer journey emotions.

## **RESULTS AND DISCUSSION**

### **Temporal Dynamics of Customer Emotions**

Customer emotions evolve continuously across the journey, forming dynamic emotional trajectories rather than isolated responses at specific touchpoints. These trajectories reflect how emotions build, fluctuate, and interact over time as customers engage with a brand. Each interaction contributes incrementally to the overall emotional experience, creating patterns that can influence long-term perceptions and behaviors (Kumar et al., 2022). Understanding these trajectories allows organizations to identify how early experiences shape later responses. It also highlights the importance of consistency in delivering positive emotional experiences throughout the journey. Rather than focusing solely on individual touchpoints, marketers must consider the cumulative emotional path (Li et al., 2022). This perspective provides a more comprehensive understanding of customer experience.

Within these trajectories, peaks, troughs, and critical moments play a particularly significant role in shaping overall evaluations. Emotional peaks, whether positive or negative, tend to have a disproportionate impact on how

customers remember their experiences (Tuerlan et al., 2021). Critical moments, such as service failures or exceptional service encounters, can redefine the trajectory of the entire journey. Additionally, lag effects and emotional carryover mean that past experiences continue to influence current emotional states. For example, a negative interaction may affect how subsequent interactions are perceived, even if they are objectively positive. These temporal dynamics highlight the importance of managing not only immediate experiences but also their lasting effects (Klaus & Kuppelwieser, 2021). By recognizing these patterns, organizations can better design interventions that improve long-term customer outcomes.

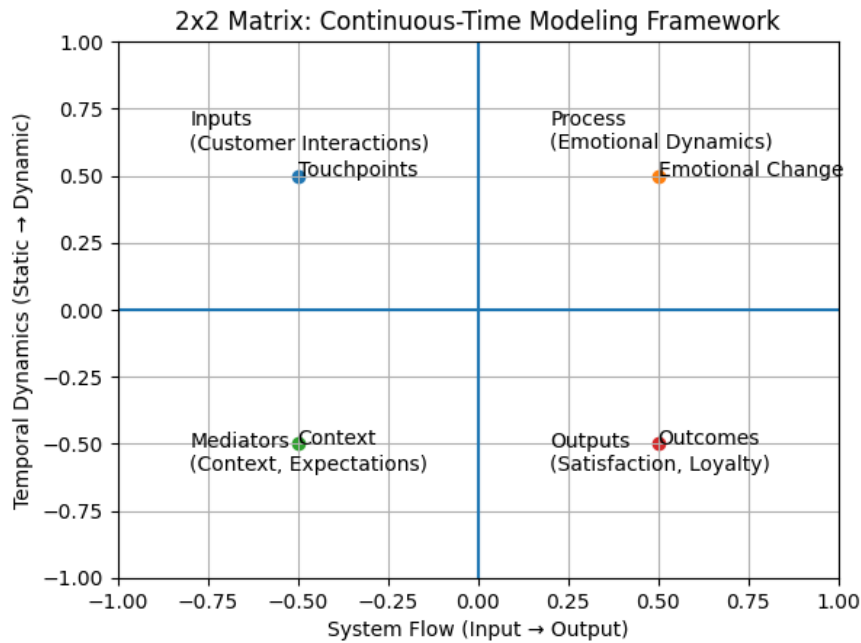
**Table 1.** Temporal Dynamics of Customer Emotions Across the Customer Journey

Dimension	Definition	Key Characteristics	Managerial Implications
Emotional Trajectories	Continuous evolution of customer emotions across the journey	Dynamic, cumulative, interaction-based changes over time	Focus on managing the entire journey rather than isolated touchpoints
Emotional Peaks and Troughs	High and low emotional moments that shape overall experience	Disproportionate impact on memory, strong positive/negative reactions	Design peak moments strategically and minimize negative troughs
Critical Moments	Key interactions that significantly alter emotional trajectories	Service failures, exceptional experiences, turning points	Identify and manage critical touchpoints to influence overall perception
Lag Effects and Emotional Carryover	Influence of past experiences on current emotional states	Memory effects, persistence of emotions, spillover across interactions	Address negative experiences quickly and reinforce positive ones over time

The table as presented in Table 1 highlights four key dimensions that explain how customer emotions evolve dynamically throughout the journey, emphasizing the importance of a temporal perspective in experience management. Emotional trajectories demonstrate that customer feelings are cumulative and continuously shaped by ongoing interactions, requiring organizations to manage the entire journey rather than isolated touchpoints (Koch et al., 2023). Emotional peaks and troughs reveal that certain moments have a disproportionate impact on overall perception, making it crucial to design positive peak experiences while minimizing negative ones. Critical moments further underscore the significance of specific interactions that can redefine the entire emotional trajectory, highlighting the need for careful management of high-impact touchpoints (Mele et al., 2021). Additionally, lag effects and emotional carryover show that past experiences influence present perceptions, meaning that unresolved negative emotions can persist and affect future interactions. Together, these dimensions illustrate that customer experience is a dynamic and interconnected process influenced by both immediate and past interactions (Caruelle et al., 2024). This reinforces the need for organizations to adopt proactive and continuous strategies to manage emotional experiences effectively over time.

**Continuous-Time Modeling Framework (Proposed Model)**

The proposed continuous-time modeling framework begins with customer interactions and touchpoints as the primary inputs, representing the various moments of engagement between customers and organizations. These inputs include both digital and physical interactions, such as website visits, customer service encounters, and product usage. Each interaction contributes to the evolving emotional state of the customer (Frank et al., 2021). Unlike traditional models that treat these interactions as discrete events, the continuous-time approach captures their ongoing and interconnected nature. This allows for a more accurate representation of how experiences unfold in real time. By incorporating continuous inputs, the framework reflects the complexity of modern customer journeys (Towers & Towers, 2021). The process component of the framework focuses on continuous emotional state changes over time, mediated by factors such as context, expectations, and prior experiences. These mediators influence how customers interpret and respond to each interaction, shaping their emotional trajectory (Chevtchouk et al., 2021). For example, a customer’s expectations can amplify or diminish emotional responses to a given experience. The outputs of the framework include key outcomes such as satisfaction, loyalty, and behavioral intentions. These outcomes are not static but evolve alongside the emotional trajectory (Prentice & Nguyen, 2020). By linking inputs, processes, mediators, and outputs, the framework provides a comprehensive model for understanding customer experience. It offers a structured approach for analyzing how emotions drive long-term customer behavior (Keyser et al., 2020).



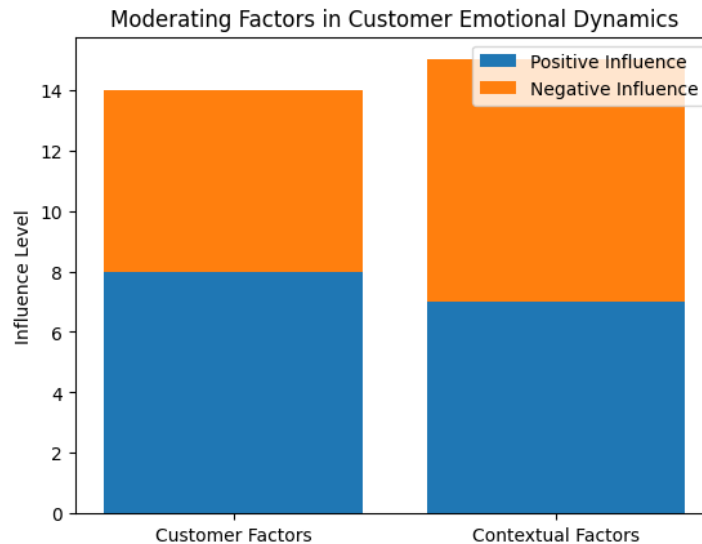
**Figure 1.** Continuous-Time Modeling Framework of Customer Journey Emotions

The 2×2 matrix chart as shown in Figure 1 provides a simplified yet insightful representation of the continuous-time modeling framework by organizing its core components into inputs, processes, mediators, and outputs. The positioning of customer interactions and touchpoints in the input quadrant highlights their role as the starting point of the emotional journey, while the process quadrant emphasizes the continuous and evolving nature of emotional dynamics over time (Tyrväinen et al., 2020). The mediators, including context, expectations, and prior experiences, illustrate how customer perceptions are shaped and filtered before influencing outcomes. The output quadrant captures key results such as satisfaction and loyalty, demonstrating how emotional trajectories translate into behavioral consequences (Kumar et al., 2022). The matrix also reflects a logical flow from inputs to outputs, reinforcing the interconnected and dynamic structure of the framework. By integrating temporal dynamics with system flow, the chart effectively conveys how customer experiences develop continuously rather than in discrete stages (Li et al., 2022). Overall, it provides a clear conceptual visualization that helps bridge theoretical modeling with practical understanding of customer journey emotions.

**Moderating Factors**

Several moderating factors influence how customer emotions evolve and how they impact overall experience outcomes. Customer characteristics, such as personality traits, prior experiences, and individual preferences, play a significant role in shaping emotional responses. For example, some customers may be more sensitive to negative experiences, while others may be more resilient (Tuerlan et al., 2021). Prior experiences with a brand can also influence expectations and emotional reactions. These individual differences highlight the need for personalized approaches to customer experience management. Understanding customer heterogeneity is essential for accurately modeling emotional dynamics. It also enables organizations to tailor their strategies to different customer segments (Klaus & Kuppelwieser, 2021).

In addition to individual factors, contextual variables such as channel type, timing, and external conditions also moderate emotional dynamics. Different channels, such as online platforms or in-store experiences, may evoke different emotional responses. The timing and frequency of interactions can influence how emotions accumulate or dissipate over time (Kumar et al., 2022). For instance, frequent positive interactions may reinforce satisfaction, while repeated negative experiences can quickly erode trust. External factors, such as social influences or situational contexts, further shape customer perceptions. These moderating factors demonstrate that emotional dynamics are influenced by a complex interplay of variables. Accounting for these factors is crucial for developing accurate and effective models of customer experience (Li et al., 2022).



**Figure 2.** Double Stacked Bar Chart of Moderating Factors Influencing Customer Emotional Dynamics

The double stacked bar chart as shown in Figure 2 illustrates how both customer-related and contextual moderating factors jointly shape the evolution of emotional dynamics within the customer journey. By separating positive and negative influences within each category, the chart highlights the dual nature of these factors in either enhancing or undermining customer experiences (Caruelle et al., 2024). Customer factors, such as personality and prior experiences, show a relatively balanced but slightly stronger positive influence, suggesting that individual traits can support resilience and favorable emotional outcomes. In contrast, contextual factors, including channel type and interaction timing, display a higher negative contribution, indicating their potential to introduce variability and disrupt emotional consistency (Frank et al., 2021). This comparison underscores that while organizations can leverage customer insights to foster positive experiences, they must carefully manage contextual elements to avoid negative emotional impacts. The stacked structure also emphasizes that both positive and negative influences coexist and interact rather than operate independently (Towers & Towers, 2021). Overall, the chart reinforces the importance of adopting a holistic and balanced approach to managing moderating factors in order to optimize customer emotional experiences over time.

### Managerial Implications

The findings of this study have important implications for managers seeking to enhance customer experience through a deeper understanding of emotional dynamics. One key implication is the need for real-time monitoring of customer emotions across the journey. Advances in data analytics and digital technologies enable organizations to track emotional signals, such as sentiment, engagement, and behavioral indicators, in real time (Towers & Towers, 2021). This allows for more timely and responsive interventions when negative emotions arise. By continuously monitoring emotional states, organizations can proactively manage customer experiences rather than reacting after the fact. This approach supports more agile and customer-centric decision-making. It also enhances the ability to deliver consistent and positive experiences (Chevtchouk et al., 2021).

Another important implication is the design of emotionally adaptive experiences that respond to changing customer needs and contexts. Organizations can leverage data analytics to identify patterns in emotional trajectories and anticipate future responses. This enables the development of personalized and adaptive strategies that enhance customer satisfaction and loyalty (Prentice & Nguyen, 2020). For example, targeted interventions can be implemented at critical moments to mitigate negative emotions or amplify positive ones. Additionally, predictive analytics can be used to forecast emotional trends and inform strategic decisions. By integrating continuous-time modeling with advanced analytics, organizations can move toward more proactive and intelligent customer experience management (Tyrväinen et al., 2020). Ultimately, these approaches help create more meaningful and lasting customer relationships.

## CONCLUSION

This article has examined the temporal dynamics of customer journey emotions and highlighted the limitations of traditional static and stage-based models in capturing the complexity of customer experiences. The findings emphasize that customer emotions are not isolated events but continuously evolving states that develop across multiple interactions over time. Key insights such as emotional trajectories, critical moments, and lag effects demonstrate that past experiences significantly influence current perceptions and future behaviors. By adopting a temporal perspective, this study provides a more nuanced understanding of how emotions shape satisfaction, loyalty, and decision-making. The proposed continuous-time modeling framework offers a structured approach to analyzing these dynamics by integrating inputs, processes, mediators, and outcomes. This perspective underscores the importance of viewing customer experience as an ongoing and interconnected process rather than a sequence of discrete stages.

From a theoretical standpoint, this study contributes to the integration of customer journey research with temporal modeling and emotional dynamics, advancing the understanding of how experiences unfold over time. Practically, it offers valuable guidance for organizations to implement real-time monitoring, emotionally adaptive strategies, and data-driven interventions to enhance customer experiences. However, the study is limited by its narrative review approach, which may not fully capture the diversity of empirical evidence across contexts. Future research should focus on empirically validating the proposed framework and exploring the application of continuous-time models in different industries and customer segments. Additionally, further studies could investigate the role of emerging technologies, such as artificial intelligence and real-time analytics, in capturing and managing emotional dynamics. Ultimately, adopting a temporal and dynamic perspective will enable organizations to create more responsive, personalized, and emotionally engaging customer experiences.

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