

Understanding Client Approval Time Through Customer Journey Analysis in VR and Non-VR Interior Design Workflows

Satria Putra Pamungkas^{1*}

School of Business and Management, Institut Teknologi Bandung

Email: satriapamungkas.entree@gmail.com

Abstract

Client approval delays in interior design workflows often stem from inefficient interactions, disrupting project timelines and reducing efficiency. This study investigates the root causes of these delays by applying Customer Journey Analysis (CJA) to compare Virtual Reality (VR) and non-VR presentation workflows at Visial Studio. Addressing the lack of empirical work on how visualization tools shape touch-point sequences, this study introduces a novel application of CJA within the creative service context. By reconstructing customer journeys through methodological triangulation of communication records, approval documents, and revision files, the analysis compares planned workflow expectations with actual journeys. The findings offer a significant theoretical contribution by identifying two additional deviation types—Timing Deviation and Iteration Deviation—extending the established typology by Halvorsrud et al. (2016). Unlike traditional service failures, 'Iteration Deviation' is redefined here as a necessary refinement process in creative service delivery. Empirically, VR presentations improved client understanding, eliminating failing touch-points (0% in VR vs. 15% in non-VR) and reducing ad hoc interactions by 23%. However, VR did not automatically accelerate the total approval timeline (75 days for VR vs. 69.6 days for non-VR), as speed remained dependent on external factors such as client type and site readiness. This study concludes that while VR may not shorten project duration, it is a critical tool for enhancing communication quality and minimizing process deviations, offering a more robust framework for managing client expectations in interior design.

Keywords: Customer Journey Analysis; Virtual Reality; Interior Design; Service Design; Deviation Typology.

A. INTRODUCTION

Interior design is an inherently collaborative process between designer and client, where the final output is developed through repeated discussions and feedback until it meets expectations (Ambrose & Harris, 2014). The profession requires a synthesis of technical, analytical, and artistic skills, ensuring solutions satisfy client expectations while complying with site requirements and regulations (Mustapha et al., 2021). In Indonesia, the Himpunan Desainer Interior Indonesia (HDII) mandates client approval at specific stages: preliminary design, concept planning, schematic design, design development, and supervision.

Visial Studio follows this standard workflow, utilizing Virtual Reality (VR) during schematic design presentations to facilitate client understanding of spatial scale, proportion, materials, and design intent (Hussain, 2025). Despite the adoption of such technology, approval times frequently exceed anticipated schedules, leading to operational inefficiencies, cost overruns, and potential declines in client satisfaction. These delays often stem from communication barriers that hinder decision-making confidence. Establishing trust is therefore critical, as familiarity and positive service experience are fundamental to trusting the service provider (Jarvenpaa et al., 1999).

To diagnose these workflow bottlenecks, this study employs Customer Journey Mapping and the Customer Journey Framework (Stickdorn & Schneider, 2011; Halvorsrud & Kvale, 2017). While Customer Journey Analysis (CJA) is effective for identifying delay factors, previous applications have predominantly

* Corresponding author

focused on transactional services. A key challenge faced by Visial Studio is the significant variation in approval times during the schematic phase. Literature suggests that VR offers solutions by improving visualization accuracy and facilitating faster feedback (Zhang et al., 2019; Zhang et al., 2021). However, the specific mechanism of how VR alters the sequence of service touch-points remains underexplored.

Despite growing interest in VR for design communication and the widespread use of CJA for service improvement, no empirical study has systematically examined how VR influences touch-point sequences and deviation patterns in interior design workflows. This gap is significant because interior design is an iterative, co-creative service where client understanding directly impacts agreement efficiency—a dynamic distinct from the linear, transactional services for which the Customer Journey Framework (CJF) was originally developed.

To address this gap, this study poses the following research questions:

1. What factors contribute to the variability and delays in client approval during the schematic design phase in Visial Studio's interior design projects?
2. How does the utilization of visualization tools (VR vs. Non-VR) influence client understanding and decision-making behaviors?
3. How can the Customer Journey Framework (CJF) be adapted to map the planned versus actual client journey and identify touch-points that trigger approval delays?

What managerial recommendations can be proposed to improve schematic design approval efficiency, minimize timeline deviations, and enhance client satisfaction?

B. LITERATURE REVIEW

The Customer Journey Framework

The customer journey is a predominant method in service design for conceptualizing services from the client's perspective, capturing the entire cycle of interaction (Stickdorn & Schneider, 2011). This client-centric approach is particularly critical for interior design firms like Visial Studio, where service quality is contingent upon accurately interpreting and fulfilling unique client needs (Dodsworth & Anderson, 2015; Anderson et al., 2007). By adopting a structured Customer Journey Framework (CJF), service providers can simplify complex service modeling, thereby strengthening trust and increasing satisfaction through consistent service delivery (Halvorsrud & Kvale, 2017). Consequently, the CJF serves as a robust theoretical lens for evaluating the efficacy of Visial Studio's workflow and client interaction processes.

According to (Halvorsrud and Kvale, 2017), the CJF provides a formal structure to delineate service processes, clarifying the critical distinction between the planned journey (the expected sequence) and the actual journey (the unique client experience). Developed through iterative research and practical case studies, the CJF adheres to design science methodology (Hevner et al., 2004). While historically applied to technology-based services with clearly defined tasks (Sandstrom et al., 2008), this study argues for its applicability in creative sectors. Although Visial Studio's service is not fully automated, it relies heavily on digital tools—such as 3D modeling, rendering, and VR presentations—to facilitate approval at specific workflow phases. Given that recurring delays in client approval have led to increased project time and costs, the CJF offers a methodological rigour through triangulation to diagnose these inefficiencies (Halvorsrud et al., 2016).

Within the CJF, interactions occur through specific channels—mediums through which the client and provider communicate (Halvorsrud & Kvale, 2017). At Visial Studio, these channels include digital platforms (WhatsApp, email) and formal documentation mechanisms like minutes of meeting (MoM). These interactions form a sequence of touch-points ranging from hours to weeks in duration. Halvorsrud et al. (2016) outline five design principles governing this framework, as presented in Table 1.

Table 1. Design principles governing CJF

Principle	Description
Principle 1: Be customer-centric	CJF is built from the customer's point of view. It looks at how services are delivered from the customer's experience.
Principle 2: Be precise	CJF uses clear definitions and models of customer journeys and the points where customers interact with a service (touch-points).
Principle 3: Distinguish planned and actual customer journeys	It separates the planned service from the actual service that happens. CJF helps find the differences between what was planned and what actually happens for each customer.
Principle 4: Distinguish objective and subjective factors	It also makes a clear distinction between the measurable parts of a journey and the personal feelings and experiences customers have during the journey.
Principle 5: Provide visual representation	CJF uses a visual way to show the important parts of the journey, which helps people in different parts of the company understand and talk about the service more easily.

Source: Research data, 2025

A core analytical capability of the CJF is distinguishing between planned and actual customer journeys. The planned journey represents the ideal sequence of touch-points defined by the standard workflow—in Visial Studio's case, the expected design stages and deliverables derived from past project averages. Conversely, the actual journey captures the dynamic, often non-linear reality experienced by individual clients. Because each touch-point yields different outcomes in scale and type, and client experiences are inherently personal, modeling the journey at the individual level is essential (Zomerdijsk & Voss, 2011). Although CJF was originally developed for transactional services (Halvorsrud et al., 2016), its focus on sequential task analysis makes it an effective tool for identifying deviations in Visial Studio's schematic design phase.

Terminology

The term "touch-point," while deeply rooted in professional practice, has been formally integrated into academic literature to describe critical service encounters (Bitner et al., 2008). Zomerdijsk and Voss (2011) define touch-points as distinct moments where a customer interacts with an organization. It is essential to distinguish the touch-point itself from the "channel," which refers to the medium of communication. While Clatworthy (2011) notes that terminology can vary—sometimes conflating channels with events—the Customer Journey Framework (CJF) maintains a precise distinction: a channel is the specific medium through which the customer and service provider communicate (Halvorsrud et al., 2016). In the context of Visial Studio, these channels encompass both digital mediums (e.g., email, WhatsApp, social media) and human-mediated interactions (e.g., face-to-face meetings), all serving as conduits for service touch-points (Halvorsrud et al., 2016).

Within the CJF, a touch-point is rigorously defined as a specific, observable moment of contact between a customer and a service provider. To qualify as a touch-point, an interaction must be detectable by the customer, occur at a specific point in time, and involve a distinct exchange. The initiator of these touch-points varies, ranging from the customer, the service provider, or external partners. Crucially for this study, every touch-point reflects the customer experience at that precise moment and leaves a verifiable "trace," such as a chat log, email thread, or meeting record. Consequently, this study categorizes any communication involving Visial Studio and its clients—regardless of the medium—as a measurable touch-point for analysis.

Table 2. CJF Terminology

Term	Definition
Touch-point	Representative of the interaction between a service provider and a customer.
	Initiator: The party starting the interaction (service provider, customer, or subcontractor).

Term	Definition
Touch-point attributes	Time: The specific moment when the touch-point occurred.
	Channel: The medium used for the touch-point.
	Trace: Evidence that emerges as a result of a touch-point (e.g., logs, documents).
Customer Journey	The interaction of a customer with one or more service providers to reach a certain objective.
Customer Journey types	Planned journey: The proposed journey reflecting the service delivery process (<i>static state</i>).
	Actual journey: The individual journey experienced while the service is being provided (<i>dynamic state</i>).

Source: Research data, 2025

Visual Notation

To ensure the Customer Journey Framework (CJF) is analytically accessible, its processes are visualized using specific notations and color-coding. Service design relies heavily on such visual tools to transform complex data into actionable insights and facilitate stakeholder communication (Segelstrom & Holmlid, 2009). The visual notation system in CJF was specifically developed to make the comparison between planned and actual journeys intuitive, highlighting discrepancies and facilitating the diagnosis of workflow failures (Halvorsrud et al., 2016). In this study, qualitative and quantitative data gathered from Visial Studio via Customer Journey Analysis (CJA) are synthesized using these notations to reveal failing touch-points, sequence errors, and other deviations.

Touch-point Representation

Touch-points are represented as circular nodes, where the color and border attributes indicate their status and initiator (Halvorsrud et al., 2016). Leveraging (Moody, 2009) principles on effective color coding, this study distinguishes actors: blue circles represent touch-points initiated by the service provider (Visial Studio), while orange circles represent those initiated by the client (see Figure 1). A symbol within the circle denotes the specific communication channel or task output. To visually flag service failures—such as missed emails or unsuccessful actions—touch-points are marked with a diagonal over-stroke.

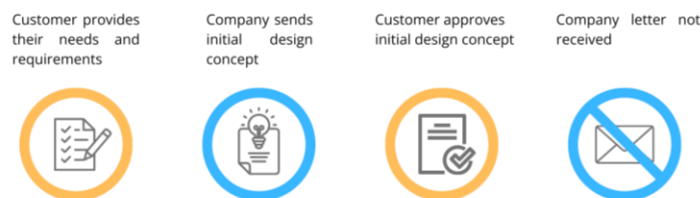


Figure 1. Visualization of Touch-points

Source: Research data, 2025

Timeline and Annotation

To facilitate precise timeline tracking, day-count annotations are integrated into the visualization. As illustrated in Figure 2a, each touch-point node is annotated with labels indicating its sequential order (T_n), the deviation count (D_n) in the upper-left, and the specific day of occurrence (XX) in the upper-right. Figure 2b demonstrates how these annotated touch-points appear within the context of an actual journey 11.

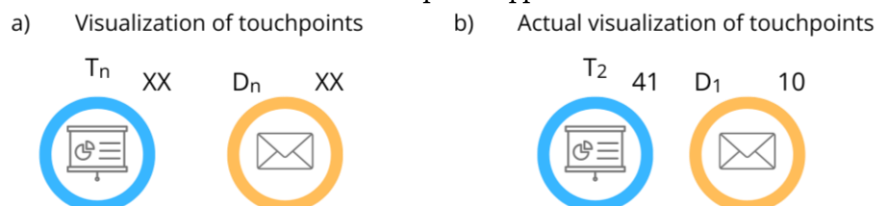


Figure 2. Labels on Visualization of Touch-points

Source: Research data, 2025

Mapping Planned vs. Actual Journeys

The structural distinction between the intended workflow and the client's reality is illustrated in Figure 3. The planned journey is depicted as a linear, interconnected series of touch-points (e.g., T_0 , T_1) representing the ideal sequence (Halvorsrud et al., 2016)¹². In contrast, the actual journey is superimposed on a dynamic timeline, represented by a horizontal gray arrow. Deviations from the plan (D_n) are vertically shifted beneath the preceding touch-point, creating an immediate visual gap that highlights ad hoc interactions or timing errors. This vertical separation allows for rapid identification of disruptions where touch-points occur out of the intended sequence.

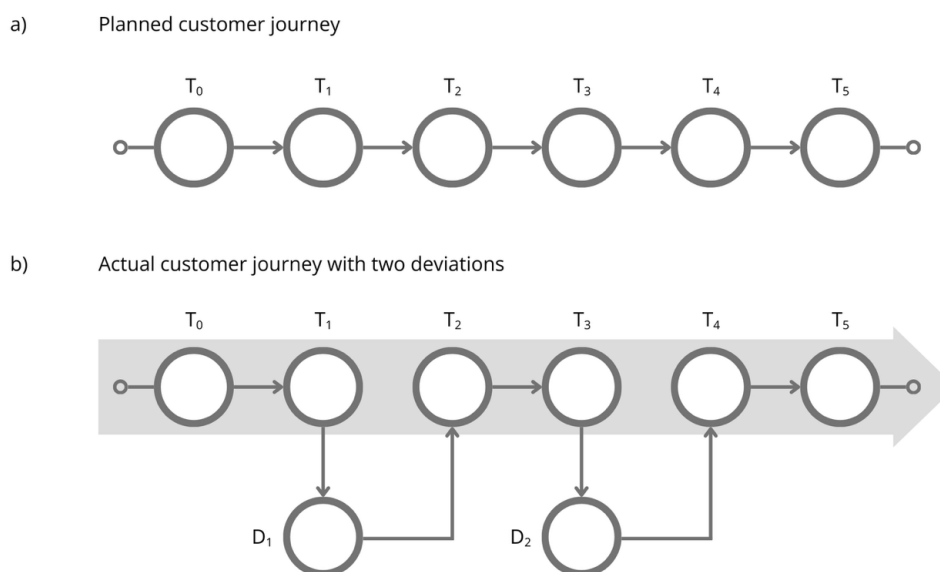


Figure 3. Visualization of Customer Journeys

Note: (a) planned journey represented by six sequential touch-points, and (b) actual journey illustrating two deviations (D_1 and D_2) as unexpected touch-points

Source: Research data, 2025

Virtual Reality (VR) in Interior Design

Virtual Reality (VR) is fundamentally defined as a computer-generated simulation that immerses users in a three-dimensional reality, creating a psychological sense of "being there" (Gere et al., 2021). Craig et al. (2009) expand on this by describing VR as a 3D interactive system that tracks user movement and provides sensory feedback to sustain this immersive experience. To understand the mechanism of VR in design, Burdea (1993) proposes the "3 Is" framework: Interactivity, which enables direct manipulation of the virtual model; Immersion, which establishes a sense of presence through hardware and sensory inputs; and Imagination, which empowers designers to visualize and construct creative spatial solutions. Unlike static 2D imagery, VR facilitates dynamic, real-time interaction, allowing stakeholders to navigate and control the virtual environment autonomously (Afacan, 2016).

In interior design, the quality of communication regarding materials, spatial arrangement, and lighting is a critical determinant of long-term client satisfaction (Guo, 2017; Valipoor et al., 2022). Traditional communication gaps often lead to ambiguity, resulting in excessive revisions and workflow delays. VR addresses these issues by offering a superior platform for real-time design review and stakeholder discussion (Basso, 2017). By providing realistic and immersive scenarios long before construction begins, VR bridges the cognitive gap between the designer's vision and the client's perception (Meggs et al., 2012). This clarity

enhances spatial imagination and deepens client engagement, transforming the review process from a passive viewing into an active group collaboration (Hussain, 2025).

The practical value of VR lies in its ability to accelerate decision-making processes. By allowing clients to intuitively grasp scale, spatial flow, and proportions (Hussain, 2025), VR reduces uncertainty and boosts client confidence (Trindade et al., 2023; Wang et al., 2020). Consequently, the technology serves as an efficient feedback mechanism, making revisions easier to understand and significantly less time-consuming compared to traditional methods (Zhang et al., 2019; Zhang et al., 2021). Furthermore, VR supports interdisciplinary cooperation, enabling designers to model unconstructed spaces and experiment with finishes and lighting in a risk-free virtual environment (Bailey, 2024; Ververidis et al., 2022). Although challenges such as cost, operational complexity, and lack of standardization persist (Basso, 2017), advancements in technology have made VR increasingly accessible for client education and design experience (Cazacova & Semlali, 2023).

Visial Studio leverages these technological capabilities to enhance the schematic design phase, employing two distinct types of VR renderings. The first is VR 360 image rendering, which presents static 3D visuals in an equirectangular format, allowing users to look around in all directions from a fixed point. The second is a VR walkthrough, an interactive application that enables clients to navigate freely through the three-dimensional space, providing a comprehensive simulation of the proposed design. These tools are implemented to enable clients to directly experience the proposed space, thereby facilitating more informed and timely approvals.

Conceptual Framework

This study adopts a process-oriented conceptual framework (see Figure 4) grounded in the planned customer journey for the schematic design phase at Visial Studio. Within this framework, the Customer Journey Framework (CJF) constructs a planned journey representing the normative sequence of touch-points within the service delivery process. This planned journey reflects how interactions are intended to occur under standard operating conditions, incorporating procedural interventions embedded within the workflow. Following (Halvorsrud and Kvale, 2017), this planned trajectory serves as the primary reference point against which actual customer journeys are compared and evaluated. However, it is acknowledged that this planned journey represents an idealistic model based on average historical project data, rather than a uniform experience applicable to all clients.

Rather than conceptualizing client approval time as a standalone outcome-based variable, this framework views approval dynamics as an emergent outcome of interactions occurring across a series of interconnected service touchpoints⁶. The schematic design flow is organized into six planned touch-points (T₀-T₅), emphasizing that service delivery is a continuous, interdependent series of events.

Within this linear sequence, Touch-point 2 (Schematic Design Presentation) is identified as the critical juncture for interpretation and decision-making. At this stage, clients must translate synthesized visual representations—encompassing spatial organization, scale, and material composition—into a mental model of the future space. Consequently, T₂ acts as the primary interface that shapes client understanding, drives feedback loops, and directs the approval trajectory.

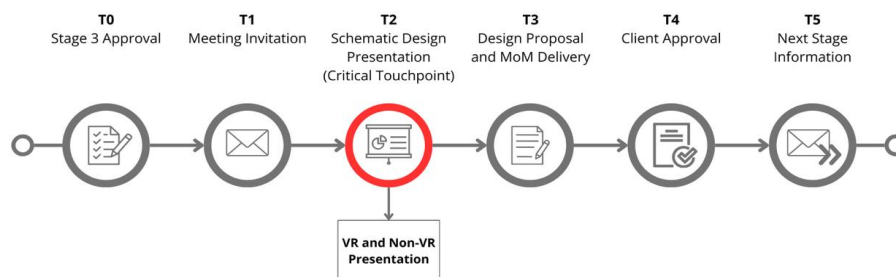


Figure 4. Conceptual Framework

Source: Research data, 2025

The framework integrates Trust Theory and principles of cognitive processing to explain the impact of visualization methods at T2. Virtual Reality (VR) and non-VR presentations are treated not as separate process stages, but as distinct communication conditions within the same touch-point. The framework posits that the visualization method significantly moderates the quality of interaction. By offering dynamic, real-time interaction, VR is theorized to reduce the client's cognitive load, thereby enhancing Perceived Ease of Use (a core component of technology acceptance). This clarity fosters immediate trust in the service provider's competence—a critical factor since familiarity and experience are antecedents to trust (Jarvenpaa et al., 1999). Differences in visualization methods thus fundamentally alter how design information is perceived and evaluated, directly influencing decision confidence and the necessity for subsequent iterations.

Importantly, this framework does not assume predefined causes for approval delays. Instead, it posits that delays are symptomatic of deviations from the planned journey—manifesting as ad hoc interactions, timing disruptions, or repeated revision cycles initiated at T2. The root causes of these delays are empirically derived through Customer Journey Analysis (CJA), which reconstructs the actual client journey to pinpoint exactly where the process diverges from the plan. By positioning the planned journey as a baseline and CJA as the diagnostic mechanism, this framework establishes coherence between the intended service design and the empirical realities of client interaction.

C. METHODS

Customer Journey Analysis

In this research, Customer Journey Analysis (CJA) is employed as the primary method for data analysis. CJA is an empirical approach designed to diagnose and enhance service quality, grounded in the modelling tools of the Customer Journey Framework (CJF) (Halvorsrud et al., 2016; 2017). The methodological process encompasses five distinct phases (see Figure 5): the initial two phases establish the planned service vision, while the third and fourth phases reconstruct the actual customer journeys using empirical evidence. The fifth phase involves synthesizing results to detect deviation patterns and formulating actionable recommendations for service improvement.

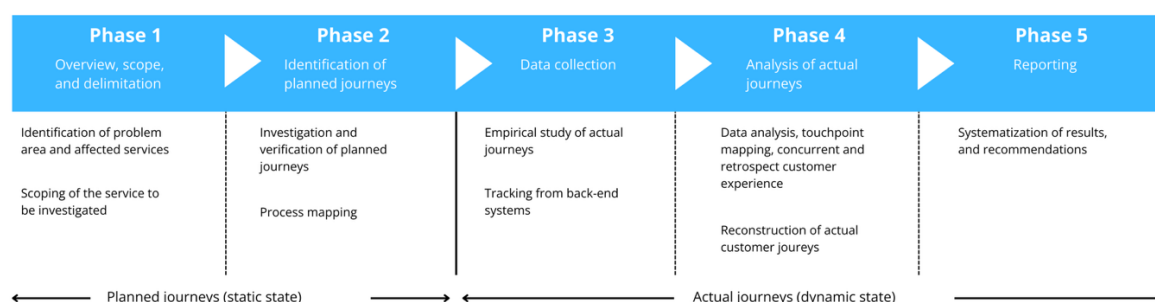


Figure 5. The Five Phases of Customer Journey Analysis

Source: Research data, 2025

In this study, the CJA methodology is applied to the schematic design phase (Stage 4) at Visial Studio. To evaluate the impact of visualization tools, the study compares traditional 2D workflows against VR-based workflows. Data validity is ensured through methodological triangulation, utilizing three complementary data sources:

1. Communication Logs: WhatsApp messages and emails to track interaction dynamism, clarifications, and complaints.

2. Administrative Records: Approval documents and Minutes of Meeting (MoM) to verify formal stage completion.
 3. Technical Artifacts: Design revision files to trace how client feedback materialized into design changes.
- This triangulation aligns with the CJF's core objective of comparing planned versus actual journeys, enabling the precise identification of gaps, pain points, and points of alignment (Halvorsrud & Kvale, 2017).

Phase 1: Overview, Scope, and Delimitation

Phase 1 establishes the analytical boundaries. It begins by assessing the "as-is" state of the service, driven by the complexity and delays observed in Visial Studio's existing workflow (Halvorsrud et al., 2016; 2017). The heterogeneity of communication channels and the lack of flow uniformity were identified as primary contributors to approval delays. The objective of this phase is to define the scope necessary to facilitate future service improvements.

Phase 2: Identification of Planned Journey

Phase 2 maps the planned journey from the service provider's perspective. Using the CJF, this stage verifies the standard operating procedure for "Schematic Design and Briefing to Contractors" (Halvorsrud et al., 2016; 2017). This mapping is conducted from an "outside-in" perspective, establishing a normative baseline against which the actual customer experiences in Phase 3 are evaluated.

Phase 3: Data Collection and Sampling Strategy

Phase 3 focuses on informant sampling and empirical data collection. A purposive sampling strategy was employed to select eight interior design projects that completed the schematic design phase between 2018 and 2025. The sample consists of three VR cases and five Non-VR cases (see Table 3).

While the sample size is small, it adheres to the guidelines for exploratory CJA studies, where the objective is to uncover structural mechanisms and deviation patterns rather than to achieve statistical generalization (Halvorsrud & Kvale, 2017). The 3:5 ratio is representative of the natural distribution of VR adoption at Visial Studio during the study period.

Table 3. Data Collection Table

No	Date	Code	Day	Channel	Description	Comment	File Revision
1	Nov 5, 2022	T0	1	WhatsApp, Email	Stage 3 Approved	"Okay, let's move on to 3D as discussed earlier."	Approval Document

Source: Research data, 2025

Data collection and journey mapping were conducted simultaneously to ensure the accurate reconstruction of evolving customer journeys (see Figure 6).



Figure 6. Principal Sketch of The CJA Method

Source: Research data, 2025

Phase 4: Analysis of Actual Journey

Phase 4 involves modeling the actual customer journey for each project and comparing it against the planned journey. This visualization makes deviations immediately apparent (see Figure 3b). Deviations were categorized using a hybrid approach: deductively using Halvorsrud et al.'s (2016) original typology

(see Table 4) and inductively identifying new patterns that emerged from the specific context of creative design.

Table 4. Deviation Types In Customer Journey Analysis

Deviation Type	Definition
Type 1 – Ad hoc Touch-points	Unplanned or spontaneous touch-points that appear outside the intended journey design.
Type 2 – Timing Errors	A deviation occurs when a touch-point takes place earlier or later than intended, or in a different sequence, causing a permutation of the journey.
Type 3 – Failing Touch-points	Touch-points that occur but fail to deliver the intended result, requiring corrective action or repeated attempts.
Type 4 – Missing Touch-points	Planned touch-points that do not occur at all, representing gaps where expected interactions are bypassed.

Source: Research data, 2025

Phase 5: Reporting and Synthesis

Phase 5 synthesizes findings to provide actionable recommendations. The goal is to detect recurring deviation patterns—such as Ad Hoc Touch-points (Type 1), Timing Errors (Type 2), Failing Touch-points (Type 3), and Missing Touch-points (Type 4)—and identify their root causes to propose appropriate mitigation plans (Halvorsrud & Kvale, 2017). Case Selection Criteria and Analytic Procedure To ensure rigorous analysis, strict criteria governed case selection:

1. Temporal Scope: Projects completed between 2018 and 2025.
2. Data Completeness: Availability of full documentation (chat logs, MoM, approval documents, revision files).
3. Process Completion: Successful completion of Stage 4.
4. Variation: Inclusion of diverse client types (corporate/private) and project scales.

Table 5. Overview of Selected Interior Design Projects and Approval Duration at Visial Studio

Case	Project type	Project size (sqm)	Duration (days)
1	Residential (Apartment, private, non-tender)	92	56
2	Commercial (Corporate, Tender)	354.3	69
3	Office (Corporate, Tender)	4142	100
4	Residential (Apartment, private, non-tender)	32	89
5	Residential (Apartment, private, non-tender)	32	49
6	Residential (House, private, non-tender)	37.7	53
7	Residential (House, private, non-tender)	176	67
8	Commercial (Corporate, Tender)	135.5	70

Source: Research data, 2025

Analytic Procedure

The unit of analysis is the individual customer journey per project. The analysis followed a structured three-step procedure:

1. Chronological Reconstruction: Coding interaction records to build a timeline of touch-points.
2. Deviation Classification: Mapping actual journeys against the planned workflow. Initial deviations were coded using the standard CJF typology.
3. Inductive Pattern Recognition: Where recurring patterns (such as long response gaps or repetitive design cycles) could not be explained by the original framework, new deviation categories were identified inductively.
4. Cross-Case Synthesis: Finally, a comparative analysis was conducted to distinguish deviation patterns between VR and Non-VR cases.

Although this study utilizes a limited sample size, the methodological rigor of CJA allows for valid analytical generalization, revealing structural mechanisms of the design process rather than statistical generalization to the entire industry.

D. RESULTS AND ANALYSIS

Results

This chapter presents the empirical findings of Visial Studio's customer journey analysis using the CJF model (Halvorsrud et al., 2016; 2017). By juxtaposing planned and actual journeys across VR and Non-VR workflows, the analysis isolates specific touch-point behaviors, identifies deviation patterns, and diagnoses the root causes of approval delays.

Phase 1: Overview and Scoping

The analysis focuses on the schematic design phase, a fundamental stage determining spatial decisions and project direction. VR applications—defined here as VR walkthroughs and VR 360 image renderings via Enscape—were analyzed to evaluate their capacity to mitigate weak points in client understanding. Three VR cases and five Non-VR cases were selected to represent varying degrees of complexity and client interaction patterns.

Phase 2: Planned Journey

IdentificationThe planned customer journey for Stage 4 serves as the normative benchmark (see Figure 7). The sequence initiates with the client's approval of the concept design (T_0). Visial Studio then executes the schematic design over approximately two weeks, followed by a presentation invitation (T_1) and the critical design presentation (T_2). Post-presentation, the client receives the proposal and Minutes of Meeting (T_3) for review. Upon satisfaction, the client submits formal approval (T_4), triggering the transition to the next stage (T_5). Based on historical data, the standard duration for this phase is projected between 15 and 30 working days, contingent on project complexity.

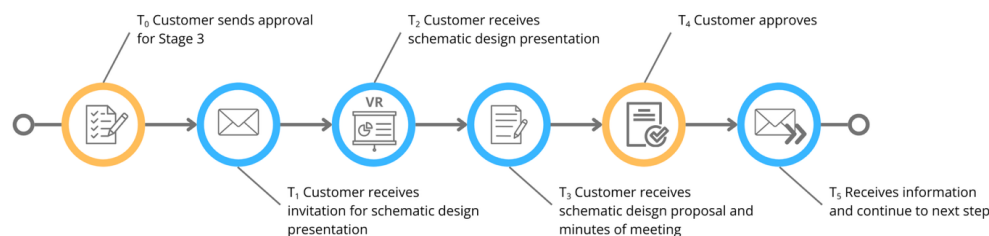


Figure 7. The CJF Model of The Planned Customer Journey for Stage 4 in Visial Studio

Source: Research data, 2025

Phase 3 & 4: Data Collection and Analysis of Actual Journeys

Actual journeys were reconstructed through the triangulation of chat logs, revision files, and approval documents. Figure 8 illustrates the actual journey for Case VR-1 (Residential, 92 sqm). Figure 8. The actual journey of VR Case Residential-1 on schematic design phase. In Case VR-1, the journey generally adhered to the planned sequence but exhibited specific deviations. While the initial flow from T_0 to T_1 was linear, Timing Deviations occurred when the client delayed their response by five days (D_1) and subsequently rescheduled due to unforeseen issues (D_2). Crucially, the VR 360 presentation (T_2) facilitated immediate, specific feedback regarding spatial clearances, recorded in the MoM (T_3). Notably, this case prompted a "refinement loop" rather than a failure. The client initiated an ad hoc meeting request (D_3), leading to a rapid second presentation ($D_4/R02$) where the static VR 360 was upgraded to a full VR Walkthrough to

resolve spatial queries. This repeated interaction (D₄-D₇) represents an Iteration Deviation—a constructive cycle aimed at design perfection rather than error correction. The phase concluded with successful approval (T₄) and handover (T₅).

Phase 5: Synthesis and Comparative Reporting

Across all reconstructed journeys, 60 touch-points were identified, including 46 deviations. No actual journey perfectly mirrored the planned workflow; VR cases expanded to an average of 20 touch-points compared to the planned 6. The analysis reveals that project scale significantly influences deviation patterns: larger corporate projects exhibited higher frequencies of Ad Hoc deviations (Type 1) due to multi-stakeholder coordination, whereas smaller residential projects maintained a more linear flow.

Table 6. Summary of The Actual Journey Analysis Table of the VR Case Study

Case	Project Type	Durati on (Days)	Total #TP	Ad Hoc (Type 1)	Timing Error (Type 2)	Failing #TP (Type 3)	Missing #TP (Type 4)	Timing Dev (Type 5)	Iteration (Type 6)
1	Residential	56	13	1	-	0	-	2	4
2	Commercial	69	24	7	2	0	-	-	10
3	Office	100	23	5	2	0	2	1	9

Note: #TP = Touchpoint
Source: Research data, 2025

Table 6 highlights a critical finding: VR cases recorded zero Failing Touch-points (Type 3). Conversely, deviations in VR cases were dominated by Iteration Deviations (Type 6), confirming that VR facilitates active design exploration.

Discussion

The Paradox of Efficiency vs. Speed

A comparative analysis of VR and Non-VR cases (see Table 7) reveals a paradox: while VR improves communication quality, it does not necessarily accelerate the process. The average approval duration for VR cases was 75 days, compared to 69.6 days for Non-VR cases.

Table 7. Key Numbers From Customer Journey Analysis of VR and Non-VR Case Study

Category	Journeys with Failing #TP	Journey with Timing Deviations	Avg. Actual Touch-points
VR Case Study	0	2	20
Non-VR Case Study	3	3	18

Source: Research data, 2025

This finding suggests that approval speed is less dependent on visualization tools and more dependent on external factors such as client type, decision-making hierarchy, and site readiness. However, the quality of the journey differs significantly. Non-VR cases were plagued by Failing Touch-points, often requiring backtracking due to misunderstandings. In contrast, VR cases eliminated these failures, trading "correction time" for "refinement time."

The complete absence of Failing Touch-points in VR cases can be explained through the Technology Acceptance Model (TAM) and Trust Theory. The immersive nature of VR (Burdea's "Immersion") significantly reduces the cognitive load required for clients to understand spatial relationships (Afacan, 2016). By providing a "Perceived Ease of Use" in visualizing the final result, VR bridges the gap between designer intent and client perception. This clarity fosters rapid competence-based trust (Jarvenpaa et al., 1999), empowering clients to make decisions with confidence during the presentation (\$T_2\$), thereby negating the need for corrective loops caused by misunderstanding.

- This study extends Halvorsrud et al.'s (2016) typology by identifying two new categories (see Table 8).
1. Timing Deviation (Type 5): Characterized by idle periods (e.g., long client response gaps) rather than sequence errors. This was the primary driver of the 75-day average duration.
 2. Iteration Deviation (Type 6): Unlike "Failing Touch-points," which signal service breakdown, Iteration Deviations represent a value co-creation process. In creative industries, design development is inherently iterative (Ambrose & Harris, 2014). The high frequency of Type 6 in VR cases indicates that clients used the technology not just to approve, but to actively refine and perfect the design, shifting the service model from transactional delivery to collaborative engagement.

Table 8. Additional Deviation Types In Customer Journey Analysis

Deviation Type	Definition
Type 5 – Timing Deviation	Extended delays or prolonged intervals (e.g., long response gaps) that affect the overall pacing without altering the sequence.
Type 6 – Iteration Deviation	Repeated occurrence of planned touch-points for refinement or alignment. Unlike failure, this represents intentional cycles of improvement (Co-creation).

Source: Research data, 2025

Practical Implications

For practitioners, these findings suggest that VR should be positioned not as a "time-saver" but as a "quality-assurance" tool. While it may not shorten the calendar timeline due to external client factors (e.g., holidays, internal approvals), it significantly reduces the internal rework costs associated with miscommunication. The reduction of Ad Hoc interactions by 23% in VR cases further indicates a more streamlined, purposeful communication flow.

E. CONCLUSION

This study successfully applied Customer Journey Analysis (CJA) to the interior design domain, revealing that while Virtual Reality (VR) does not statistically shorten approval timelines (75 days vs. 69.6 days), it fundamentally transforms the nature of the approval process. VR creates a "zero-failure" environment by eliminating Failing Touch-points, replacing corrective friction with constructive Iteration Deviations.

Key Contributions:

1. Theoretical Extension: The identification of Timing Deviation and Iteration Deviation expands the CJF typology, offering a framework suitable for iterative, creative services beyond the traditional transactional model.
2. Managerial Insight: Approval delays are primarily driven by Timing Deviations (external client factors) rather than visualization tools. However, VR acts as a safeguard against design misunderstanding, building trust, and reducing ad hoc noise.

The study is limited by its specific context within a single Indonesian firm (Visial Studio) and a sample size of eight projects, which invites selection bias and limits generalization. Future research should expand this CJA approach to a broader range of firms to test the universality of the "Iteration Deviation." Additionally, longitudinal diary studies could further illuminate the emotional trajectory of clients during these distinct deviation types.

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