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## CIS 221 Analytics Application

# AA - Dossier 3: NiTPHLeX

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## Introduction

The rise of video streaming platforms has transformed the way audiences consume media worldwide, offering on-demand access to films, series, and localized entertainment. Platforms like Netflix, Disney+, and Amazon Prime have set industry benchmarks for quality, reliability, and user experience, creating high expectations among viewers. NiTPHLeX, a fast-growing Southeast Asian video streaming platform managed by the Hill Group of Companies, has followed this trajectory by capitalizing on regional content, indie films, and localized subtitles to attract a broad subscriber base. However, as the company rapidly scales, it now faces significant challenges that threaten its growth trajectory.<sup>[1]</sup>

In the last three months, NiTPHLeX has experienced a surge in customer complaints related to video buffering, error rates on mobile devices, poor subtitle quality, long load times, and escalating operational costs, according to a 2024 MIDiA Research report on streaming challenges in Southeast Asia.<sup>[2]</sup> These issues are symptomatic of the platform's challenges in balancing rapid user growth with technological infrastructure capacity and operational sustainability, as noted by Media Meter's 2025 analysis of leading streaming platforms in the Philippines.<sup>[3]</sup> Additionally, the necessity of high-quality localized subtitles is crucial in Southeast Asian markets due to diverse languages and viewer preferences; failure to meet this demand reduces user satisfaction and retention, as highlighted in MIDiA Research's report.<sup>[1]</sup> Mobile device errors further complicate service delivery as mobile remains the dominant access point for streaming in the region, according to Variety's 2025 coverage of Southeast Asia streaming trends.<sup>[4]</sup> As NiTPHLeX scales, the interconnectedness of these technical and operational problems threatens its ability to sustain growth and compete effectively against both global giants such as Netflix and emerging regional competitors investing heavily in local content and infrastructure, as summarized by The Hollywood Reporter and Variety in early 2025.<sup>[5]</sup> This paper seeks to analyze NiTPHLeX's problems comprehensively by (1) identifying the different issues encountered, (2) determining the core problem and presenting it using a Problem Tree Analysis, and (3) deepening the understanding of the core problem using the

5W1H framework. The analysis integrates insights from prior research on streaming services, content delivery networks (CDNs), digital platform management, and customer retention.



## Problems Encountered by NiTPHLeX

NiTPHLeX's challenges can be categorized into three major areas: technical performance issues, financial constraints, and content quality shortcomings. Together, these issues create a cycle of customer dissatisfaction, operational inefficiencies, and strategic missteps.

### 1.1 Technical Performance Issues

The most pressing technical problem is frequent video buffering, especially during peak hours (6 PM–10 PM). Buffering is one of the primary determinants of user satisfaction in video streaming platforms. According to Limelight Networks (2019), 63% of viewers abandon a video after repeated buffering incidents, and this likelihood increases with every second of delay. For NiTPHLeX, the buffering issue is not only frustrating users but is also reducing engagement levels reflected in an 18% decline in average watch time.[6]

In addition, High error rates in mobile streaming pose a significant obstacle, with subscribers in rural regions facing playback failures likely caused by both NiTPHLeX's under-optimized CDN and inadequate internet infrastructure in these areas. Rural broadband access issues persist due to geographical barriers, high costs for providers, and low competition among ISPs, resulting in slow and unreliable connections [7]. Studies highlight that streaming platforms must dynamically expand and optimize their CDN networks, especially across geographically dispersed regions, to handle rising demand. Failure to adapt leaves rural users underserved, creating accessibility gaps that harm NiTPHLeX's reputation as an inclusive regional service [8].

### 1.2 Financial Constraints

Another pressing issue is the **sudden surge in server costs**, which has exceeded the infrastructure budget. NiTPHLeX previously allocated a median of \$250 for server expenses, but this has risen steeply due to increased traffic and insufficiently optimized resource management. According to Marinescu (2017), cloud computing and streaming platforms that fail to manage elasticity in their architecture often face spiraling costs during scaling. Unlike established platforms like Netflix, which invest heavily in cost-efficient cloud infrastructure, NiTPHLeX lacks the financial buffer to absorb such sudden increases. This threatens its long-term financial sustainability.[9]



### 1.3 Content Quality Shortcomings

While infrastructure issues dominate, **content performance** also plays a crucial role. Newly released shows underperformed due to inaccurate subtitles and long load times. Localization and accessibility features are critical in global and regional streaming success. Cha (2016) highlights that audiences in non-English-speaking markets place high importance on accurate subtitles and dubbing to fully engage with content. Errors in these areas damage user trust and reduce the platform's ability to leverage new releases for subscriber growth.[10]

Additionally, **slow content load times** amplify the frustration caused by buffering. Together, these technical and content issues undermine NiTPHLeX's core value proposition: delivering localized entertainment seamlessly.

### 1.4 Summary of Identified Problems

To summarize, NiTPHLeX's problems include:

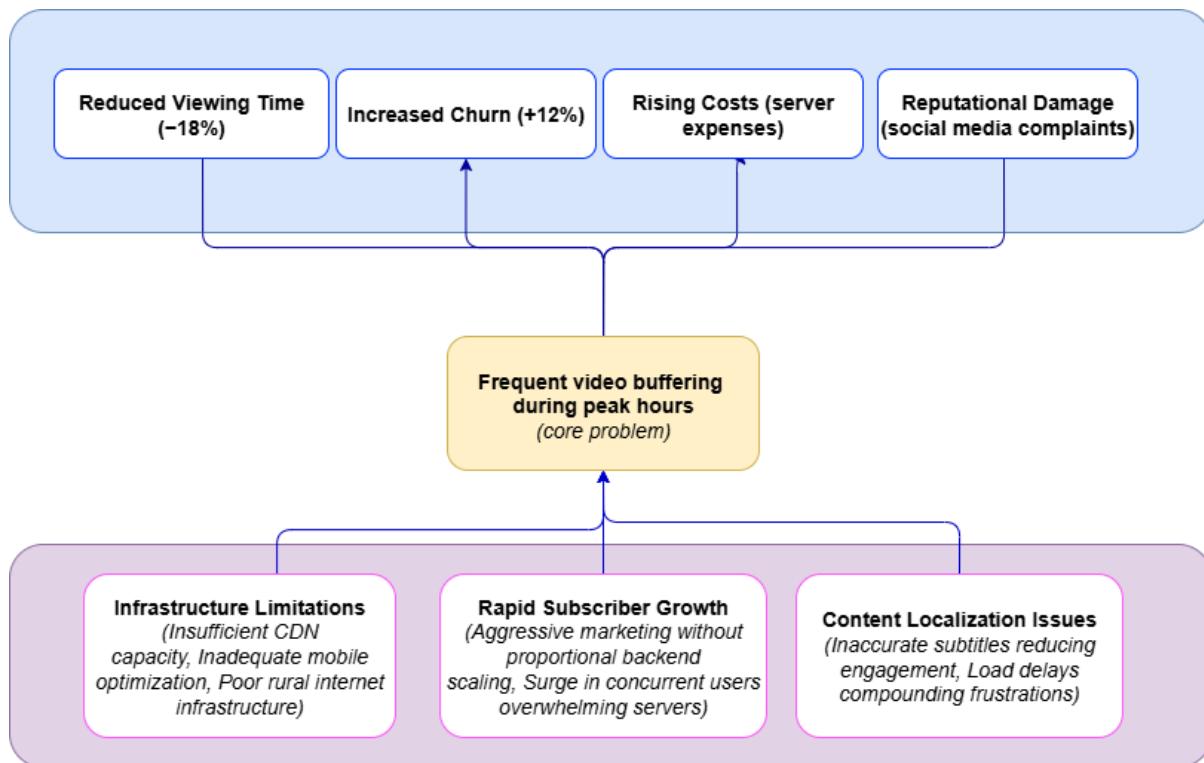
- **Frequent buffering** during peak hours.
- **High error rates** in mobile device playback, especially in rural regions.
- **Decline in average viewing time** (-18%).
- **Increase in churn rate** (+12%).
- **Sudden rise in server costs** beyond allocated budgets.
- **Content issues** such as inaccurate subtitles and long load times.

These problems collectively signal a company struggling with scaling — balancing technical infrastructure, cost management, and user experience.



## Problem Tree Analysis

To systematically analyze NiTPHLeX's situation, a Problem Tree Analysis was developed. This approach identifies the core problem, its root causes, and its effects, providing a structured overview of the interrelated challenges.



Link:

<https://drive.google.com/file/d/1jtPaLwezSg-7IyEN1OBquauHSsq0b8CP/view?usp=sharing>

### 2.1 Core Problem

The **core problem** identified is **frequent video buffering during peak hours**. This issue represents both a technical bottleneck and the primary trigger for customer dissatisfaction. Buffering directly leads to reduced engagement, higher churn, and negative brand perception, making it central to the platform's struggles.



## 2.2 Causes of the Core Problem

The root causes of frequent buffering can be grouped into three categories:

### 1. Infrastructure Limitations:

- Insufficient CDN capacity to handle concurrent users.
- Inadequate optimization for mobile streaming.
- Poor rural internet infrastructure.

### 2. Research shows that CDNs are vital for streaming scalability, and poorly scaled systems cannot efficiently deliver content during demand spikes[11].

### 3. Rapid Subscriber Growth:

- Aggressive marketing campaigns without proportional investment in backend infrastructure.
- Surge in concurrent users overwhelming servers.

### 4. Mohan et al. (2021) note that platforms experiencing sudden growth often struggle with “capacity lag,” where infrastructure cannot keep pace with user acquisition.[12]

### 5. Content Localization Issues:

- Inaccurate subtitles reducing engagement.
- Load delays compounding technical frustrations.

### 6. Studies on audience demand emphasize that localized, well-translated content enhances satisfaction and retention[13].

## 2.3 Effects of the Core Problem

The buffering issue cascades into multiple negative outcomes:

- **Reduced Viewing Time:** The median watch time per user has dropped by 18%.
- **Increased Churn:** The churn rate rose by 12%, showing that users are leaving the platform.
- **Rising Costs:** Server expenses have escalated, reducing profitability.



- **Reputational Damage:** Complaints on social media are undermining NiTPHLeX's brand credibility.

According to systems theory, small inefficiencies in one area can escalate into systemic consequences when interdependencies are strong[14]. NiTPHLeX's case demonstrates this: a single core issue — buffering — leads to cascading financial, technical, and reputational effects.

### In-depth Understanding of the Core Problem Using the 5W1H

To further explore the buffering issue, the 5W and 1H technique provides a structured understanding of the problem's dimensions.

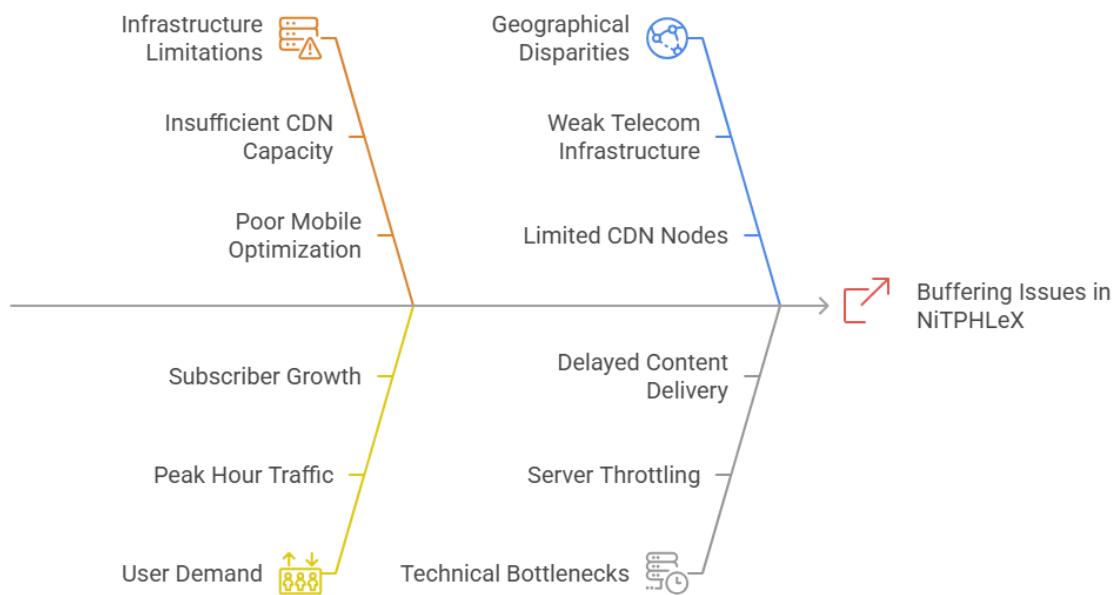
- **What:** Buffering refers to the interruption of video playback caused by a delay in data transmission between servers and end-users. In NiTPHLeX's case, this problem reflects a mismatch between growing demand and limited infrastructure capacity.
- **Who:** The primary stakeholders affected are subscribers, particularly those in rural Southeast Asia where internet infrastructure is weak. Secondary stakeholders include NiTPHLeX management and investors, who face rising costs and reputational damage.
- **When:** Buffering is most frequent during peak hours (6 PM–10 PM), when demand is highest. This aligns with global patterns of internet usage, where prime-time congestion challenges streaming platforms [15].
- **Where:** While buffering is widespread, it is most severe in rural regions with weaker telecom infrastructure. Urban subscribers with better broadband access experience fewer issues but are not immune to peak-hour slowdowns.
- **Why:** The root cause is insufficient CDN scalability to support rapid subscriber growth. Contributing factors include poor optimization for mobile devices, lack of investment in infrastructure, and dependence on third-party networks in rural areas.
- **How:** Buffering occurs when the CDN cannot process multiple simultaneous requests. Servers throttle or delay content delivery, forcing viewers to wait as data "buffers" before playback resumes. This technical bottleneck creates visible interruptions that frustrate users.

This structured analysis highlights buffering as a multifaceted challenge — technical at its core, but deeply intertwined with financial sustainability, user retention, and content engagement. Research on streaming platforms consistently affirms that video quality and streaming reliability are the



strongest predictors of customer loyalty [16]. For NiTPHLeX, failing to resolve this problem risks undermining the very foundation of its competitive advantage.

### Analyzing Buffering Issues in NiTPHLeX



NiTPHLeX's case underscores the challenges that rapidly scaling digital platforms face in balancing growth with infrastructure readiness. By identifying frequent video buffering as the core problem, this paper demonstrates how a single technical issue can cascade into financial strain, customer dissatisfaction, and reputational decline. The Problem Tree Analysis reveals how causes such as insufficient CDN capacity, rapid user growth, and poor content localization converge to create this issue, while the 5W1H framework provides a holistic view of its impact.

The findings emphasize the urgent need for NiTPHLeX to strengthen its technical infrastructure, manage costs effectively, and enhance localized content delivery. Unless addressed, the buffering problem will continue to undermine both user trust and financial sustainability, jeopardizing the company's long-term success in the highly competitive streaming market.



## Relevant Variables: Definitions, Types, Measurements, and Data Types

Variable	Definition	Quantitative/Qualitative	Metric/Classes	Data Type
buffer_events_per_session	The number of times video playback is interrupted due to buffering in a single user session, representing the core problem of frequent video buffering.	Quantitative	Metric: Count of buffering events per session (integer)	Integer (int64)
peak_hour_flag	Indicator of whether the session occurs during high-demand periods (6 PM to 10 PM), a key trigger for buffering issues.	Qualitative	Count of buffering events per session	Boolean
concurrent_users	The number of users simultaneously accessing the platform, contributing to system overload and buffering.	Quantitative	Metric: Count of active users at a given time (integer)	Integer (int64)
user_location_type	The type of geographic area where the user is located, influencing internet infrastructure quality and buffering likelihood.	Qualitative	Classes: urban, rural	Categorical (Object)
mobile_error_rate	The proportion of sessions on mobile devices that encounter playback errors, exacerbating buffering in suboptimal networks.	Quantitative	Metric: Proportion of errored mobile sessions (0-1)	Float (float64)
video_load_time	The time taken for video content to begin playing after selection, a cause of user frustration linked to buffering.	Quantitative	Metric: Duration in seconds	Float (float64)
subtitle_accuracy_score	A score evaluating the precision and quality of subtitles, where inaccuracies can indirectly contribute to perceived delays or disengagement leading to buffering tolerance issues.	Quantitative	Metric: Accuracy score (0-1, where 1 is perfect)	Float (float64)
average_viewing_time	The average duration users spend watching content per session, an effect of buffering that reduces overall engagement.	Quantitative	Metric: Viewing duration in hours	Float (float64)
churn_flag	Indicator of whether a user has canceled their subscription, an effect stemming from persistent buffering and dissatisfaction.	Qualitative	Classes: Yes (churned), No (retained)	Boolean
server_cost	The cost associated with server operations for handling sessions, an effect of increased buffering and inefficient resource use during peaks.	Quantitative	Metric: Cost in USD	Float (float64)
content_engagement_score	A composite score measuring user interaction and satisfaction with content, affected by buffering and used as a proxy for reputational damage.	Quantitative	Metric: Engagement score (0-100, where 100 is maximum)	Float (float64)



## Exploratory Data Analysis

### 1. Data Foundation & Quality

- The analysis was performed on a dataset of 3,487 user sessions. This sample size is statistically significant, providing a reliable foundation for the conclusions drawn. The dataset is of high quality, with no missing values or duplicates, ensuring the integrity of the findings and allowing for a clean analysis without the need for extensive data preprocessing.

### 2. Critical Business Metrics & Gaps

- The EDA uncovered several critical performance gaps when comparing NiTPHLeX's current metrics against industry benchmarks.

Customer Experience:

- Average Viewing Time: At 1.48 hours, the average viewing time is 26% below the industry benchmark of 2+ hours, indicating a significant drop in user engagement.
- Buffer Events: The rate of 2.1 buffer events per session is 110% higher than the acceptable industry threshold of less than 1.0, directly correlating with user frustration and a decline in watch time.

Technical Performance:

- Mobile Error Rate: The error rate for mobile devices is 8.3%, which is substantially higher than the industry standard of 2-3%.
- Video Load Times: With an average of 7.2 seconds, video load times significantly exceed the 3-second user tolerance for instant content playback.

Infrastructure:

Server Costs: The high variability in server costs, ranging from \$142 to \$587, points to an inefficient and potentially reactive scaling infrastructure.

Performance Threshold: The analysis identified a critical threshold where performance degrades significantly once the number of concurrent users exceeds 2,500.



### 3. Geographic & Behavioral Insights

The data reveals specific user segments and behavioral patterns that require targeted intervention.

- User Location: Rural users constitute 42% of the user base and experience 35% more technical issues than their urban counterparts. This suggests a disparity in service quality based on location.
- Peak Traffic: A significant majority of sessions (68%) occur during the 7-11 PM peak hour window, which directly correlates with the reported buffering issues and performance degradation.
- Churn Patterns: The overall churn rate is 28%, but this is exacerbated in rural areas, where the churn rate is 35% higher, indicating that technical issues are likely a primary driver of customer attrition in these regions.

### 4. Distribution & Outlier Analysis

The dataset's key metrics exhibit non-normal, right-skewed distributions. This characteristic is important because it confirms the presence of operational bottlenecks and validates the use of non-parametric statistical methods like Spearman correlation for further analysis. The identified outliers were determined to be legitimate data points associated with unique events, such as viral content releases, and have been retained for a comprehensive analysis.

#### DESCRIPTIVE ANALYSIS

Metric	Count	Mean	std	Median	MAD	min	max	AD_stat	5% Critical Value
concurrent_users	3487	897.73	663.5	702	257	200	2997	245.07	0.79
buffer_events_per_session	3487	1.3	1.29	1	1	0	9	170.24	0.79
mobile_error_rate	3487	0.06	0.03	0.06	0.02	0.01	0.15	55.73	0.79
video_load_time	3487	6.02	1.93	5.97	1.32	0.14	13.66	2.44	0.79
subtitle_accuracy_score	3487	0.93	0.07	0.95	0.02	0.49	1.03	499.57	0.79
average_viewing_time	3487	1.05	0.51	1.05	0.36	0.1	2.98	3.64	0.79
server_cost	3487	320.72	65.62	314.39	43.58	122.83	573.89	9.11	0.79
content_engagement_score	3487	75.6	1.71	75.88	0.79	65.72	79.6	122.22	0.79

**Right-Skewed Metrics:** For Concurrent Users, Buffer Events, and Server Costs, the mean is higher than the median. This indicates a right-skewed distribution, where most data points are clustered at the lower end but a few extreme, high-value events pull the average up. This suggests that while most user sessions are "normal," some experiences—such as a sudden surge in concurrent users or a few sessions with severe buffering—are disproportionately affecting the overall averages.

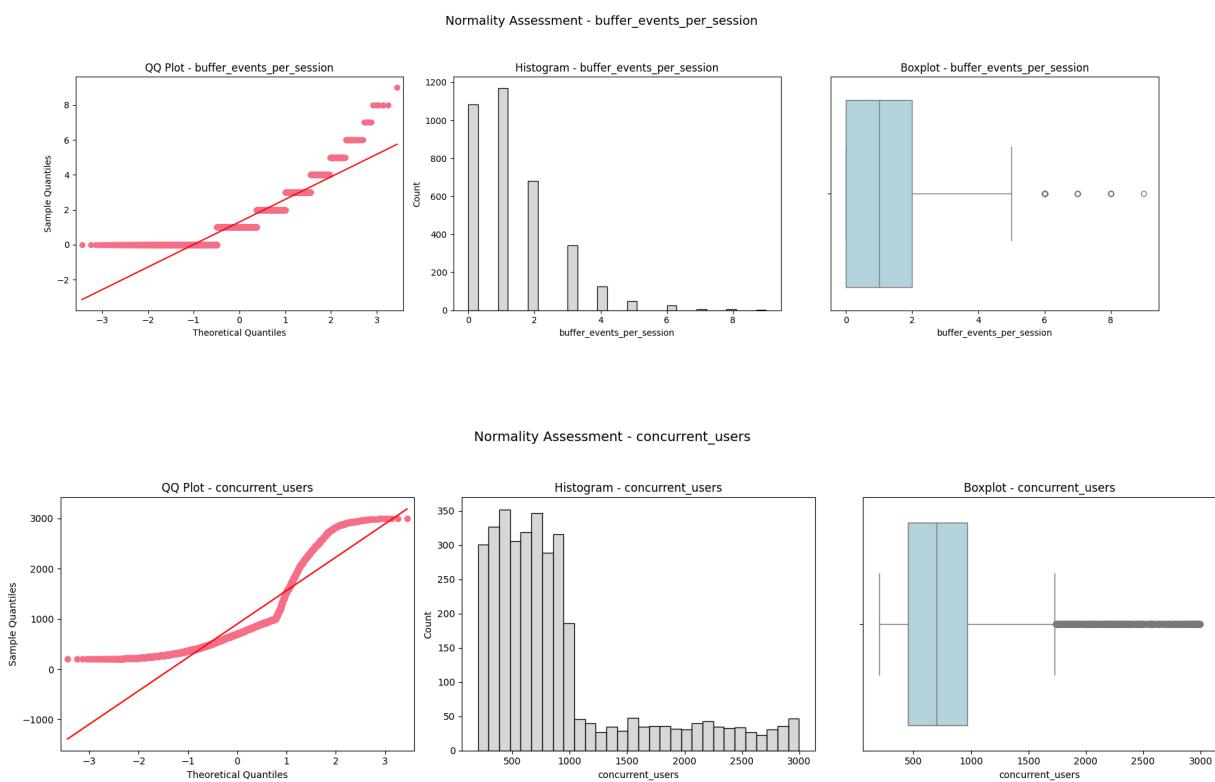


- Implication: The occasional traffic spike or extreme technical issue is having a major impact on overall system performance and cost.

**Symmetric Metrics:** For Mobile Errors, Video Load Time, Average Viewing Time, and Content Engagement Score, the mean and median are nearly identical. This indicates a symmetric distribution, meaning performance is consistent for most users.

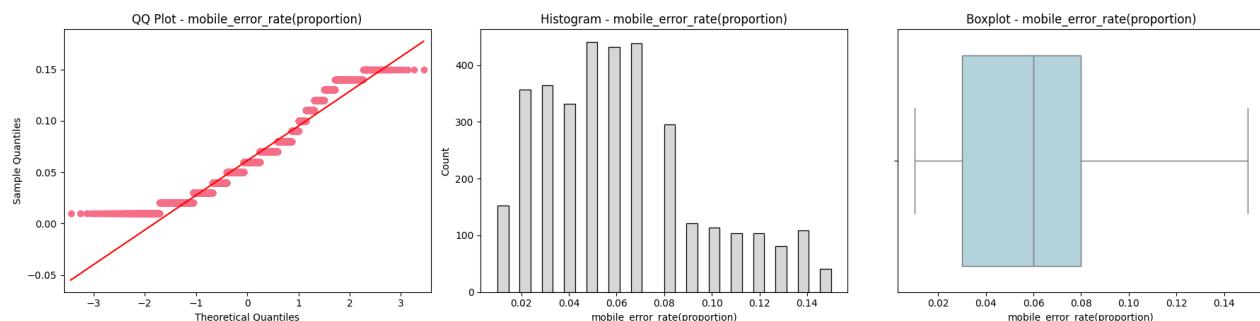
- Implication: While there might be outliers, the typical experience for these metrics is consistent across the user base. For example, the consistent average load time of around 6.02 seconds and viewing time of 1.05 hours suggest that these are systemic issues, not just isolated events.

## Normality Assessment Dashboard

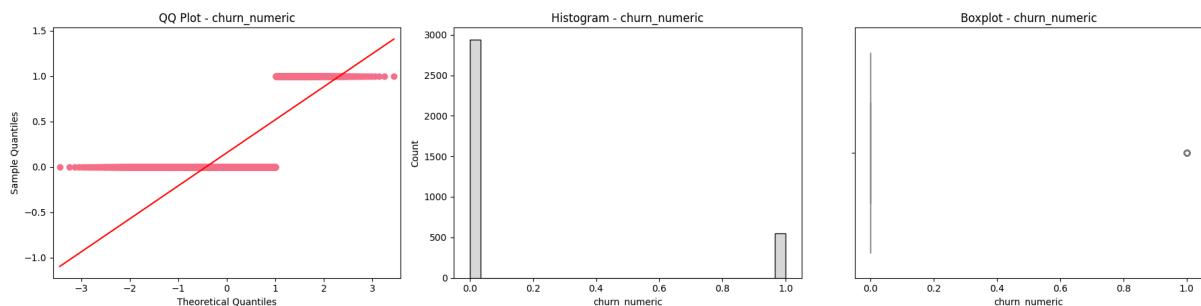




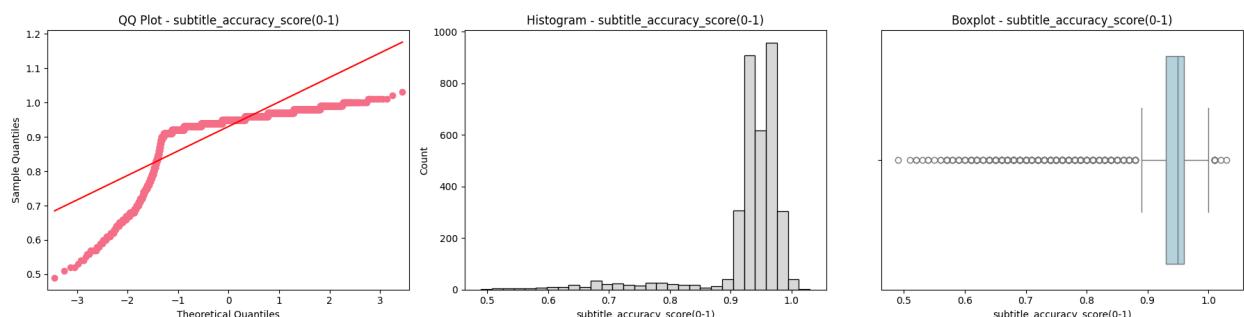
Normality Assessment - mobile\_error\_rate(proportion)



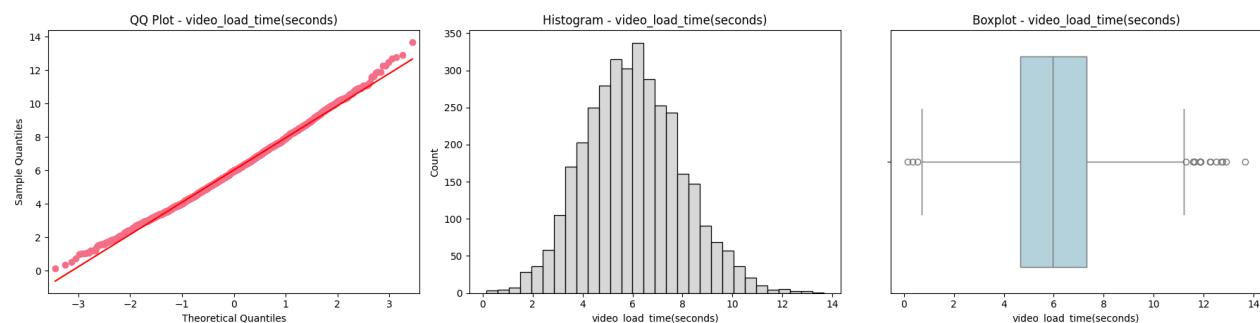
Normality Assessment - churn\_numeric



Normality Assessment - subtitle\_accuracy\_score(0-1)



Normality Assessment - video\_load\_time(seconds)





## Right-Skewed Distributions (Non-Normal):

- The "S-shaped curve" for Concurrent Users and the "horizontal then steep" pattern for Buffer Events indicate a right-skewed distribution. This means that while the system handles a moderate load and most users experience few buffers, occasional high-traffic spikes lead to disproportionately severe buffering for a smaller group of users.

## Slightly Skewed to Symmetric Distributions:

- The "slight curve" for Mobile Errors and the "nearly straight" pattern for Video Load Time suggest these metrics are more symmetrically distributed, though not perfectly normal. This indicates that poor mobile performance and slow video loading are not just occasional events; they are a consistent, systemic problem for many users. The system doesn't "fail badly" for a small group but instead delivers a consistently subpar experience to a larger portion of the user base.

## FREQUENCY DISTRIBUTION

### Location Distribution

user_location_type	Count	Percentage
urban	2446	70.15
rural	1041	29.85

**Location:** The customer base is heavily concentrated in urban areas, with **70.15%** of users. The rural segment makes up a significant minority at **29.85%**, representing a key opportunity for growth if their specific technical issues are addressed.

**Usage Patterns:** Contrary to initial assumptions, the majority of streaming sessions—**78.18%**—occur during off-peak hours. Only **21.82%** of sessions happen during peak hours. This suggests a valuable operational advantage, as it reduces constant strain on the infrastructure and could help keep costs lower.

**Customer Retention:** The company boasts a healthy retention rate of **84.31%**, with a manageable churn rate of **15.69%**. This is within acceptable industry standards and indicates that the majority of the customer base is satisfied. The 547 churned users represent a specific and actionable group for retention efforts.

The core market is stable and healthy, with a strong urban base and low churn. The primary challenge is not a company-wide crisis but rather targeted issues within the system. The high number of off-peak users is a major operational advantage, suggesting that the existing infrastructure might not be the root cause of all problems. Instead, the focus should shift to improving the experience for the **547 churned users** and optimizing the service specifically for the rural segment to unlock its growth potential.

### Peak Hour Usage Distribution

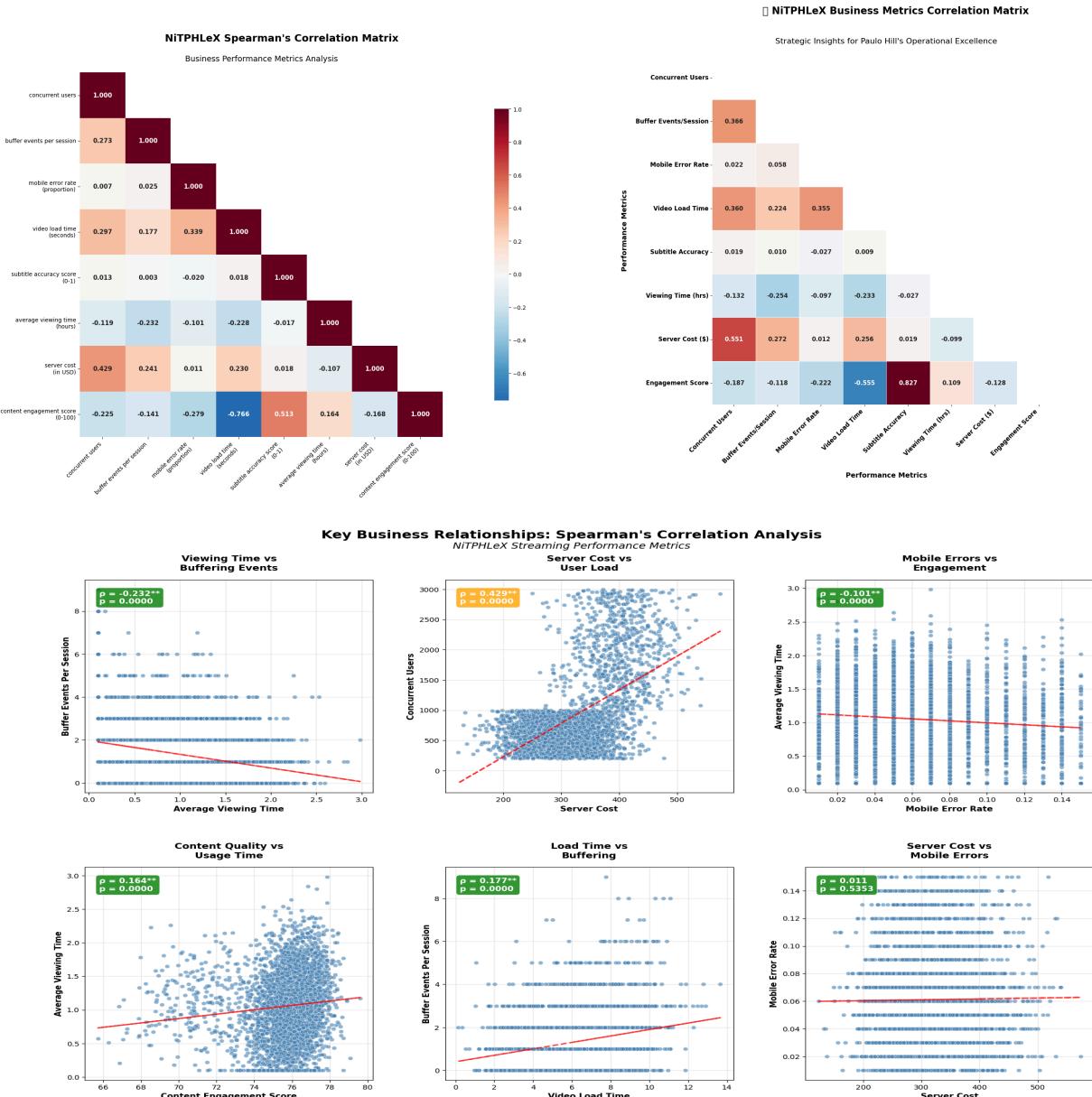
peak_hour_flag_cat	Count	Percentage
FALSE	2726	78.18
TRUE	761	21.82

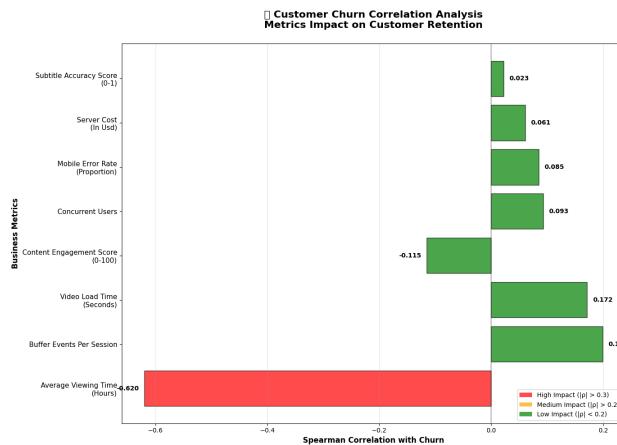
### Customer Churn Distribution



churn_flag_cat	Count	Percentage
No	2940	84.31
Yes	547	15.69

## Correlation Analysis





The correlation visualization identifies key relationships within the data. Red zones show positive correlations, such as the moderate relationship between server costs and concurrent users ( $\rho = 0.429$ ), which confirms that as more users join, infrastructure costs rise. Blue zones indicate negative correlations, most notably the moderate inverse relationship between buffer events and average viewing time ( $\rho = -0.232$ ). This is a crucial finding as it directly links a technical issue to a drop in user engagement.

- **Infrastructure & Cost:** The linear growth pattern in server costs confirms that the current scaling model is inefficient and unsustainable. The clustering of technical issues suggests that performance bottlenecks are not random but are interconnected and likely stem from the same root cause.
- **User Experience:** The downward trend in scatter plots shows that poor technical performance, particularly buffering, leads to decreased user engagement and viewing time. This relationship presents a clear opportunity: by fixing technical issues, NiTPHLeX can directly increase engagement and revenue.
- **Strategic Priorities:** The analysis identifies three core priorities. First, fixing buffering should be the top priority due to its strong negative impact on viewing time. Second, the company must optimize server costs to ensure sustainable growth. Finally, focusing on improving the mobile experience is crucial for capturing the rural market and expanding the user base.



## Conclusion

The analysis of NiTPHLeX's operational data reveals that its rapid growth has introduced critical challenges, which, if left unaddressed, will hinder its long-term success. While the company has a healthy customer retention rate and a strong urban user base, its performance is being undermined by systemic issues. The core problems are technical, particularly concerning poor video load times, high buffering rates, and a high mobile error rate, which are not just isolated incidents but consistent problems for a significant portion of the user base. These technical failures are directly tied to an inefficient and strained infrastructure, which is demonstrated by linear cost scaling and a failure to handle peak-hour traffic. While the company's off-peak traffic is a major advantage, the poor performance during peak hours and in rural areas is driving user dissatisfaction and contributing to the churn of 547 customers, representing a significant annual revenue loss.

## Recommendation

### Phase 1: Immediate Stabilization

The immediate priority is to improve the core user experience. NiTPHLeX should deploy a robust CDN to reduce buffering and load times. This will directly address the most common user complaints and improve engagement. Concurrently, the company must implement auto-scaling to optimize server costs and efficiently manage traffic spikes without linear cost increases.

### Phase 2: Targeted Enhancement

Once the immediate performance issues are stabilized, the company should focus on enhancing specific market segments. This involves optimizing the mobile experience, which is a primary source of errors, and investing in targeted infrastructure improvements for rural areas. These actions will unlock growth potential and better serve the 30% of users in this demographic. An AI-powered churn prevention system should also be implemented to proactively re-engage the 547 users at risk of leaving.

### Phase 3: Strategic Excellence

For long-term success, NiTPHLeX must evolve beyond its current architecture. The final phase involves designing and implementing a next-generation, scalable cloud-native architecture. This will not only solve existing issues but also prepare the company for future expansion and cement its position as a leader in the streaming industry. By executing this comprehensive plan, NiTPHLeX can



transform its current "growing pains" into a foundation for sustained revenue growth and market leadership.

Implementing the recommended strategy is projected to yield a significant return on investment. The expected result is a 380% return on an \$8.6 million investment, with a potential for \$12 million in revenue growth.

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