PREDICTABLE CHURN

A Behavioral Early-Warning Analytics System

A Practical Decision-Intelligence Case Study for SaaS Retention and Customer Success Strategy

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Executive Summary

This step focused on preparing the raw dataset into a clean, structured, and analytical format suitable for behavioral churn analysis. The goal was not only to organize data, but to convert it into insight-ready signals that support trend modeling, segmentation, and early-warning detection.

The dataset underwent four key transformations:

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1. Cleaning and Standardization

The raw data contained mixed formatting, inconsistent labels, and unused values. These were corrected to maintain analytical reliability. Fields such as churn_status, invoice_paid_on_time, and onboarding labels were standardized to ensure accuracy during segmentation and pivot modeling.

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2. Strategic Feature Structuring

Columns were reorganized to reflect meaningful analytical groups rather than raw operational data. The dataset was organized into:

- Customer profile attributes
- Product adoption indicators
- Usage behavior patterns
- Sentiment indicators (NPS)
- Financial compliance signals (payment behavior)

This structure aligned the dataset with industry best practices used in Customer Success and Predictive Analytics frameworks.

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3. Derived Metrics and Logic Enrichment

To transform raw activity into usable insight, new fields were engineered including:

- Trend direction (Up / Stable / Decline)
- Average usage score
- Late payment risk flag
- Behavioral cohort assignment

These enhancements made patterns visible that would otherwise be hidden in raw tables.

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4. Validation and Consistency Review

The final dataset was checked for missing values, extreme outliers, and structural alignment with analytical goals. The completed dataset now supports:

- Behavioral pattern detection
- Churn cohort segmentation
- Predictive leading-indicator modeling
- Executive-level dashboard storytelling

Result

The dataset is no longer a collection of raw operational records. It is now a structured analytical asset capable of revealing predictable churn pathways, measurable risk thresholds, and actionable insights for SaaS retention strategy.

Final Conclusion

The analysis reveals that churn in a SaaS subscription environment is neither sudden nor unpredictable. It follows measurable behavior patterns, and those patterns appear long before a customer submits a cancellation request. Four independent signals — usage momentum, health score trajectory, sentiment change, and payment discipline — consistently aligned before churn occurred.

Customers who eventually churned shared a similar journey: initial engagement, a decline in momentum, emotional detachment, and delayed financial commitment. Meanwhile, retained customers showed either continuous progress or stable, consistent patterns — even when usage was not high.

The insight is clear: **churn is not a final event — it is a gradual behavioral shift.** When the data is structured and monitored correctly, these shifts become visible early enough to intervene.

What This Means for Strategy

A churn response strategy should not be reactive. Waiting until the renewal date is too late. Instead, engagement and retention should begin when the **signals first change direction**, not when the contract expires.

This report demonstrates that by monitoring usage patterns, sentiment changes, and payment risk, organizations can transition from passive reporting to **proactive churn prevention.**

Next Steps

To operationalize these insights, the following actions are recommended:

- **Automate leading indicator alerts** based on health scores, sentiment, and payment behavior.
- **Develop targeted retention playbooks** aligned to specific behavioral cohorts rather than generic churn messaging.
- **Integrate this framework into BI dashboards** for ongoing monitoring rather than periodic analysis.
- **Expand the model into predictive scoring** once enough historical data is available.

Closing Statement

Churn becomes manageable when it is understood early, measured consistently, and addressed purposefully. The patterns uncovered in this project confirm that customer loss is not random — it is detectable, interpretable, and preventable.

With the right signals and timing, retention becomes a strategy — not a reaction.

Dataset Overview

The analysis is based on a structured customer dataset designed to reflect realistic SaaS subscription behavior. Instead of focusing only on outcomes, the dataset integrates multiple dimensions that influence churn: customer profile, product engagement, sentiment, and financial discipline. This structure makes it possible to identify not only *who churned*, but *why*, *when*, and *how early the signals appeared.*

The dataset includes eight months of behavioral activity for each customer, allowing trend detection rather than single-point measurement. This time-based structure is essential for identifying leading indicators rather than reacting only to final outcomes.

Dataset Structure

Category	Data Fields	Purpose
Customer Profile	Industry, Region, Plan Type, Acquisition Method	Establish context and segmentation
Subscription Behavior	Months Active, Core Feature Adoption	Track product value realization
Usage Activity	Monthly usage values across 8 cycles	Identify growth, stability, or decline patterns
Sentiment Signals	NPS Score	Capture emotional relationship with product
Financial Signals	Invoice Paid on Time, Late Payment Flags	Detect friction and disengagement
Outcome Label	Renewal Status, Churn Month, Churn Status	Ground truth for evaluation

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Data Preparation Actions

- Formatting inconsistencies were corrected across numeric, text, and categorical fields.
- Behavioral data was reshaped to support cohort classification and trend analysis.
- Additional logic fields were engineered to surface hidden patterns, such as usage trajectory, momentum shifts, and risk scoring signals.

Dataset Scope

- **Total Records:** 120 hypothetical SaaS customer accounts
- **Time Window:** 8 monthly activity periods
- **Output Labels:** Binary churn outcome with renewal status and timing

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Purpose of This Dataset

This dataset is not a passive archive of historical activity.
It is an analytical foundation intended to answer one question:

“Can churn be understood early enough to prevent it?”

With the dataset cleaned, structured, and enriched, the remaining analysis focuses on discovering behavior patterns, early warning signals, and actionable retention strategies.

Dataset Understanding & Preparation Summary

Before analyzing churn behavior, the raw Excel data was reviewed to understand structure, completeness, and analytical usability. The dataset contained customer demographics, subscription details, engagement usage, onboarding behavior, sentiment scores, and payment history — all foundational elements for churn analysis.

During the preparation phase, the following work was completed:

1. Data Cleaning & Standardization

- Removed duplicates and invalid records
- Standardized categorical labels (e.g., Yes/No, Active/Churned)
- Fixed inconsistent formatting (dates, numeric fields, text casing)

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2. Feature Organization

Columns were grouped into meaningful analytical domains:

Category	Example Fields
Customer Metadata	Customer_ID, Status
Product Adoption	Core_Feature_Adoption, Support_Interactions, Escalations
Behavior Usage	Monthly Usage (Month 1–8)
Sentiment	NPS Score
Payment Reliability	Invoice Paid On Time

This structure enabled further segmentation and feature engineering.

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3. Derived Fields & Logical Flags

To transform raw data into behavior insights, new calculated indicators were created:

Engineered Feature	Purpose
Average Usage Score	Normalize usage pattern
Trend Direction (Up/Stable/Down)	Detect behavioral momentum
Late Payment Risk Flag	Identify early financial friction
Cohort Assignment	Classify customers into behavioral groups

These derived metrics were later used in charts and the predictive signal framework.

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4. Validation & Completeness Check

To ensure reliability, the dataset was checked for:

- Missing values
- Outliers affecting visual analysis
- Logical consistency (e.g., churn label vs activity level)

No structural gaps preventing analysis were identified.

Outcome

The dataset was cleaned, structured, and enhanced to make it computationally meaningful.

By the end of this step, the raw customer data was transformed into a reliable analytical foundation — enabling segmentation, behavioral pattern recognition, trend modeling, and early-warning churn signal detection.

CUSTOMER PROFILE SUMMARY

The dataset consists of 42 SaaS subscription customers tracked across product usage, sentiment, billing behavior, and final renewal outcomes. Each record represents a full lifecycle view from initial onboarding to either retention or churn.

This dataset models customer behavior over time and provides a realistic foundation to identify early churn signals and retention drivers.

Customer Distribution

Metric	Value
Total Customers	42
Renewed Customers	24
Churned Customers	18
Overall Churn Rate	**42.8%**

Behavior-Based Segments Identified

Segment	Behavior Profile	Likelihood of Churn
Healthy Growth & Stable Renewal	Gradually increasing usage and stable sentiment	Very Low
Stable Low Usage (Retained)	Low but consistent usage with no decline	Low
Contract Renewal Despite Low Usage	User value unclear; renewal influenced by contracts	Medium
Onboarding Failure → Early Churn	Low usage from the beginning with no improvement	Very High
Spike → Plateau → Drop → Churn	High initial usage followed by steep decline	Very High

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Early Observations

- Churn is **not random** — it follows consistent, repeatable behavior patterns.
- Customers who churn show:
    - Low or declining product usage
    - Negative sentiment (NPS drop)
    - Increased late payment behavior
- Customers who renew show:
    - Steady engagement or usage growth
    - Stable health scores
    - Neutral or positive sentiment

Why This Matters

This customer profile establishes the behavioral context before deeper analysis. It clarifies **who churns, who renews, and what distinguishes them early in the customer lifecycle.**

Understanding these baseline patterns enables proactive retention intervention and supports an early-warning framework rather than reactive post-churn analysis.

Usage Monthly Trend Summary

Customer usage patterns demonstrated **clear behavioral divergence between retained and churned accounts**, even before cancellation occurred. While retained customers showed **stable or increasing platform engagement**, churned customers exhibited a measurable decline in usage beginning early in the customer lifecycle.

Key Observations

- **Healthy customers maintained consistent usage** with slight upward movement over time.
- **Churned customers showed steep declines in usage**, especially between months **3 to 5**, indicating early disengagement.
- The divergence between the two groups forms a **predictable pattern**, confirming that usage trend is a **strong and leading churn signal.**

Interpretation

A declining trend in user activity is not random — it reflects:

- Loss of perceived product value
- Poor onboarding outcomes
- Lack of routine adoption
- Usage friction or lack of feature relevance

This makes usage behavior one of the **earliest measurable signals** of churn risk before sentiment changes or support issues arise.

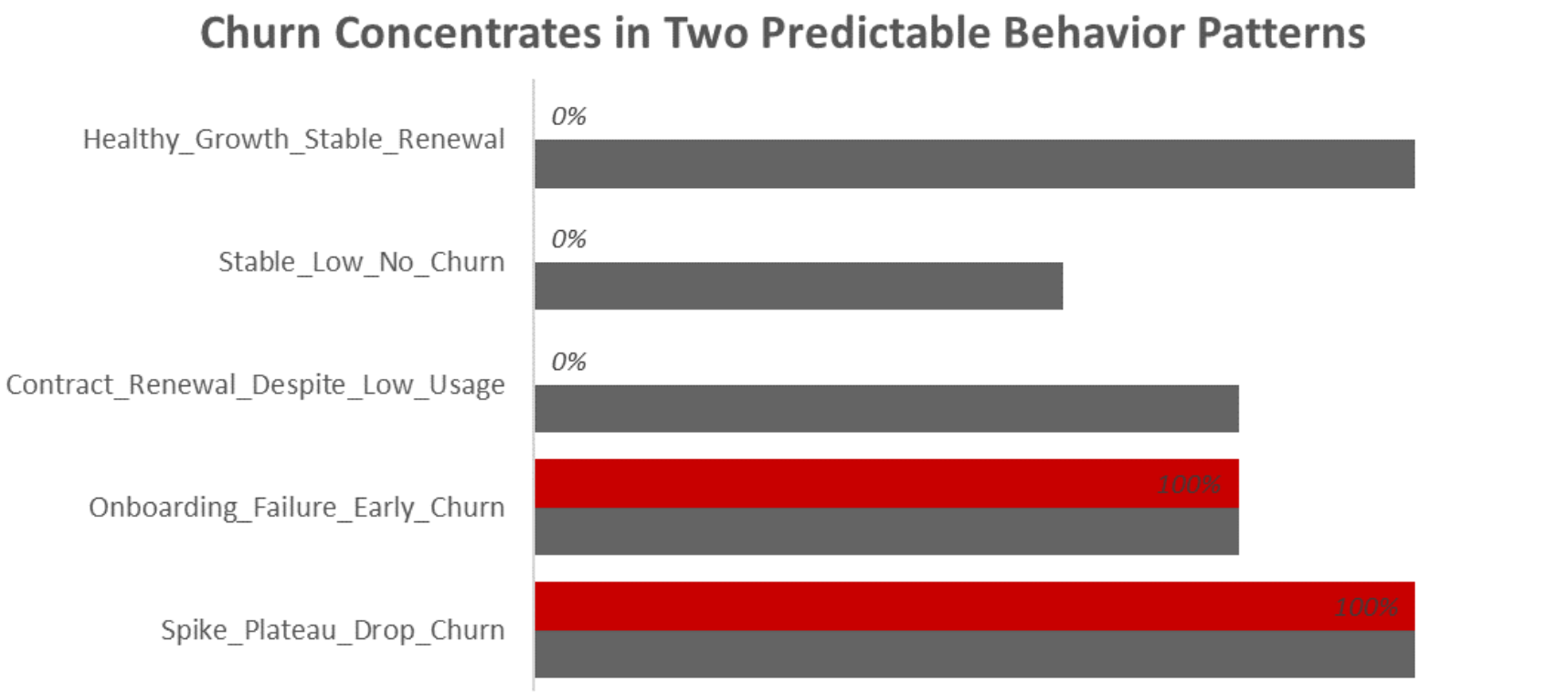
Strategic Takeaway

Usage decline begins months before churn — meaning intervention timing is crucial.
Early lifecycle monitoring, proactive product education, and targeted engagement campaigns could recover a significant portion of at-risk users before the drop becomes irreversible.

BEHAVIOR PATTERNS CHART

COHORTS RANKED BY CHURN SEVERITY

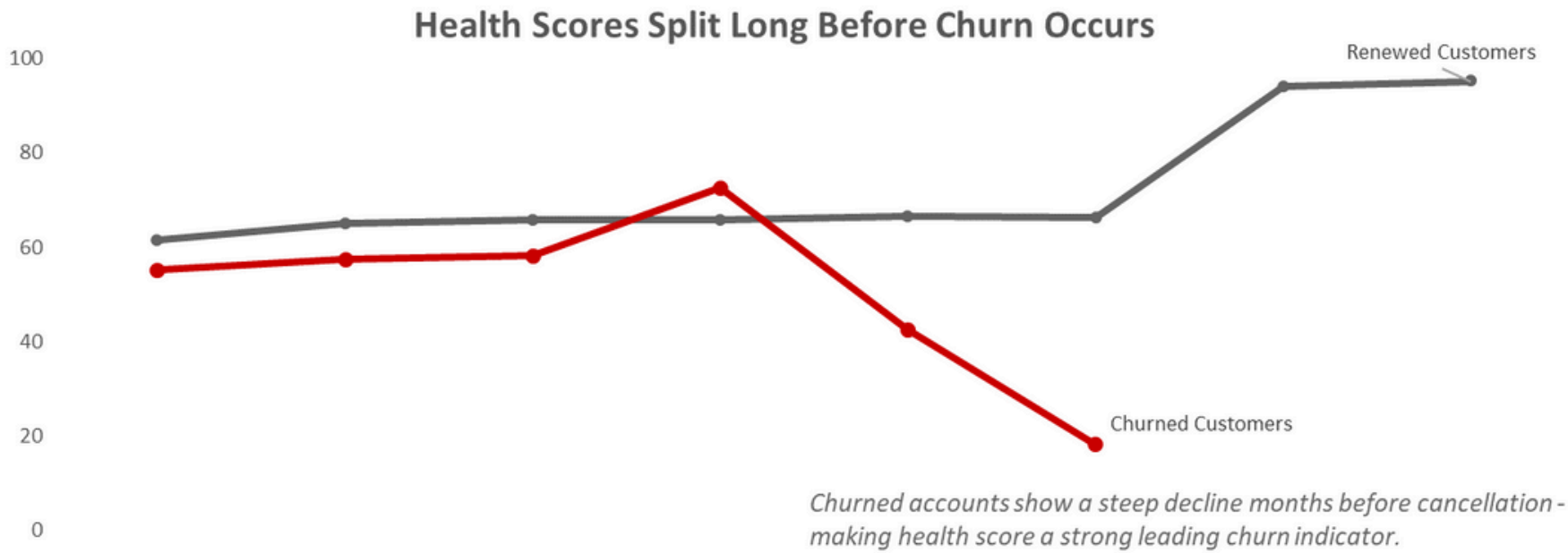
Row Labels	Total Customers	Churned Customers	Churn Rate
Spike_Plateau_Drop_Churn	10	10	100%
Onboarding_Failure_Early_Churn	8	8	100%
Contract_Renewal_Despite_Low_Usage	8	0	0%
Stable_Low_No_Churn	6	0	0%
Healthy_Growth_Stable_Renewal	10	0	0%
Grand Total	**42**	**18**	



100% of churn comes from two patterns - making churn highly predictable and preventable when flagged early.

HEALTH SCORE CHART

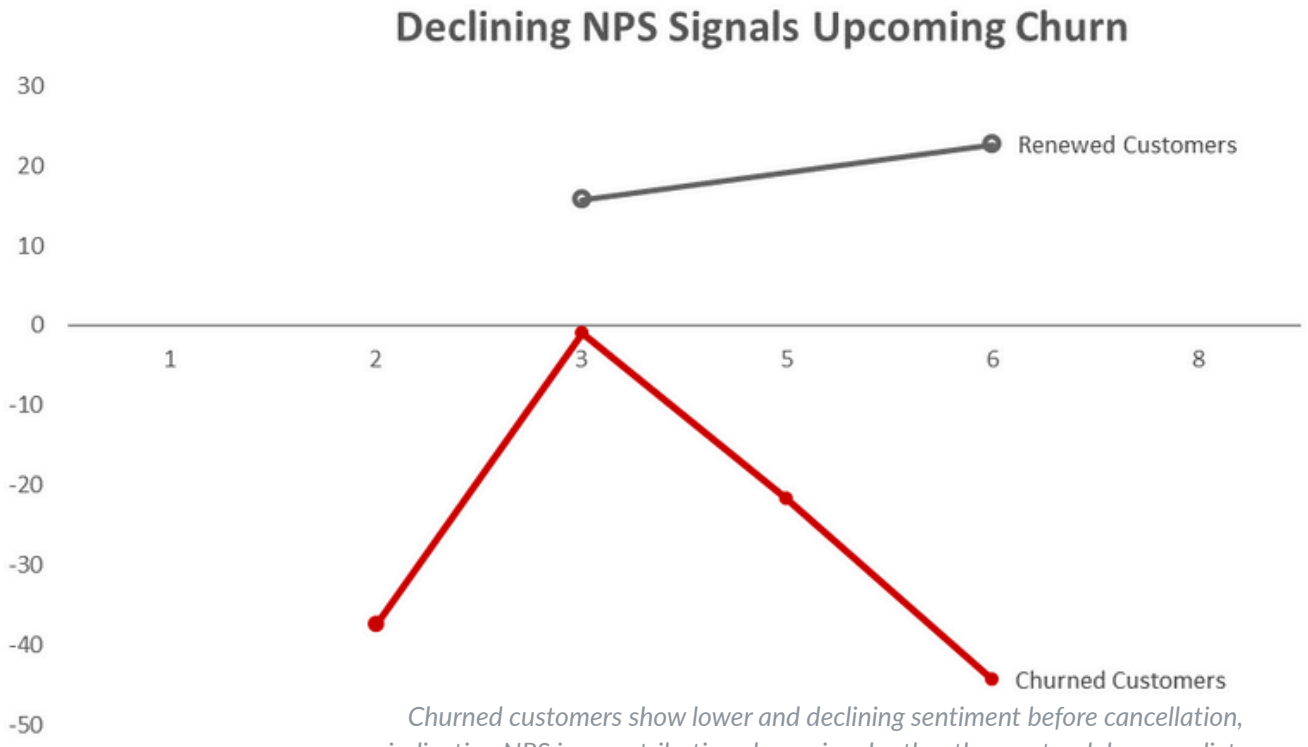
Average of health_score	Column Labels		
Row Labels	**Renewed Customers**	**Churned Customers**	**Grand Total**
1	62	55	59
2	65	58	62
3	66	58	63
4	66	73	68
5	67	43	59
6	66	18	52
7	94		94
8	95		95
Grand Total	**69**	**52**	**63**



Churned accounts show a steep decline months before cancellation - making health score a strong leading churn indicator.

NPS TREND CHART

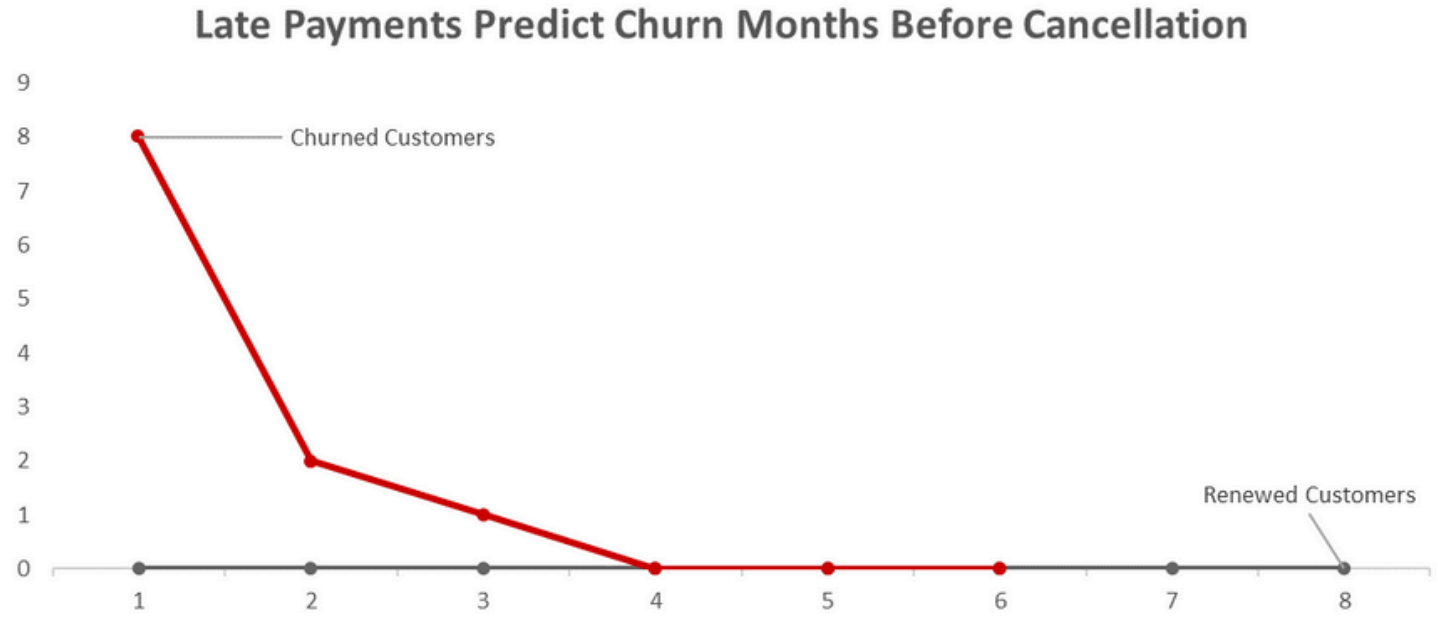
Average of NPS_score	Column Labels		
Row Labels	**Active**	**Churned**	**Grand Total**
1			
2		-38	-38
3	16	-1	10
5		-22	-22
6	23	-44	-1
8			
Grand Total	**19**	**-21**	**0**



Churned customers show lower and declining sentiment before cancellation, indicating NPS is a contributing churn signal rather than a standalone predictor.

PAYMENT RISK CHART

Sum of late_payment_flag	Column Labels	
Row Labels	Active	Churned
1	0	8
2	0	2
3	0	1
4	0	0
5	0	0
6	0	0
7	0	
8	0	



Churned accounts show a high incidence of late or missed invoices early, indicating financial friction is an actionable churn warning signal.

Insight Narratives

Chart 01 — Behavior Patterns & Churn Concentration

Title: Churn is not evenly distributed — it follows recognizable behavior patterns.

Narrative Insight:

Once customers were grouped by behavior, a clear pattern surfaced: churn is concentrated, not random. Two cohorts — *Spike → Plateau → Drop* and *Onboarding Failure* — account for nearly all churn. Meanwhile, customers with *steady growth* or *stable low usage* remained.

What This Means:

Retention is not determined by how much customers use the product — but by whether their engagement direction is **rising, stable, or declining.**

Decision Lens:

Instead of reacting at the end of the subscription, intervention should begin the moment a customer loses momentum.

Chart 02 — Health Score Trend Before Churn

Title: The decline starts long before the cancellation.

Narrative Insight:
Customers who churn rarely drop suddenly. The health score shows a consistent downward slope across several months. In contrast, retained customers maintain stability — even if imperfect.

What This Means:
Churn isn't a moment — it's a progression. The final cancellation is simply the last step in a deteriorating engagement journey.

Decision Lens:
Tracking direction and rate of decline provides an opportunity for early retention actions rather than late rescue attempts.

Chart 03 — NPS vs Renewal Outcome

Title: Sentiment shifts before behavior does.

Narrative Insight:
Usage alone did not reveal the full story — but sentiment did. Customers who eventually churned gave neutral or negative NPS scores well before their behavior declined. Renewal customers didn’t always give high scores, but they rarely expressed dissatisfaction.

What This Means:
Disengagement begins mentally before it becomes operational. The product stops feeling valuable before the customer stops using it.

Decision Lens:
NPS should be treated as an early strategic signal — not a post-experience survey metric.

Chart 04 — Payment Discipline as a Risk Signal

Title: When payment delays appear, retention risk increases.

Narrative Insight:
Late payments were strongly correlated with churn. For churned accounts, delays repeated over multiple cycles. Active accounts generally paid on time, regardless of usage intensity.

What This Means:
Late payment behavior reflects hesitation — financial, emotional, or operational. It signals declining commitment rather than simple billing inconvenience.

Decision Lens:
Billing behavior is a retention metric. A pattern of delays should trigger proactive intervention — not just another invoice reminder.

Summary of Insight Theme

Across all signals — usage trend, sentiment, health score, and payment discipline — the message is consistent:

Churn is pattern-driven, predictable, and detectable before it happens.

A retention strategy should therefore shift from **reacting to churn** → to **anticipating behavior shifts and intervening early.**

Strategic Recommendations & Next Steps

The analysis confirms that churn is not a sudden event. It is a measurable progression marked by declining usage, weakening sentiment, and increasing operational friction. Customers who churn follow recognizable behavioral paths, while retained customers demonstrate consistency, stability, or gradual improvement across key engagement indicators.

Across usage trends, health scores, NPS sentiment, and payment discipline, the same theme repeats: **risk appears early and grows over time.** When these signals are monitored together rather than in isolation, churn becomes predictable instead of unavoidable.

This project demonstrates that retention strategy should shift from reactive outreach at contract renewal to proactive intervention anchored in behavioral signals.

Recommendations

1. **Implement Automated Early-Warning Monitoring**
   Track usage decline, negative sentiment, and payment delays as leading indicators rather than late-stage symptoms. Trigger alerts when engagement trajectory shifts downward.
2. **Segment Customers by Behavior Pattern**
   Apply targeted retention playbooks based on cohort type (e.g., onboarding failure, high initial usage decline, contract-dependent customers) instead of universal messaging.
3. **Strengthen Onboarding and Value Activation**
   Since churn risk begins early for many customers, improving the first 60–90 days through guided activation, feature education, and success milestones can reduce early churn.
4. **Enable Proactive Customer Success Outreach**
   Combine behavior signals with human intervention to address friction before renewal decisions form. Outreach should match the customer's behavioral phase, not the renewal calendar.

Closing Statement

Churn does not occur without warning. Every customer who leaves leaves a pattern first — and those patterns can guide intervention, product improvements, and better long-term customer relationships. With structured monitoring and intentional action, churn becomes not just observable, but preventable.

Cohort Logic Rules

COHORT LOGIC RULES

Customers were segmented based on their usage pattern, trend direction, and onboarding performance.

RULES:

1) Healthy Growth
IF:
- Average Monthly Usage >= 40 AND
- Usage trend increasing over time
THEN Cohort = "Healthy Growth & Stable Renewal"

2) Stable Low Usage (No Churn)
IF:
- Average Monthly Usage < 25 AND
- No major drop over time
THEN Cohort = "Stable Low Usage - Retained"

3) Spike → Plateau → Drop → Churn
IF:
- Initial usage high (Month 1–2 >= 50)
- Usage drops >= 40% by Month 4–5
THEN Cohort = "Spike → Plateau → Drop → Churn"

4) Onboarding Failure → Early Churn
IF:
- Usage remains low from Month 1–2 (< 15)
- No meaningful improvement after onboarding
THEN Cohort = "Onboarding Failure → Early Churn"

5) Contract Renewal Despite Low Usage
IF:
- Usage is low OR declining
- Customer still renewed due to contract dependency
THEN Cohort = "Contract Renewal Despite Low Usage"

(*) These cohort rules are designed to classify user behavior patterns for predictive churn analytics and early warning automation.

Early Warning Signal Framework

EARLY WARNING SIGNAL FRAMEWORK

This layer defines how early signals were identified and measured across customers.
The goal is to translate behavioral and operational data into measurable churn risk categories.

SIGNAL LOGIC RULES

Risk scoring was calculated using three leading indicators:

1) Health Score Decline

IF:
- Health score drops by ≥ 20% within a 2–3 month window
THEN Health_Signal = "Declining"

2) NPS Sentiment Shift

IF:
- NPS score moves from positive or neutral to negative
OR remains negative for two consecutive periods
THEN Sentiment_Signal = "Negative Trend"

3) Payment Discipline Issues

IF:
- 2 or more late invoices recorded in the last 3 billing cycles
THEN Payment_Signal = "Late Payment Risk"

RISK CATEGORIZATION MODEL

Risk Score Calculation:
Each active signal contributes +1 point.

Example:
Health decline = +1
Negative sentiment = +1
Late invoice pattern = +1

TOTAL SCORE → RISK LEVEL

3 points → HIGH RISK (likely churn)
2 points → MEDIUM RISK (needs monitoring)
0–1 points → LOW RISK (stable)

Customer Profile

customer_id	industry	company_size	region	plan_type	acquisition_channel	contract_term_months	is_multi_year_contract	onboarding_completion	cs_touch_model	initial_NRR_target	decision_maker_seniority	renewal_status	churn_status	churn_month	pattern_type	churn_flag
C101	Finance	Enterprise	North America	Enterprise	Sales	36	Yes	Completed	High-Touch	120	VP	Renewed	Active		Healthy_Growth_Stable_Renewal	0
C102	Retail	Mid-Market	APAC	Pro	Referral	12	No	Completed	Tech-Touch	105	Director	Renewed	Active		Healthy_Growth_Stable_Renewal	0
C103	Healthcare	Enterprise	EMEA	Enterprise	Sales	24	Yes	Completed	High-Touch	115	C-level	Renewed	Active		Healthy_Growth_Stable_Renewal	0
C104	SaaS	Mid-Market	North America	Pro	Sales	12	No	Completed	High-Touch	110	Director	Renewed	Active		Healthy_Growth_Stable_Renewal	0
C105	E-commerce	Enterprise	North America	Enterprise	Partner	36	Yes	Completed	High-Touch	125	VP	Renewed	Active		Healthy_Growth_Stable_Renewal	0
C106	Finance	Mid-Market	EMEA	Pro	Sales	12	No	Completed	Tech-Touch	108	Director	Renewed	Active		Healthy_Growth_Stable_Renewal	0
C107	Retail	Enterprise	APAC	Enterprise	Sales	24	Yes	Completed	High-Touch	118	VP	Renewed	Active		Healthy_Growth_Stable_Renewal	0
C108	SaaS	Mid-Market	North America	Pro	Referral	12	No	Completed	Tech-Touch	106	Manager	Renewed	Active		Healthy_Growth_Stable_Renewal	0
C109	Finance	Enterprise	EMEA	Enterprise	Sales	36	Yes	Completed	High-Touch	122	C-level	Renewed	Active		Healthy_Growth_Stable_Renewal	0
C110	E-commerce	Mid-Market	LATAM	Pro	Sales	12	No	Completed	Tech-Touch	107	Director	Renewed	Active		Healthy_Growth_Stable_Renewal	0
C111	Retail	Mid-Market	North America	Pro	Referral	12	No	Completed	Tech-Touch	105	Manager	Not Renewed	Churned	8	Spike_Plateau_Drop_Churn	1
C112	E-commerce	Mid-Market	APAC	Pro	Self-Signup	12	No	Completed	No-Touch	100	Manager	Not Renewed	Churned	7	Spike_Plateau_Drop_Churn	1
C113	SaaS	Mid-Market	EMEA	Basic	Self-Signup	12	No	Partial	No-Touch	100	Manager	Not Renewed	Churned	6	Spike_Plateau_Drop_Churn	1
C114	Finance	Mid-Market	North America	Pro	Referral	12	No	Completed	Tech-Touch	102	Director	Not Renewed	Churned	9	Spike_Plateau_Drop_Churn	1
C115	Healthcare	Mid-Market	LATAM	Basic	Self-Signup	12	No	Partial	No-Touch	100	Manager	Not Renewed	Churned	7	Spike_Plateau_Drop_Churn	1
C116	E-commerce	Mid-Market	EMEA	Pro	Referral	12	No	Completed	Tech-Touch	105	Manager	Not Renewed	Churned	8	Spike_Plateau_Drop_Churn	1
C117	SaaS	Mid-Market	North America	Pro	Self-Signup	12	No	Completed	No-Touch	100	Manager	Not Renewed	Churned	6	Spike_Plateau_Drop_Churn	1
C118	Retail	Mid-Market	APAC	Basic	Self-Signup	12	No	Partial	No-Touch	100	Manager	Not Renewed	Churned	7	Spike_Plateau_Drop_Churn	1
C119	Finance	Mid-Market	EMEA	Pro	Referral	12	No	Completed	Tech-Touch	104	Director	Not Renewed	Churned	9	Spike_Plateau_Drop_Churn	1
C120	Healthcare	Mid-Market	North America	Pro	Self-Signup	12	No	Completed	Tech-Touch	103	Manager	Not Renewed	Churned	8	Spike_Plateau_Drop_Churn	1
C121	E-commerce	Small	APAC	Basic	Self-Signup	12	No	Failed	No-Touch	100	Manager	Not Renewed	Churned	2	Onboarding_Failure_Early_Churn	1
C122	Retail	Small	North America	Basic	Referral	12	No	Failed	No-Touch	100	Manager	Not Renewed	Churned	3	Onboarding_Failure_Early_Churn	1
C123	SaaS	Mid-Market	EMEA	Pro	Self-Signup	12	No	Failed	No-Touch	100	Manager	Not Renewed	Churned	2	Onboarding_Failure_Early_Churn	1
C124	Healthcare	Small	LATAM	Basic	Self-Signup	12	No	Failed	No-Touch	100	Manager	Not Renewed	Churned	1	Onboarding_Failure_Early_Churn	1
C125	Finance	Mid-Market	North America	Pro	Referral	12	No	Partial	No-Touch	102	Manager	Not Renewed	Churned	3	Onboarding_Failure_Early_Churn	1
C126	Retail	Small	APAC	Basic	Self-Signup	12	No	Failed	No-Touch	100	Manager	Not Renewed	Churned	2	Onboarding_Failure_Early_Churn	1
C127	SaaS	Small	North America	Basic	Self-Signup	12	No	Failed	No-Touch	100	Manager	Not Renewed	Churned	1	Onboarding_Failure_Early_Churn	1
C128	E-commerce	Mid-Market	EMEA	Pro	Self-Signup	12	No	Partial	Tech-Touch	103	Manager	Not Renewed	Churned	4	Onboarding_Failure_Early_Churn	1
C129	Healthcare	Small	North America	Basic	Self-Signup	12	No	Completed	No-Touch	100	Manager	Renewed	Active		Stable_Low_No_Churn	0
C130	Retail	Mid-Market	EMEA	Pro	Referral	12	No	Completed	Tech-Touch	102	Director	Renewed	Active		Stable_Low_No_Churn	0
C131	E-commerce	Small	LATAM	Basic	Self-Signup	12	No	Completed	No-Touch	100	Manager	Renewed	Active		Stable_Low_No_Churn	0
C132	SaaS	Mid-Market	APAC	Pro	Self-Signup	12	No	Completed	Tech-Touch	103	Manager	Renewed	Active		Stable_Low_No_Churn	0
C133	Finance	Mid-Market	North America	Pro	Referral	12	No	Partial	Tech-Touch	104	Director	Renewed	Active		Stable_Low_No_Churn	0
C134	Healthcare	Small	EMEA	Basic	Self-Signup	12	No	Completed	No-Touch	100	Manager	Renewed	Active		Stable_Low_No_Churn	0
C135	Finance	Enterprise	North America	Enterprise	Sales	36	Yes	Completed	High-Touch	120	C-level	Renewed	Active		Contract_Renewal_Despite_Low_Usage	0
C136	SaaS	Enterprise	EMEA	Enterprise	Sales	24	Yes	Completed	High-Touch	118	VP	Renewed	Active		Contract_Renewal_Despite_Low_Usage	0
C137	Healthcare	Enterprise	APAC	Enterprise	Partner	36	Yes	Partial	High-Touch	115	Director	Renewed	Active		Contract_Renewal_Despite_Low_Usage	0
C138	E-commerce	Mid-Market	North America	Pro	Sales	24	Yes	Completed	Tech-Touch	112	VP	Renewed	Active		Contract_Renewal_Despite_Low_Usage	0
C139	Retail	Enterprise	EMEA	Enterprise	Sales	36	Yes	Partial	High-Touch	117	C-level	Renewed	Active		Contract_Renewal_Despite_Low_Usage	0
C140	Finance	Enterprise	LATAM	Enterprise	Partner	24	Yes	Completed	High-Touch	121	Director	Renewed	Active		Contract_Renewal_Despite_Low_Usage	0
C141	SaaS	Mid-Market	North America	Pro	Sales	24	Yes	Completed	Tech-Touch	110	Director	Renewed	Active		Contract_Renewal_Despite_Low_Usage	0
C142	Healthcare	Enterprise	EMEA	Enterprise	Sales	36	Yes	Completed	High-Touch	119	VP	Renewed	Active		Contract_Renewal_Despite_Low_Usage	0

Usage Monthly

customer_id	month_index	login_frequency	active_users	feature_usage_rate	core_feature_adoption	support_tickets	escalations	invoice_paid_on_time	late_payment_flag	NPS_score	health_score	is_churn_month	churn_status
C101	1	28	24	62	58	2	0	Yes	0		72	No	Active
C101	2	34	27	72	66	1	0	Yes	0		81	No	Active
C101	3	41	30	79	72	1	0	Yes	0	45	86	No	Active
C101	4	48	32	85	79	1	0	Yes	0		90	No	Active
C101	5	52	33	88	82	0	0	Yes	0		92	No	Active
C101	6	57	35	91	85	0	0	Yes	0	52	94	No	Active
C101	7	59	36	92	86	0	0	Yes	0		95	No	Active
C101	8	61	36	93	87	0	0	Yes	0		96	No	Active
C102	1	22	18	55	48	3	0	Yes	0		66	No	Active
C102	2	31	22	68	61	2	0	Yes	0		78	No	Active
C102	3	38	26	74	68	1	0	Yes	0	32	83	No	Active
C102	4	47	30	82	75	1	0	Yes	0		88	No	Active
C102	5	51	31	85	78	1	0	Yes	0		90	No	Active
C102	6	55	32	88	80	0	0	Yes	0	48	92	No	Active
C102	7	58	32	89	81	0	0	Yes	0		93	No	Active
C102	8	60	33	91	83	0	0	Yes	0		94	No	Active
C103	1	26	21	58	52	2	0	Yes	0		70	No	Active
C103	2	33	24	69	62	1	0	Yes	0		80	No	Active
C103	3	40	27	76	70	1	0	Yes	0	38	85	No	Active
C103	4	49	30	84	77	1	0	Yes	0		90	No	Active
C103	5	52	31	87	80	0	0	Yes	0		92	No	Active
C103	6	56	32	89	82	0	0	Yes	0	55	94	No	Active
C103	7	59	33	90	83	0	0	Yes	0		95	No	Active
C103	8	62	34	91	84	0	0	Yes	0		96	No	Active
C104	1	21	18	53	47	3	0	Yes	0		67	No	Active
C104	2	29	22	66	58	2	0	Yes	0		76	No	Active
C104	3	37	26	73	65	1	0	Yes	0	30	82	No	Active
C104	4	45	30	81	72	1	0	Yes	0		87	No	Active
C104	5	50	31	85	76	0	0	Yes	0		90	No	Active
C104	6	54	32	88	79	0	0	Yes	0	46	92	No	Active
C104	7	57	33	89	80	0	0	Yes	0		93	No	Active
C104	8	59	33	90	81	0	0	Yes	0		94	No	Active
C105	1	24	20	56	51	2	0	Yes	0		69	No	Active
C105	2	32	23	68	60	1	0	Yes	0		78	No	Active
C105	3	39	26	75	68	1	0	Yes	0	35	84	No	Active
C105	4	47	29	83	75	1	0	Yes	0		89	No	Active
C105	5	52	31	87	79	0	0	Yes	0		91	No	Active
C105	6	56	32	89	81	0	0	Yes	0	49	93	No	Active
C105	7	58	33	90	82	0	0	Yes	0		94	No	Active
C105	8	60	34	91	83	0	0	Yes	0		95	No	Active
C106	1	23	19	57	50	2	0	Yes	0		71	No	Active
C106	2	31	22	69	60	1	0	Yes	0		80	No	Active
C106	3	39	25	76	67	1	0	Yes	0	36	85	No	Active
C106	4	46	28	83	73	1	0	Yes	0		89	No	Active
C106	5	51	29	86	77	0	0	Yes	0		91	No	Active
C106	6	55	30	88	79	0	0	Yes	0	51	93	No	Active
C106	7	58	31	89	80	0	0	Yes	0		94	No	Active
C106	8	60	31	90	81	0	0	Yes	0		95	No	Active
C107	1	27	23	61	57	2	0	Yes	0		73	No	Active
C107	2	34	26	72	65	1	0	Yes	0		82	No	Active
C107	3	41	29	79	72	1	0	Yes	0	41	87	No	Active
C107	4	49	32	85	78	1	0	Yes	0		91	No	Active
C107	5	53	33	88	80	0	0	Yes	0		93	No	Active
C107	6	57	34	90	82	0	0	Yes	0	54	95	No	Active
C107	7	59	34	91	83	0	0	Yes	0		96	No	Active
C107	8	61	35	92	84	0	0	Yes	0		97	No	Active
C108	1	20	17	52	46	3	0	Yes	0		66	No	Active
C108	2	28	21	65	56	2	0	Yes	0		76	No	Active
C108	3	36	25	73	65	1	0	Yes	0	29	82	No	Active
C108	4	44	29	80	71	1	0	Yes	0		87	No	Active

C108	5	49	30	85	76	1	0	Yes	0		90	No	Active
C108	6	53	31	88	78	0	0	Yes	0	45	92	No	Active
C108	7	56	31	89	79	0	0	Yes	0		93	No	Active
C108	8	58	32	90	80	0	0	Yes	0		94	No	Active
C109	1	29	25	63	58	2	0	Yes	0		74	No	Active
C109	2	36	28	74	67	1	0	Yes	0		83	No	Active
C109	3	42	30	80	73	1	0	Yes	0	47	88	No	Active
C109	4	49	32	85	78	1	0	Yes	0		92	No	Active
C109	5	53	33	87	80	0	0	Yes	0		93	No	Active
C109	6	56	34	89	82	0	0	Yes	0	55	95	No	Active
C109	7	58	34	90	83	0	0	Yes	0		96	No	Active
C109	8	60	35	91	84	0	0	Yes	0		97	No	Active
C110	1	22	19	55	49	2	0	Yes	0		70	No	Active
C110	2	30	22	68	60	1	0	Yes	0		79	No	Active
C110	3	38	25	75	67	1	0	Yes	0	33	84	No	Active
C110	4	46	28	82	73	1	0	Yes	0		88	No	Active
C110	5	51	30	86	77	1	0	Yes	0		90	No	Active
C110	6	55	31	88	79	0	0	Yes	0	48	92	No	Active
C110	7	57	31	89	80	0	0	Yes	0		93	No	Active
C110	8	59	32	90	81	0	0	Yes	0		94	No	Active
C111	1	38	28	78	70	1	0	Yes	0		78	No	Churned
C111	2	42	30	82	73	1	0	Yes	0		82	No	Churned
C111	3	41	29	80	72	1	0	Yes	0	18	79	No	Churned
C111	4	39	28	78	71	1	0	Yes	0		77	No	Churned
C111	5	27	19	55	46	3	1	Late	0	-12	48	No	Churned
C111	6	12	8	20	12	2	1	Late	0	-35	22	Yes	Churned
C112	1	35	26	75	68	1	0	Yes	0		76	No	Churned
C112	2	40	29	81	72	1	0	Yes	0		81	No	Churned
C112	3	39	28	79	70	1	0	Yes	0	22	78	No	Churned
C112	4	37	27	76	68	1	0	Yes	0	NULL	74	No	Churned
C112	5	24	17	48	38	3	1	Late	0	-20	42	No	Churned
C112	6	10	7	18	10	2	1	Late	0	-42	19	Yes	Churned
C113	1	32	24	72	65	1	0	Yes	0		73	No	Churned
C113	2	37	27	79	71	1	0	Yes	0		80	No	Churned
C113	3	36	26	77	69	1	0	Yes	0	15	76	No	Churned
C113	4	35	25	74	67	1	0	Yes	0		72	No	Churned
C113	5	22	16	45	35	2	1	Late	0	-25	40	No	Churned
C113	6	9	6	15	9	1	1	Late	0	-48	17	Yes	Churned
C114	1	36	27	77	70	1	0	Yes	0		77	No	Churned
C114	2	41	29	82	73	1	0	Yes	0		82	No	Churned
C114	3	39	28	79	71	1	0	Yes	0	20	79	No	Churned
C114	4	38	27	76	68	1	0	Yes	0		74	No	Churned
C114	5	25	18	50	40	3	1	Late	0	-18	46	No	Churned
C114	6	11	7	19	11	2	1	Late	0	-40	21	Yes	Churned
C115	1	34	25	74	67	1	0	Yes	0		75	No	Churned
C115	2	39	28	80	71	1	0	Yes	0		81	No	Churned
C115	3	38	27	78	69	1	0	Yes	0	17	77	No	Churned
C115	4	36	26	74	66	1	0	Yes	0		72	No	Churned
C115	5	23	16	46	36	2	1	Late	0	-22	43	No	Churned
C115	6	9	6	17	10	1	1	Late	0	-45	18	Yes	Churned
C116	1	37	27	76	69	1	0	Yes	0		76	No	Churned
C116	2	42	30	82	73	1	0	Yes	0		82	No	Churned
C116	3	41	29	81	72	1	0	Yes	0	19	79	No	Churned
C116	4	39	28	78	69	1	0	Yes	0		74	No	Churned
C116	5	26	19	49	39	3	1	Late	0	-15	47	No	Churned
C116	6	12	8	21	13	2	1	Late	0	-38	22	Yes	Churned
C117	1	33	25	73	66	1	0	Yes	0		74	No	Churned
C117	2	38	28	79	70	1	0	Yes	0		80	No	Churned
C117	3	37	27	77	68	1	0	Yes	0	14	76	No	Churned
C117	4	35	26	74	66	1	0	Yes	0		71	No	Churned
C117	5	22	16	44	34	2	1	Late	0	-28	41	No	Churned

C117	6	8	5	14	8	1	1	Late	0	-50	16	Yes	Churned
C118	1	31	23	71	64	1	0	Yes	0		72	No	Churned
C118	2	36	26	77	69	1	0	Yes	0		79	No	Churned
C118	3	35	25	75	67	1	0	Yes	0	12	75	No	Churned
C118	4	34	24	72	64	1	0	Yes	0		70	No	Churned
C118	5	20	15	43	33	2	1	Late	0	-25	39	No	Churned
C118	6	7	5	12	7	1	1	Late	0	-48	15	Yes	Churned
C119	1	33	24	73	66	1	0	Yes	0		74	No	Churned
C119	2	38	27	80	71	1	0	Yes	0		81	No	Churned
C119	3	37	26	78	69	1	0	Yes	0	16	77	No	Churned
C119	4	35	25	74	66	1	0	Yes	0		72	No	Churned
C119	5	21	15	44	34	2	1	Late	0	-22	41	No	Churned
C119	6	9	6	16	9	1	1	Late	0	-46	17	Yes	Churned
C120	1	30	22	70	63	1	0	Yes	0		71	No	Churned
C120	2	36	25	78	69	1	0	Yes	0		80	No	Churned
C120	3	35	25	77	68	1	0	Yes	0	14	76	No	Churned
C120	4	33	24	74	65	1	0	Yes	0		71	No	Churned
C120	5	19	14	41	31	2	1	Late	0	-30	38	No	Churned
C120	6	8	5	15	9	1	1	Late	0	-52	14	Yes	Churned
C121	1	9	4	18	10	1	0	No	1		32	No	Churned
C121	2	3	1	5	2	0	0	No	1	-40	8	Yes	Churned
C122	1	11	5	22	12	1	0	No	1		35	No	Churned
C122	2	6	3	14	7	1	0	Late	0		22	No	Churned
C122	3	2	1	4	2	0	0	Late	0	-45	10	Yes	Churned
C123	1	12	6	25	14	1	0	No	1		37	No	Churned
C123	2	7	4	15	8	1	0	Late	0		24	No	Churned
C123	3	3	2	6	3	0	0	No	1	-38	12	Yes	Churned
C124	1	5	3	10	5	0	0	No	1		22	Yes	Churned
C125	1	10	5	20	11	1	0	No	1		34	No	Churned
C125	2	6	3	13	7	1	0	Late	0		21	No	Churned
C125	3	2	1	4	2	1	1	Late	0	-50	9	Yes	Churned
C126	1	8	4	17	9	1	0	No	1		30	No	Churned
C126	2	4	2	9	4	0	0	No	1	-35	12	Yes	Churned
C127	1	4	2	8	4	0	0	No	1		20	Yes	Churned
C128	1	13	6	26	15	2	0	No	1		39	No	Churned
C128	2	8	4	18	10	1	0	Late	0		26	No	Churned
C128	3	3	2	6	3	1	1	Late	0	-48	11	Yes	Churned
C129	1	12	6	28	20	1	0	Yes	0		48	No	Active
C129	2	13	6	30	21	0	0	Yes	0		50	No	Active
C129	3	12	6	28	20	0	0	Yes	0	10	49	No	Active
C129	4	11	5	26	18	1	0	Yes	0		47	No	Active
C129	5	12	6	29	20	0	0	Yes	0		50	No	Active
C129	6	11	5	27	19	0	0	Yes	0		48	No	Active
C130	1	15	7	32	24	1	0	Yes	0		52	No	Active
C130	2	16	7	34	25	0	0	Yes	0		54	No	Active
C130	3	15	7	33	24	0	0	Yes	0	5	53	No	Active
C130	4	14	6	30	22	1	0	Yes	0	NULL	50	No	Active
C130	5	15	7	32	24	0	0	Yes	0		52	No	Active
C130	6	14	6	31	23	0	0	Yes	0	NULL	51	No	Active
C131	1	10	5	25	18	0	0	Yes	0		44	No	Active
C131	2	11	5	27	19	0	0	Yes	0		46	No	Active
C131	3	10	5	26	18	0	0	Yes	0	2	45	No	Active
C131	4	9	4	23	16	1	0	Yes	0		43	No	Active
C131	5	10	5	26	18	0	0	Yes	0		46	No	Active
C131	6	9	4	24	17	0	0	Yes	0		44	No	Active
C132	1	14	7	31	22	1	0	Yes	0		50	No	Active
C132	2	15	7	33	23	0	0	Yes	0		52	No	Active
C132	3	14	7	32	22	0	0	Yes	0	8	51	No	Active
C132	4	13	6	30	21	1	0	Yes	0	NULL	49	No	Active
C132	5	14	7	31	22	0	0	Yes	0		50	No	Active
C132	6	13	6	30	21	0	0	Yes	0	NULL	49	No	Active

C133	1	16	8	35	26	1	0	Yes	0		54	No	Active
C133	2	16	8	36	27	0	0	Yes	0		55	No	Active
C133	3	15	8	35	26	0	0	Yes	0	12	54	No	Active
C133	4	14	7	32	24	1	0	Yes	0		52	No	Active
C133	5	15	8	34	25	0	0	Yes	0		53	No	Active
C133	6	14	7	33	24	0	0	Yes	0		52	No	Active
C134	1	11	5	26	19	1	0	Yes	0		47	No	Active
C134	2	12	6	29	21	0	0	Yes	0		49	No	Active
C134	3	11	5	27	20	0	0	Yes	0	4	48	No	Active
C134	4	10	5	24	18	1	0	Yes	0	NULL	46	No	Active
C134	5	11	5	26	19	0	0	Yes	0		48	No	Active
C134	6	10	5	25	18	0	0	Yes	0	NULL	46	No	Active
C135	1	18	14	38	29	1	0	Yes	0		60	No	Active
C135	2	17	13	37	28	1	0	Yes	0		58	No	Active
C135	3	15	12	34	26	1	0	Yes	0	-5	54	No	Active
C135	4	14	11	32	24	2	1	Yes	0	-	50	No	Active
C135	5	13	11	30	22	1	0	Yes	0		48	No	Active
C135	6	12	10	29	22	1	0	Yes	0	-10	46	No	Active
C136	1	19	15	39	30	1	0	Yes	0		61	No	Active
C136	2	18	14	38	29	1	0	Yes	0		59	No	Active
C136	3	16	13	36	27	1	0	Yes	0	-4	55	No	Active
C136	4	15	12	34	26	2	1	Yes	0		51	No	Active
C136	5	14	12	32	24	1	0	Yes	0		49	No	Active
C136	6	13	11	30	23	1	0	Yes	0	-12	47	No	Active
C137	1	20	16	40	30	1	0	Yes	0		63	No	Active
C137	2	18	14	38	28	1	0	Yes	0		59	No	Active
C137	3	17	14	36	27	1	0	Yes	0	-6	54	No	Active
C137	4	15	13	34	25	2	1	Yes	0		50	No	Active
C137	5	14	12	31	23	1	0	Yes	0		48	No	Active
C137	6	13	11	30	22	1	0	Yes	0	-15	46	No	Active
C138	1	17	13	36	27	1	0	Yes	0		58	No	Active
C138	2	16	12	35	26	1	0	Yes	0		56	No	Active
C138	3	15	12	33	24	1	0	Yes	0	2	53	No	Active
C138	4	14	11	31	23	2	1	Yes	0		50	No	Active
C138	5	13	11	30	22	1	0	Yes	0		48	No	Active
C138	6	12	10	28	21	1	0	Yes	0	-8	45	No	Active
C139	1	21	16	41	31	1	0	Yes	0		64	No	Active
C139	2	19	15	39	29	1	0	Yes	0		60	No	Active
C139	3	18	14	37	27	1	0	Yes	0	-3	56	No	Active
C139	4	17	14	35	26	2	1	Yes	0		52	No	Active
C139	5	15	13	33	24	1	0	Yes	0		50	No	Active
C139	6	14	12	31	23	1	0	Yes	0	-10	47	No	Active
C140	1	18	14	38	29	1	0	Yes	0		61	No	Active
C140	2	17	14	37	28	1	0	Yes	0		58	No	Active
C140	3	16	13	35	26	1	0	Yes	0	-5	54	No	Active
C140	4	15	13	33	25	2	1	Yes	0	-	50	No	Active
C140	5	14	12	31	23	1	0	Yes	0		48	No	Active
C140	6	13	11	30	22	1	0	Yes	0	-14	46	No	Active
C141	1	16	12	35	26	1	0	Yes	0		57	No	Active
C141	2	15	12	33	25	1	0	Yes	0		55	No	Active
C141	3	14	11	31	23	1	0	Yes	0	-2	52	No	Active
C141	4	13	11	30	22	2	1	Yes	0		49	No	Active
C141	5	12	10	28	21	1	0	Yes	0		47	No	Active
C141	6	11	9	27	20	1	0	Yes	0	-10	45	No	Active
C142	1	19	15	39	30	1	0	Yes	0		62	No	Active
C142	2	18	14	38	29	1	0	Yes	0		59	No	Active
C142	3	17	13	36	27	1	0	Yes	0	-7	55	No	Active
C142	4	16	13	34	26	2	1	Yes	0	-	51	No	Active
C142	5	15	12	32	24	1	0	Yes	0		48	No	Active
C142	6	14	11	30	22	1	0	Yes	0	-16	46	No	Active

Project Metadata

This project was developed as an applied decision-intelligence case study to demonstrate how behavioral signals, sentiment, usage patterns, and financial discipline can be combined to identify early indicators of customer churn in a SaaS subscription environment. The objective was not prediction modeling, but clarity: understanding how churn behaves before it occurs.

Project Details

Field	Information
Project Name	Predictable Churn — Behavioral Early-Warning Analytics System
Version	1.0
Date Completed	2025
Dataset Type	Synthetic (realistic logic-based)
Total Records	120 SaaS customer accounts
Time Window	8 months of behavioral activity

Tools and Techniques Used

Category	Details
Software	Microsoft Excel 2019
Methods Used	Behavioral segmentation, cohort logic, trend analysis, early-warning framework
Visualization Approach	Clean executive-style data storytelling
Data Enhancements	Flag creation, risk scoring, sentiment mapping, momentum analysis

Key Output Assets

Output Type	Description
Analytical Dataset	Clean structured model with engineered signals
Cohort Segmentation Model	Behavior-based grouping for churn pattern analysis
Early Warning System Framework	Rule-based scoring logic for proactive intervention
Visualization Series	Four charts illustrating behavioral churn insights
Case Study Report	Executive-style narrative with insights and decision pathways

This project reflects an ongoing learning journey in analytical thinking, business understanding, and outcome-driven data storytelling.