

TEAM 4

Term Project – BPM with Process Mining

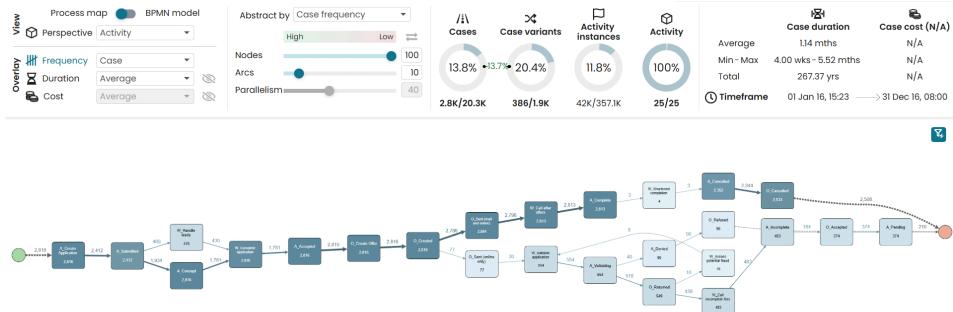
Dhana bank's Loan Application Process

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1. SLA Analysis

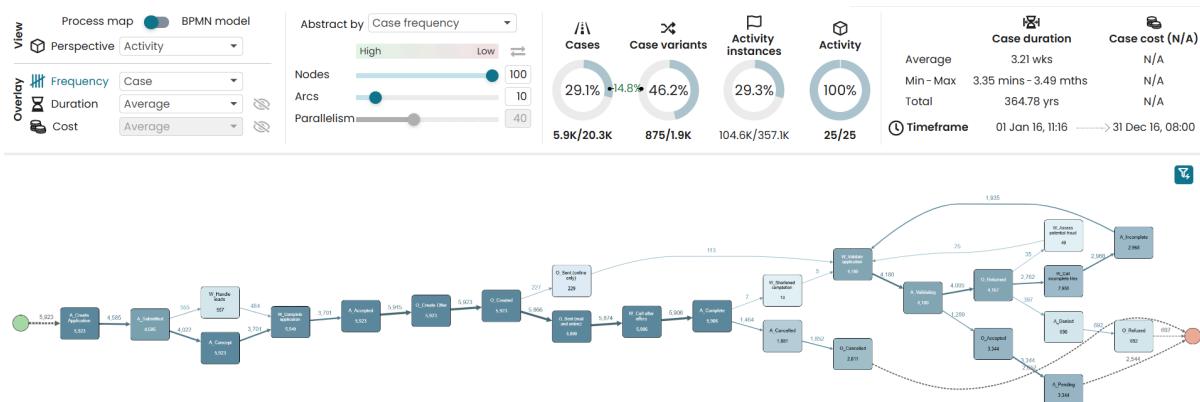
<Car Loan>

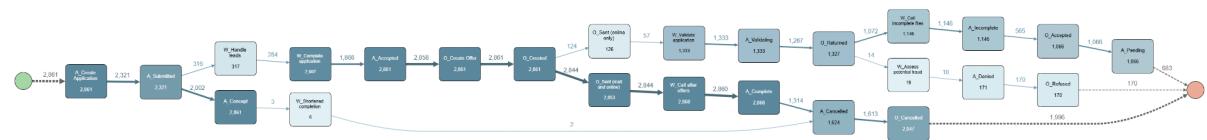
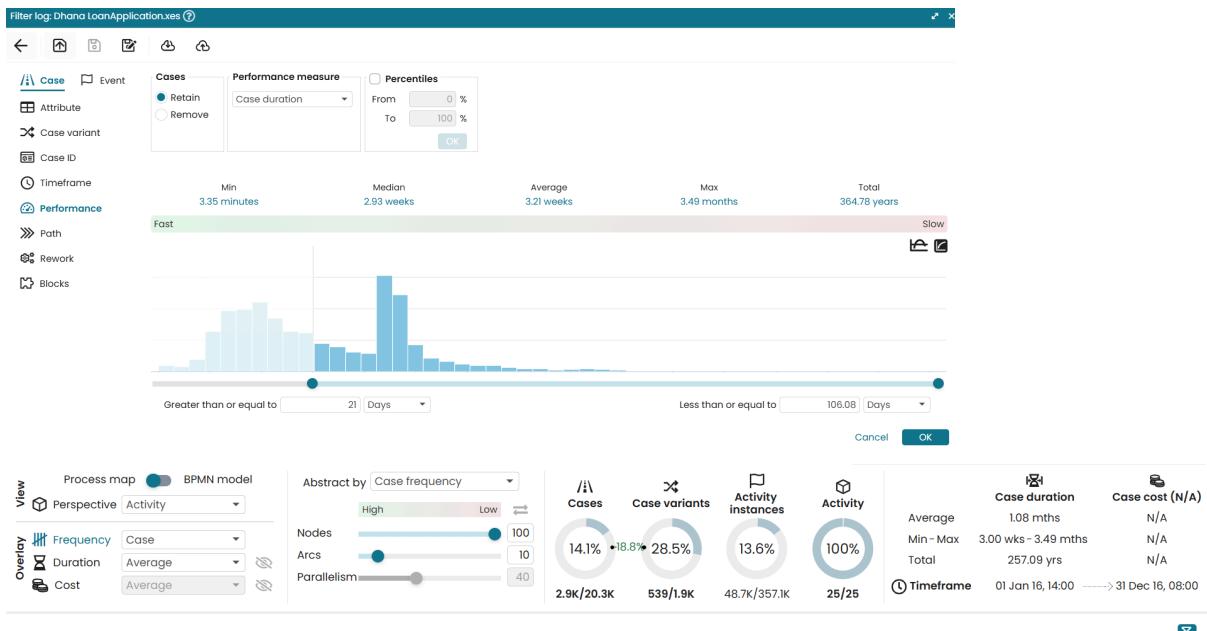




- Provided Data:
 - Average Cycle Time(Average): 2.97wks (approximately 20.8 days)
 - Median(Median): 2.46wks (approximately 17.2day)
 - Maximum Cycle Time(Max): 5.52 months
 - Minimum Cycle Time(Min): 8.36 minutes
- SLA Standard:
 - The SLA for Car loans is 28 days (4 weeks).
 - Comparison of Results:
 - Average Cycle Time(2.97wks): The cycle time for this type of loan is within the SLA standard of 28 days, thus meeting the SLA requirements.
 - Maximum Cycle Time(5.52 months): Some cases exceed the SLA, which appear to be exceptions and constitute SLA violations.
 - Histogram Analysis: The histogram shows that most cases appear to be processed within the SLA standard (28 days). Cases exceeding the SLA are concentrated on the far right of the histogram.
 - SLA Exceeding Case Analysis
 - >Total Number of Cases: 7,705 (Car Loan Cases).
 - >Number of SLA Exceeding Cases: 2,800 cases.
 - >SLA Exceeding Rate
 - >Formula: (Number of SLA Exceeding Cases / Total Number of Cases) × 100
 - >Calculation: $(2,800 / 7,705) \times 100 \approx 36.3\%$

<Home improvement>





- Provided Data
 - Average Cycle Time(Average): 3.21wks (approximately 22.5 days)
 - Median(Median): 2.93wks (approximately 20.5days)
 - Maximum Cycle Time(Max): 3.49 months
 - Minimum Cycle Time(Min): 3.35 minutes
 - SLA Standard
 - The SLA for Home Improvement loans is 21 days (3 weeks)
 - Comparison of Results
 - Average Cycle Time(3.21wks): The cycle time for this type of loan exceeds the SLA standard of 3 weeks, and therefore does not meet the SLA requirements.
 - Maximum Cycle Time(3.49 months): The average cycle time (3.21 weeks) is close to the SLA (3 weeks), but there are instances where it is exceeded.
 - SLA Exceeding Case Analysis
 - >Total Number of Cases: 5,923 (Home improvement Cases).
 - >Number of SLA Exceeding Cases: 2,861cases
 - >SLA Exceeding Rate
 - >Calculation: $(2,891 / 5,923) \times 100 \approx 48.8\%$

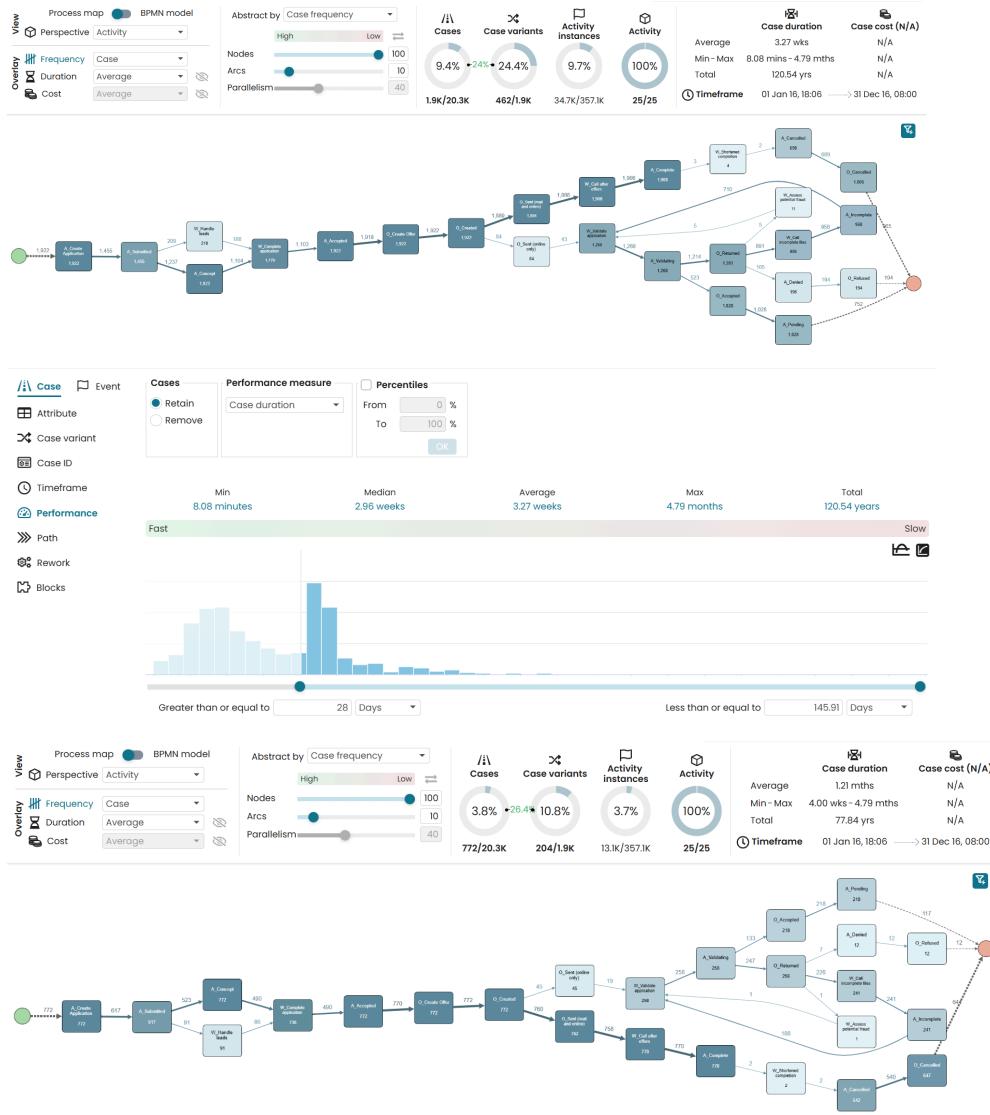
<Loan takeover>



- Provided Data
 - Average Cycle Time(Average): 3.29wks (approximately 23 days)
 - Median(Median): 2.98wks (approximately 20.9days)
 - Maximum Cycle Time(Max): 4.4 months
 - Minimum Cycle Time(Min): 7.08 minutes
- SLA Standard
 - The SLA for Loan Takeover is 14 days (2 weeks).
- Comparison of Results
 - The average cycle time (3.29 weeks) exceeds the SLA standard (2 weeks), and therefore, it does not meet the SLA on average.
 - Maximum Cycle Time (4.4 months): Some cases show significantly exceeded processing times, which constitutes a severe SLA violation.
 - Histogram Analysis: The histogram indicates that a substantial number of cases exceed the SLA standard (14 days). Cases exceeding the SLA are concentrated in the rightmost section of the histogram.
 - SLA Exceeding Case Analysis
 - >Total Number of Cases: 4,793

- >Number of SLA Exceeding Cases: 3,331
- >SLA Exceeding Rate
- >Calculation: $(3,331 / 4,973) \times 100 \approx 68.75\%$

<All Other Loans>

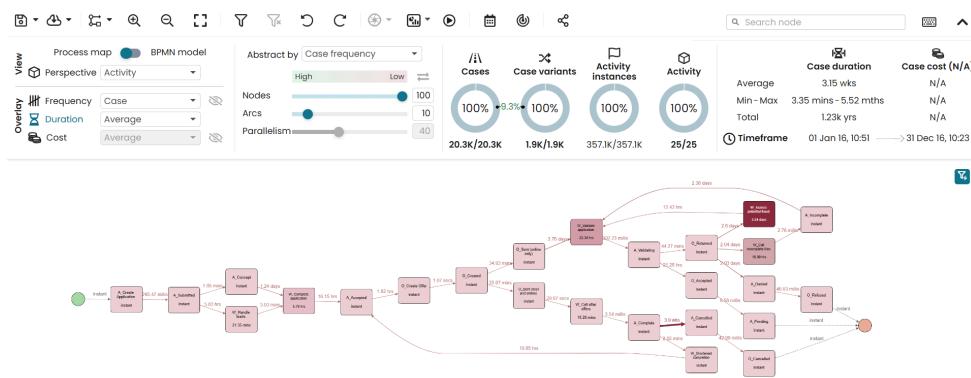


- Provided Data
 - Average Cycle Time(Average): 3.27wks (approximately 22.9days)
 - Median(Median): 2.96wks (approximately 20.7days)
 - Maximum Cycle Time(Max): 4.79months
 - Minimum Cycle Time(Min): 8.08 minutes
- SLA Standard
 - he SLA for All Other Loans is 28 days (4 weeks).
- Comparison of Results

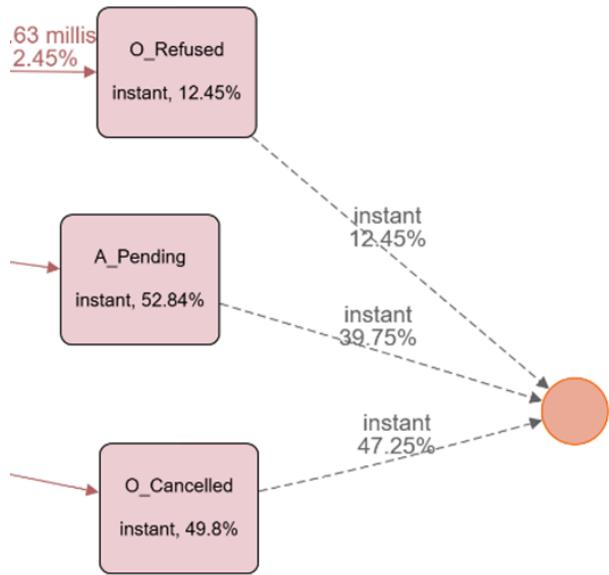
- The average cycle time (3.27 weeks) is within the SLA standard (4 weeks), and therefore, it meets the SLA on average.
- Maximum Cycle Time (4.79 months): There are exceptional cases where the SLA is significantly exceeded.
- Histogram Analysis: The histogram shows that most cases appear to be processed within the SLA standard (28 days). Cases exceeding the SLA are concentrated at the far right of the histogram.
- SLA Exceeding Case Analysis
 - >Total Number of Cases: 1,922
 - >Number of SLA Exceeding Cases: 772
 - >SLA Exceeding Rate:
 - >Calculation: $(772 / 1,922) \times 100 \approx 40.16\%$

2. Cycle Time analysis

<Total Process>



Cycle Time of Total Process = 3.15 wks



The process is divided into three main paths.

1. A_Create Application -> O_Refused
2. A_Create Application -> O_Pending
3. A_Create Application -> O_Cancelled

-> The processes causing customer waiting time are assumed to be A_Create Application, A_Submitted, O_Sent (Online Only), and O_Sent (Online and Email).

- **1st case:** A_Create Application -> O_Refused

Cycle Time: 2.34 weeks

Client Waiting Time: 0.02 Weeks

Bank Process Time: 2.32 weeks

- **2nd case:** A_Create Application -> A_Peding

Cycle Time: 2.59 weeks

Client Waiting Time: 0.02 weeks

Bank Process Time: 2.57 weeks

- **3th case:** A_Create Application -> O_Cancelled

Cycle Time: 3.93 weeks

Client Waiting Time: 0.02 weeks

Bank Process Time: 3.91 weeks

- Conclusion

$$2.31\text{wks} \times 0.1245 = 0.28\text{wks}$$

$$2.57\text{wks} \times 0.3975 = 1.02\text{wks}$$

$$3.37\text{wks} \times 0.4725 = 1.59\text{wks}$$

$$\Rightarrow 0.28 + 1.02 + 1.59 = 2.89 \text{ weeks}$$

Total Cycle Time: 3.15 weeks

Total Bank Process Time: 2.89 weeks

Client Waiting Time: 0.26 weeks

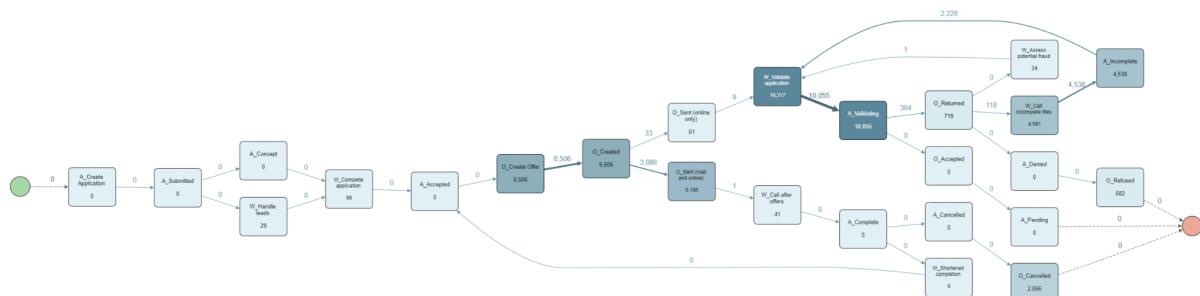
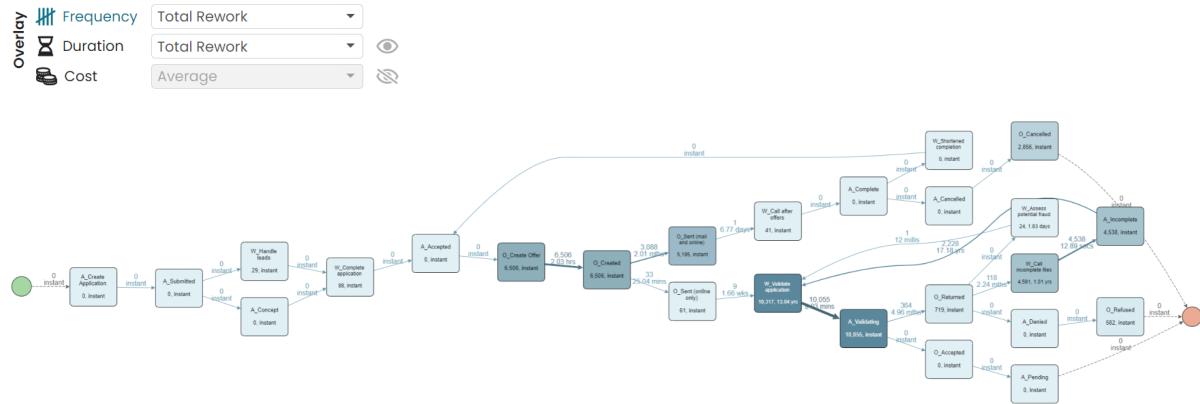
3. Rework Analysis

Is there any rework loop in this process? If so, what is its impact of each rework loop on the cycle time (i.e. by how much does the occurrence of the rework loop increases the process)? Note: here we define a rework as one or a sequence of activities that occurs twice or more in the same case.

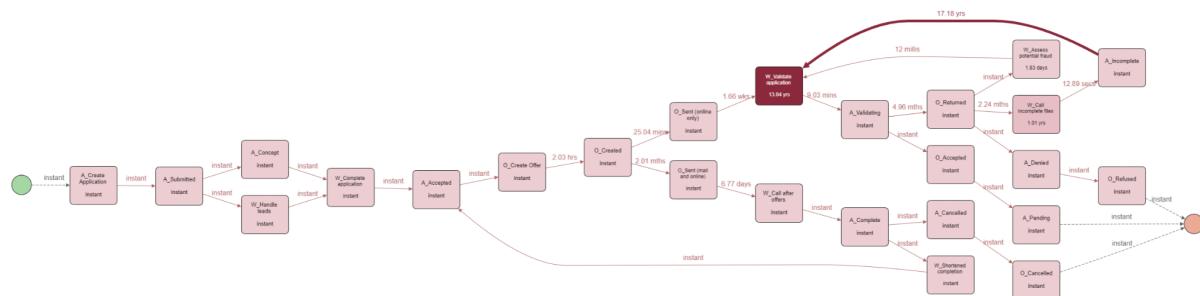
Rework is a common type of waste in a business process. The occurrence of rework increases the cycle time and cost of cases in a process.

There are two common causes for rework. First, the task was not done right the first time, so someone has to go and do it again. Second, information that would have been necessary to process a case was missing, so it had to be sent back. And the rework is divided into three types. The self-loop, the short loop, and the indirect repetition.

First, I figured out the key points where the rework occurs. By setting the overlay as the following picture, it is able to find the total rework in the whole process. On this map, most of the rework occurred in the mid-to-late part of the process map. The main activity that caused the most rework was shown in dark color and thick arrow.



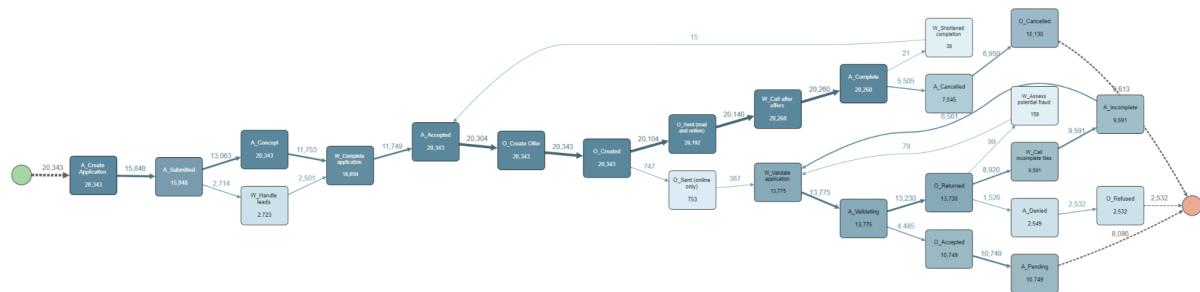
(The frequency of the Total Rework indicates how often the activity has been repeated.)

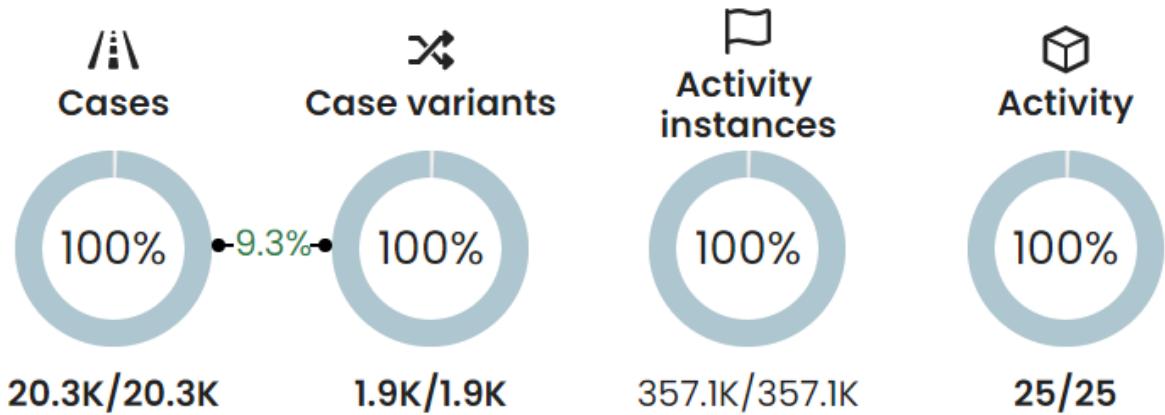
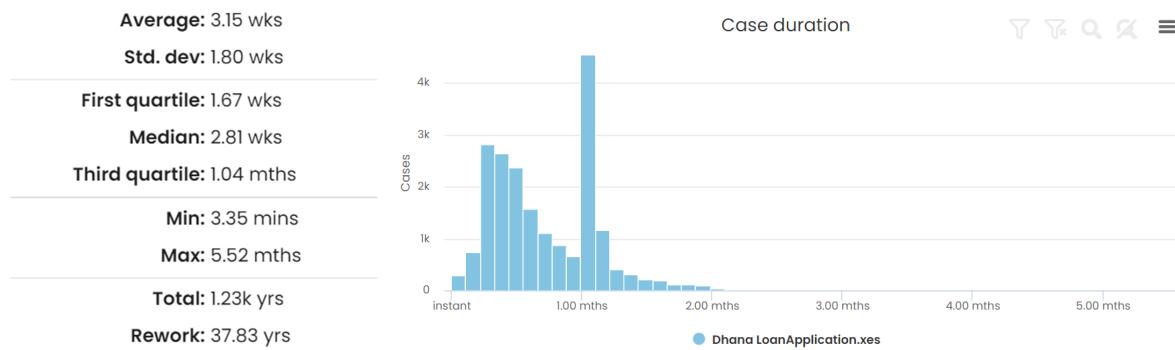


(The duration of the Total Rework indicates the time required due to the rework.)

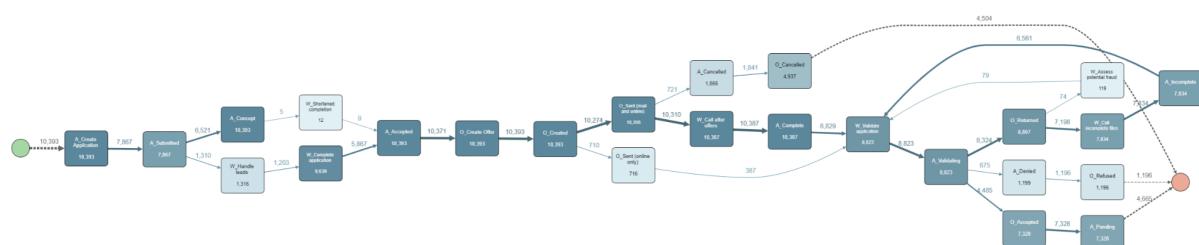
1. Analyze each process map

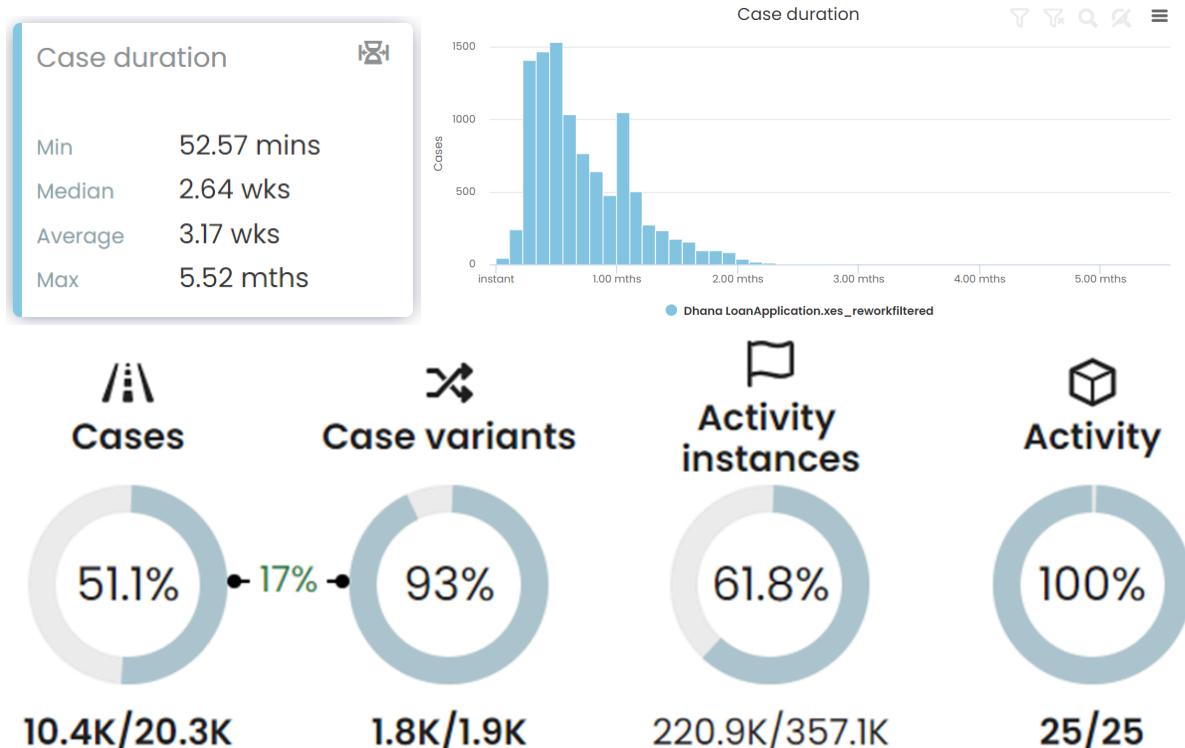
First, it is essential to check the original process map. Below is the duration information of the original process map. It's an original process, so we can see that all items are 100%.



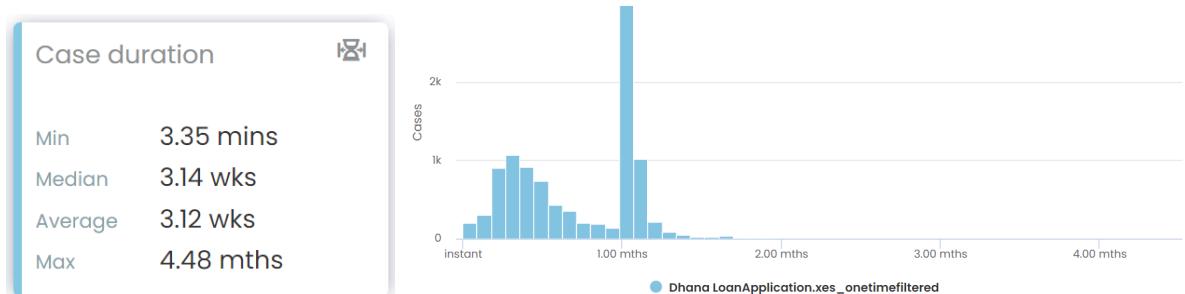
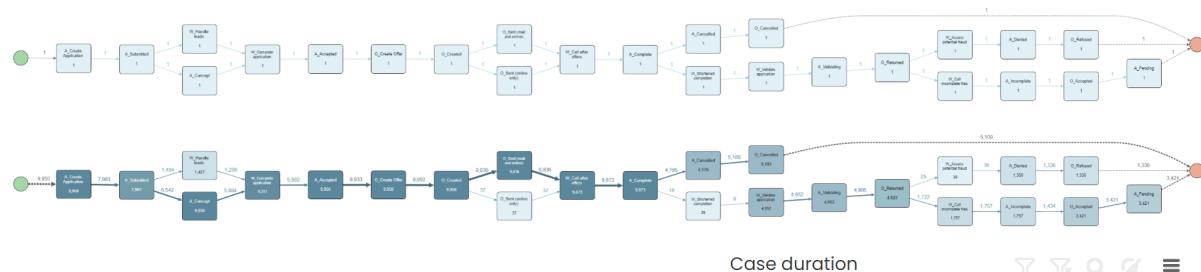


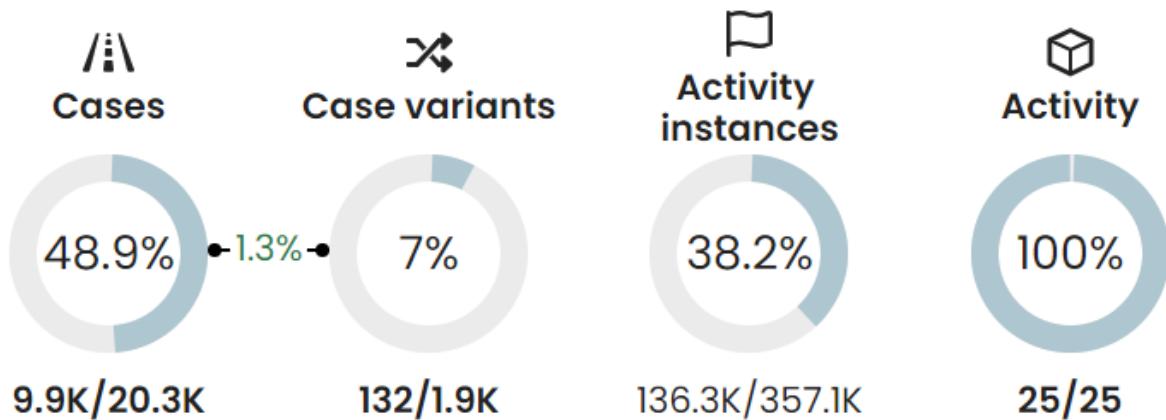
Next, I set the filter function as the following picture to indicate the map that contains any activities that are reworked. More than half of the process (51.1%) has been reworked. This suggests a significant amount of rework occurs in the entire process.





Lastly, I checked the map that all activities occur at once. As you can see, the frequency of all activities is only one. In other words, only cases without rework are left. Of the total 20,300 cases, 9,900 cases are left. And only 7% are left of the total variations. Also, only about 38.2% of the activity instances have been maintained.





2. Cycle time comparison

Let's compare the cycle times of the original process map and the process map that the rework removed.

Case duration	
Min	3.35 mins
Median	2.81 wks
Average	3.15 wks
Max	5.52 mths

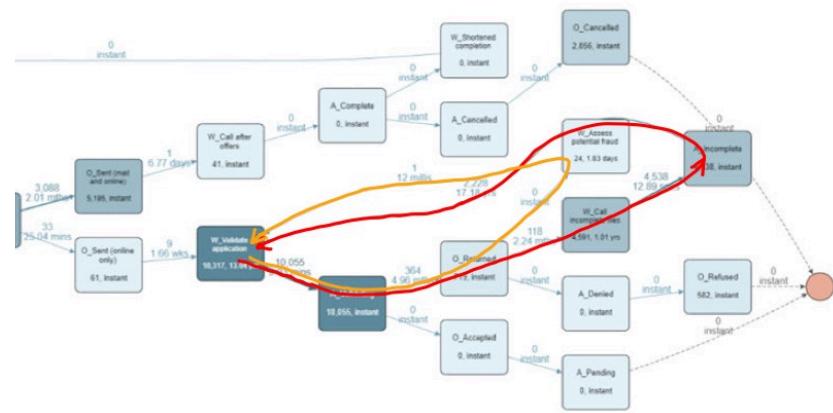
Case duration	
Min	3.35 mins
Median	3.14 wks
Average	3.12 wks
Max	4.48 mths

The left side is the case duration of the original process map and the right side is the case duration of the process map that removed all the rework.

Average cycle time difference = 3.15 weeks - 3.12 weeks = 0.03 week = about 5 hours
 Therefore, it can be seen that the average cycle time is delayed by about 5 hours due to the rework. Also, we can obtain the increased rate of cycle time by using this information. By removing the rework, the cycle time increase rate is $(3.15 - 3.12) / 3.15 * 100 = 0.961538\ldots$

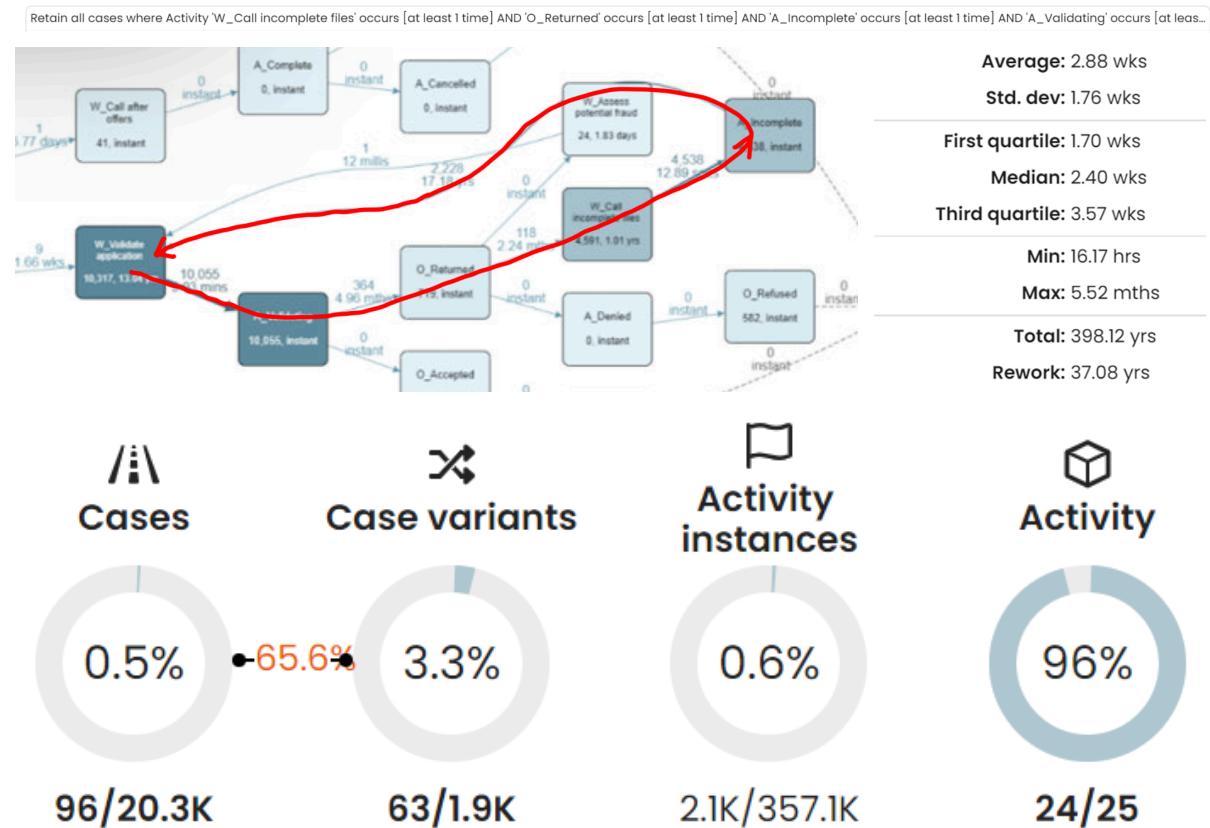
3. Analyze two main loops

Next, I will analyze the effect of each rework loop on the overall cycle time. I focused on these two loops, red and yellow. Both are indirect repetition because they include a series of multiple activities.



(1) W_Validate application -> A_Validating -> O_Returned -> W_Call incomplete -> A_Incomplete -> W_Validate application indirect repetition

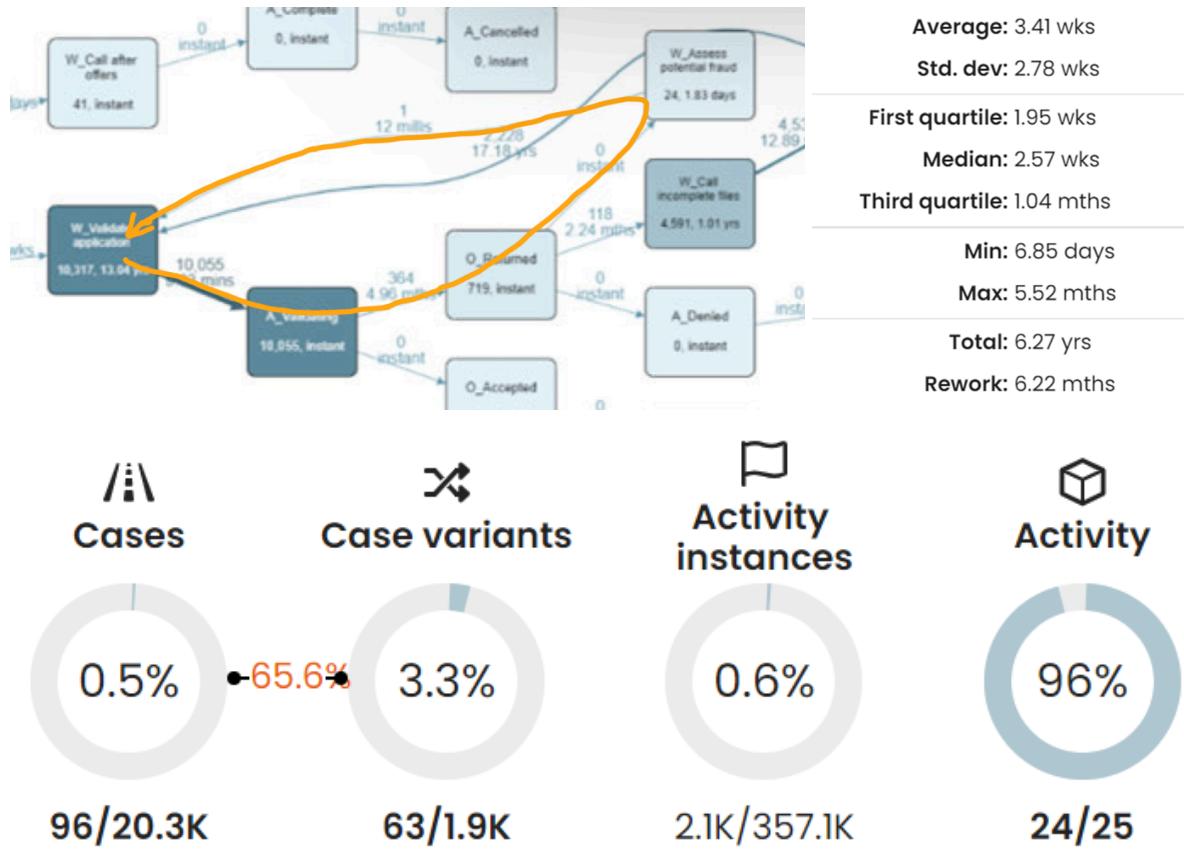
First, the red one is the loop that follows this path. It is the process of verifying the application, requesting a return due to incomplete data, and verifying it again. By dividing the rework time of the process by the total time of the original process and multiplying it by 100, you can get 32.4% (Rework Time Rate = $401.66 \text{ years} / 1.23k \text{ years} * 100 = 32.4\%$). This indicates how much rework takes up the total time. So, if the bank modifies the process between W_Validate application and O_Returned, it will be more efficient because it can reduce the rework time.



(2) W_Validate application -> A_Validating -> O_Returned -> W_Assess potential fraud -> W_Validate application indirect repetition

Next, the yellow one. It is a process that is validated repeatedly due to the potential of fraud. This accounts for about 0.5% of the total process (Rework Time Rate = $6.27 \text{ years} / 1.23k \text{ years} * 100 = 0.5\%$). This means that this rework does not have a huge impact on the original process.

Retain all cases where Activity 'W_Assess potential fraud' occurs [at least 1 time] AND 'O_Returned' occurs [at least 1 time] AND 'A_Validating' occurs [at least 1 time] AND 'W_Validate application' occurs [at least 1 time]



4. Recommendation

In both indications, incomplete data is repeatedly returned during application verification and causes problems. This issue can be resolved by adding activities between W_Validate application and O_Returned. For example, introducing a system that automatically checks the validity and completeness of data in the application stage may be a solution. Or AI-based text analysis technology that automatically supplements data submitted by the applicant may be used.

4. Analysis of Cancellations

: How many loan applications are cancelled? What are the characteristics of the loan applications being cancelled? Is there any common pattern among them?

1. Introduction

Background:

Dhana Bank offers a variety of loan services, but recently, the number of loan application cancellations has been increasing. This trend negatively impacts both customer experience

and service quality. Key reasons for cancellations include missing document submissions and prolonged waiting times.

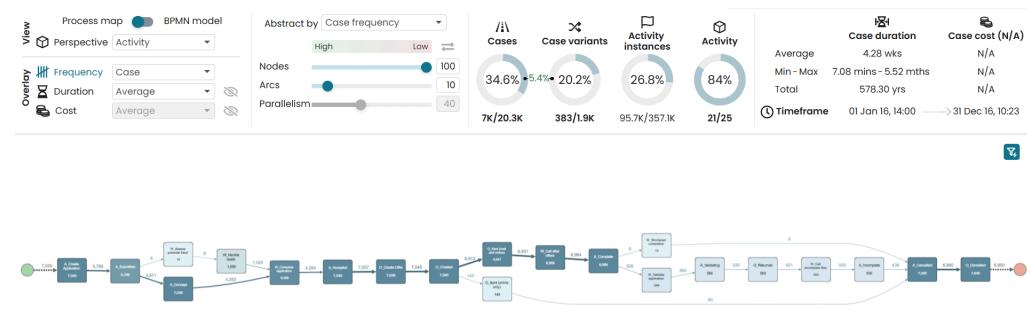
These issues not only reduce customer trust but also hinder the bank's profitability and operational efficiency.

To address these challenges, Dhana Bank aims to analyze the causes of cancellations, improve its processes, and optimize the customer experience. The ultimate goal is to reduce the cancellation rate and enhance customer loyalty.

2. How many loan applications are cancelled?

Total number of cases: **20,343** cases

Cancelled cases (A Cancelled): **7,045 cases** (approximately 34.6%)



3. What are the characteristics of the loan applications being cancelled? Is there any common pattern among them?

1) loangoal types

We identified the number and frequency of cases for each loan goal type in the overall data, as well as the number and frequency of cases after filtering for **A Cancelled**. Using the case counts from both versions, we calculated the cancellation rate for each loan goal type.

1) Loan Types

(Cancellation Rate (%) = (A Cancelled Cases ÷ Total Cases) × 100)

loangoal	Cases	Frequency	A Cancelled		Cancellation Rate
			Cases	Frequency	
Car	7,705	37.88%	2,925	41.9%	37.96 %
Home improvement	5,923	29.12%	1,881	26.7%	31.76 %
Existing loan takeover	4,793	23.56%	1,514	21.49%	31.59 %
Remaining dept home	680	3.34%	222	3.15%	32.65 %
Extra spending limit	408	2.01%	145	2.06%	35.54 %
Caravan / Camper	299	1.47%	117	1.66%	39.13 %
Motorcycle	227	1.12%	92	1.31%	40.53 %
Boat	166	0.82%	68	0.97%	40.96 %
Tax payment	116	0.57%	41	0.58%	35.34 %
Business goal	24	0.12%	11	0.16%	45.83 %
Dept restructuring	2	0.01%	2	0.03%	100 %

-> Through this, we identified three key characteristics.

- 1) Transportation Loan Goal (Car, Motorcycle, Caravan/Camper, Boat):
 - High cancellation rate: 37% +
 - Car loans: Stable, relatively low cancellation rate despite large volume.
- 2) Business goal loan:
 - Very high cancellation rate: 45.83%
- 3) Caravan/Camper, Motorcycle, Boat, Tax Payment, Business Goal, Debt Restructuring:
 - Fewer cases, high cancellation rates.
 - Debt Restructuring Loans: Extreme cancellation rate: 100% (2/2 cases canceled).
 - > Debt Restructuring Loans may be difficult for heavily indebted individuals to apply for or get approved due to strict eligibility criteria and financial burdens.

-> The pattern of the loan applications being cancelled.

- 1) Business goal: The average duration of W Call Incomplete Files is higher compared to other loan goal types.
 - > It appears that the average duration of W Call Incomplete Files has a significant impact on the cancellation rate.

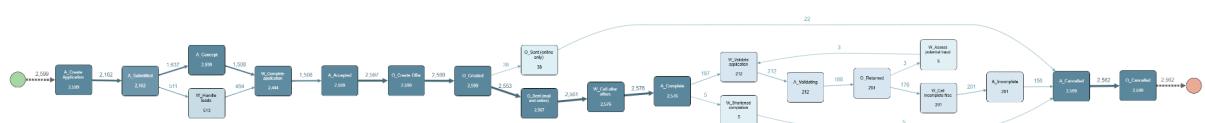
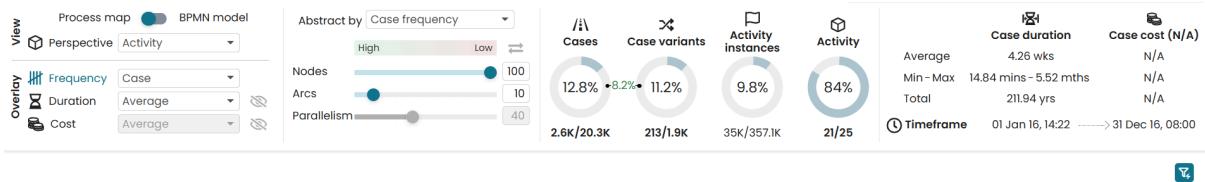
2. Loan amount

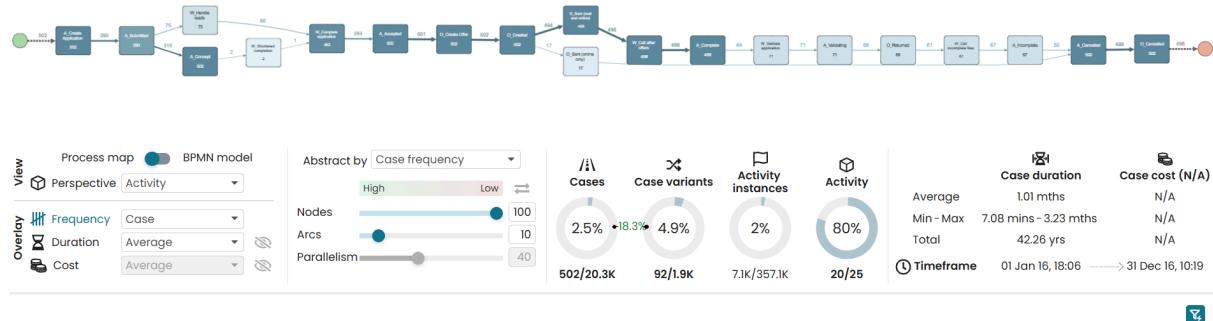
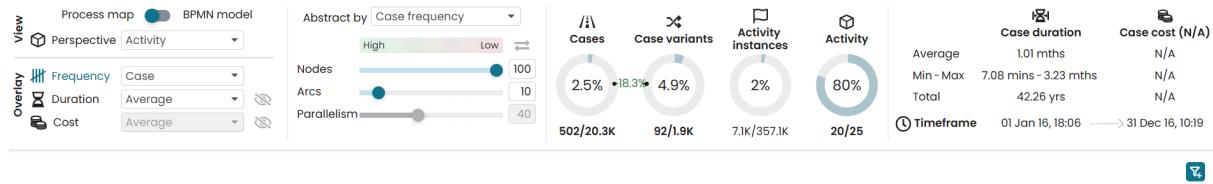
Next, we analyzed the cancellation rates based on loan amount ranges. We categorized the amounts into 5 categories.

-> We expected that there would be significant differences in cancellation rates across these loan amount ranges.

2) Loan Amount

- **0–9,999**: 2,599 cancellations out of 6,748 cases (Cancellation Rate: 38.5%)
 - **10,000–19,999**: 2,415 cancellations out of 7,475 cases (Cancellation Rate: 32.3%)
 - **20,000–39,999**: 1,528 cancellations out of 4,725 cases (Cancellation Rate: 32.3%)
 - **40,000–100,000**: 502 cancellations out of 1,381 cases (Cancellation Rate: 36.4%)
 - **100,000+**: 1 cancellation (400,000) out of 14 cases (Cancellation Rate: 7.1%)





-> We analyzed and anticipated the reasons behind the cancellation rates for each loan amount range.

- Low Amount (0–9,999): Highest cancellation rate at 38.5%, as small loans are often canceled with less hesitation.
- Medium Amount (10,000–39,999): Both 10,000–19,999 and 20,000–39,999 have a cancellation rate of 32.3%, showing more cautious decision-making compared to small loans.
- High Amount (40,000–100,000): Cancellation rate rises to 36.4%, likely due to stricter terms or customer hesitation.
- Very High Amount (100,000+): Lowest cancellation rate at 7.1%, as applications are more deliberate and likely to proceed.

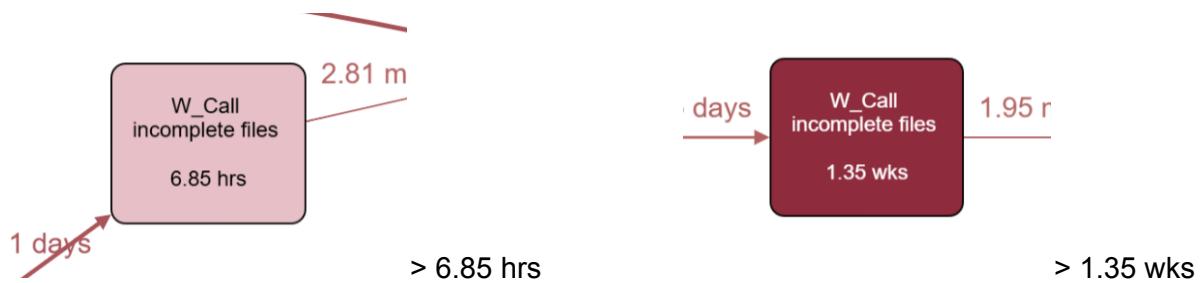
-> The largest loan amounts had very low cancellation rates, but the limited data made it difficult to draw meaningful conclusions. Additionally, in other ranges with more data, there were no significant differences in cancellation rates by amount.

Therefore, this analysis did not yield any meaningful results.

3) Comparison of Removing A Cancelled activity and Retaining A Cancelled activity

Next, we compared cases where A Cancelled activity was included versus excluded. The biggest difference appeared in the W Call Incomplete Files step.

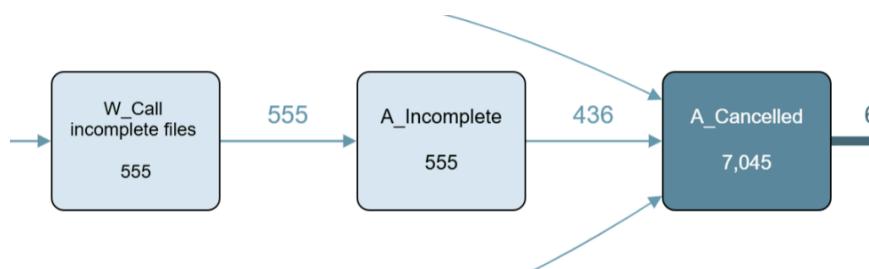
When customers don't respond to requests for missing documents, the process stays in a waiting state, which often leads to cancellation.



- For cases without A Cancelled, the W Call Incomplete Files step took an average of 6.85 hours.
- For cases with A Cancelled, it took much longer—1.35 weeks.

In most canceled cases, the path followed was:

W Call Incomplete Files → A Incomplete → A Cancelled.



In this case, a total of 436 cases were canceled through this path.

4) Comparison of Duration

We also compared the duration between the O_Return activity and the time when the request for incomplete files was made.

Retain all cases that contain 'Activity' ['O_Cancelled']

+

Retain all cases that contain 'Activity' ['A_Pending']

Remove all cases that contain 'Activity' ['O_Cancelled']

-> In this filtered log, filtering with

```
Retain all cases that contain the eventually-follows relation 'O_Returned' -> 'W_Call incomplete files' between Activity nodes
Retain all cases that contain 'Activity' ['O_Returned' AND 'W_Call incomplete files']
Retain all activity instances where attribute 'Activity' is equal to ['O_Returned' OR 'W_Call incomplete files']
```

Case duration		Case duration	
Average	3.73 days	Average	1.08 wks
Min - Max	1.78 secs - 3.08 mths	Min - Max	4.79 secs - 5.22 mths
Total	55.03 yrs	Total	61.15 yrs
+			

-> For canceled cases, the average duration was 1.08 weeks, whereas for cases that were not canceled and remained pending, the average duration was much shorter—only 3.73 days.

This shows that if there is a delay in requesting incomplete files after O_Return, the likelihood of cancellation increases.

-> Therefore, I suggest that we act quickly and request incomplete files as soon as O_Return occurs. By reducing this waiting period, we can help lower the number of cancellations and improve the overall process.

5. Impact of Application Incompleteness:

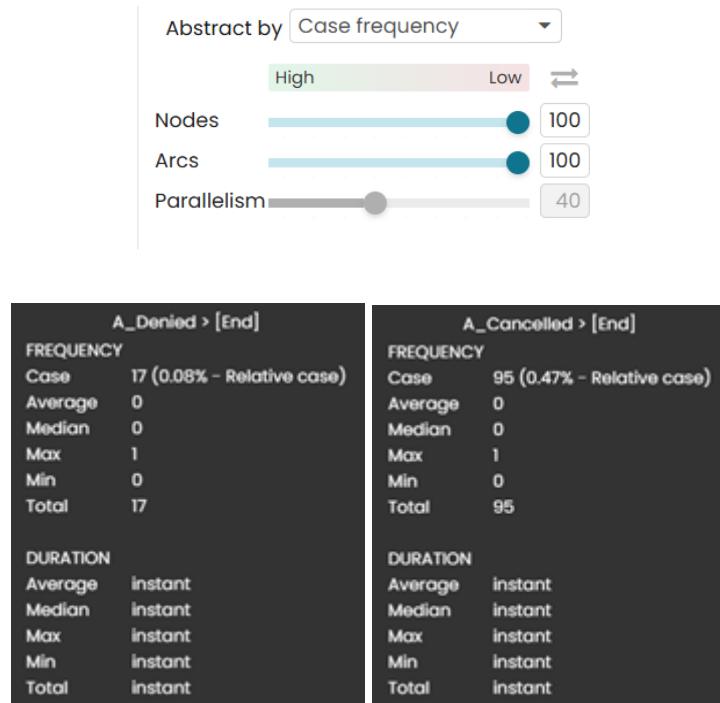
Does the frequency of incompleteness influence the final outcome? The bank's hypothesis is that if applicants are confronted with more requests for completion, they are more likely not to accept the final loan offer.

5-1) Final Endpoints

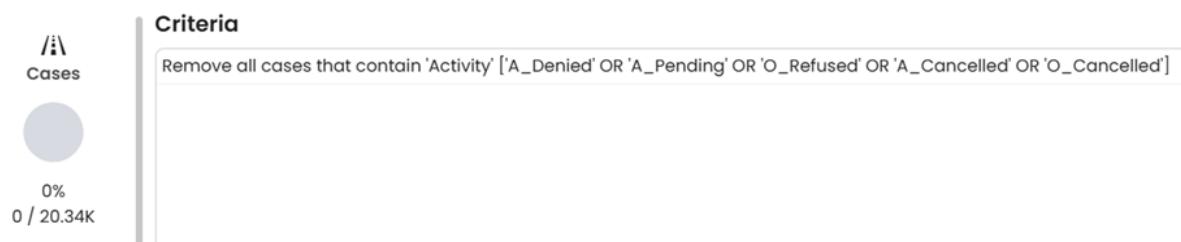
To solve this question, **firstly**, we checked already stated 3 endpoints. 1. Pending, 2. Denied, 3. Cancelled.

- **Pending:** if all documents are received and the assessment is positive, the loan is final, and the customer is paid.
- **Denied:** if somewhere in the process the loan cannot be offered to the customer, because the application does not fit the acceptance criteria, the application is declined, which results in the state 'denied'.
- **Cancelled:** if the customer never sends in their documents or calls to tell they do not need the loan anymore, the application is cancelled.

Additionally, we find other two endpoints by setting Arcs 100. These were '*A_Denied*' and '*A_Cancelled*'.



Second, we checked whether there are other endpoints or missing case, but there were no any case.



⇒ Check 1) There were no cases when we filtered with all endpoints.

O_Refused > [End]		A_Pending > [End]		O_Cancelled > [End]	
FREQUENCY		FREQUENCY		FREQUENCY	
Case	2,532 (12.45% - Relative case)	Case	8,086 (39.75% - Relative case)	Case	9,613 (47.25% - Relative case)
Average	0.12	Average	0.4	Average	0.47
Median	0	Median	0	Median	0
Max	1	Max	1	Max	1
Min	0	Min	0	Min	0
Total	2,532	Total	8,086	Total	9,613
DURATION		DURATION		DURATION	
Average	instant	Average	instant	Average	instant
Median	instant	Median	instant	Median	instant
Max	instant	Max	instant	Max	instant
Min	instant	Min	instant	Min	instant
Total	instant	Total	instant	Total	instant
A_Denied > [End]		A_Cancelled > [End]			
FREQUENCY		FREQUENCY			
Case	17 (0.08% - Relative case)	Case	95 (0.47% - Relative case)		
Average	0	Average	0		
Median	0	Median	0		
Max	1	Max	1		
Min	0	Min	0		
Total	17	Total	95		
DURATION		DURATION			
Average	instant	Average	instant		
Median	instant	Median	instant		
Max	instant	Max	instant		
Min	instant	Min	instant		
Total	instant	Total	instant		

- ⇒ Check 2) We confirmed that adding all the cases leading to end at the three endpoints matches the value of start($20,343 = 2,532+8,086+9,613+17+95$)

However, we used only three endpoints(O_Refused, A_Pending and O_Cancelled) in this question analysis because A_Denied and A_Cancelled account for only 0.55%.

5-2) Impact of the frequency of incompleteness

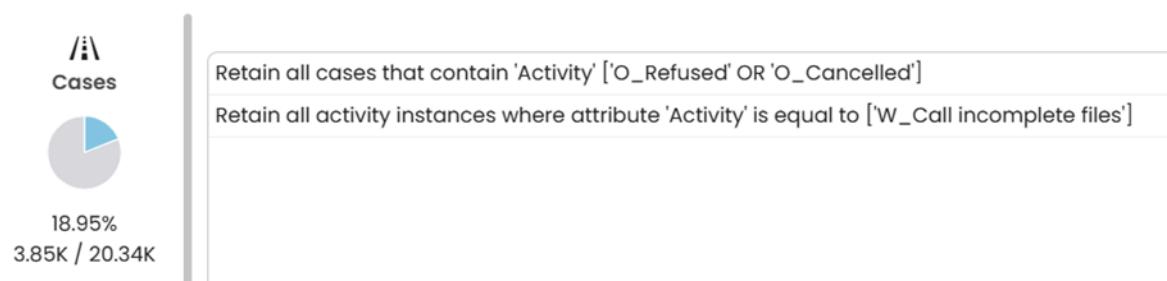
To confirm whether the frequency of request incompleteness influence the final outcome, we followed below steps.

First, we checked the percentage of states where the final state is O_Refused or O_Cancelled by filtering with them.



⇒ Result 1: 61.86% of cases are refused or cancelled.

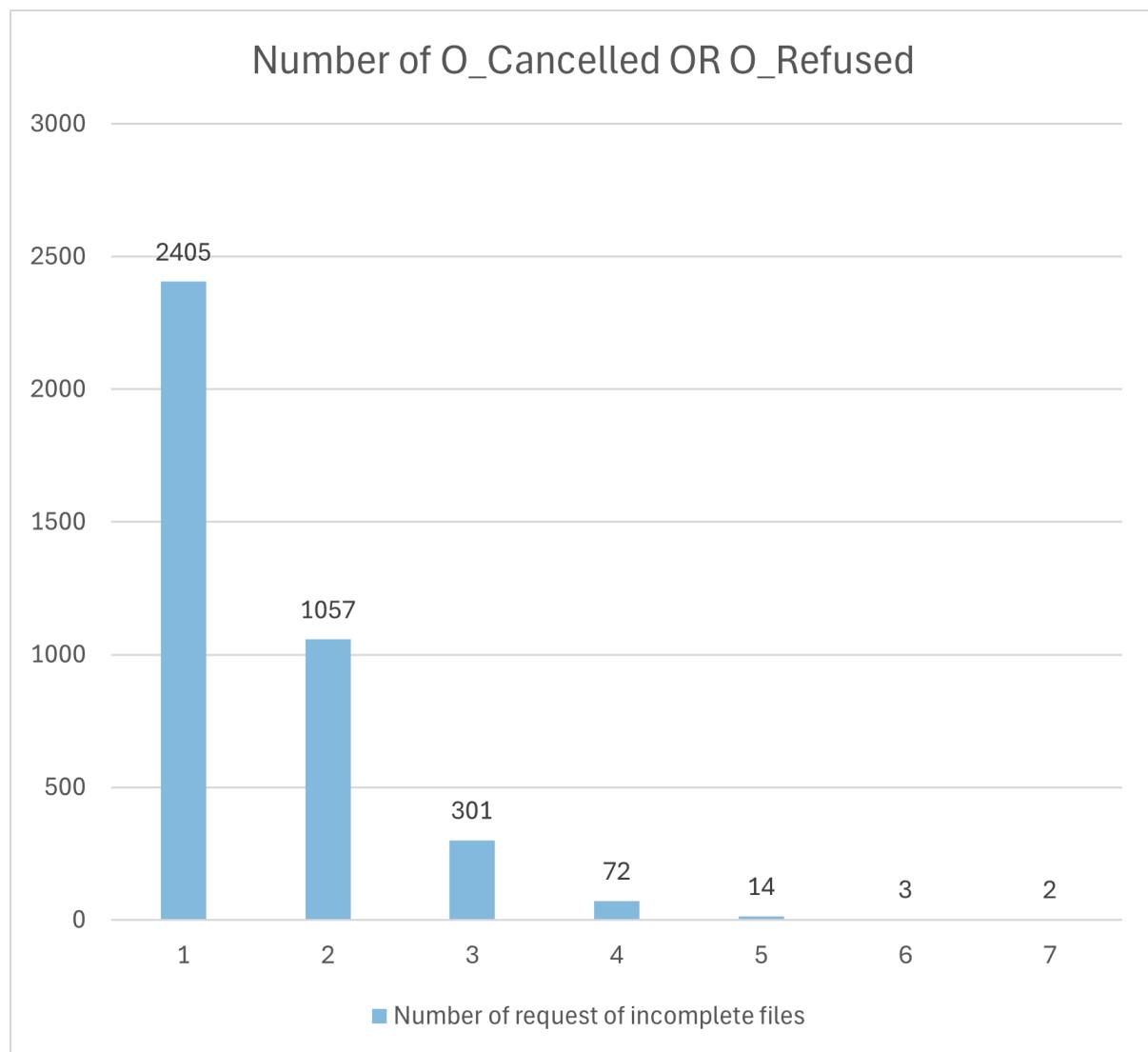
Second, we filtered with O_Refused or O_Cancelled attributes and W_Call incomplete files event.



⇒ Result 2-1: 18.95% of cases with incomplete file requests were finally refused or canceled.

Case variants ▾	Activity instances	Cases	Min duration	Median duration	Average duration	Max duration
1	1	2,405	0 secs	0 secs	2.08 days	4.01 mths
2	2	1,057	40.59 secs	3.18 days	6.12 days	2.67 mths
3	3	301	6.27 hrs	6.94 days	1.41 wks	4.23 mths
4	4	72	1 days	1.28 wks	2.8 wks	5.22 mths
5	5	14	1.86 days	1.38 wks	1.87 wks	1.88 mths
6	6	3	1.59 wks	1.85 wks	2.21 wks	3.17 wks
7	7	2	1.84 wks	2.5 wks	2.5 wks	3.16 wks

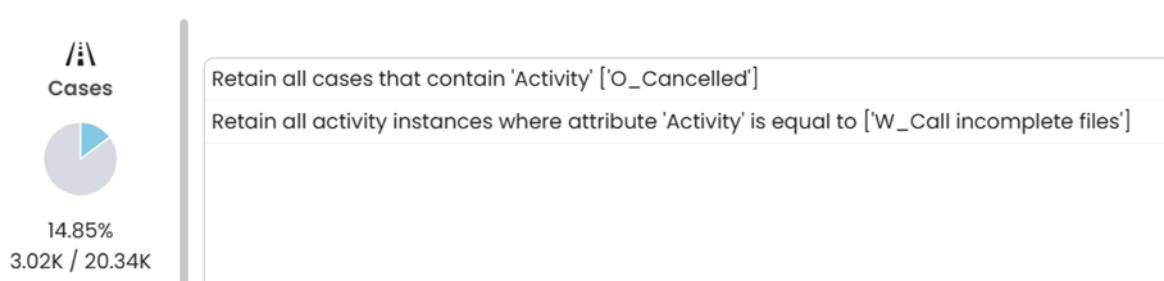
⇒ Result 2-2: In Dashboard, we confirmed that there have been at least 1 to 7 incomplete file requests, and more than 97%(3,763/3,854*100) of cases have been rejected or cancelled in cases where 3 or less requests have been received.



Graph drawn after moving the dashboard data to Excel

Third, we checked at the cases of final cancelled and refused, respectively.

1) Final Cancelled case



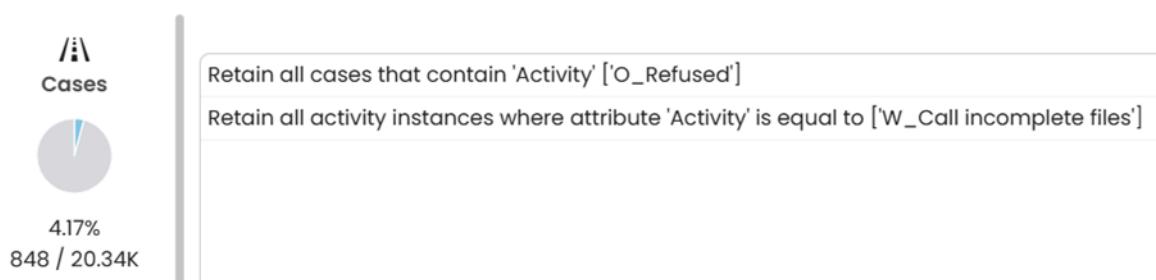
- ⇒ Result 3-1: **14.85%** of the final cancelled cases received incomplete file requests.

Case variant ID	Activity instances	Cases	Min duration	Median duration	Average duration	Max duration
1	1	1,771	0 secs	0 secs	2.78 days	4.01 mths
2	2	903	40.59 secs	3.14 days	6.32 days	2.67 mths
3	3	266	6.27 hrs	6.84 days	1.4 wks	4.23 mths
4	4	63	1 days	1.69 wks	2.09 wks	5.22 mths
5	5	12	1.86 days	1.38 wks	1.94 wks	1.88 mths
6	6	3	1.59 wks	1.85 wks	2.21 wks	3.17 wks
7	7	2	1.84 wks	2.5 wks	2.5 wks	3.16 wks



- ⇒ Result 3-2: In dashboard, we confirmed also most cases cancelled in cases where **3 or less** requests have been received. (about **97.4%** ($2,940/3,020 \times 100$))

2) Final Refused case



⇒ Result 3-3: **4.17%** of the final refused cases received incomplete file requests.



⇒ Result 3-4: In dashboard, we confirmed also most cases refused in cases where **3 or less** requests have been received. (about **98.7%** ($837/848*100$))

⇒ Result 3-5: We also confirmed that the number of final O_cancelled(14.85%) was more than that of final O_Recused(4.17%) when receiving incomplete file requests.

Finally, we checked comparison with all final endpoints .



⇒ Result 4-1: We checked the graph comparing the number of incomplete file requests with the final results and we confirmed also most result cases in cases where **3 or less** requests have been received.

5-3) Conclusion

In conclusion, most *O_Cancelled* and *O_Refused* occurred when **3 or less** requests of incomplete files were received, as was the case with *A_pending*.

Therefore, **the bank's hypothesis** that many incomplete files requests affect the final outcome **is not established**.

In addition, the percentage of incomplete file request events in the case of final cancelled and refused is 18.95%, and it can be said that the incomplete file request itself **does not significantly affect** the final not accept cases.

It is expected that there have been other factors for final not accept (such as speed of incomplete file requests, degree of interaction with customers, etc).

6. Impact of Fraud Assessments:

Is there a difference in cycle time between the cases that include a fraud investigation and those that do not?

6-1) Filtering with *W_Assess potential fraud*

To check this question, we filtered the case with and without *W_Assess potential fraud* and checked the cycle time.

Retain all cases that contain 'Activity' ['W_Assess potential fraud']

Remove all cases that contain 'Activity' ['W_Assess potential fraud']

Case duration		
Average	3.14 wks	3.38 wks
Min - Max	3.35 mins - 4.79 mths	1.96 days - 5.52 mths
Total	1.22k yrs	10.23 yrs

● A: Dhana LoanApplication_not_fraud_investigation ● B: Dhana LoanApplication_fraud_investigation

6-2) Analysis Result

As a result, it took an average cycle time of 3.14 weeks when the potential fraud was assessed and 3.38 weeks when the potential fraud was assessed.

Therefore, we found that case with assessing potential fraud took about 0.28 weeks(1.96 days) more than not assessing potential fraud.

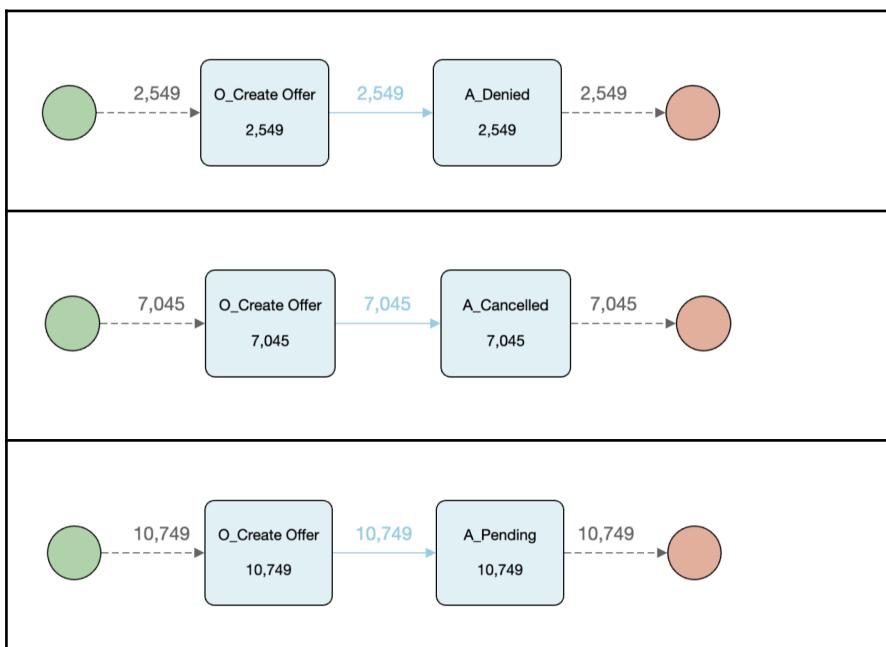
7. Analysis of multiple offers

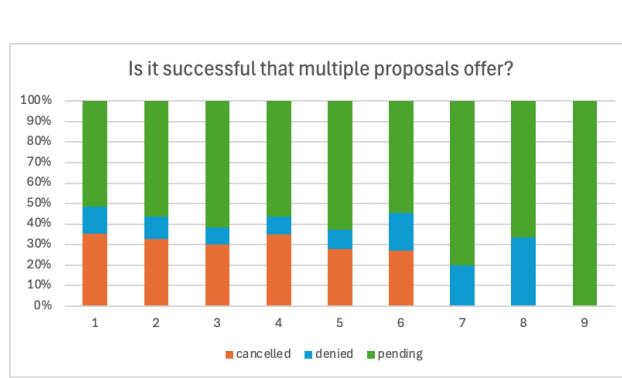
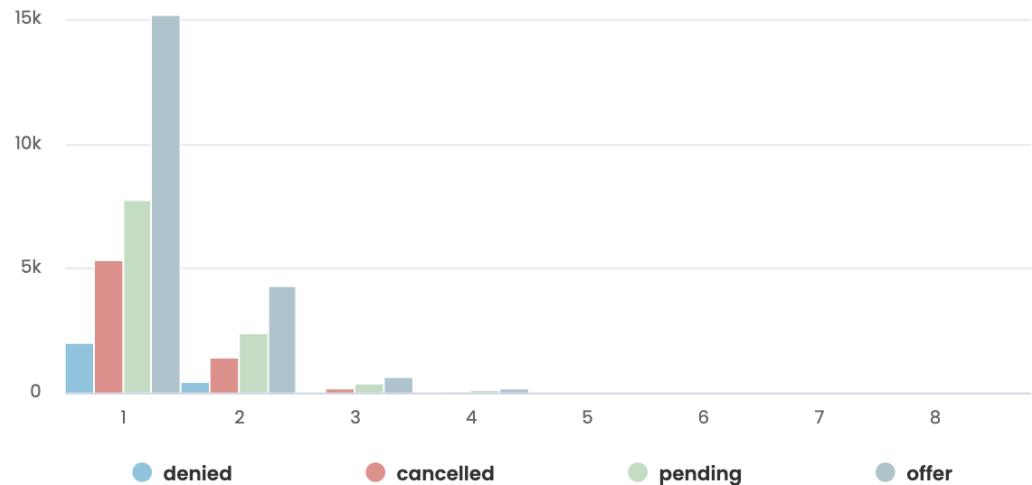
1) How many customers are asking for more than one offer?



Of the total customers, 15,116 (75%) received only one loan offer, while 4,312 (21.20) received two offers. Additionally, 655 (3.22%) received three offers, and 197 (0.97%) received four offers. So, of the total customers, about 25%, or 5,227, received more than one offer, and the remaining 75% received only one.

2) Is it a successful outcome to present multiple proposals?





	cancelled	denied	pending
1	0.354327	0.132376	0.513297
2	0.326763	0.108534	0.564703
3	0.299237	0.083969	0.616794
4	0.350254	0.086294	0.563452
5	0.27907	0.093023	0.627907
6	0.428571	0.285714	0.857143
7	0	0.166667	0.666667
8	0	0.166667	0.333333
9	0	0	1

We analyzed the correlation between when a single loan offer was presented to the customer and when multiple loan offers were presented. When making multiple offers, we can assume that the probability of a successful outcome (the final "A Pending" event) increases.

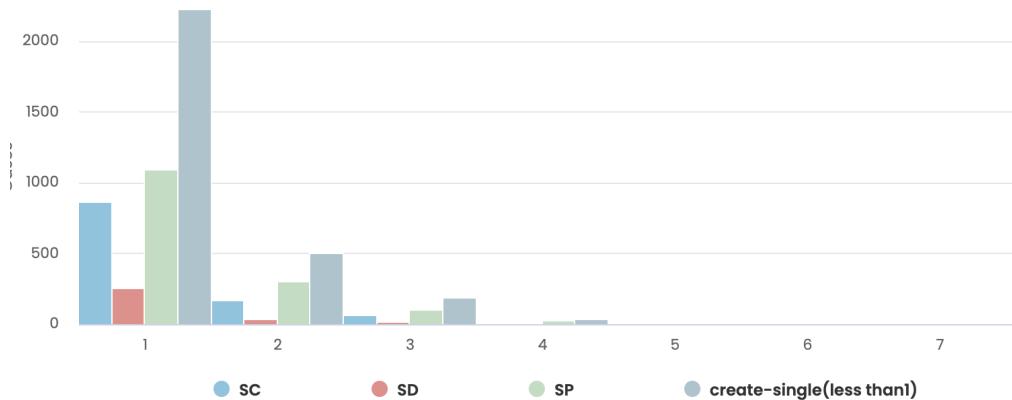
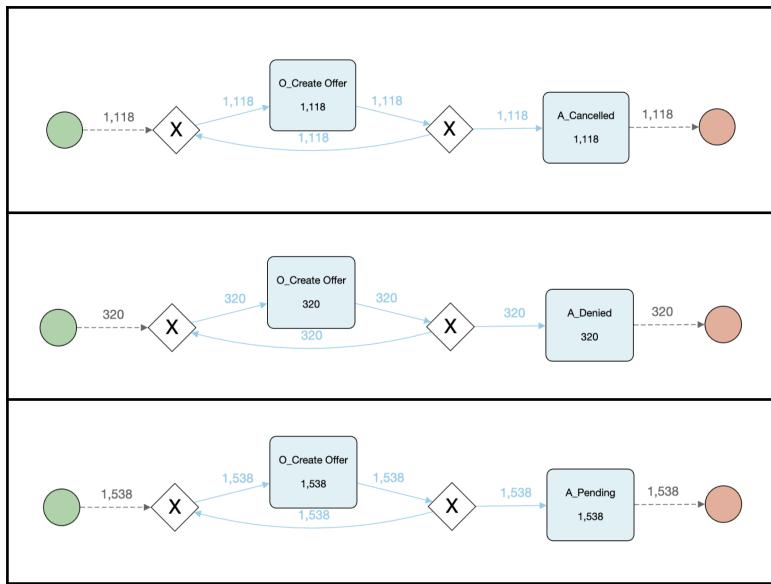
3) For cases where more than two loan offers have occurred, let's separate "whether it was done in one conversation or multiple conversations."

The criteria were divided into three categories: "W" (Workflow) events representing conversation events (e.g., phone calls or emails) and "W_Call afterwards" and "W_Call complete files" were the examples.

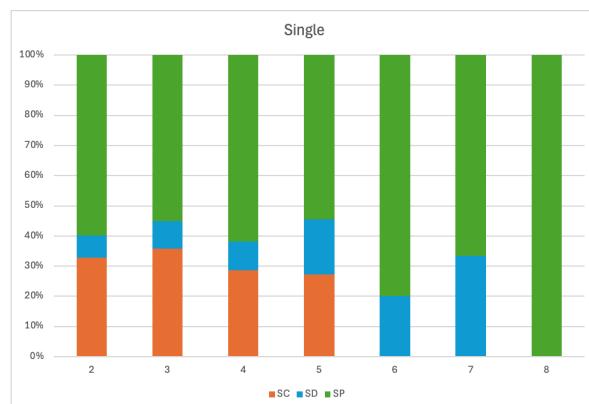
1. single conversation

A single conversation is likely to have more than one proposal within a single conversation. Extract the case where two O_Create Offer events occurred in temporal proximity (day ≤ 1). This is a scenario where two proposals occurred simultaneously in a single conversation. Filtered as follows:

Filter by: Directly-follows (From: O_Create Offer To: O_Create Offer)
Time interval: Lower bound = 0 , Upper bound = 1



<conversion rate>

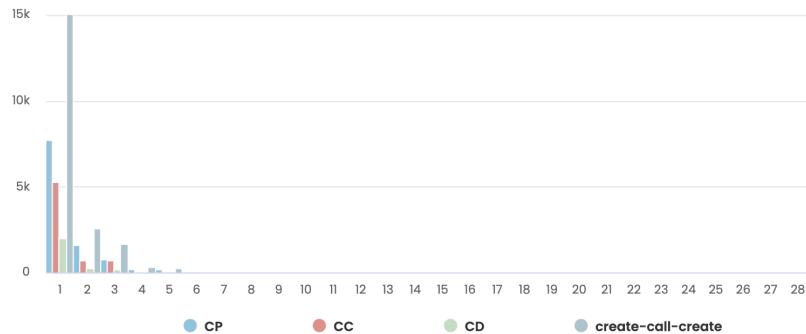
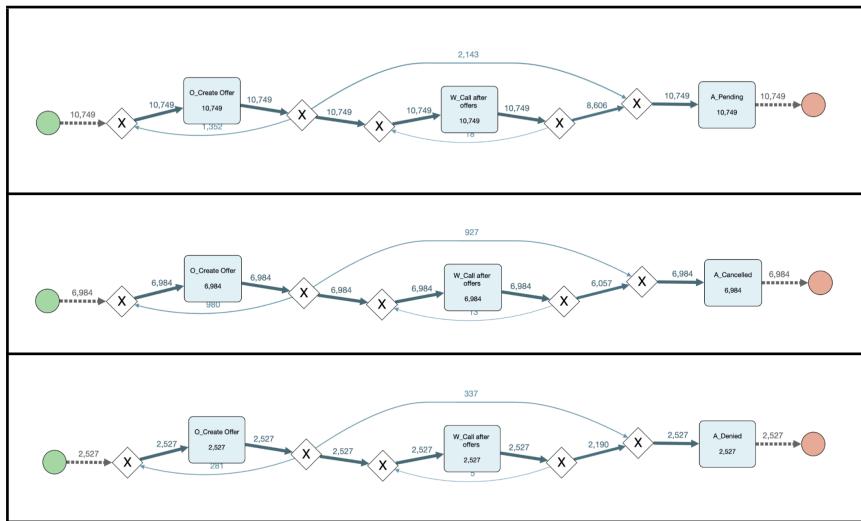


	SC	SD	SP
2	0.32874	0.072835	0.598425
3	0.358289	0.090909	0.550802
4	0.285714	0.095238	0.619048
5	0.428571	0.285714	0.857143
6	0	0.166667	0.666667
7	0	0.166667	0.333333
8	0	0	1

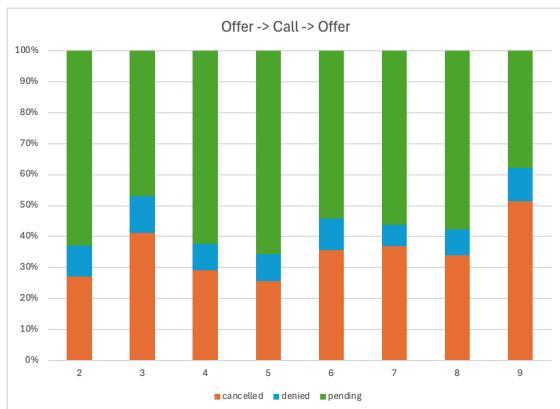
If the time interval is short, the customer receives two offers in the same conversation. The conversion rate appears almost the same, and most of them lead to approval. The SD (denied) and SC (canceled) ratios are low, and the overall pattern is stable.

2. Call after offers

O_Create Offer → W_Call after offers → O_Create Offer: After the first offer, a call is made with the customer, followed by a second offer.



<conversion rate>



	CC	CD	CP
2	0.270073	0.101806	0.628121
3	0.412389	0.118584	0.469027
4	0.323232	0.094276	0.690236
5	0.22695	0.078014	0.58156
6	0.388889	0.111111	0.588889
7	0.364865	0.067568	0.554054
8	0.3125	0.078125	0.53125
9	0.542857	0.114286	0.4

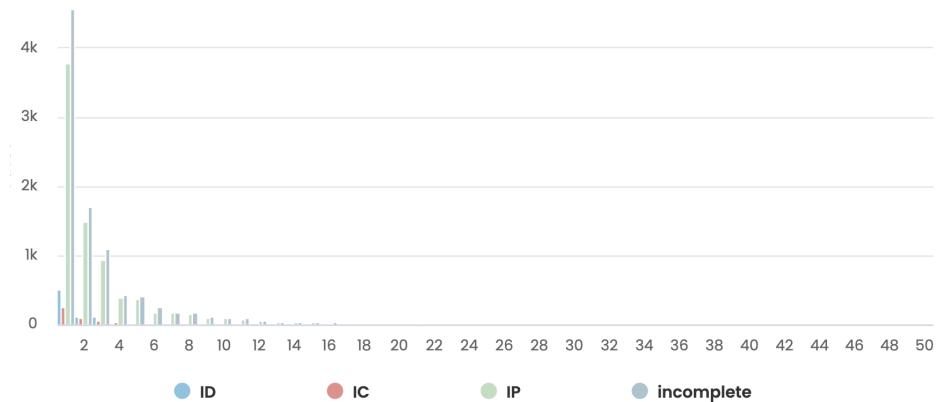
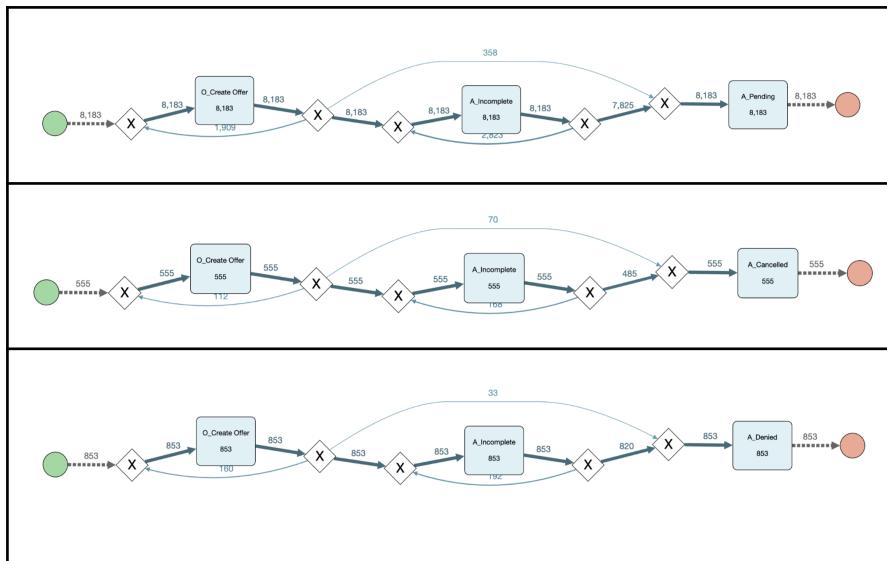
After the first proposal, a second proposal is created after a phone call.

After calling consultation, the proposal is repeated, and the cancellation rate tends to increase slightly.

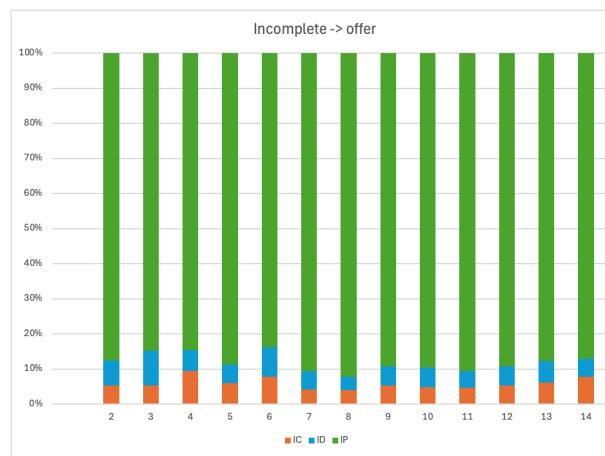
3.

O_Create Offer → → A_incomplete → O_Create Offer

: The first loan offer is sent, and the document is incomplete, resulting in an A_Incomplete event, followed by a second offer.



<conversion rate>



	IC	ID	IP
2	0.052538	0.071429	0.876033
3	0.053636	0.099091	0.847273
4	0.102138	0.064133	0.916865
5	0.059524	0.052381	0.87619
6	0.068826	0.072874	0.736842
7	0.043956	0.054945	0.945055
8	0.038674	0.038674	0.911602
9	0.054054	0.054054	0.900901
10	0.048077	0.057692	0.903846
11	0.045455	0.045455	0.875
12	0.055556	0.055556	0.925926
13	0.06383	0.06383	0.914894
14	0.083333	0.055556	0.944444

If the document is incomplete in the first loan offer, the customer will receive a second offer, which is a process of readjusting the terms of the loan.

There is a lot of Pending status in the second offer due to non-document, indicating that loan approval has been delayed or is still in progress. However, that's a good sign.

This course provides customers with better conditions or opportunities to make up for deficiencies

<insight>

1. single conversation:

- If a customer receives multiple offers in a short time, they are more likely to approve a loan, have less rejection and waiting status, and tend to accept offers quickly. Loan approval rates are up by about 30%.

2. calling conversation:

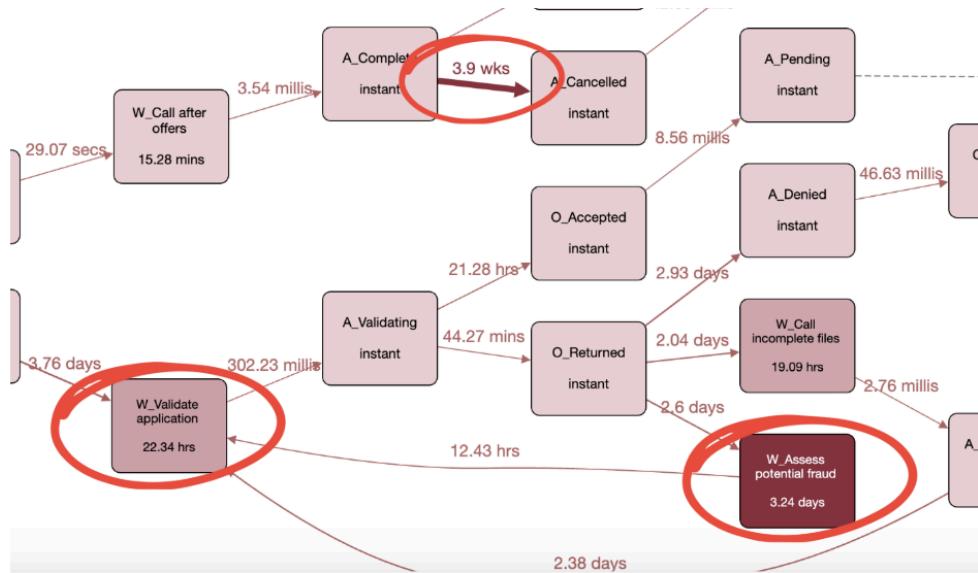
- If an offer is made after a telephone consultation, the customer will consider it carefully, resulting in a slight increase in the cancellation rate.
- If the customer's dissatisfaction or concern grows, the loan application can be canceled, so countermeasures are needed for this part.
- Re-clarifying unclear conditions in a conversation with the customer can be a way to reduce cancellations.

3. incomplete:

- If a second offer is made due to incompleteness of documents, the customer is still likely to approve the loan and there is a lot of waiting conditions is a positive sign.
- In the course of the loan, incompleteness of documents is a major cause of delay in the process, and to resolve this, banks speed up the process of verifying documents, and require clear guidance from customers for incomplete documents. (The bank must quickly adjust the terms of the offer to quickly process loan approval.)
- It is important to increase the efficiency of the lending process because repeated document deficiencies can move customers to other lending products.

8. WIP Analysis: Is the WIP of the process constant over the timeframe of the log. If not, what factors can explain the change(s) in WIP?

<Duration> - To find Bottlenecks



W_Validate application

- Reason:** This activity involves application validation, with an average processing time of **22.34 hours**, creating a major bottleneck.
- Significance:** Delays in this step cause subsequent activities to remain in a waiting state, increasing WIP. By analyzing this activity, opportunities for optimization or automation in the validation process can be identified.

W_Assess potential fraud

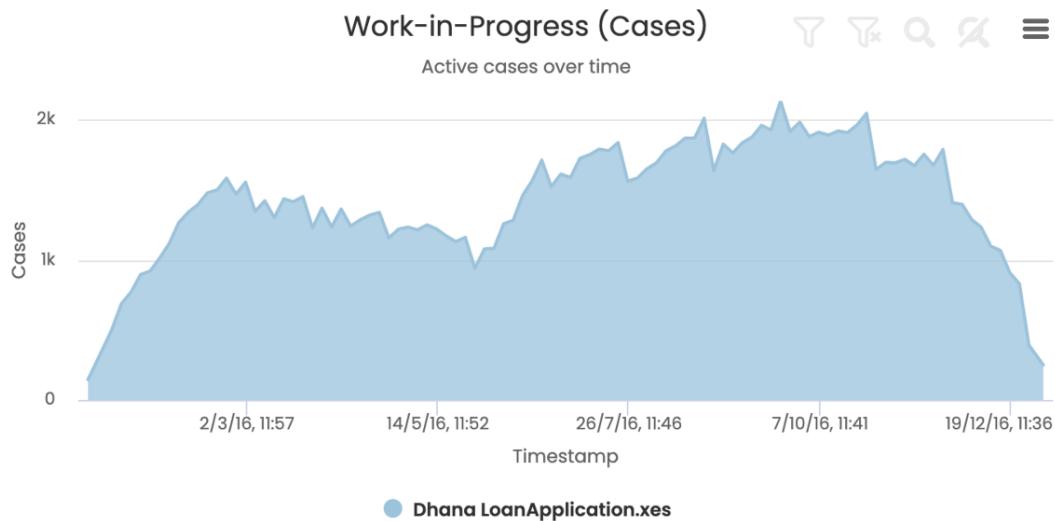
- Reason:** This activity evaluates potential fraud cases, taking an average of **3.24 days**, and is resource-intensive.
- Significance:** While crucial for risk management, the extended processing time slows down the overall workflow. Addressing this issue could enhance processing speed and reduce bottlenecks in the system.

A_Cancelled

- Reason:** This activity represents cases canceled after a long processing time, averaging **3.9 weeks**, near the completion stage.
- Significance:** Canceled cases consume resources and delay other activities. Improvements in customer communication or root cause analysis of cancellations could prevent such delays and improve overall process efficiency.

These three activities were chosen because they represent significant bottlenecks at different stages of the process, contributing to increased WIP. By targeting these areas, actionable insights can be gained to streamline operations and enhance overall process efficiency.

Question 1: Is the WIP constant over time?



Based on the graph, we can observe that the "Work-in-Progress (WIP)" data does not remain constant over time. The analysis is as follows:

1. Observations of WIP Changes:

- **Initial Increase:**
In the early phase, the graph shows a rapid increase in WIP. This indicates a surge in the number of tasks being processed due to the activation of initial processes.
- **Mid-Phase Plateau:**
During the mid-phase (March to June), the WIP stabilizes, forming a plateau. This indicates that the process is maintaining a balance between inflow and outflow, with no significant increase or decrease in active cases. However, this plateau might also suggest potential bottlenecks or resource limitations that prevented further progress during this period.
- **Final Decrease:**
In the later phase (from October onward), the graph shows a gradual decline in WIP. This suggests that the process is entering the completion stage, with the number of tasks being processed decreasing over time.

2. WIP Consistency:

- WIP is **not constant** over time.
- The WIP graph shows significant fluctuations, with no periods of consistent values.
- This variability suggests that multiple factors—such as processing speed, bottlenecks, or rework—are influencing the process over time.

Question 2. What factors can explain the change(s) in WIP?

The focus is on W_Validate application, W_Assess potential fraud, and A_Cancelled.

<Analyzing WIP Changes at the Occurrence of These Activities>

O_Refused & A_Cancelled

Characteristics:

This group represents activities that interrupt the process.

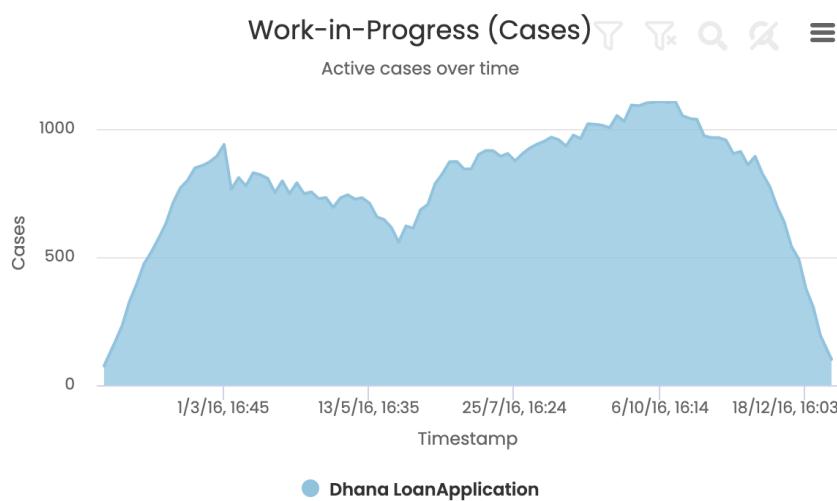
- **O_Refused (Rejection):** Occurs during the evaluation stage, leading to the termination of the process.
- **A_Cancelled (Cancellation):** Happens when the customer voluntarily cancels or the process halts due to unmet conditions.

Purpose:

These two activities have a significant impact on WIP changes.

- In the early stages, rejections and cancellations can accumulate, contributing to WIP increases.
- In the later stages, as rejections and cancellations are resolved or decrease, they can help reduce WIP levels.

Retain all cases that contain 'Activity' ['O_Refused' OR 'A_Cancelled']



1. WIP Increase Phase (January to Early March)

(1) O_Refused (Rejected Cases)

Characteristics: Initially, the proportion of rejected cases was low, but from January to March, rejection activities gradually increased, contributing to the rise in WIP.

Causes:

- Mismatch between customer requirements and process criteria.

- Stricter review procedures, leading to a higher rejection rate.

(2) A_Cancelled (Cancelled Cases)

Characteristics: Cases canceled by customers steadily accumulated, contributing to the increase in WIP.

Causes:

- Changes in customer requirements. Process interruptions due to insufficient document preparation.

2. WIP Plateau Phase (April to Mid-September)

(1) Interaction Between O_Refused and A_Cancelled

Characteristics: During this period, both rejected and canceled cases occurred consistently, leading to a plateau in WIP.

Bottleneck Possibilities:

- Rejected cases may have remained in a pending state due to requests for reconsideration.
- Canceled cases may have required rework, exacerbating the stagnation.

(2) Process Resource Limitations

Characteristics: Insufficient resources (manpower, systems) slowed down the resolution of pending cases.

Result: Prolonged bottleneck effects, maintaining WIP at a steady level.

3. WIP Decrease Phase (Mid-October to End of December)

(1) Decrease in O_Refused (Rejected Cases)

Characteristics: The number of rejected cases declined, reducing WIP.

Improvement Factors:

- Relaxation of review criteria or adjustments to better align customer requirements with the process.

(2) Decrease in A_Cancelled (Cancelled Cases)

Characteristics: A sharp decline in canceled cases contributed to the reduction in WIP.

Improvement Factors:

- Improved communication with customers and stabilization of the process.
- Clearly defining conditions at earlier stages to prevent unnecessary cancellations.

4. Conclusion: Key Causes and Improvement Suggestions

O_Refused (Rejected Cases):

Adjusting review criteria and understanding customer requirements to reduce early-stage rejections.

A_Cancelled (Cancelled Cases):

Preventing cancellations through clear communication with customers and step-by-step guidance.

Addressing Process Bottlenecks:

Deploying additional resources and improving review speed to reduce pending cases and alleviate bottlenecks.

****Additional filtering****

First (W_Handle leads & W_Call incomplete files): Separate Filtering

Why were they filtered separately?

- W_Handle leads and W_Call incomplete files have significantly different characteristics:
 - W_Handle leads: Focuses on processing leads (customer data) in the early stages, crucial for analyzing potential bottlenecks.
 - W_Call incomplete files: Deals with specific errors (incomplete files), addressing issues in the middle stages that could either resolve problems or contribute to WIP stagnation.

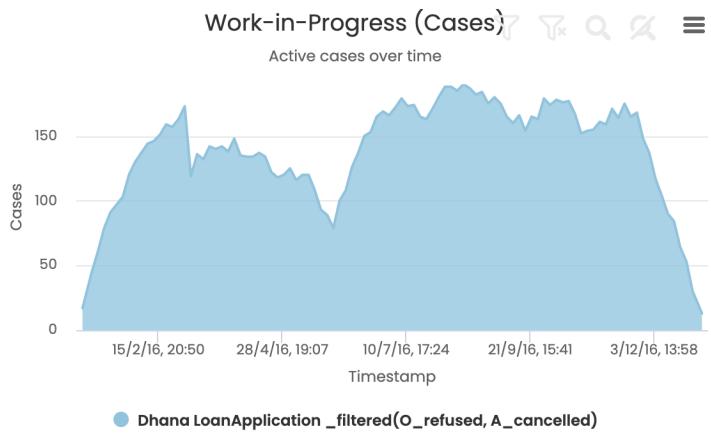
Reason for separate filtering:

- To individually isolate and assess the impact of each activity on WIP:
 - For example, whether bottlenecks occurred in W_Handle leads or if delays in handling errors in W_Call incomplete files led to WIP increases.

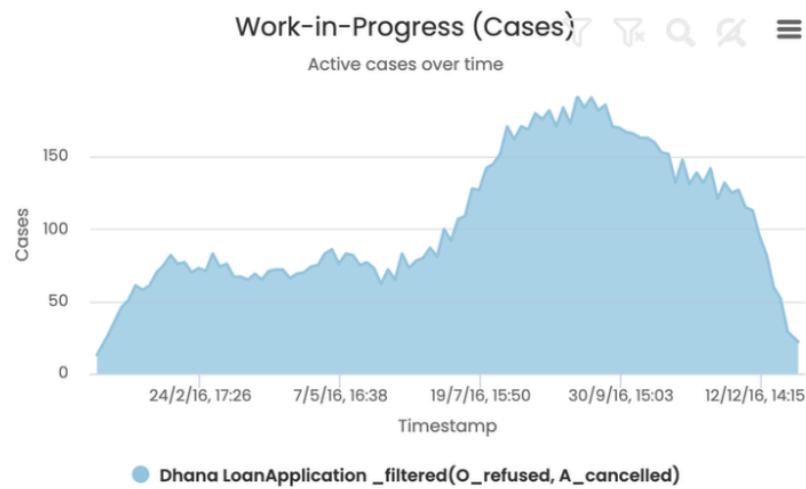
Conclusion:

In this initial stage, activities were analyzed separately to identify more detailed causes, as they likely influenced WIP changes independently.

Retain all cases that contain 'Activity' ['W_Handle leads']



Retain all cases that contain 'Activity' ['W_Call incomplete files']



Analysis of WIP Change Factors:

First Graph (Filtered by W_Handle leads):

- **Sharp Initial Increase:** The W_Handle leads activity for filtered cases shows a high level of activity in the early phase.
- **Mid-Level Stability and Gradual Decline:** The graph flattens or shows a gradual decline as it moves into the middle phase.
- **Insights:** W_Handle leads is strongly tied to the increase in activity during the initial stages of cases, indicating its significant role in early WIP formation.

Second Graph (Filtered by W_Call incomplete files):

- **Slower Initial Increase:** Unlike W_Handle leads, W_Call incomplete files activity shows a more gradual rise rather than a sharp spike in the early phase.
- **Significant Mid-Phase Increase:** A clear peak forms in the middle phase, indicating a period of concentrated activity for this task.

- **Decline Phase:** Activity drops sharply in the later phase, suggesting its primary role was limited to a specific time window.

Comparative Analysis:

Commonalities:

- Both graphs show a gradual rise in activity in the early phase, followed by a decrease in activity after the middle phase.
- Both activities significantly impacted WIP during their respective periods, with a noticeable drop in activity as WIP declined.

Differences:

- **W_Handle leads:** Primarily contributed to WIP growth during the early stages, emphasizing its crucial role in initial WIP formation.
- **W_Call incomplete files:** Had a significant impact in the mid-phase, acting as a complementary activity (e.g., addressing missing files) and contributing to WIP growth during that specific period.

Conclusion:

W_Handle leads primarily influenced WIP formation in the early stages, while W_Call incomplete files played a more significant role in mid-phase WIP growth. The difference in timing highlights how WIP growth factors vary depending on the characteristics of activities at different stages of the process.

<Analysis of WIP Increase and Stagnation Causes>

W_Handle leads & W_Validate application

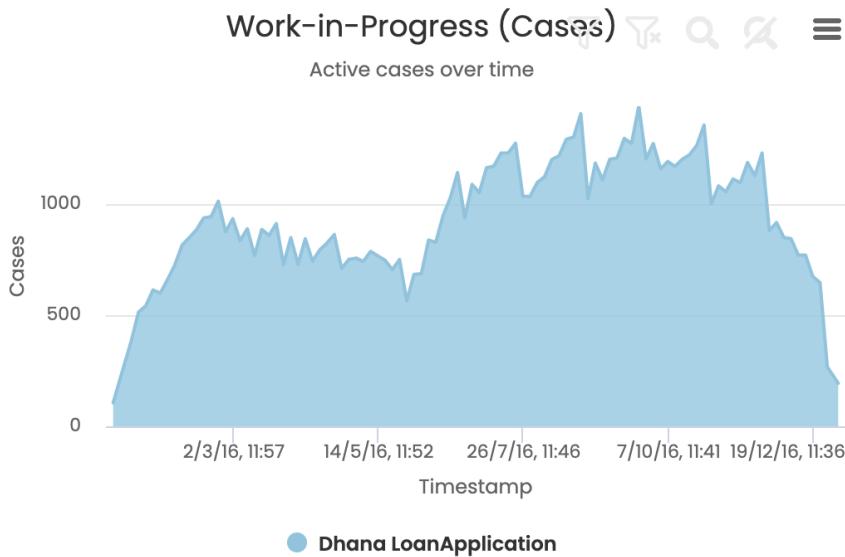
Characteristics:

- This group represents activities involved in advancing process stages.
- **W_Handle leads:** An initial activity focused on processing and reviewing lead (potential customer) data.
- **W_Validate application:** A verification activity in the review stage that assesses customer application data.

Purpose:

- This group can contribute to bottlenecks in the process or act as a cause for WIP stagnation.
- Specifically, if the processing speed of these two activities slows down, they are likely to lead to increased or stagnant WIP levels.

Retain all cases that contain 'Activity' ['W_Handle leads' OR 'W_Validate application']



Key Observations:

Sharp Increase in WIP (July to October):

- During this period, there is a significant increase in activity volume, resulting in bottlenecks.
- **W_Handle leads** appears to be a primary cause, as delays in lead processing contribute to the WIP surge.
- **W_Validate application** may also exacerbate the bottleneck effect.

Analysis of Stagnation:

- From July to October, WIP remains steady, indicating stagnation.
- This stagnation may be due to limited resources in bottleneck areas or insufficient parallel processing capabilities.

Factors Contributing to Stagnation:

W_Handle leads:

- A potential cause is insufficient processing capacity or an imbalance in the distribution of leads.
- Automation of lead processing or an increase in resources may be necessary.

W_Validate application:

- The slowdown in application validation processes impacts workflow efficiency.
- Simplification, automation, or prioritization adjustments in the validation process are recommended.

Conclusion:

Causes of WIP Increase and Stagnation:

- The high frequency and delays in **W_Handle leads** and **W_Validate application** are primary contributors.
- These activities likely caused bottlenecks or significant stagnation during specific periods, disrupting the overall process flow.

Improvement Suggestions:

- Reduce the average processing time for **W_Handle leads** and **W_Validate application** or enable parallel processing to alleviate bottlenecks.
- Additionally, redistribute workloads to balance the strain on resources and enhance process efficiency.

****Additional filtering****

(O_Refused, W_Call incomplete files, A_Cancelled): Combined Filtering

Why were they filtered together?

- These three activities serve as common factors for WIP stagnation and reduction:
 - O_Refused (Rejection): Causes process interruptions due to stricter evaluation criteria, resulting in pending tasks.
 - A_Cancelled (Cancellation): Tasks halted at the request of customers.
 - W_Call incomplete files: Rework associated with incomplete documents leading to delays.

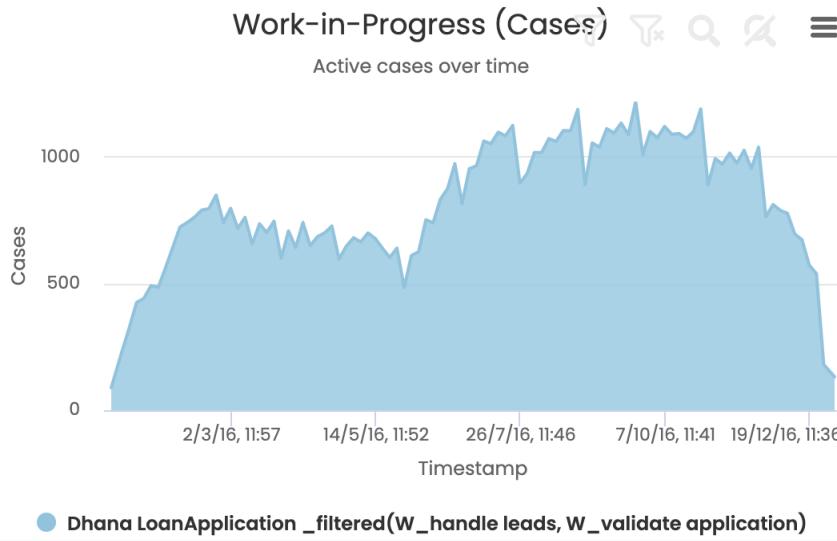
Reason for combined filtering:

- These activities are highly interconnected and likely to interact:
 - For example, incomplete files (W_Call incomplete files) may lead to rejections (O_Refused).
 - Customer cancellations (A_Cancelled) may also occur at similar stages.
- Efficiency: Instead of analyzing them individually, the goal was to assess their collective impact on bottlenecks and WIP stagnation.

Conclusion:

In this stage, the combined filtering was used to analyze the cumulative effects of these activities on WIP changes, considering their potential to simultaneously contribute to bottlenecks.

Retain all cases that contain 'Activity' ['O_Refused' OR 'W_Call incomplete files' OR 'A_Cancelled']



1. WIP Increase Phase (January to Early March)

- Characteristics:
 - A sharp increase in WIP is observed in the early phase of the graph.
 - W_Handle leads activity is highly active during this stage as part of the initial process activation.
 - The influx of new leads exceeds the processing speed, leading to a rise in WIP.
- Causes:
 - A high volume of incoming leads creates bottlenecks in the initial stages.
 - Low frequency of O_Refused activities in this phase, which gradually increase over time.

2. Slight Increase or Stability in WIP (April to June)

- Characteristics:
 - WIP shows a slow increase or remains steady during this phase.
 - W_Handle leads continues to play a key role, but the overall processing speed shows slight improvement.
 - W_Validate application begins to contribute more significantly to delays.
- Causes:
 - Accumulated canceled cases (A_Cancelled) increasingly affect WIP during this period.
 - W_Call incomplete files leads to rework, as incomplete data issues grow, further contributing to delays in the mid-process.

3. WIP Peak and Stagnation - Key Focus (July to October)

- Characteristics:
 - WIP reaches its peak during this period and remains stagnant for a prolonged time.
 - Severe bottlenecks are observed.

- W_Handle leads and W_Validate application are identified as major contributors to this stagnation.
- Contributing Factors:
 - O_Refused (Rejected Cases):
 - Increased rejection rates due to stricter screening criteria lead to an accumulation of pending cases.
 - This causes significant blockages in the process flow.
 - W_Call incomplete files (Incomplete File Activities):
 - Growing volume of corrections for missing data results in delays.
 - This disrupts the workflow and increases the waiting time for other tasks.
 - A_Cancelled (Cancelled Cases):
 - Process interruptions caused by customer-initiated cancellations.
 - These cases further add to the workload, making the WIP stagnation worse.
- Conclusion:
 - This period represents the most critical bottleneck phase, with W_Handle leads and W_Validate application being the primary culprits.
 - The interaction of O_Refused, W_Call incomplete files, and A_Cancelled significantly contributed to prolonged WIP stagnation.

4. WIP Decrease Phase (November to December)

- Characteristics:
 - A sharp decline in WIP is observed in the later phase of the graph.
 - The process moves toward completion, clearing the backlog of pending cases.
- Causes:
 - Reduced activity in W_Handle leads and W_Validate application, indicating the resolution of bottlenecks.
 - Decrease in O_Refused and A_Cancelled activities, leading to stabilization of the process.
- Conclusion:
 - Enhanced resource allocation and streamlined workflows likely contributed to this phase.
 - Efficient handling of completion activities resulted in the rapid decline of WIP.

Conclusion: Key Factors Driving WIP Changes

- Bottlenecks in W_Handle leads and W_Validate application activities.
- Process interruptions caused by O_Refused and A_Cancelled cases.
- Delays in handling W_Call incomplete files.

<Time-Series Analysis of the Entire Process> W_Complete application & A_Create application

Characteristics:

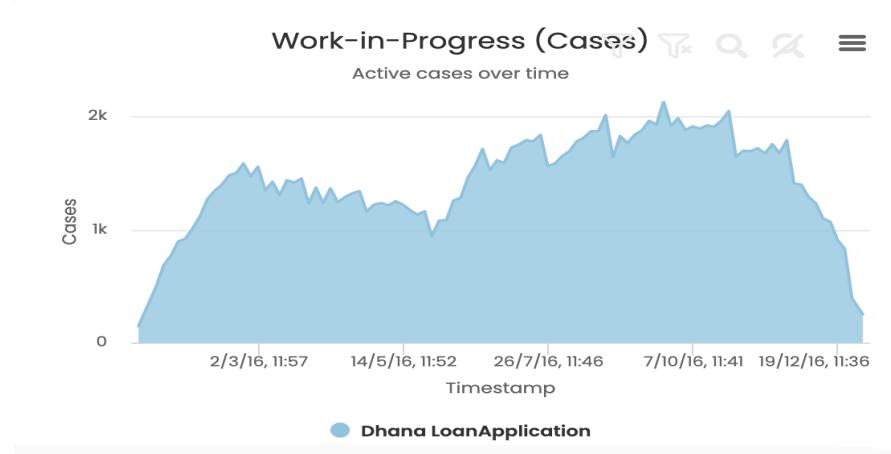
This group represents the start and end stages of the process.

- **A_Create application:** Generates new tasks (cases), contributing to an increase in WIP.
- **W_Complete application:** Completes tasks, leading to a reduction in WIP.

Purpose:

Since this group handles the start and end of the process, it has a direct impact on the rise and fall of WIP.

Retain all cases that contain 'Activity' ['W_Complete application' OR 'A_Create Application']



WIP Increase Factors:

WIP shows a sharp increase during the early phase (January to March) and mid-phase. This is likely due to the influx of new cases generated by the **A_Create Application** activity. By comparing the rate of task creation to the completion rate, it can be inferred that the creation rate exceeded the completion rate during this period, resulting in a rise in WIP.

WIP Plateau Factors:

In phases where WIP remains stable(July to September), it is likely that process activities are being executed steadily.

There may be a consistent balance between completion-related activities such as **W_Complete application** and the task generation from **A_Create Application**.

WIP Decrease Factors:

In the later phase (after November), WIP shows a decreasing trend.

This indicates that **W_Complete application** activities were executed dominantly, rapidly completing cases.

During this time, the influx of new cases may have slowed down, or the completion rate may have exceeded the creation rate.

Conclusion:

- **A_Create Application:** Drives WIP increases by generating new cases.
- **W_Complete application:** Contributes to WIP reduction by completing cases.

****Additional filtering****

(W_Handle leads, O_Refused, A_Cancelled): Filtered Together

Why were they filtered together?

- While W_Handle leads, O_Refused, and A_Cancelled represent activities from different process stages, they collectively provide insights into bottlenecks and WIP stagnation:
 - W_Handle leads: An early-stage activity that can cause bottlenecks and contribute to WIP growth.
 - O_Refused & A_Cancelled: Activities that interrupt the process and contribute to WIP reduction.

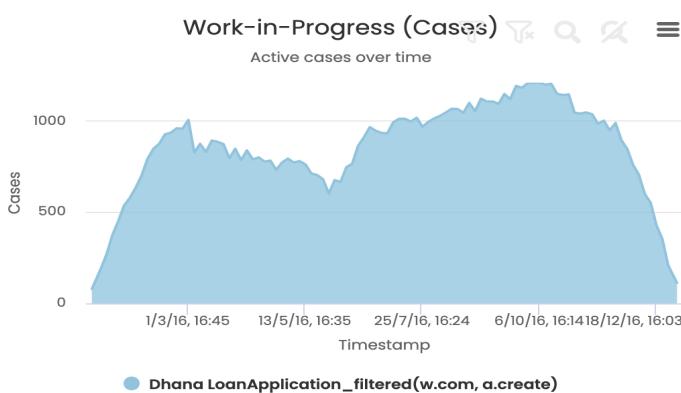
Reasons for filtering together:

- W_Handle leads contributes to the accumulation and stagnation of WIP, while rejection and cancellation (O_Refused, A_Cancelled) are closely tied to these stagnated cases, potentially reducing WIP.
- Need for combined analysis:
 - If delays occur in W_Handle leads, the affected tasks may be subsequently rejected (O_Refused) or canceled (A_Cancelled), leading to WIP reduction.
 - This combined filtering allows for a better understanding of these interconnected interactions and their simultaneous impact on WIP changes.

Conclusion:

In the third stage, these three activities (W_Handle leads, O_Refused, A_Cancelled) were analyzed together because they likely interact to influence WIP growth, stagnation, and reduction. This approach provided a comprehensive view of their collective impact on WIP dynamics.

Retain all cases that contain 'Activity' ['W_Handle leads' OR 'O_Refused' OR 'A_Cancelled']



Interpretation of the WIP Graph

1. Initial Increase Phase (January ~ Early March):

Activities like **W_Handle leads** maintained a significant number of cases in the early process, leading to a gradual rise in WIP.

This phase marks the influx of new cases, resulting in an increase in WIP.

2. Stable Fluctuation Phase (Mid-March ~ July):

The processing speed of activities remained steady during this period, with rejection (**O_Refused**) and cancellation (**A_Cancelled**) occurring at consistent rates.

As a result, WIP showed minor fluctuations and maintained a relatively stable form.

3. Peak and Plateau Phase (Late July ~ Early October):

A bottleneck in lead processing (**W_Handle leads**) likely occurred, or fewer cancellations and rejections were happening, causing WIP to plateau.

At this stage, the number of pending cases increased, potentially slowing down the processing speed.

4. Decrease Phase (Mid-October ~ Late December):

Frequent rejections and cancellations during this period contributed to a decline in WIP. This reduction reflects the activation of process completion activities.

Key Factor Analysis

- **W_Handle leads:** This activity played a crucial role in maintaining WIP during the initial and middle phases of the process.
 - Increased time spent on lead management could lead to bottlenecks.
- **O_Refused:** Rejection activities contributed to WIP reduction during phases where rejections occurred frequently.
- **A_Cancelled:** Cancellation activities removed stalled cases from the process, accelerating WIP reduction.

Conclusion

The changes in WIP are primarily caused by bottlenecks in lead processing activities (**W_Handle leads**) and the frequency of rejection and cancellation activities (**O_Refused** and **A_Cancelled**).

The peak in WIP is explained by delays in lead processing, while the reduction is attributed to an increase in termination activities.

This highlights the need to optimize the bottleneck period, particularly between July and October.

Recommendations for Process Optimization

1. Optimization of Lead Processing (**W_Handle leads**)

Issue:

Delays in lead processing cause bottlenecks.

Solutions:

- **Optimize task allocation:** Redistribute resources or implement automation tools to enable parallel processing of lead tasks.
- **Set lead priorities:** Establish policies to prioritize leads based on their importance or status.
- **Employee training:** Enhance the skills of staff to increase lead processing speed.

2. Management of Rejections (O_Refused) and Cancellations (A_Cancelled)

Issue:

Rejections and cancellations unnecessarily prolong the process or cause rework.

Solutions:

- **Early Filtering:** Use automated tools to identify and filter out unqualified leads early in the process, reducing unnecessary workload.
- **Root Cause Analysis:** Analyze rejections and cancellations to improve customer alignment and refine initial screening criteria.

3. Reduction of Process Lead Time

Issue:

The overall process duration increases, exacerbating bottlenecks.

Solutions:

- **Automation:** Use RPA to streamline repetitive tasks and increase speed.
- **Parallel Processing:** Redesign workflows to allow simultaneous execution of independent tasks.
- **Real-Time Monitoring:** Track lead times with tools like Apromore to detect and resolve inefficiencies quickly.

4. Data-Driven Improvements

Issue:

The root causes of bottlenecks are not accurately identified.

Solutions:

- **Bottleneck Analysis:** Use Apromore dashboards to identify the most frequent bottleneck areas and their root causes.
- **Simulations:** Test potential process changes to assess their impact on WIP before implementation.

Summary

To enhance process efficiency:

- **Optimize lead processing** by introducing parallel workflows and task prioritization.
- **Reduce rejections and cancellations** through early lead filtering and root cause analysis.
- **Shorten lead times** using automation and real-time monitoring.
- **Adopt data-driven improvements** with accurate bottleneck analysis and simulation tools.

By addressing these areas, WIP levels can be stabilized, bottlenecks minimized, and overall process efficiency improved.

9. Conclusion

Analyzing the Dhana bank's Loan Application Process, we have found several insights about the questions posed. Also, during our analysis a number of observations were made, there were several re-design recommendations to improve the outcome of the process in a positive way and to increase the completeness of the overall process.

Main Insight

The greater the number of incomplete file requests made by banks, the greater the likelihood that the customer will not finally receive a loan. However, there is no basis to support this, and other factors affecting the final result, such as the speed and accuracy of interactions with customers or the number of new proposals, were expected, and several significant factors were actually identified.

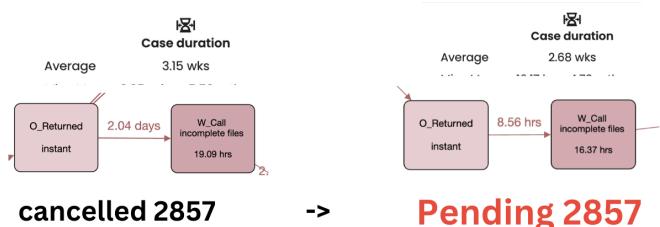
There are three factors that have a significant impact on the final outcome.

1. Time spent in WallIncomplete Files
2. Time spent requesting incomplete files after Return occurs
3. If a second offer is made due to incomplete documents, there is still a high probability that the loan will be approved. However, in this process, customers feel uncertain about the progress of the loan and the possibility of cancellation may increase if the waiting state is prolonged.

Redesign Solution

1. Improving the process of requesting and notifying documents to be submitted

After a return occurs in the absence of documents, you should immediately ask the customer for incomplete files and shorten the period as much as possible. This prevents customers from canceling their loans. The solution we propose is to send repeated notifications within a certain period of time after requesting a document submission. We establish a system that sends repeated notifications within a certain period of time if the customer does not submit documents. This can induce customer response and minimize waiting time due to insufficient documents. Clear guidance on document requests: Provide specific notices when requesting documents so that customers can accurately know and submit the required documents. This can reduce the cancellation rate due to insufficient documents.



If O_return occurs and notification requests are supported up to 1 day, this will result in a reduction in incomplete file request time from 2 days to 8 hours, which will reduce the overall process duration by a whopping 0.47 weeks. This will allow us to turn 2857 cancelled cases into pending cases.

2. Present customer customization for the second offers

If a second offer is made due to insufficient documentation based on what we analyzed in Tasks 4 and 7, we can increase loan approval by providing more favorable conditions for the customer. Automate the process of submitting incomplete documents, quickly adjust conditions and resend proposals to speed up the approval process. By providing customized offers tailored to the customer's needs and circumstances, we can increase approval rates and simplify the loan approval process.

3. Using self-check table

By self-checking, the number of incomplete file cases itself is reduced, and cases that do not meet the basic conditions cannot be applied.