IBM Cloud Pak for Business Automation Demos and Labs

IBM Process Mining

Lab Guide - Use Process Mining to Get Insights into Client Onboarding Workflow

IBM Porcess Mining 1.14.3
Lab Version 2.5

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Contents

1 Introduction

1.1 Process Mining

Process mining is a family of techniques in process management that support the analysis of actual business processes based on event logs. In Process Mining, a business process is a collection of activities or tasks related to a specific service or product to serve an established business goal, such as processing a loan application.

During process mining, specialized data mining algorithms are applied to identify trends, patterns, and details in event logs recorded by an information system. Process mining aims to improve process efficiency and understanding of processes.

More technical information about IBM Process Mining: https://ibm.box.com/v/IBMProcessMiningTechIntro

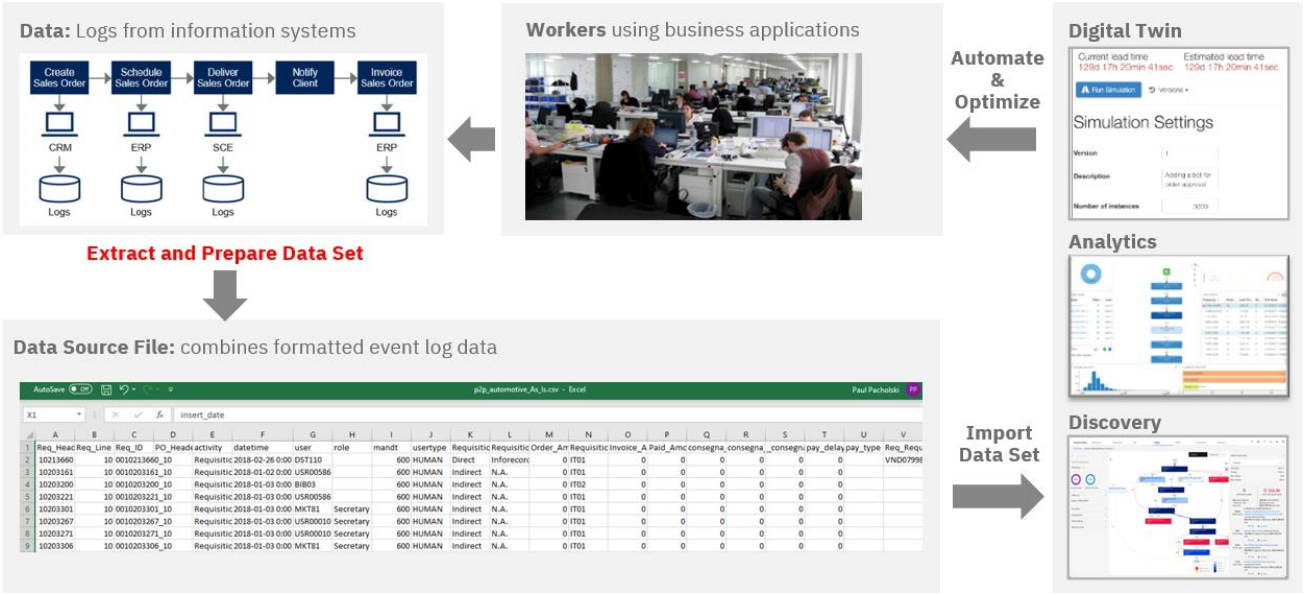


Figure 1. Process Mining

Two initial steps must be completed before we can start using Process Mining tools (see the **Extract and Prepare Data Set** Step in the Figure above, marked in red):

1. Generating and extracting audit log data from applications intended for process mining.
2. Converting the raw audit log data to the format acceptable by IBM Process Mining.

The good news is that if we use IBM Business Automation Workflow with IBM Business Automation Insights, IBM Process Mining can automatically perform data set extraction and data preparation and create a Process Mining Project for you!

1.2 Using IBM Business Automation Insights for Data Extraction

IBM Business Automation Insights enables the capture of events generated by the operational systems implemented with the IBM Business Automation products. Captured events are aggregated into business-relevant KPIs and presented in dashboards so that lines of business have a real-time view of their operations.

More technical information about IBM Business Automation Insights: https://ibm.box.com/v/IBM-BAI-Tech-Intro

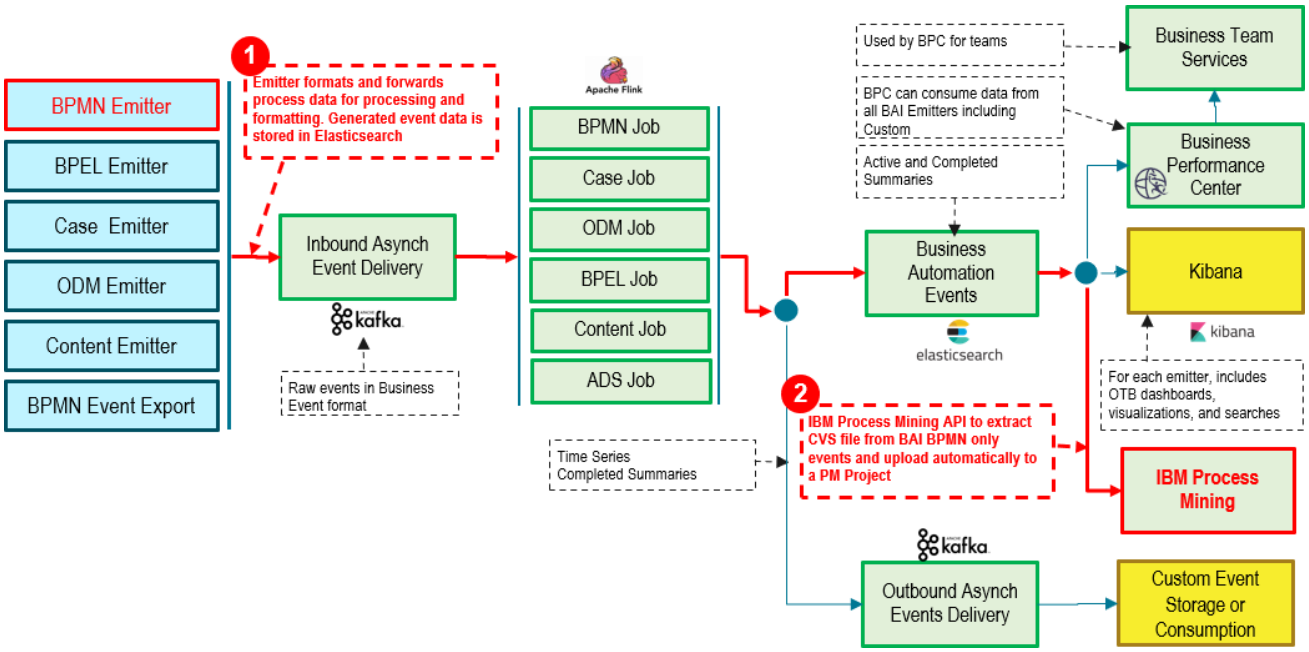


Figure 2. IBM Business Automation Architecture. Path 1: Data Generation. Path 2: Process Mining Project Creation

IBM Business Automation Insights emitters send business and process lifecycle data to the Elasticsearch datastore. The only programming effort required when designing a Workflow is to define what and when to emit the data from Cases and Processes - see **Path 1** in Figure 2 above, marked in red.

1.3 Using IBM Process Mining API for Data Preparation

IBM Process Mining provides several APIs to transfer IBM Business Automation Workflow process data from BAI Elasticsearch directly to an IBM Process Mining project. This capability helps avoid costly manual data preparation and automates process data importing directly into the IBM Process Mining project- see **Path 2** in Figure 2 above, marked in red.

The two key IBM Process Mining APIs are (see Figure 3 below):

1. API to retrieve all Process Apps that have events in Elasticsearch, and
2. API to convert events from all Processes in a selected Process App to CSV files and send them to the IBM Process Mining server.

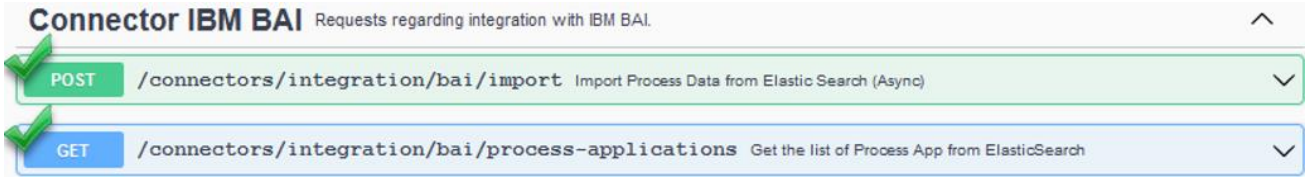


Figure 3. IBM Process Mining API for IBM Business Automation Insights

For more details, see a recorded demo: https://ibm.box.com/v/BAI-2-PROCESS-MINING-EXPORT and lab instructions: https://ibm.box.com/v/BAI-2-PM-EXPORT-LAB

1.4 Client Onboarding Solution

1.4.1 Client Onboarding Use Case

Focus Corp is a business services provider that offers various services for different industries. Focus Corp uses a fully automated solution called Client Onboarding to onboard clients to the services it provides.

Watch this video to see how client onboarding requests are completed: https://ibm.box.com/v/CLIENT-ONBORDING-USE-CASE

1.4.2 Client Onboarding Workflow Implementation Details

We implemented the Client Onboarding use case using most of the capabilities of IBM Cloud Pak for Business Automation. We selected the Case Solution capability of IBM Business Automation Workflow for orchestration. There are several reasons for this choice. The use case is ad-hoc event-driven (new situations may arise unexpectedly, e.g., backing documents expiring or new regulations requiring additional documents). A knowledge worker often decides the next steps in the Process. Finally, the use case is document-intensive and requires data persistence beyond the end of a process (we want to go back and reopen a case).

Figure 4 below shows the implementation details. Each Case Activity is implemented using a BPMN Process. Each step in a BPMN Process includes a series of Process steps. Each process step emits BAI events that are stored in Elasticsearch.

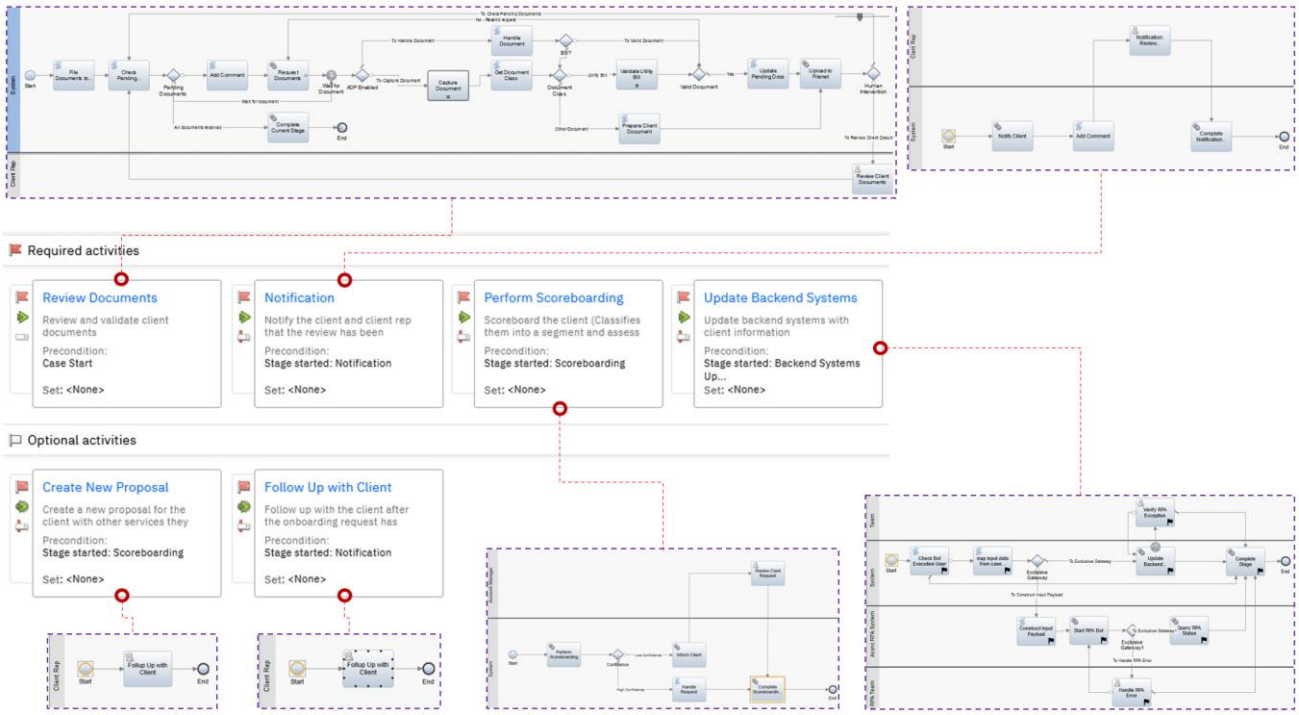


Figure 4 Client Onboarding Solution - Implementation Details

1.5 Lab Objectives

This lab demonstrates how IBM Process Mining leverages the Client Onboarding event data captured in BAI to identify automation and business improvement opportunities.

The primary objective is to introduce you to the rich features and functions of IBM Process Mining through the experiential learning of identifying process improvement opportunities.

If you need to dive deeper into any particular topic while working through the instruction or after completing the lab, please look at the documentation.

Let's get started!

2 Lab Setup

2.1 Import Lab Files

_1. Download the following files. You will use them in this lab:

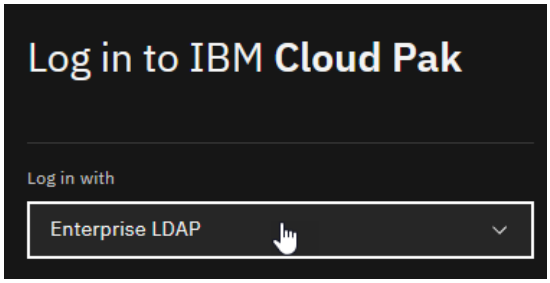
File	Link
Client Onboarding.zip	https://ibm.box.com/v/CO-LAB-DATASET
Client Onboarding.idp	https://ibm.box.com/v/CO-LAB-IDPFILE

2.2 Open IBM Process Mining Application

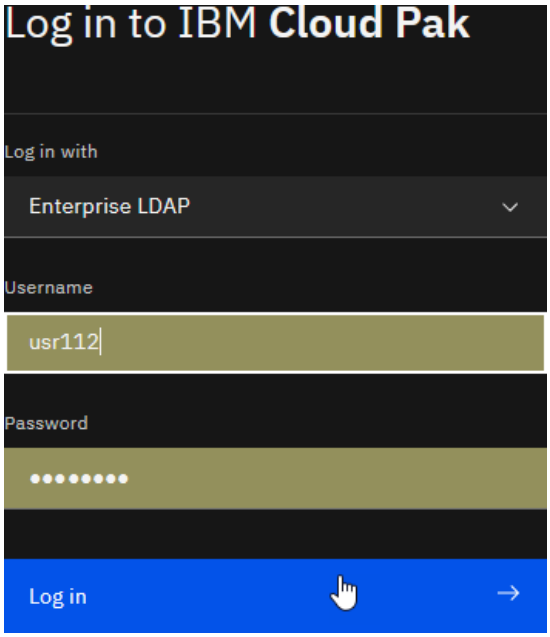
If you are performing this lab as a part of an IBM event, access the document that lists the available systems and URLs along with login instructions. For this lab, you will need to access **IBM Process Mining**.

_1. Start your browser and use the **IBM Process Mining** link

_2. Click **Enterprise LDAP**



_3. Enter your username and password, and then click **Log in**



3 Exercise: Use Process Mining to Get Insights into Client Onboarding Workflow

3.1 Create and Configure the Client Onboarding Process

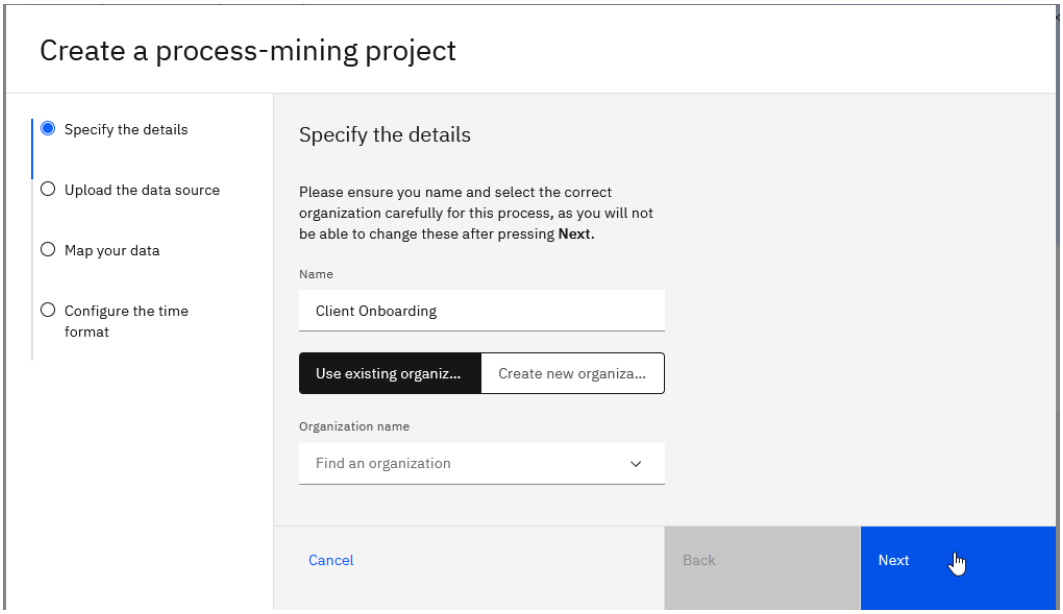
Typically, the Process Mining API that extracts process data from Elasticsearch would create a Process for you, populate it with the process data, and even map the mandatory data columns (process ID, time-stamp, and activity name). In this lab, you will not be using the API directly. However, the data set you will use in this lab to create your Process Mining Project was extracted from the Elasticsearch data store using the IBM Process Mining API.

3.1.1 Create the Client Onboarding Process

Note: IBM Process Mining tools use the term Process for a **Process Mining Project**. From now on, we will refer to the Project Mining Project as a **Process**.

_1. Click on the **Create a process-mining project** tile.

_2. For *Process Title,* enter **Client Onboarding** and click **Next.**



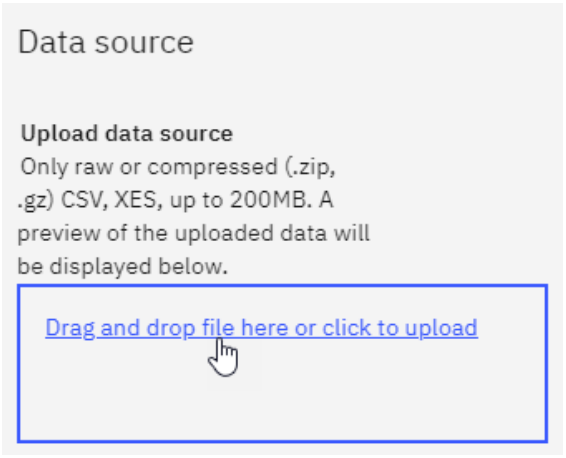
3.1.2 Upload Process Data and Configuration Settings

In addition to the CSV file generated by extracting process data from IBM Business Automation Insights (BAI), we will also upload a process configuration. The process configuration file includes predefined process filters, Client Onboarding dashboards (which we will use to analyze Client Onboarding processes), and the process reference model.

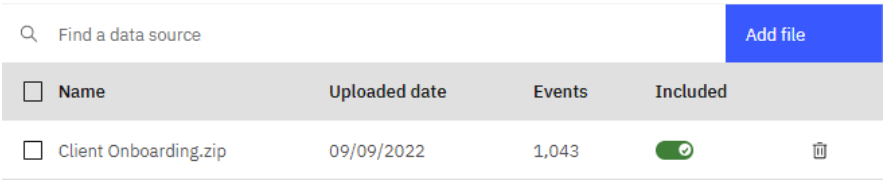
The reference model of a process describes its expected standard behavior in terms of activities and Workflow. A process owner usually designs the reference model in the BPMN or XPDL language and then imports it to a Process Mining project. A reference model is optional; it is not required to visualize a process.

_1. **Drag and drop** (or click to upload) the **Client Onboarding.zip** file you downloaded earlier.

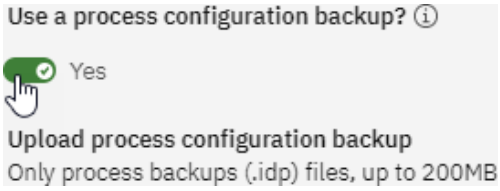
The supported Data Sources file format is a zipped CSV file.



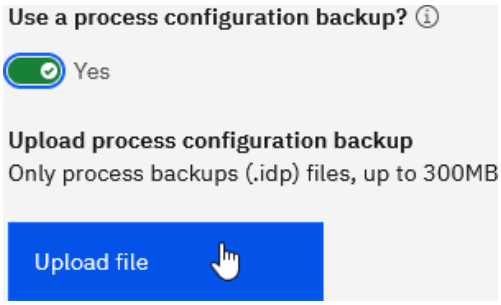
You should now see your file uploaded.



_2. Select **Yes** for Use a process configuration backup.

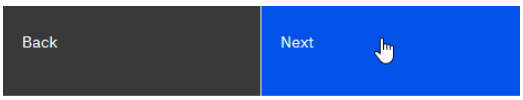


_3. Click **Upload file**



_4. Select the **Client Onboarding.idp** file you downloaded earlier.

_5. Click **Next**

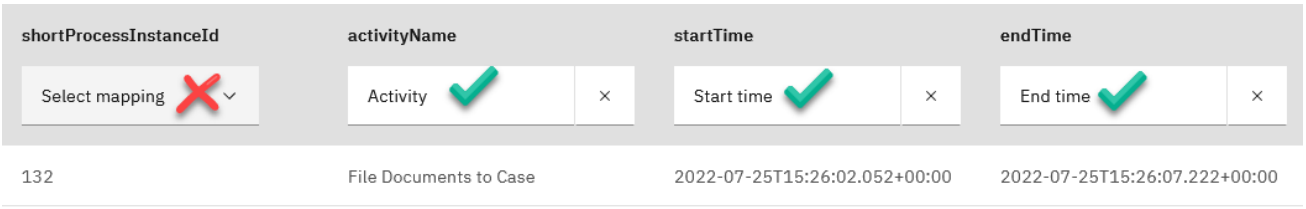


3.1.3 Perform Additional Data Mapping

The Process Mining API automatically extracted the data from BAI, created a Project for us, and even performed the compulsory data mapping. It mapped the essential fields required to generate Process visualization. The required fields are:

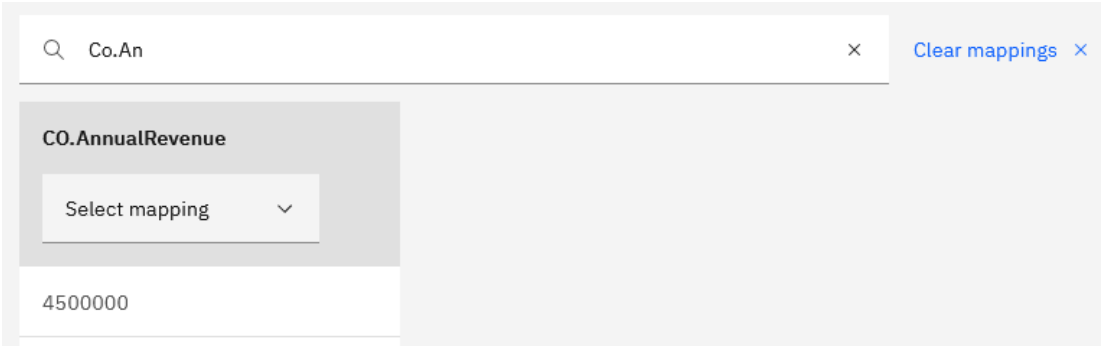
- **Process ID.** There can be multiple columns; in our dataset, we only have one – the Case Reference ID: CO.ReferenceID)
- **Activity.** In Our dataset, it is the name of an Activity in a Process - activityName
- **Time Stamp.** Only one is required (start or stop of an activity). Because BPMN processes emit this lifecycle data to BAI, our dataset has start and stop time stamps (startTime and endTime). This is important because both time stamps allow us to compute Activity durations!

Notice that some additional fields are already mapped (**green tick**), such as Resource, Role, and other business data fields. We mapped these fields for you. The **red x** shows examples of the fields that were not mapped.

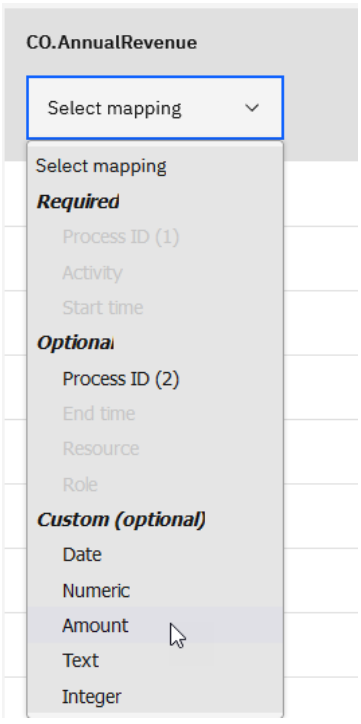


An Event represents the execution of an Activity in a process. Events are rows in the data source CSV file.

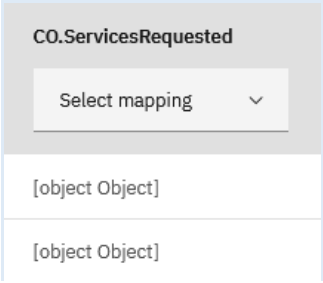
_6. In the search bar, enter **CO.An.**



_7. In the **CO.AnnualRevenue** from the dropdown, select **Amount.**



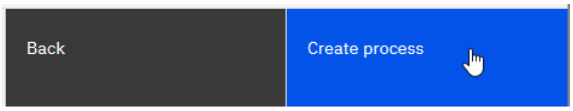
Note: Because the Co.ServicesRequest variable in BPMN Process is a List of Business Objects, and the IBM BAI BPMN Emitter does not serialize complex types, it is marked as [object Object], and the data is inaccessible in Process Mining.



_8. After you have mapped all the columns, click **Next**

_9. On the "Configure the time format" page, click **Next**

_10. On the "Custom configuration" page, click **Create Process**



The Client Onboarding process should now open in Model View...

3.2 Gain Business and Technical Insights into Client Onboarding

3.2.1 Explore Model View

The Model View depicts the Client Onboarding Process, highlighting the most frequent activities, paths taken, and the "real" Process versus the expected Process. A picture is worth 100 words!

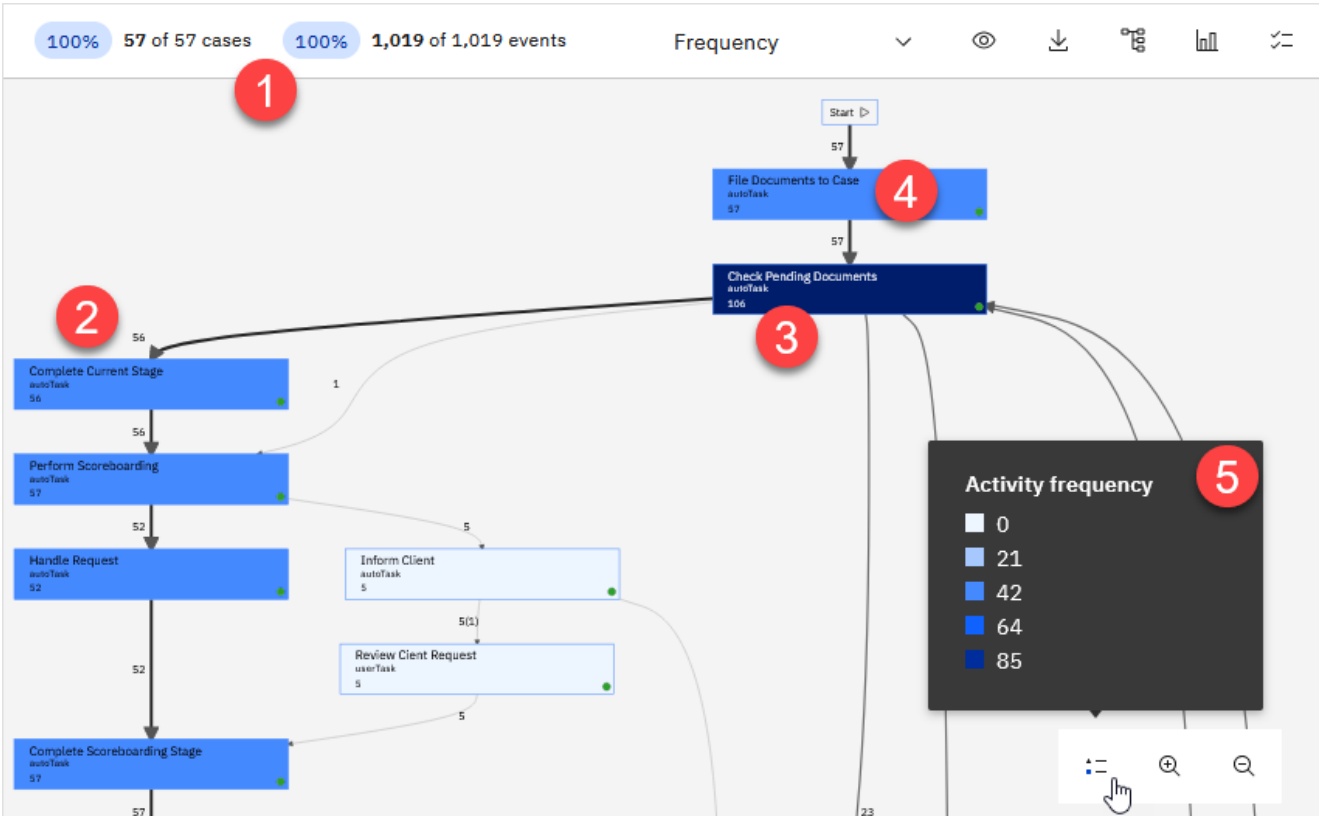
Our data set only has one Process ID field (Reference ID). IBM PM supports the visualization of multiple processes, each having a different Reference ID.

When initially opened, the Model opens in the Frequency View, showing all the **Cases** discovered in the imported data.

In Process Mining a case is an instance of a process. In flat processes, a different Process ID defines a new case. In our data set, a Case represents all activities executed to onboard a customer.

In multi-level processes, the combination of process ids defines a new case. Each process-id represents a different sub-process that contributes to executing a single Case. See this link for more details about multi-level process mining.

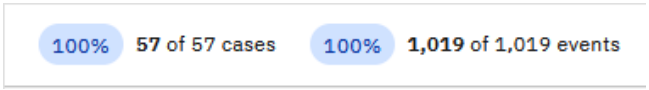
The dark blue color highlights the most frequent activities, while the bold arrows highlight the most frequent transitions. In this way, you can identify the most frequent paths between activities of the Process.



Hint: Use the mouse wheel to zoom and the mouse right button to move the Process diagram.

Let's examine the default Frequency View:

1. The top left view shows the number of Cases and all the associated events (rows in the CSV file). 100% indicates that we have no filters and are seeing all the data. The number of events represents the number of rows in the data set, Each row representing an invocation of an Activity.

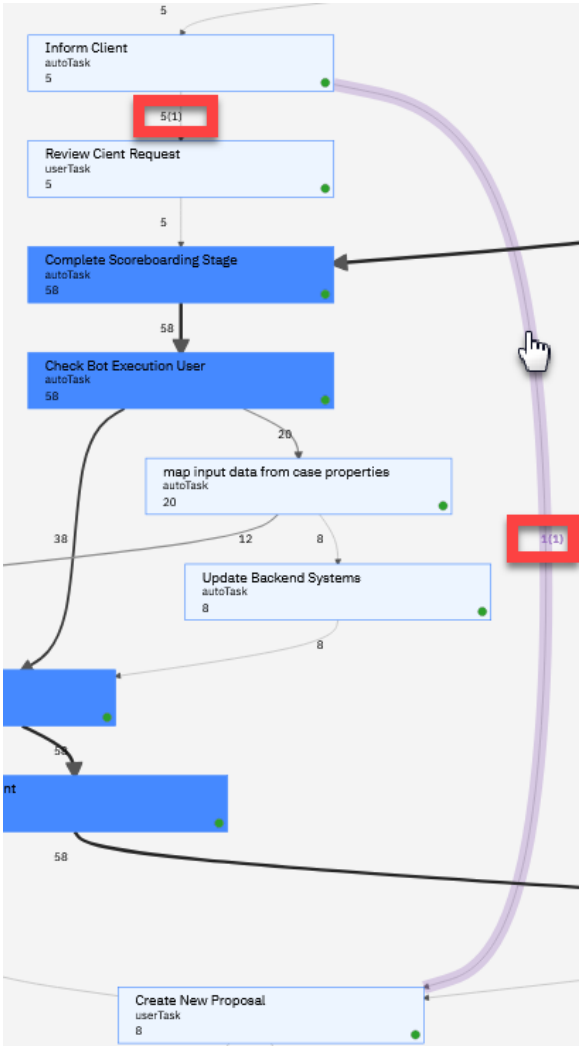
   

2. The numbers next to the lines show how often a particular path to a given activity has been followed.
3. The numbers within the rectangles show the number of times the Activity is performed. The Activity count is typically a sum of the numbers on the inflowing paths.
4. The description in the rectangles includes the name of the Activity and the roles that performed the Activity.
5. The color saturation of Activity reflects how often an activity was invoked (the frequency). See the Activity frequency legend.

3.2.2 Investigate Parallelism in Client Onboarding

The Client Onboarding solution users can easily create multiple Optional Activities, resulting in parallel process paths. Parallel paths may lead to longer case lead times because the next Activity cannot start until all the parallel Activities are complete. Let's see how we can identify when this occurs and what users are involved.

_1. Click the **Path** from **Inform Client** to **Create New Proposal** Activity

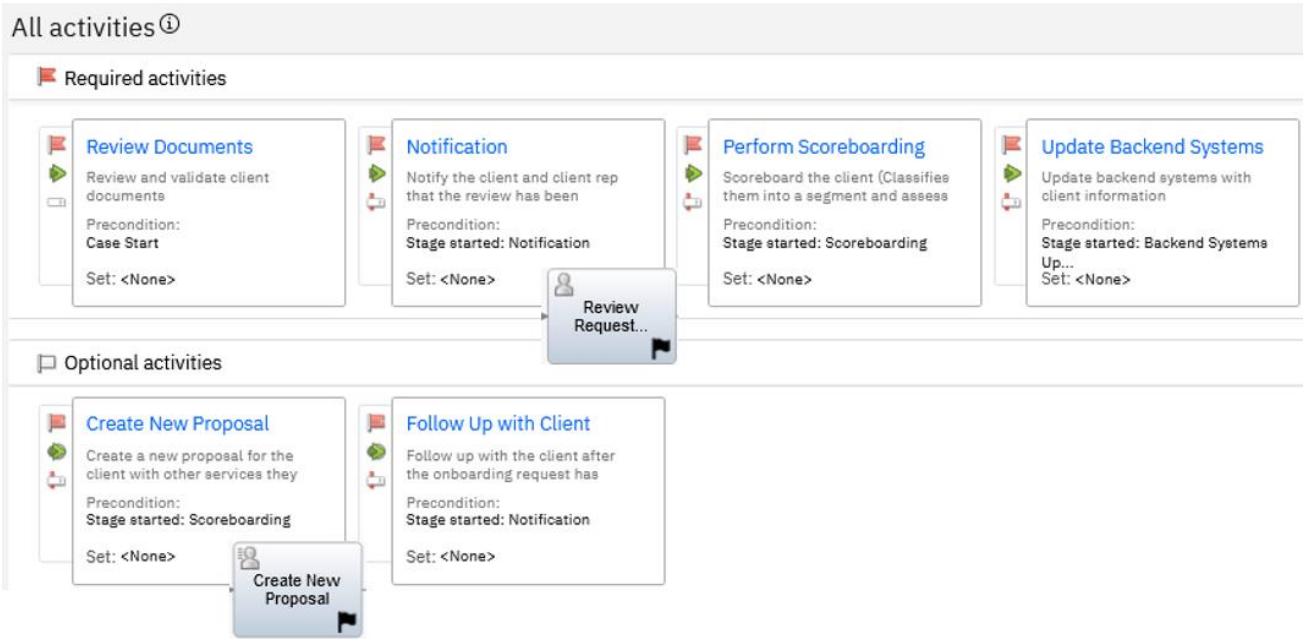


The "()" on the transition links (marked by **red squares**) indicates parallelism.

5(1) leading to *Review Client Request* – there were five transitions, and one of them occurred in parallel with another transition

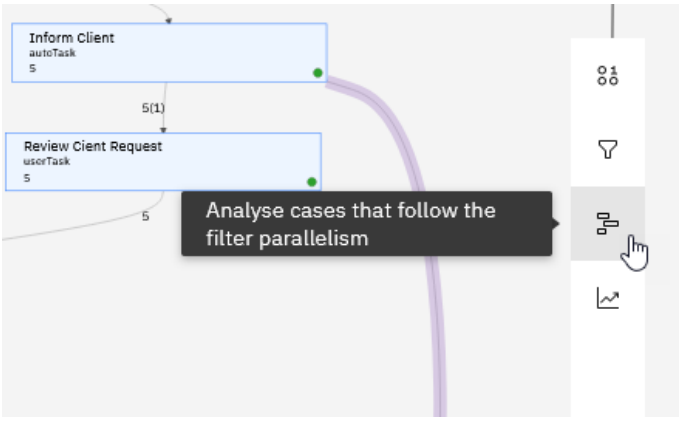
1(1) leading to *Create new Proposal* – there was one transition, and one of them occurred in parallel with another transition

Looking back at the Case Solution, we can see that Client Rep., while working on the Review Request… human task, also started the Create New Proposal optional activity from the Case UI.



Note: If you want to learn about Process Parallelism in IBM Process Mining, read this article by Patrick Megard.

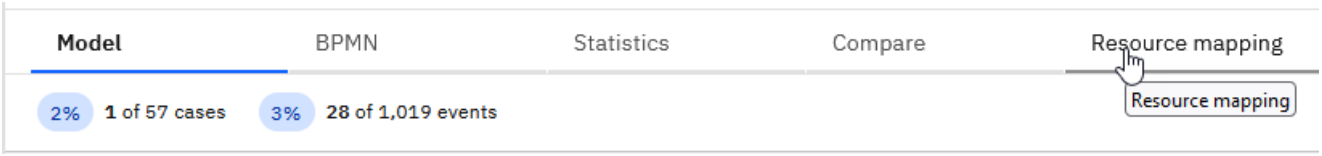
_2. Click **Analyze cases that follow the filter parallelism.**



You should now see that only 1 Case included this parallelism, and you can examine all the steps involved in detail.

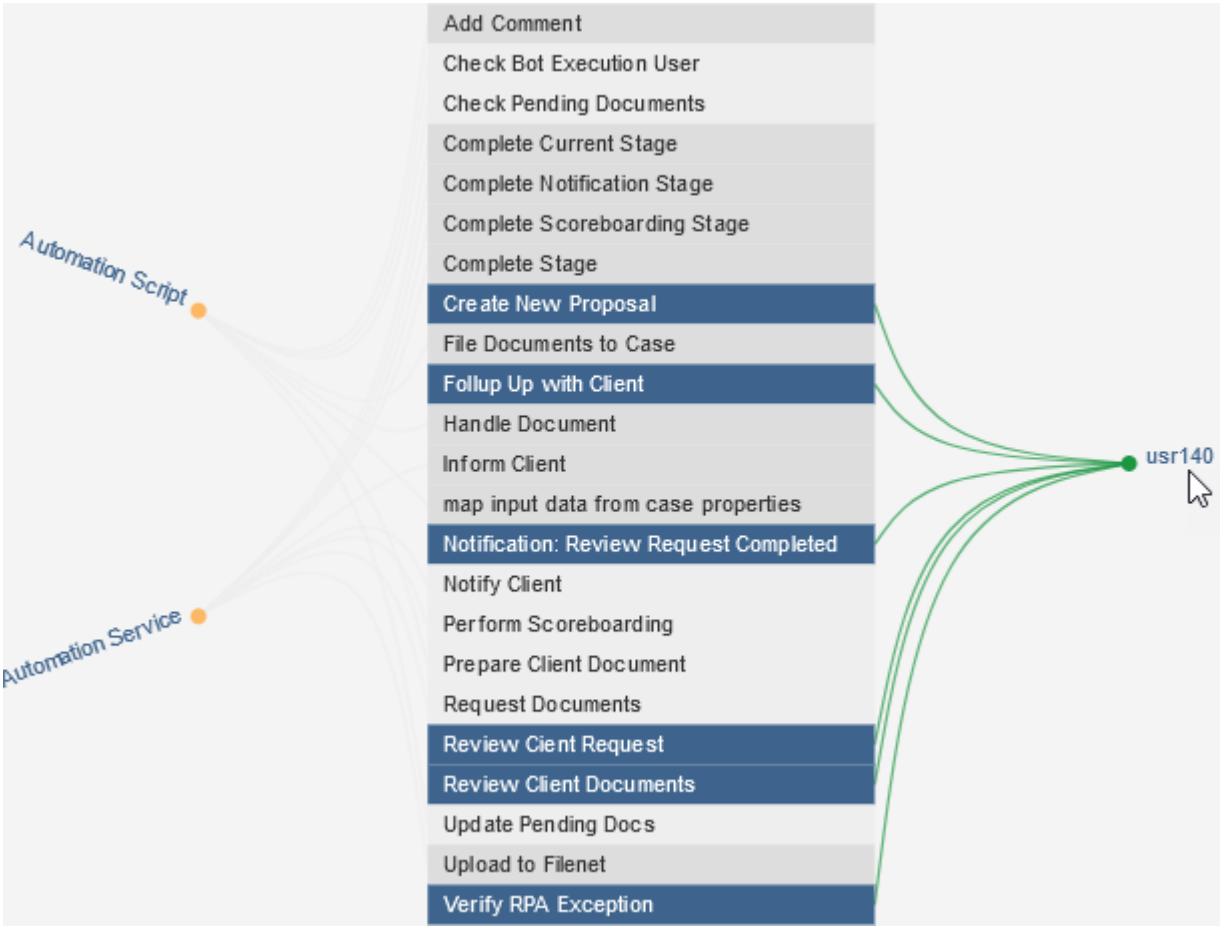
Let's find out the user who worked on this Case!

_3. Click **Resource mapping**



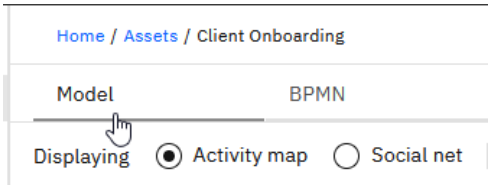
_4. Click the **green dot** close to **usr140**

_5. All the manual activities were completed by usr140, including the parallel activities *(Review Client Request* and *Create New Proposal*).

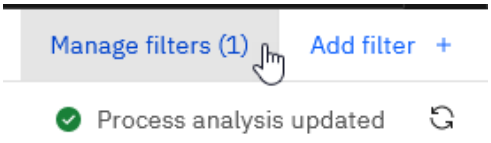


The Resource Mapping capabilities include Activity Map View to discover how resources and roles are involved in each Activity and Social Net View to discover and analyze the relationships that are formed within a process. Use this documentation link to learn more.

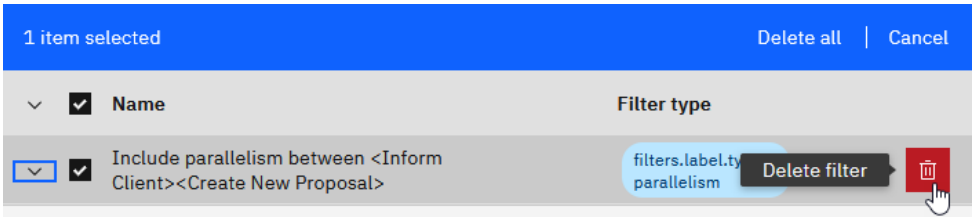
_6. Click **Model** tab



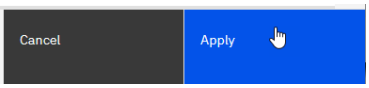
_7. Click the **Manage filters (1)**.



_8. Select the **Include parallelism...** filter and click the **Delete filter (garbage can).**



_9. Click **Apply.**



Business Insight: We identified where the parallel paths occur, their impact on the Process, and what users are involved.

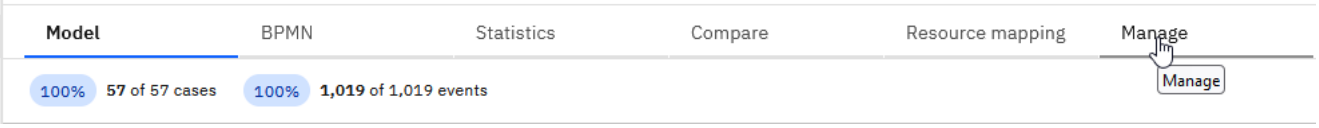
3.2.3 Identify the Most Costly Activities

The following formula defines activity cost:

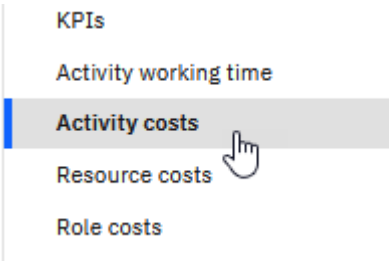
Activity Cost = Activity Standard Cost + (Average Working Time * Avg Resource or Role Cost)

The variables in the formula are hardcoded in the Manage section.

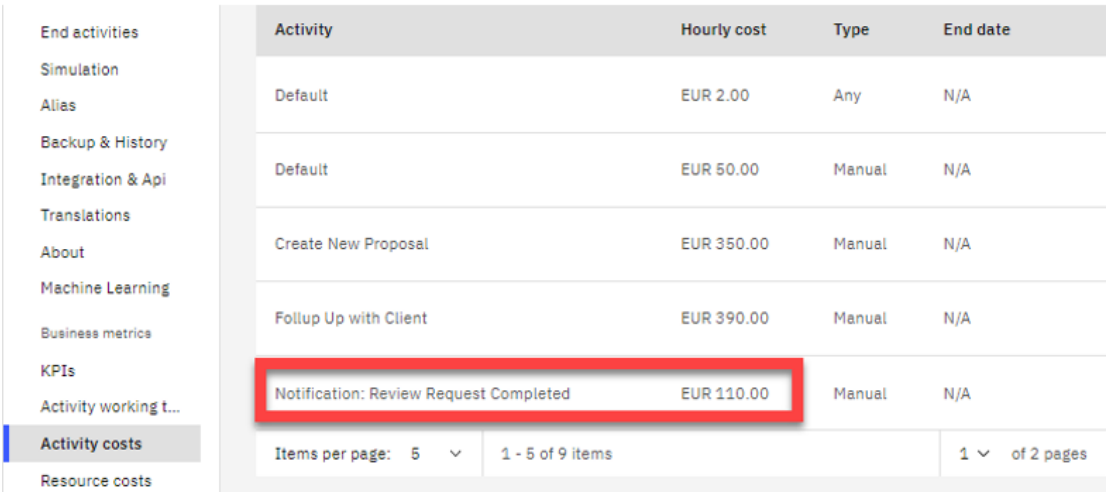
_1. Click the **Manage** tab.



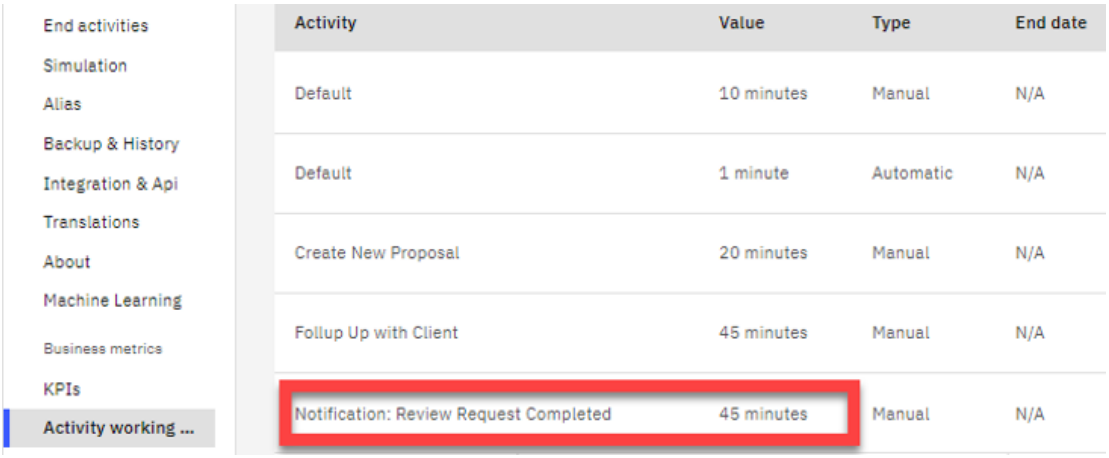
_2. Click **Activity costs**



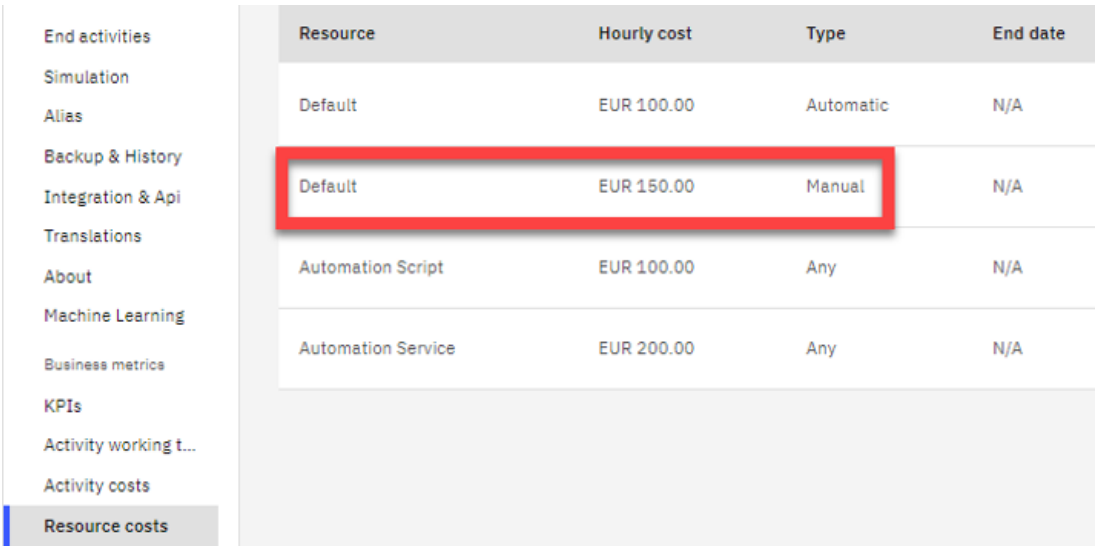
_3. Note the Activity costs. The Manual activities have their costs set individually. Specifically, note EUR 110 for the Notification: Review Request Completed.



_4. Click **Activity working time** and note 45 minutes for the Notification: Review Request Completed.

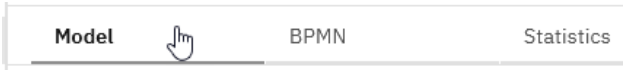


_5. Click **Resource costs** and note EUR 150 for all manual (human) tasks.

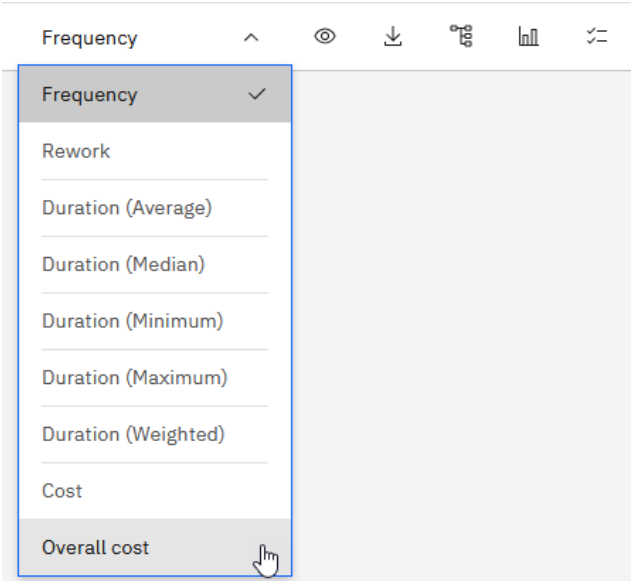


Note: Automated tasks have a lower rate than human tasks because the duration of automated tasks is significantly lower than that of automated tasks, so the overall costs (duration * cost) are considerably smaller for automated tasks.

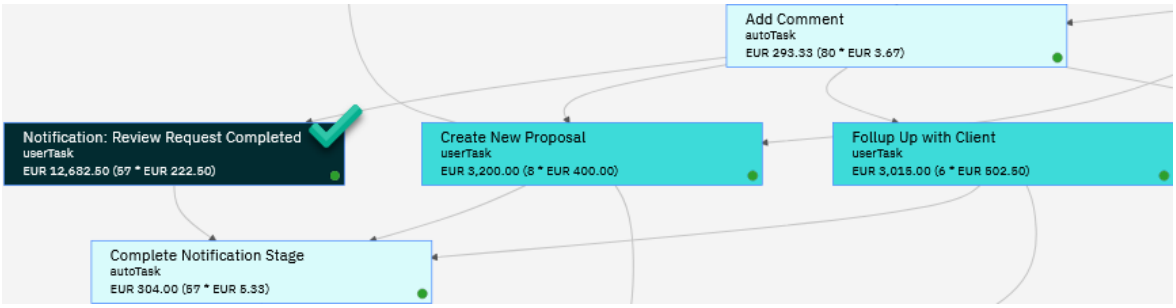
_6. Click **Model** tab



_7. For View mode, select **Overall cost**



_8. Note that the Overall Cost (the sum of all 57 cases) is the highest for the darkest Activity: **Notification: Review Request Completed.**



_9. Let's examine how IBM Process Mining calculated this Activity's overall cost.

Activity Cost = Activity Standard Cost + (Average Working Time * Avg Resource or Role Cost)

57 - is the number of Cases in our dataset. This Activity was executed once in each of the 57 cases.

EUR 222.50 = **EUR 110** (Activity Cost) + **0.75** hour (Activity Working Time) * **EUR 150** (Resource cost)

Business Insight: We identified the most costly Activity in the Client Onboarding Process.

3.2.4 Identify Rework

Activities repeated more than once in the same process instance are defined as Rework. Activities with Rework typically reveal process inefficiencies that can be targeted for process re-engineering.

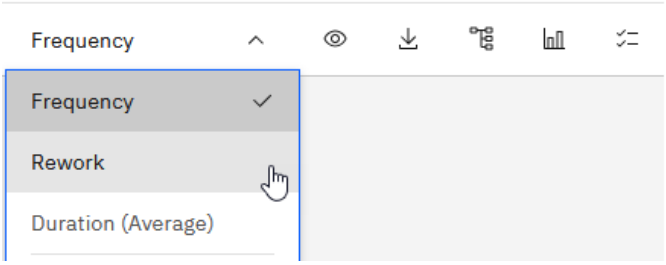
IBM Process Mining automatically discovers two kinds of Rework:

1. If you see an arrow that goes out and falls into the same Activity, it is called a **self-loop**.
2. When the Activity is repeated several times in the same process instance, it is called **instance-looping**.

Let's identify the Activity with a large Rework value and then identify the Process to which this Activity belongs. This will help us to identify the root causes of the Rework.

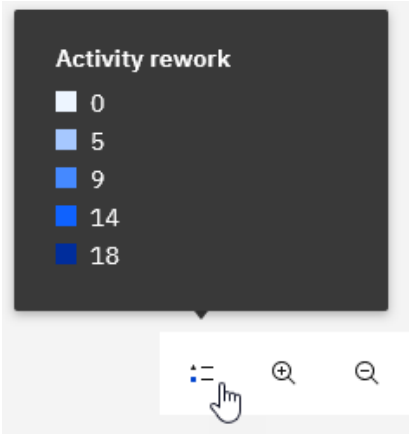
3.2.4.1 Instance Looping Rework

_1. Select **Rework** to change from Frequency to Rework view

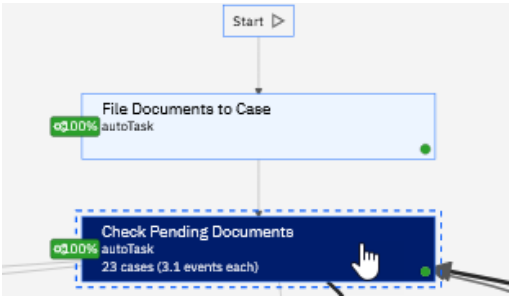


_2. Open the **Legend**

Note that Activities with Rework are marked according to the legend. The darker the activity color, the more a rework occurred in the same process instance.



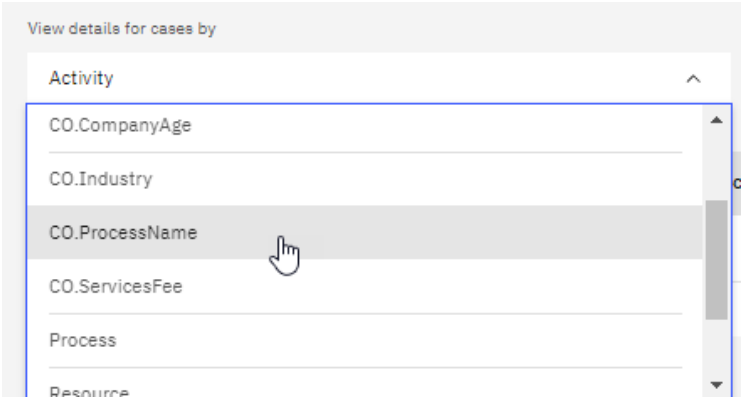
_3. Click **Check Pending Documents** activity – an example of *instance-looping*



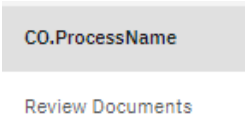
- This Activity is repeated (Rework) in 23 out of 57 cases
- On average, the Activity repeats 3.1 times during the 23 Cases where it occurs.
- This Activity has a 100% automation ratio (meaning it is automated)

_4. Click **Show activity statistics**

_5. For *View details for cases by,* select **CO.ProcessName**

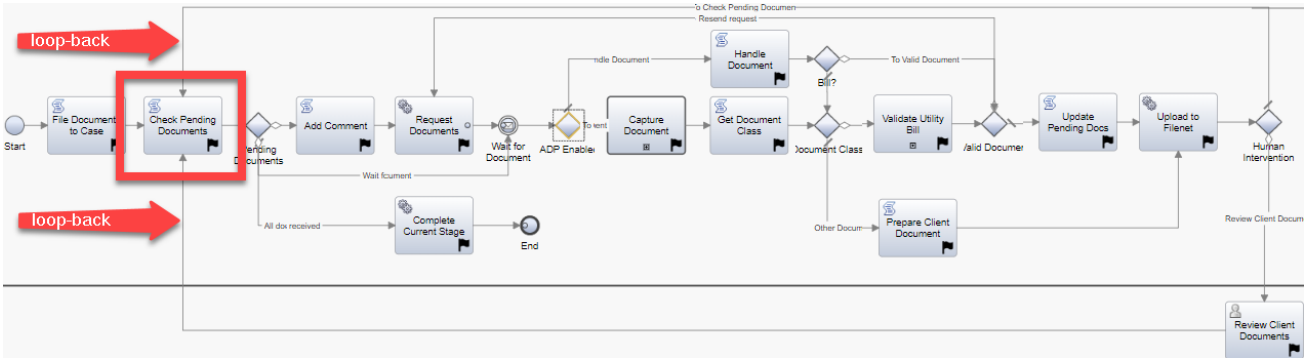


_6. Note that the BPMN Process name is *Review Documents.*



Let's examine the *Review Document* process to understand what causes the Rework we identified in the Process Mining Project.

The Rework occurs when the documents uploaded are incorrect or rejected when inspected by a human.

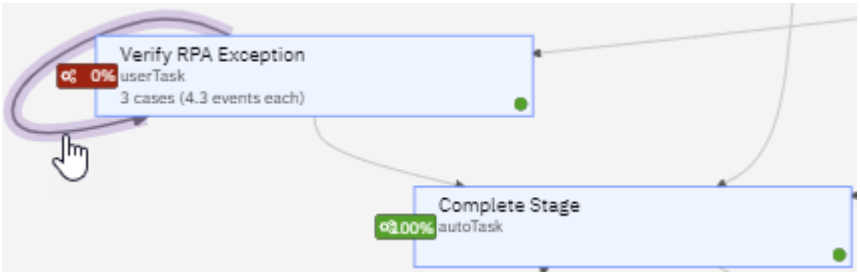


Business Insight: We now know the impact of Rework on the process metrics, such as lead time and costs. Business action is to ensure the customer provides all documents and that the documents are correct when requesting a new service for the first Time.

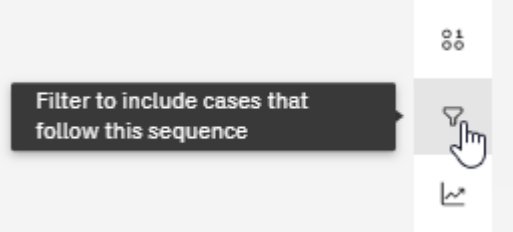
_7. Click **X** to close the *Activity statistics* window.

3.2.4.2 Self Looping Rework

_1. Click the **self-link** on the **Verify RPA Exception** activity.

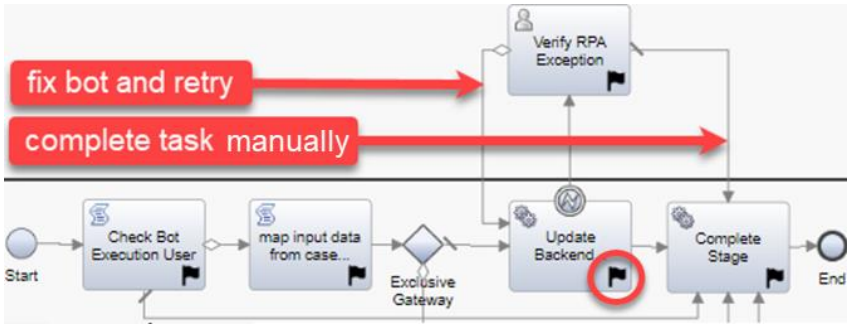


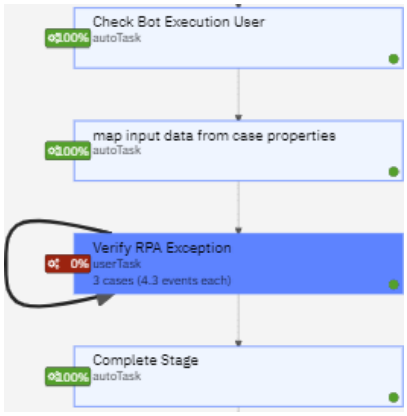
_2. Click **filter to include cases that follow this sequence.**



_3. Let's examine how the Process Mining diagram correlates with the BPMN process...

Let's compare the BPMN diagram of the *Update Backend System* process (left) with the IBM Porcess Mining Model View (right).

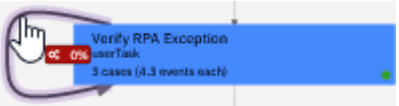




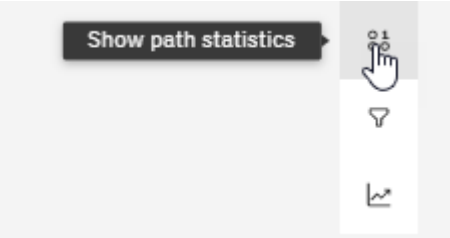
When the RPA Bot fails, the Event Emitter (black flag in the **red circle**) on the Update Backend System activity does not fire because the Activity never completes. The Event Emitter fires upon the completion of the Activity (it appears on the right-hand side of the Activity; hence it is a post-event). Therefore, we see Verify **RPA Exception Activity** immediately after **map input data from case properties** Activity.

The user that completes the Verify RPA Execution activity is responsible for either fixing the bot execution (restart the Bot in Bot Control Center) or performing manually the task that the Bot performs.

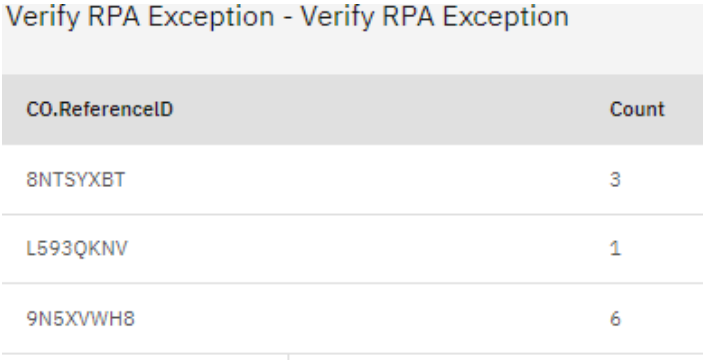
_4. Click the **self-loop** path.



_5. Click **Show path statistics.**

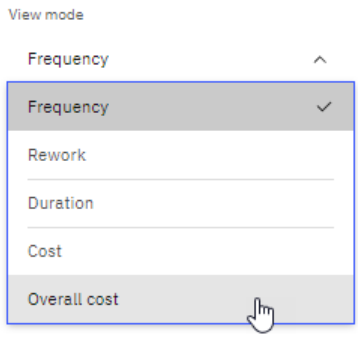


_6. Note the Case IDs and the number of retries between 1 and 6



_7. Click **X** to close the *Path statistics* window

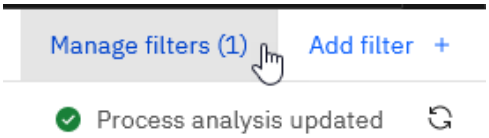
_8. Change *View mode* to **Overall cost**



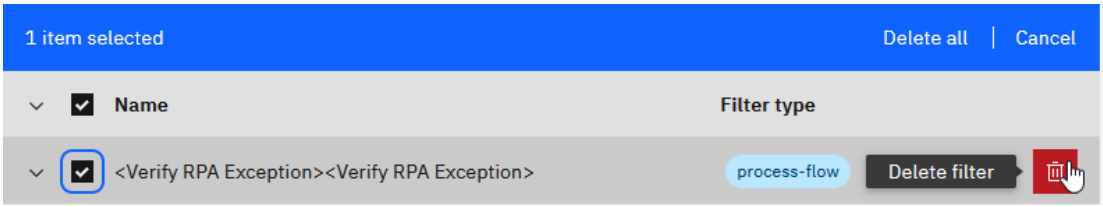
_9. Note the high overall Cost of having 3 cases, including the Verify RPA Exception activity. EUR 4,387.50! This Cost is avoidable.

Business Insight: We discovered self-loop style Rework pattern is associated with failing RPA bots and quantified its impact on the Cost and Lead Time of cases. The IT organization could consider replacing RPA Bots with an API-based Integration to address this issue.

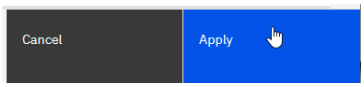
_10. Click the **Manage filters (1)**.



_11. Select the **<Verify RPA Exception>...** filter and click the **Delete filter (garbage can).**



_12. Click **Apply.**



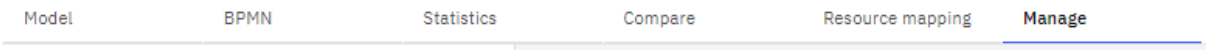
3.2.5 KPI Analysis

3.2.5.1 KPI Compliance

With IBM Process Mining, we can define KPIs (related to case cost/duration or activity duration) and monitor KPI compliance.

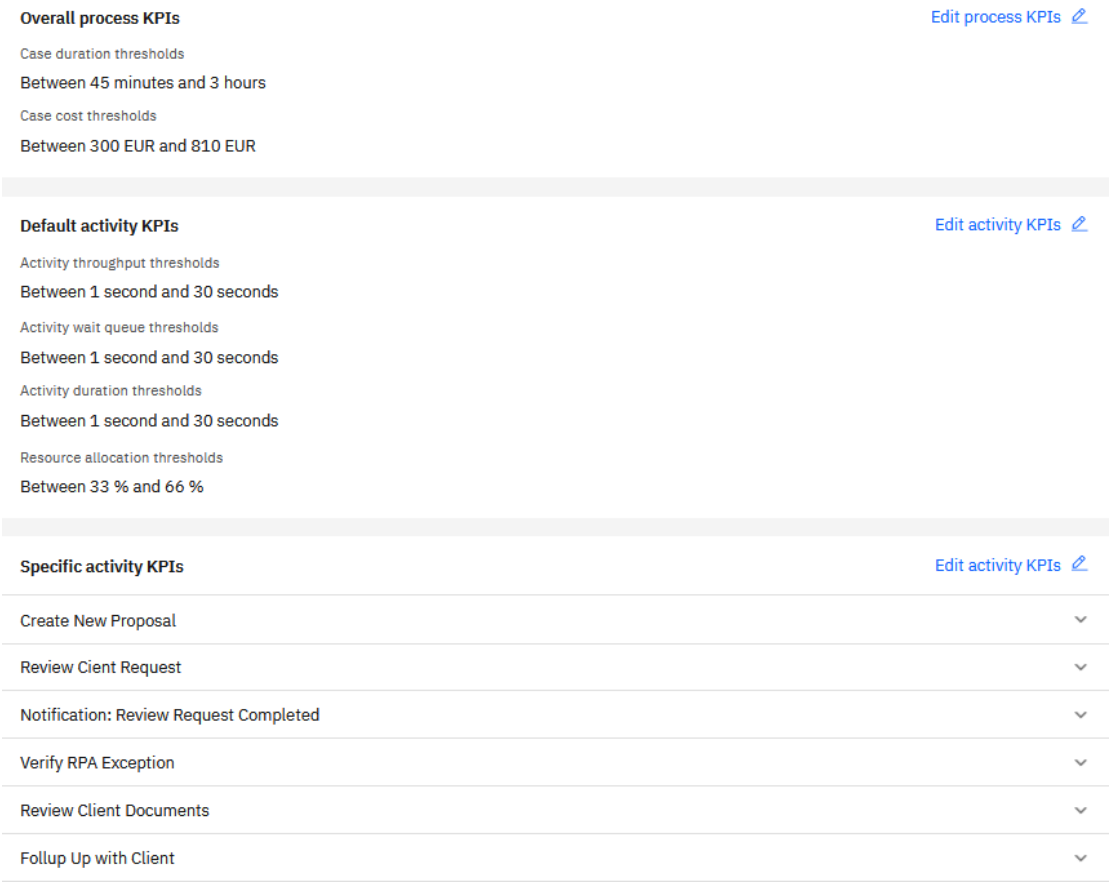
Let's look at the current KPI settings for this project.

_1. Click the **Manage** tab.



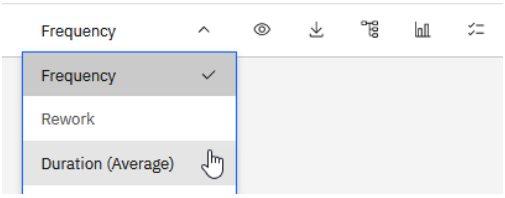
Select **KPIs** view

You should now see the Process and Activity threshold settings for this project.

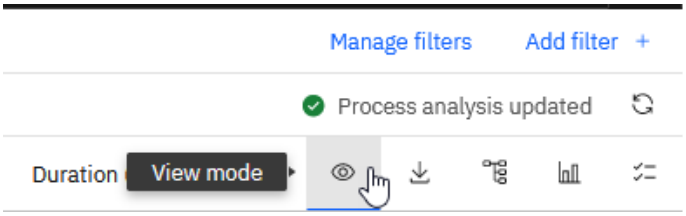


_2. Click the **Model** tab to get back.

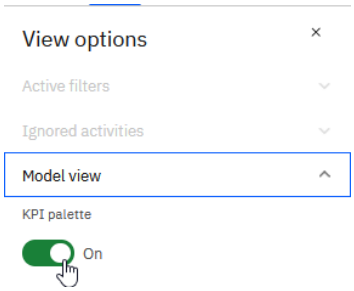
_3. Change the Model View to **Duration (Average)**



_4. Click the **View mode (eye) icon**

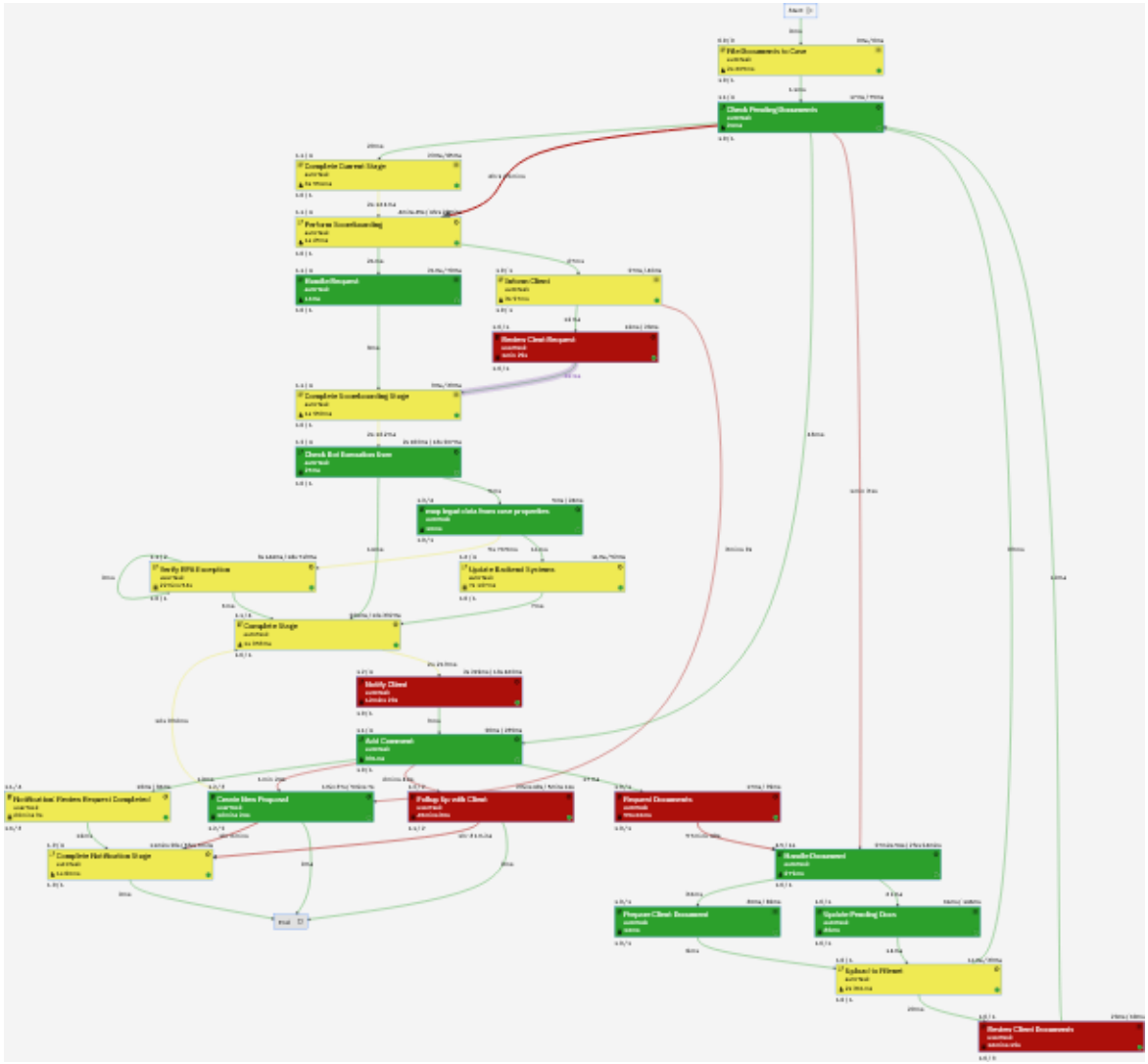


_5. Toggle the *KPI palette to* **On**



You should now see the Model with Activities and Transitions.

You can use this view to identify what Activities and Transitions deviate from the KPI.



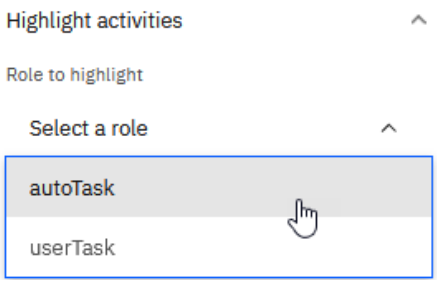
The Activities and Transitions color reflects the KPI settings. See the note below about the KPI Settings.

ACTIVITY	Activity with service time in line with the defined KPIs
CONNECTION	Transition with waiting time in line with the defined KPIs
ACTIVITY	Activity with risky service time
CONNECTION	Transition with risky waiting time
ACTIVITY	Activity with critical service time
CONNECTION	Transition with critical waiting time

3.2.5.2 Root Cause Analysis of KPI Violations

Let's focus on identifying Automated Activities that exceed their Duration KPI.

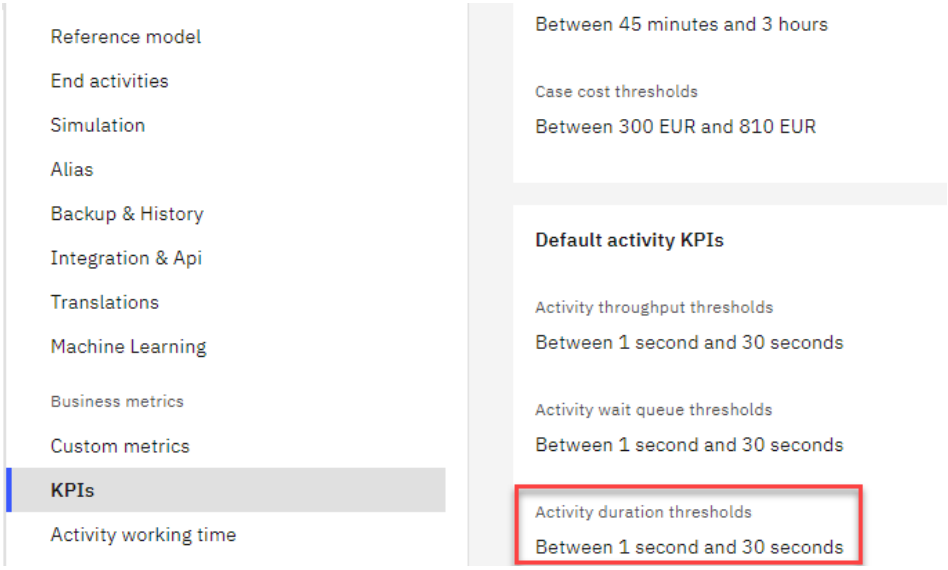
_1. In *View options*, under *Highlight activities*, for *Role to highlight,* select **autoTask**



_2. Notice that **Notify Client** Activity is marked in red

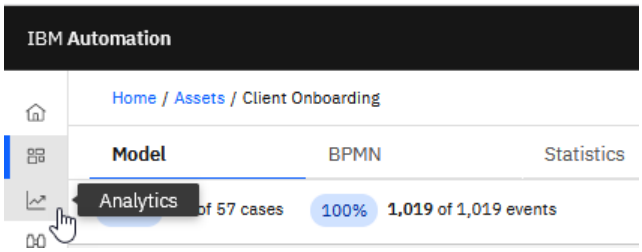
Let's focus on the *Notify Client* Activity!

It has an average service time of 12min 29s. This is way above the 30 seconds defined in the KPI Settings you examined earlier (Manage Tab > KPIs > Default activity KPIs)

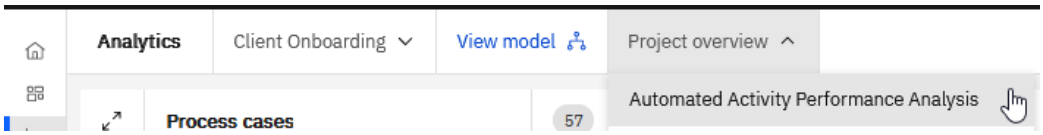


Let's drill down into details to include enough information to create a Ticket for the IT organization to investigate this issue!

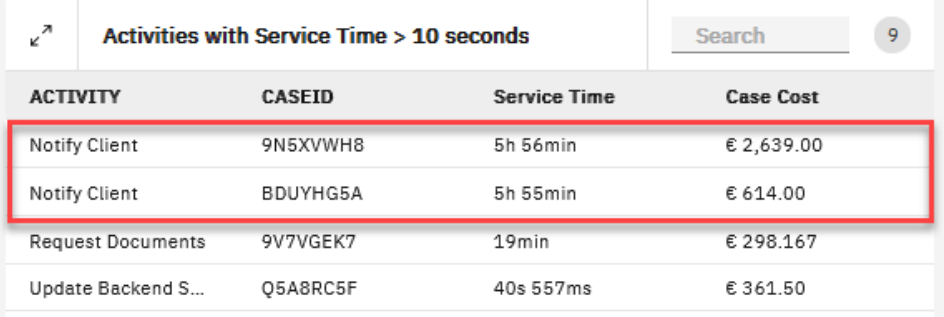
_3. Click **Analytics** icon



_4. Under **Project overview,** click **Automated Activity Performance Analysis.**



_5. Note that there are two Cases with Notify Activity exceeding 10 seconds of service time.



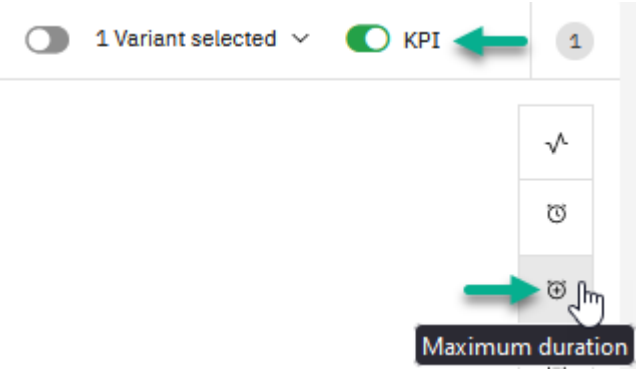
ACTIVITY	CASEID	Service Time	Case Cost
Notify Client	9N5XVWH8	5h 56min	€ 2,639.00
Notify Client	BDUYHG5A	5h 55min	€ 614.00
Request Documents	9V7VGEK7	19min	€ 298.167
Update Backend S...	Q5A8RC5F	40s 557ms	€ 361.50

_6. Click the **first row** in the table

ACTIVITY	CASEID	Service Time	Case Cost
Notify Client	9N5XVWH8	5h 56min	€ 2,639.00

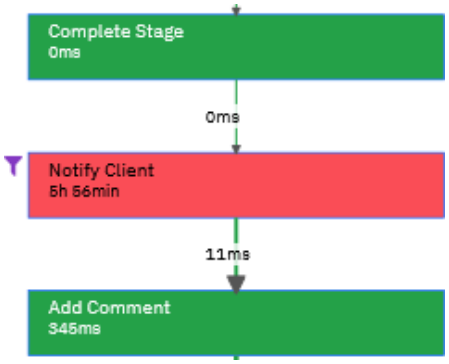
This action adds a filter to restrict the process Model to show the flow only for Case with the Case ID 9N5XVWH8

_7. Select the **Maximum duration icon** first and then select the **KPI** switch.



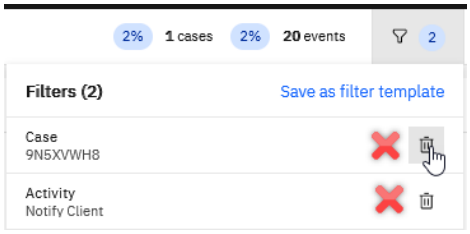
Notice that only the *Notify Customer* Activity took a long time to execute (5h 56min).

This indicates the problem lies with the Notify Customer service call, and we can exclude general system outages affecting all automated activities.

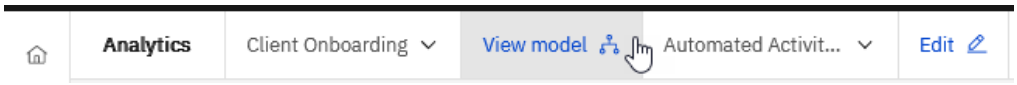


Process Improvement Insight: Several API calls (Automated Activities) contributed to excessive Case Lead times and were generally way above their KPI settings. We singled out the Notify Client activity and used the Analytics Dashboards to drill down to get more information. We provided the IT organization with the Case IDs and determined that there were no general system outages during the case execution.

_8. Click the Filters icon and then clikc the **garbage can** to remove **Case** and **Activity** Dashboard filters.



_9. Click the **View model** to return to the Model View.

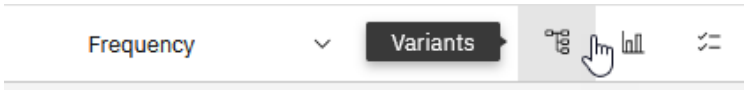


3.2.6 Process Variant Analysis

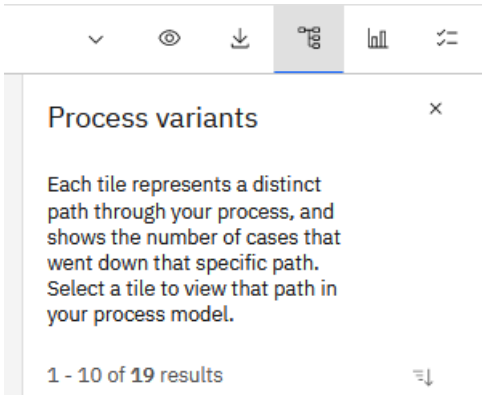
Client Onboarding Workflow has multiple paths (e.g., happy Path, exception cases, etc.). IBM Process Mining can visualize them individually or together.

Process Variant is a unique path that cases take to execute the Process from the start to the end.

_1. Click **Variants**



You should now see the Process variants view on the right-hand side.



The Process Variant view enables us to find the most frequent Variant and compare it with other variants in terms of performance (average lead Time) and the number of events (flat processes) or relations (multi-level processes).

3.2.6.1 Filter the top Five Variants

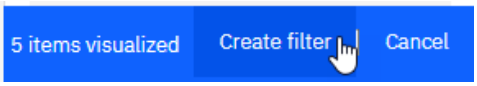
When analyzing process data, excluding outliers and focusing on the most frequently executed process paths is often essential. Focusing on the top process variants simplifies the analysis and allows us to focus on the most impactful process paths.

About Filters in IBM Porcess Mining. You can use filters to analyze the Process with a limited subset of cases that answer specific user requests. Click here to learn more about filters.

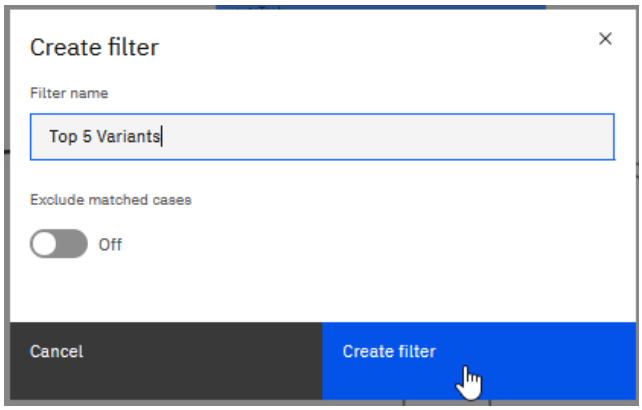
_1. Select the **check boxes of the first 5 Variants**.

If you add the percentages, you will see that the top five cases represent 70.19% of all the variants.

_2. In the bottom left corner, click **Create filter.**

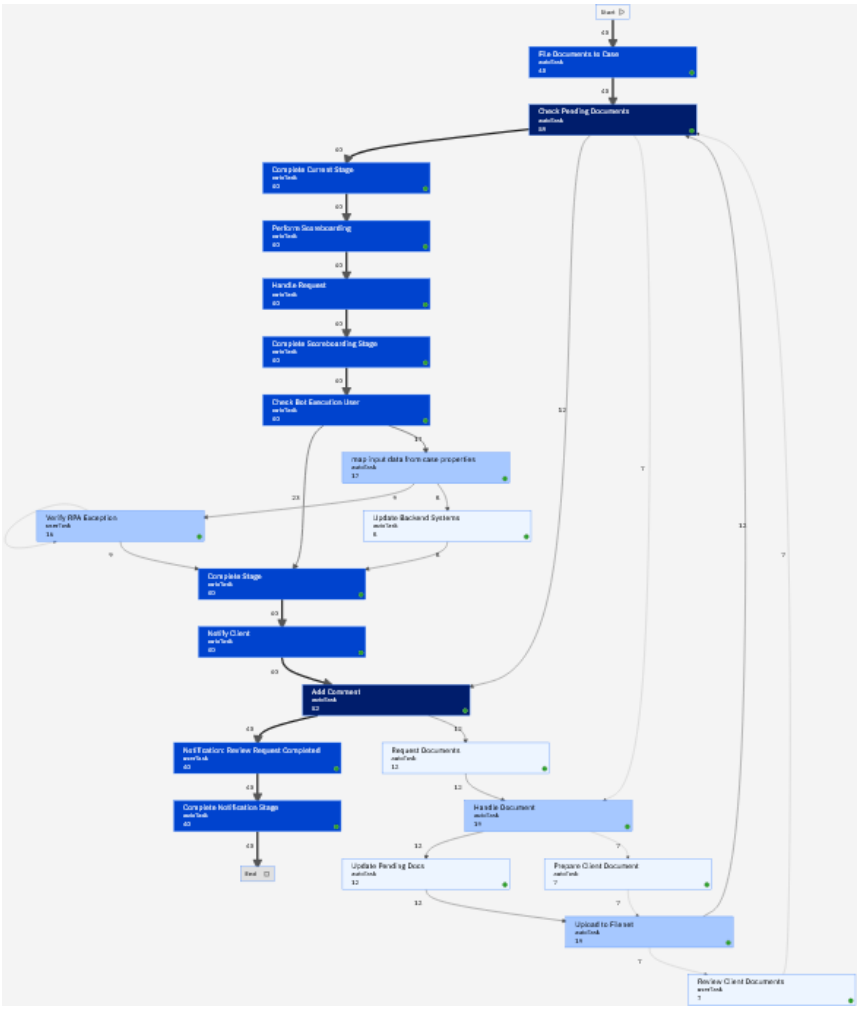


_3. For *Filter name* enter **Top 5 Variants** and click **Create filter.**



Note that if we select Exclude matched cases in the Create filter window above, the resulting filter will include the cases that belong to the selected five variants (all other variants).

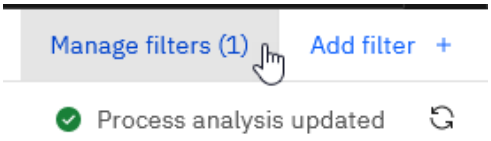
_4. The Model is now updated and shows fewer steps and connections, yet it covers 70.18% of all process paths (variants).



Note: it is possible to permanently save this filter and use it later in all process analysis tasks!

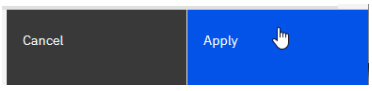
For now, let's remove this filter. It was created only for demonstration purposes. We will not need it in the remainder of this lab.

_5. Click the **Manage filters (1)**.



_6. Select the **Top 5 variants** filter and click the **Delete filter (garbage can).**

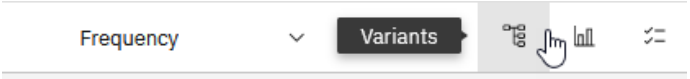
_7. Click **Apply.**



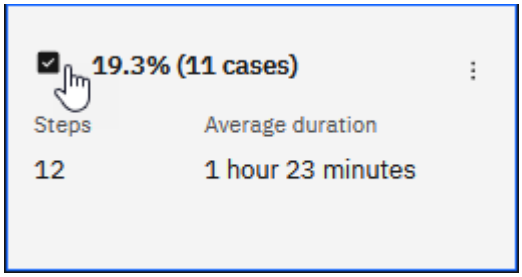
3.2.6.2 Use Filter to Discover Happy Path

Let's find the fastest Variant with the fewest steps! The Happy Path.

_1. Click **Variants**



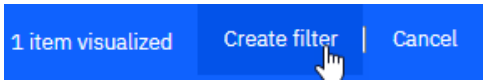
_2. On the first Variant, click the **checkbox** to filter out all other cases.



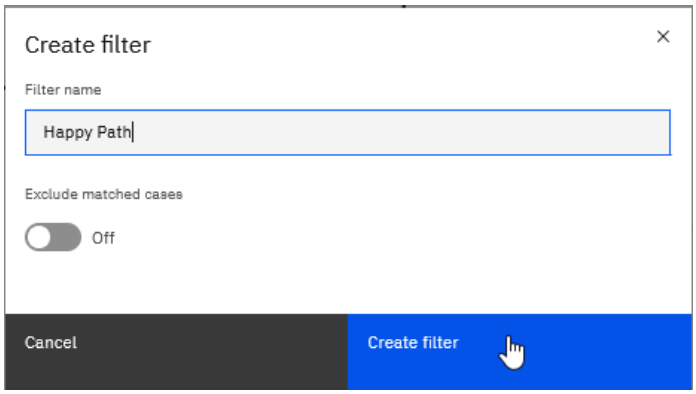
Note that the most frequent Variant is also the one with the fewest steps (12)!

Did we find the Happy Path?

_3. Click **Create filter**

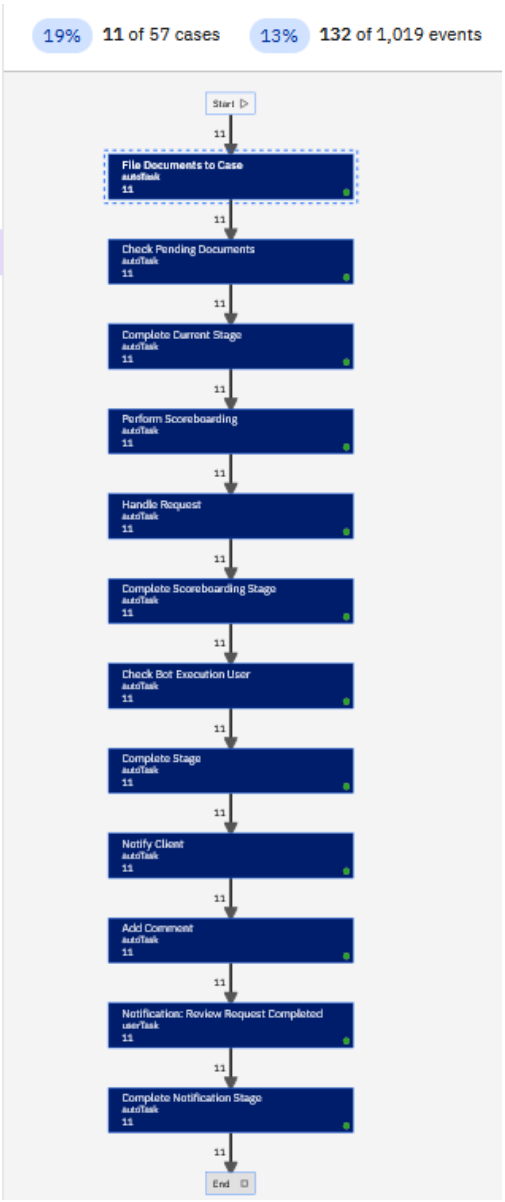


_4. For the *Filter name,* enter **Happy Path** and click **Create filter.**



_5. You should now see the Happy Path Variant.

Note that we now see the Happy Path in the Model view. 19% of the cases include 12 steps, no loops, or conditional activities. Happy Path, indeed!

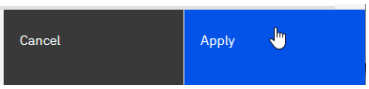


Note that to keep this filter for future use, you need to save it as a Template Filter (we have already done this for you because we will use it later in this lab). However, you will learn how to create a Template Filter later in this lab.

_6. Click the **Manage filters (1)**.

_7. Select the **Happy Path** filter and click the **Delete filter (garbage can).**

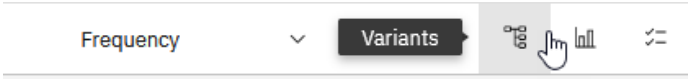
_8. Click **Apply.**



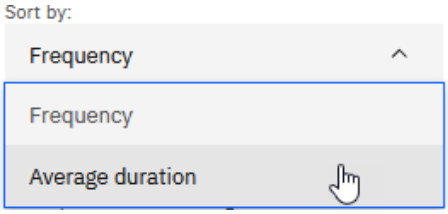
3.2.6.3 Use Filter to Discover the Slowest Variant

Let's find the slowest Variant and discover what the root causes are.

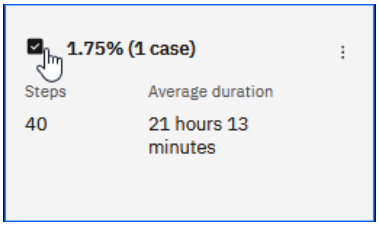
_1. Click **Variants**



_2. For *Sort by*, select **Average duration.**

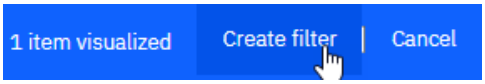


_3. On the Variant that has *40 steps*, click the **checkbox** to filter out all other cases.

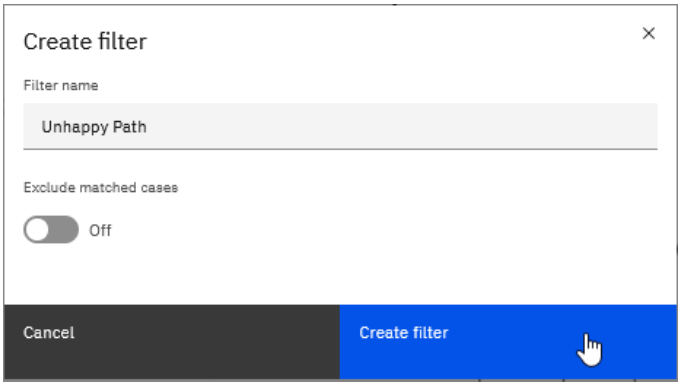


We found the Variant with the highest duration (21 h 13 m).

_4. Click **Create filter**

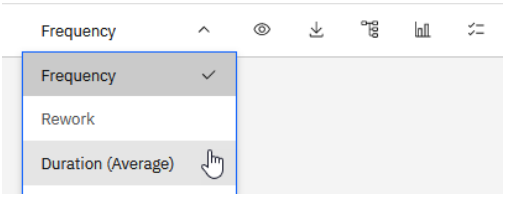


_5. For *Filter name,* enter **Unhappy Path** and click **Create filter.**



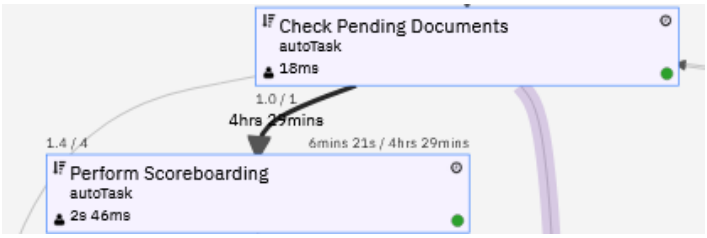
3.2.6.3.1 Investigate Long Case Duration

_1. Change the Model View to **Duration (Average)**

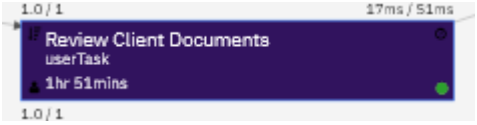


_2. Note the two areas of concern that contribute to the case duration of 21 h 13 m:

1. There is a considerable delay of **4hrs 29mins** between the two automated tasks. We will investigate this later when examining Model Conformance. We will discover that this transition is not conformant with the reference model.



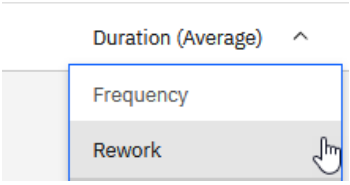
2. Note that the *Review Client Documents* task takes **1hr 51 minutes** to complete. We will now further focus on this automated task.



3.2.6.3.2 Investigate a Large Number of Steps

Rework (repeating the steps in the same Case) mainly contributes to the excessive number of steps required to complete a Case.

_1. Change *View mode* to **Rework**



_2. Note the thick rework arrows (Activity transitions)

See the Figure below to understand the Process logic where missing or inaccurate documents cause the Process to request a document – document upload request loop.

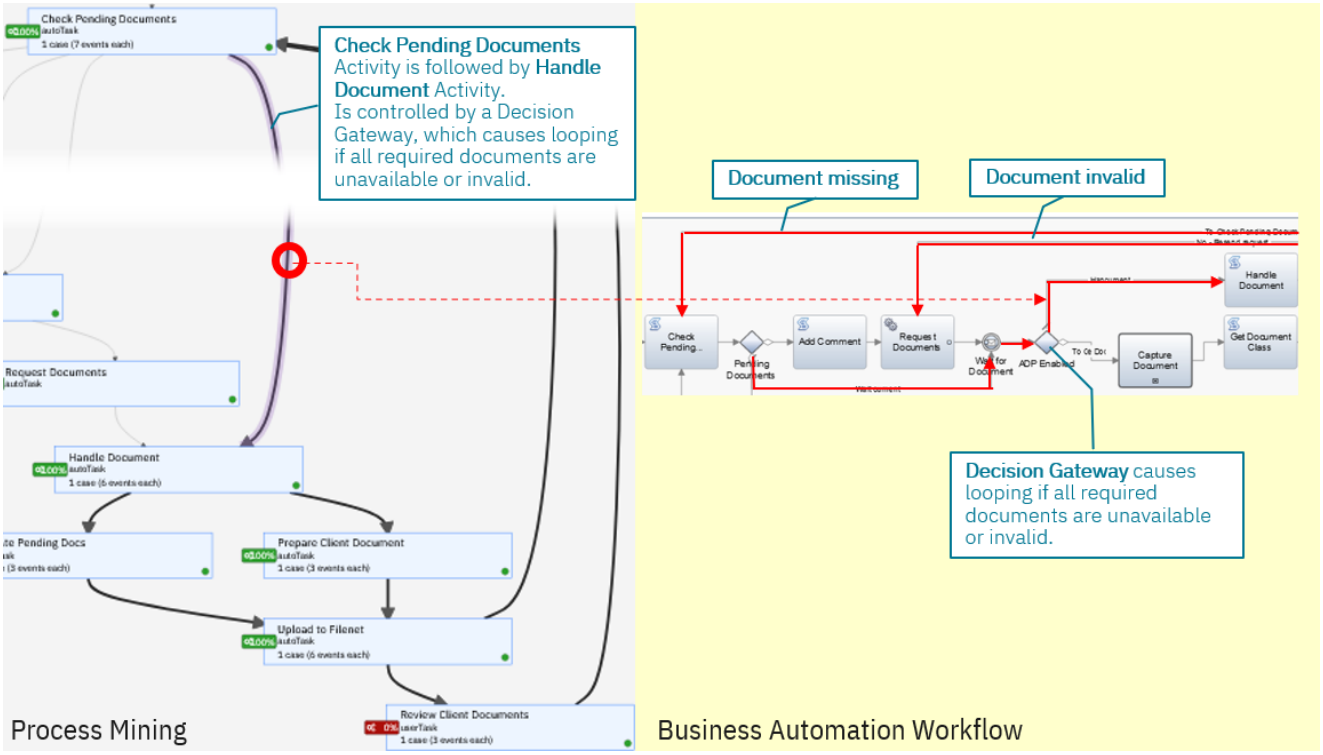
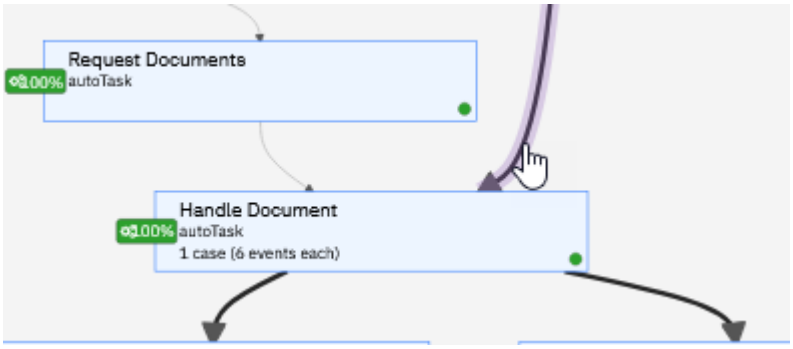


Figure 5. Document Request Upload Loop

_3. Click the thick **transition arrow** from *Check Pending Documents* to *Handle Document* Activity.



_4. Click **Show path statistics.**

_5. Note that the loop occurred five times!

Check Pending Documents - Handle Document

CO.ReferenceID	Count	Wait time
TNHWLHQJ	5	3 minutes 2 seconds

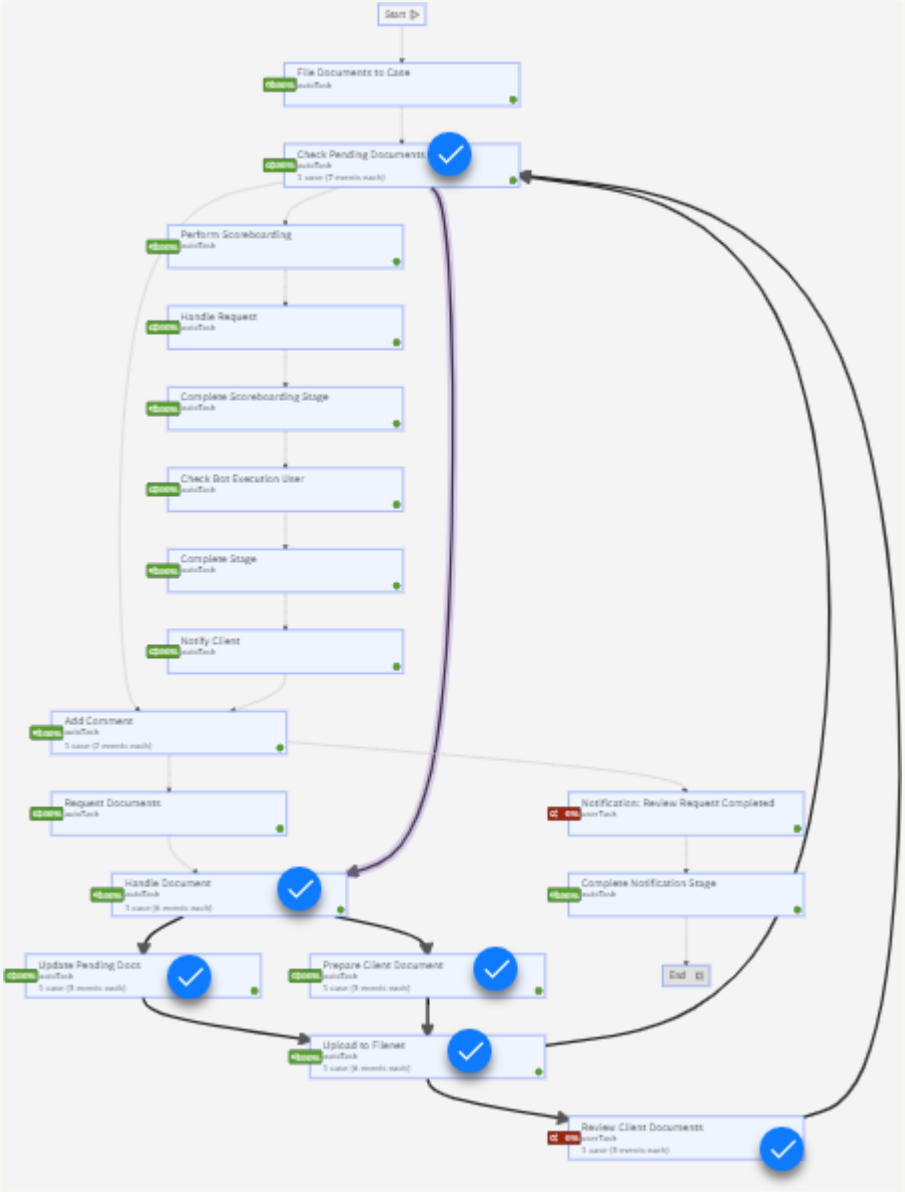
Items per page: 10 1 - 1 of 1 item

If you count the number of activities repeated, we can now see that this loop is responsible for

5 ACTIVITIES * 5 LOOPS = 25 ACTIVITIES

of the 40 Activities executed in this Unhappy Path Process Variant.

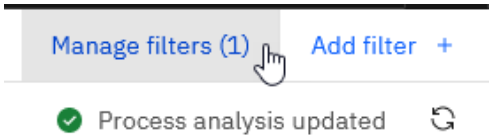
Note: you can discover the 5 ACTIVITIES count by examining the activities involved in the loop (counting Update Pending Docs and Prepare Clint Documnt as one).



Process Improvement Insight: We identified a Variant with the least number of steps, lowest cost, and lowest lead time. We also discovered a variant with the longest lead time. We determined the root Duracauses: (i) a long delay between two automated activities (to be probed further) and (ii) a large number of executed Activities (25) caused by missing or incorrect documents. The former is an IT insight, while the latter is a business decision to ensure a complete set of correct documents is supplied first.

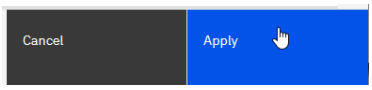
_6. Click **X** to close the *Path statistics* window

_7. Click the **Manage filters (1)**.



_8. Select the **Unhappy Path** filter and click the **Delete filter (garbage can).**

_9. Click **Apply.**



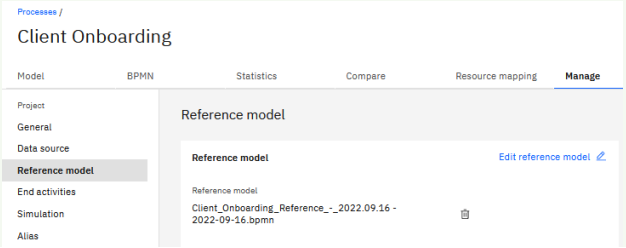
3.2.7 Analyze Model Conformance

The Model Conformance view provides a visual conformance check between the data-derived and reference models.

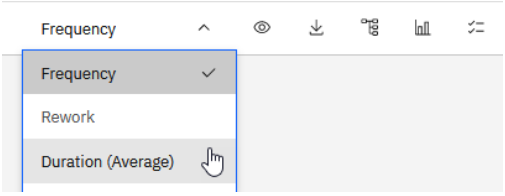
The reference model (BPMN or XPDL) depicts the Process as it is understood, not as it is being executed. A reference model is compared with the derived model to perform conformance checking and to determine activities and activity transitions that are not defined in the reference model.

Let's address why there could be non-conformance with fully orchestrated processes. After all, BPMN processes are predictable by definition! There are two reasons. The Client Onboarding was implemented as a Case that, by definition, is unstructured, allowing for unexpected process variability. The second reason is that even the structured BPMN processes (Activities in the Case) can have unexpected paths: **business fault** handling (throwing exceptions to deal with process faults) and **technical faults** that the admin resolves in the Process Admin Console. The above can cause deviations from the ideal process path defined by our Reference Model!

Note: The reference model is supplied with the BPMN diagram and can be uploaded when the new Process Mining project is created. The reference model can also be added or changed after the project is created.



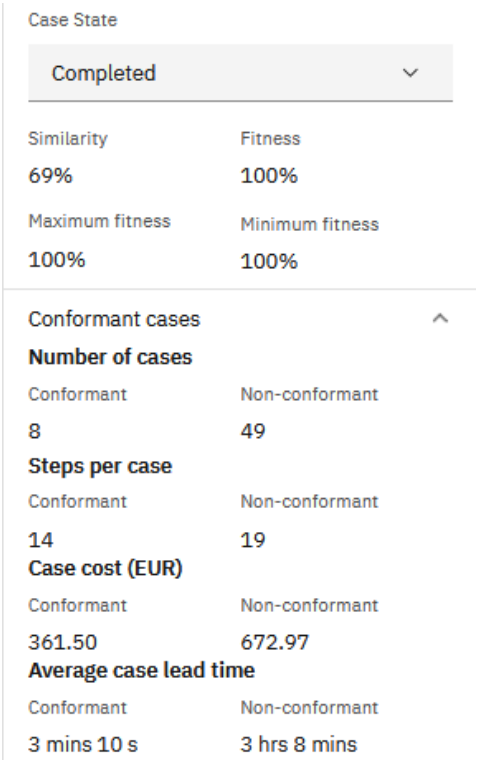
_1. Change the Model View to **Duration (Average)**



_2. Click **Conformance** (top right)

Using the Model conformance panel, it is possible to do a visual conformance check between the data-derived model and the reference model. You can also compare both the models to analyze the similarities and the differences between the models.

_3. Note summary of the impact of non-conformance on critical process statistics. It includes essential Case statistics, as shown below.



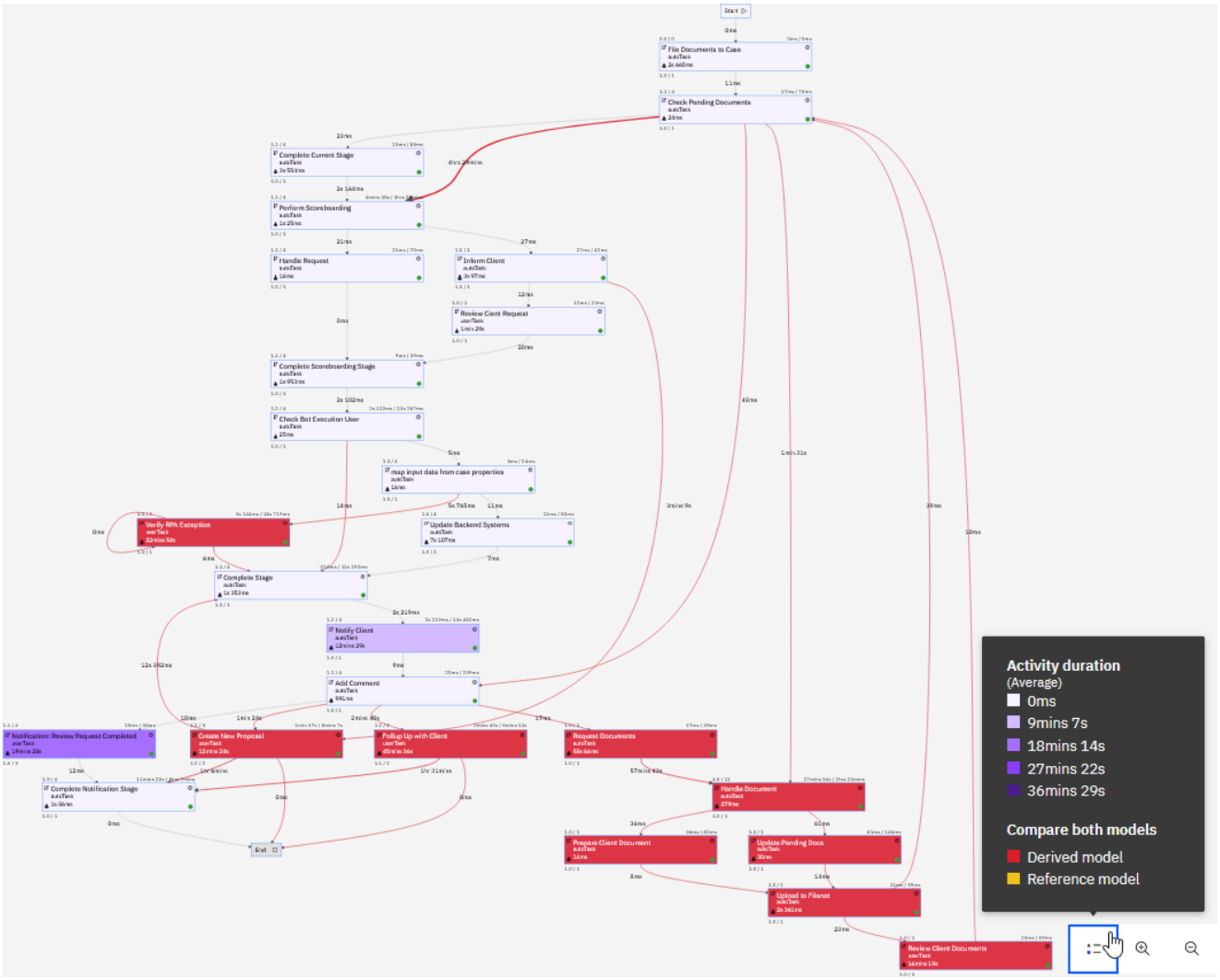
Similarity: Indicates the percentage of similarity between the data-derived model and the reference model.

Fitness: Indicates the percentage of represented cases in the data-derived model.

Minimum fitness: Indicates the percentage of least similar cases when you compare the data-derived model to a reference model.

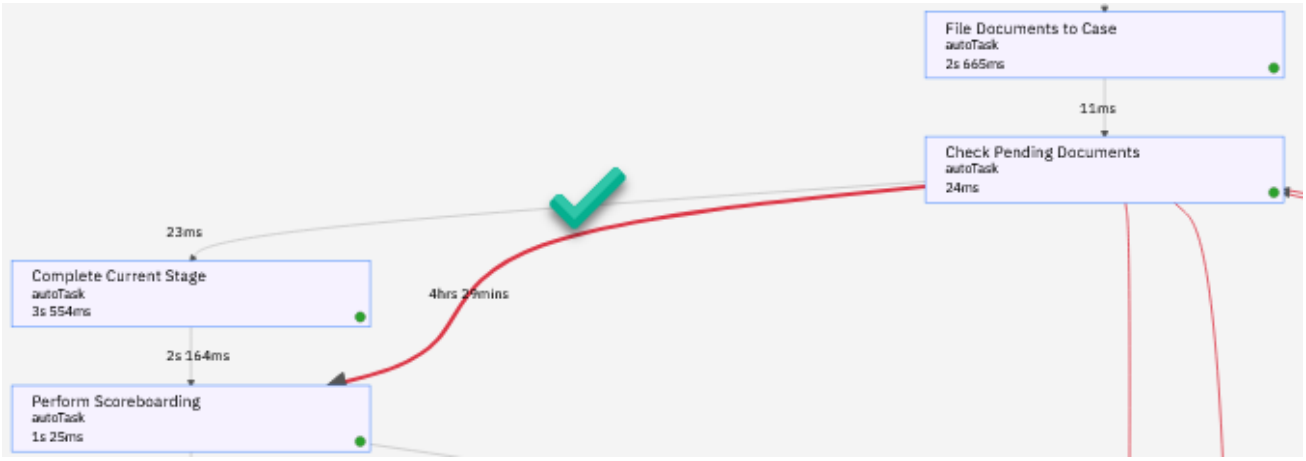
Maximum fitness: Indicates the percentage of most similar cases when you compare the data-derived model to a reference model.

_4. Note that non-conformant Activities and Transitions are marked **red**

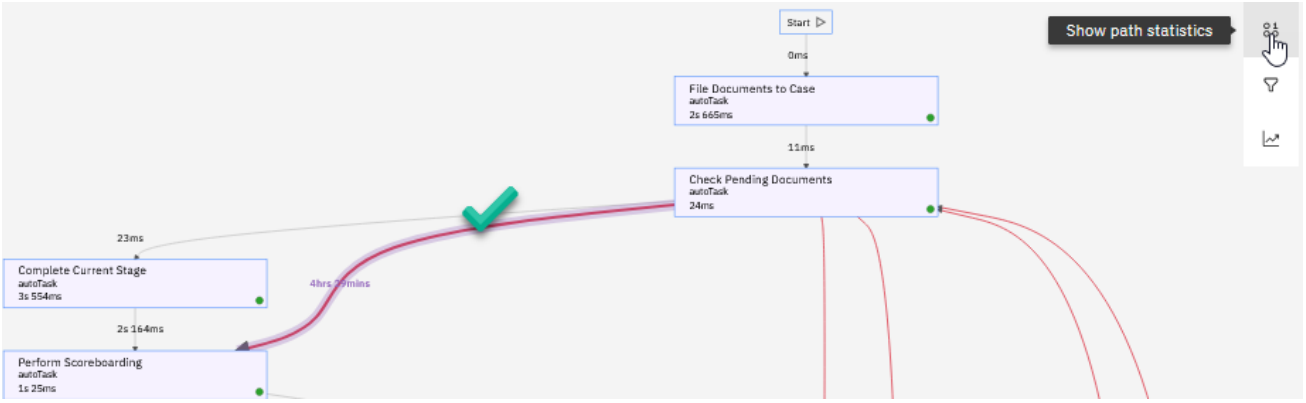


3.2.7.1 Analyze an Unexpected Process Flow

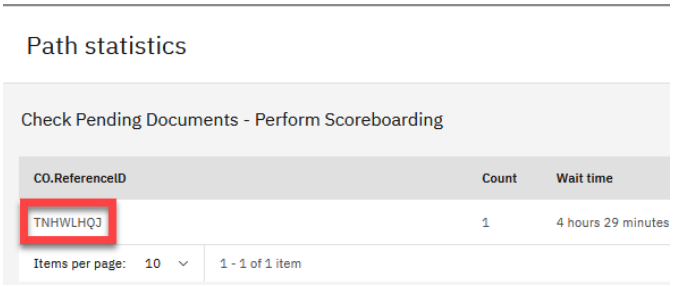
_1. Notice the non-conformant transition, taking **4hrs 29min,** between two Automated tasks (autoTask): *Check pending Documents* and *Perfrom Scoreboarding*.



_2. Select the transition and then select **Show path statistics.**



_3. Note that we now see the reference ID.



Process Improvement Insight: Since both activities are Automated activities managed by the IT, we could provide the Reference ID to the IT organization for further investigation and eliminate this significant delay.

_4. Click **X** to close the *Path statistics* window.

After consulting the IT organization, the incident was explained as follows (See the Figure below):

3. The process instance with the reference id **TNHWLHQJ** failed when executing the **Complete Document Stage** Activity.
4. This process failure caused it to get stuck at the **Review Documents** Case Stage.
5. The IT organization manually advanced the Workflow to the **Perform Scoreboarding** Stage using ACCE Admin Console.
6. After this happened, the Workflow advanced to the next stage (**Perform Scoreboarding**) and started **executing the Perform Scorebarding Activity**.

This IT intervention took almost 5 hours!

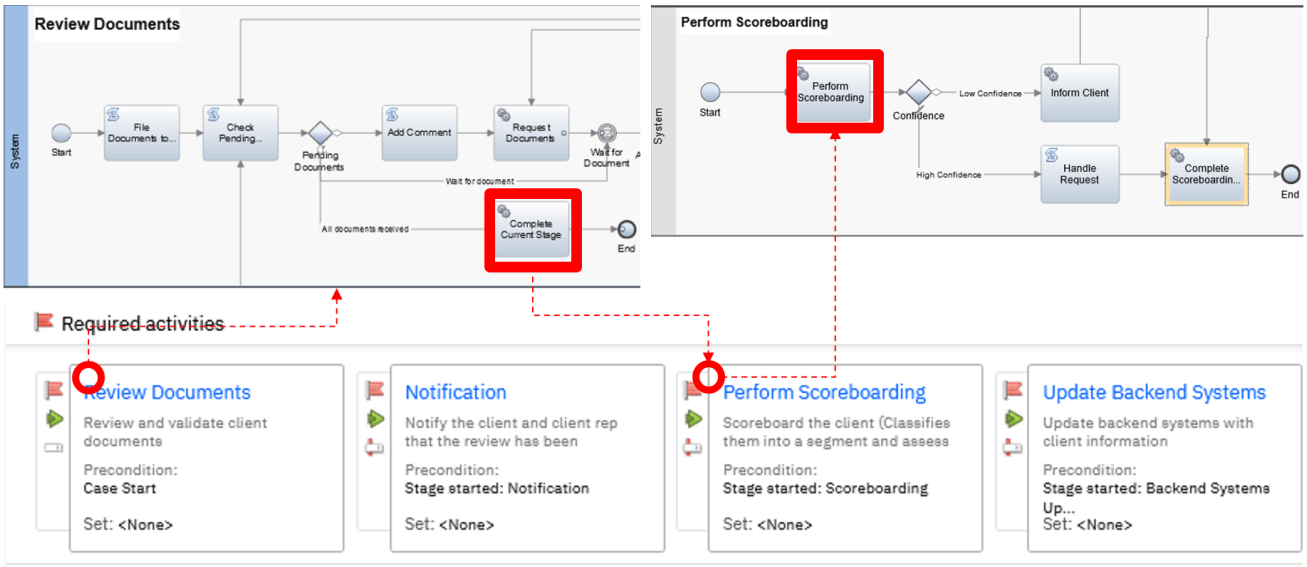
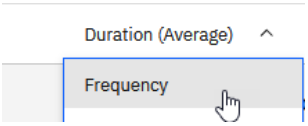


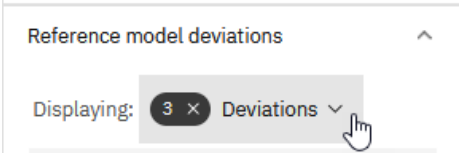
Figure 6. The Explanation of Invalid Transition Causing 4h 29 min Wait

3.2.7.2 Identify the Most Costly Deviant Transition

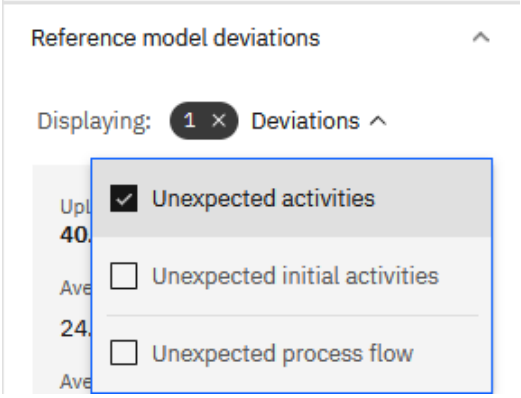
_1. For *View mode,* select **Frequency** view



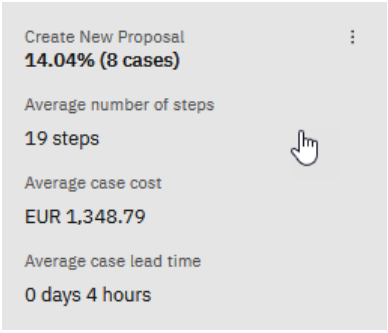
_2. Click **Deviations** dropdown



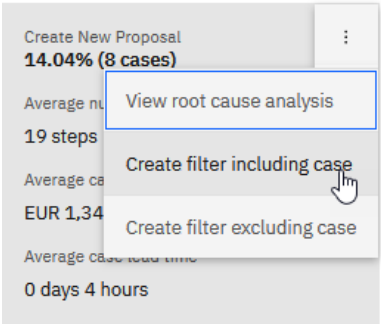
_3. Make sure that only the **Unexpected activities** checkbox is checked.



_4. Scroll down to **Create New Proposal** – one of the unexpected Activities.

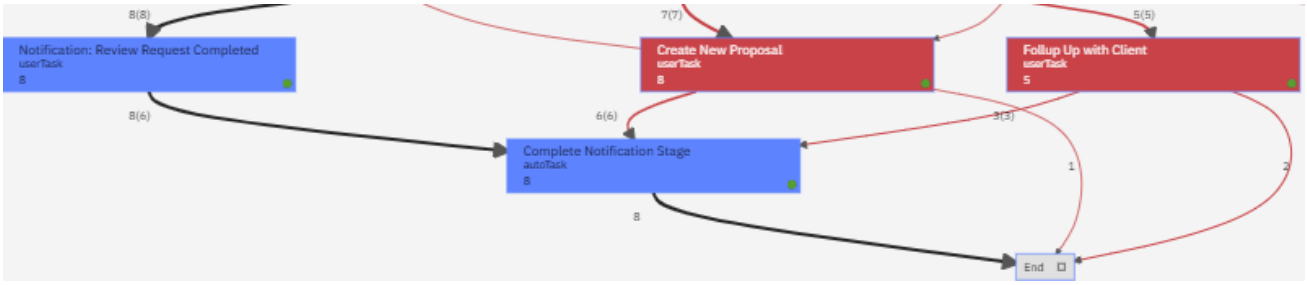


_5. Click **vertical ellipses** and then select **Create filter including case.**



You should now see the Cases that only include the Create New Proposal Activity.

_6. To find the Create New Proposal Activity, focus on the part of the Model close to the **End** Activity.



Business Explanation:

The two non-conformant activities, shown above in red, are causing the excessive lead time. The reason is that even though the client is already onboarded and the Case is completed. However, the clock is still ticking as the actual cases can not be completed until the above activities are completed.

Technical Explanation [Optional Read]:

You may skip this part unless you are familiar with the IBM Workflow Programming model.

As shown in the Figure below, both Follow Up with Client and Create New Proposal are optional Activities. Note the preconditions; both are available to start when the Notification Stage is reached.

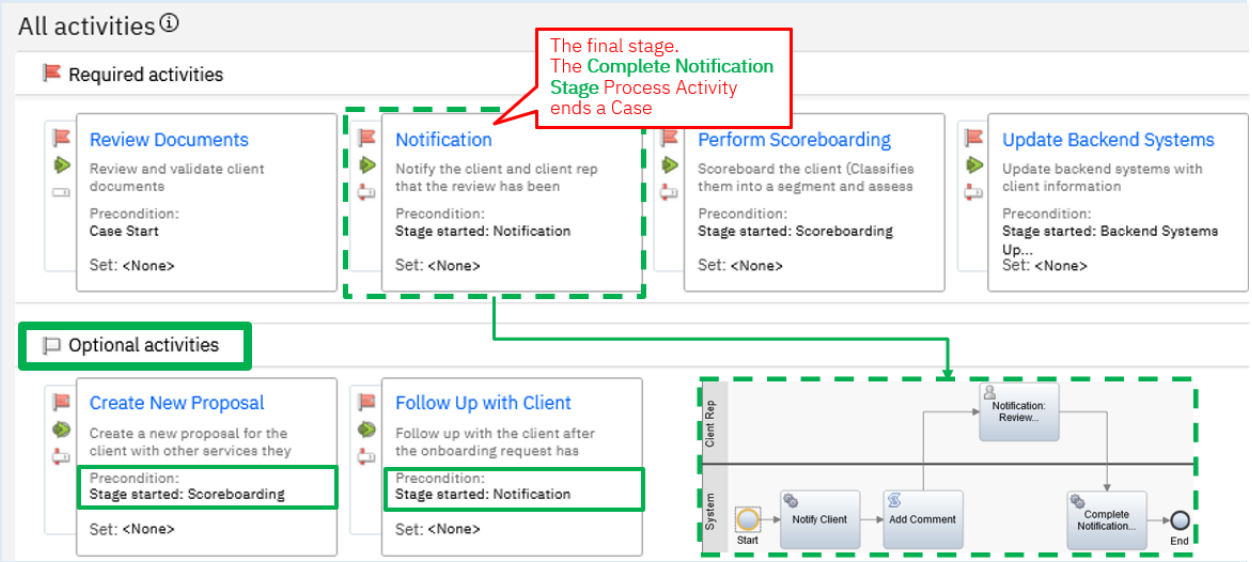
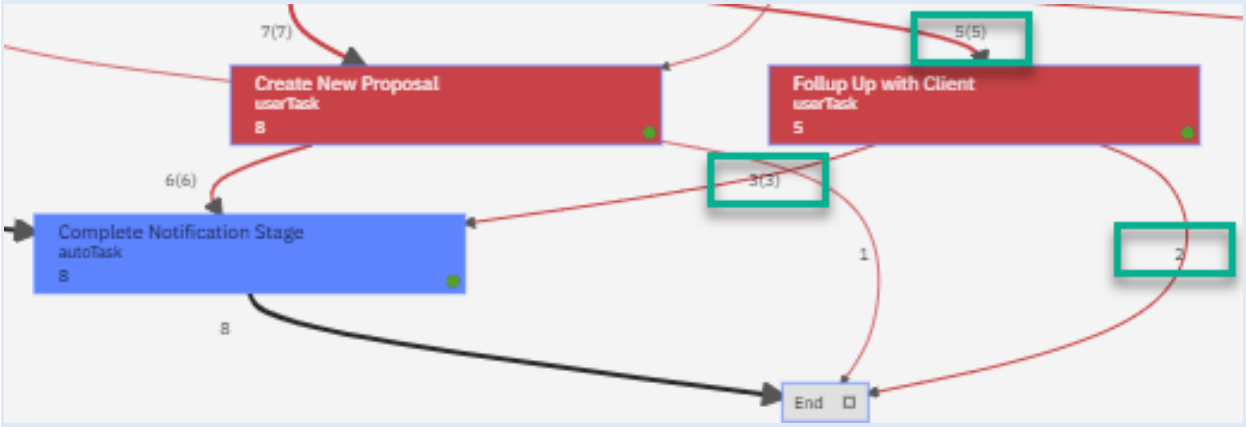


Figure 7. "Follow up with Client" - an Optional Activity Enabled in the Scoreboarding Stage



Here are key insights you can draw from the Frequency view regarding the Follow up with Client Activity:

The Follow up with Client Activity was started before the Notification: Review Request Completed (a human Activity).

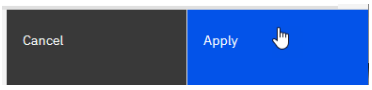
2 times the Follow up with Client Activity was completed after Case was completed (Complete Notification Stage activity completed)

6 times the Follow up with Client Activity was completed before Case was completed (Complete Notification Stage activity completed). This implies that the Client Rep. delayed the Case completion until the Create New Proposal Activity was completed.

_7. Click the **Manage filters (1)**.

_8. Select the **Activity is...** filter and click the **Delete filter (garbage can).**

_9. Click **Apply.**

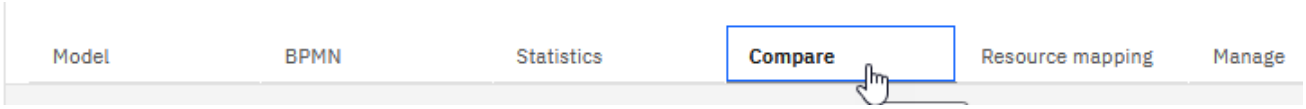


Process Improvement Insight:
(1) Non-conformant Path Analysis. We found an exception path that was not covered in the reference model. We discovered that when a process instance fails, it takes too long (the IT intervention took almost 5 hours!) for the process admin to repair a failed process instance. Such incidents have a significantly negative impact on the Case Lead Time KPI. Business action is to improve monitoring of failed process instances or change the Process to handle technical faults more gracefully.
(2) Non-Conformant Activity Analysis. We discovered a negative impact on Case Lead Time by an Activity not covered by the reference model**.** Client Reps sometimes delay the Case completion until they complete the *Followup with Client* Activity, negatively impacting the Case Lead Time KPI. Business actions are to instruct Client Reps always to complete the Case first, and a long-term solution is to change the Client Onboarding Workflow to prevent this from happening.

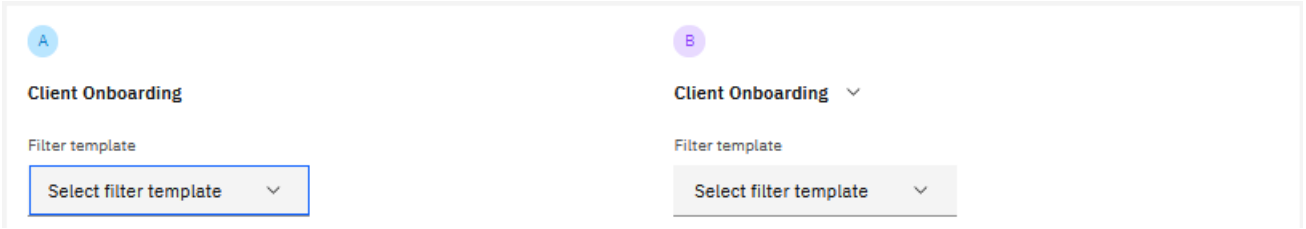
3.2.8 Compare Case Variants

The Compare page of IBM Process Mining helps you to compare two different filter templates from the same or different processes. You can use the Compare page to compare two filter templates. To do so, you must create at least one filter template for the Process. When using simulation, you can compare as-is versus to-be simulated processes. You will use the Compare page to asses the results of a simulation in 3.2.11 Using Simulation Validate Business Case for Automation Candidate

_1. Click **Compare** tab



_2. Examine the *Compare View*



Note that it is organized into two columns:

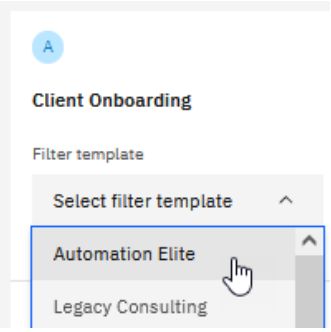
A – (As-is), where you can specify a Filter Template that filters the data in your current project.

B – (To-be), where you can specify a Filter Template that filters either the data in your current project or a different project. You can also use simulation data here (we will do this later in this lab).

3.2.8.1 Compare Clients

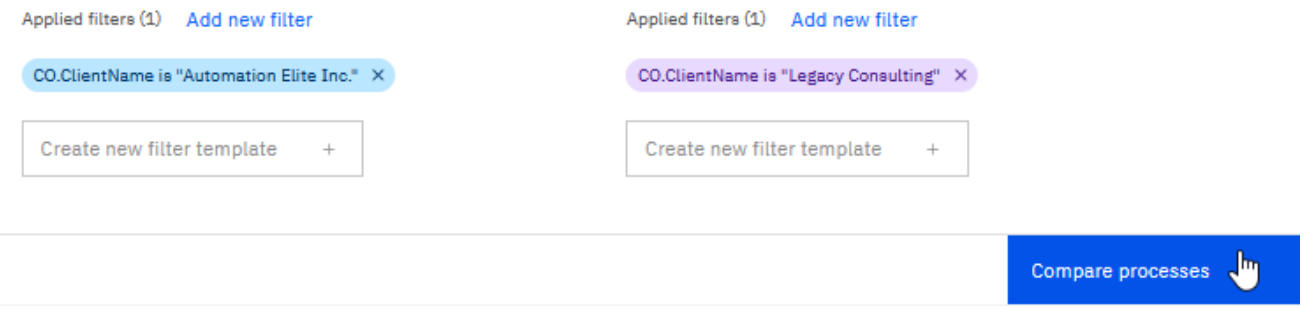
Let's compare Client Onboarding Workflow metrics between two different clients. We have already created Filter Templates that filter out cases representing two clients: Automation Elite Inc. and Legacy Consulting.

_1. For A *As-is*, select a pre-built **Automation Elite** template filter (you will learn how to create template filters later in this lab)



_2. For B *To-be*, select **Legacy Consulting** template filter

_3. Click **Compare processes**



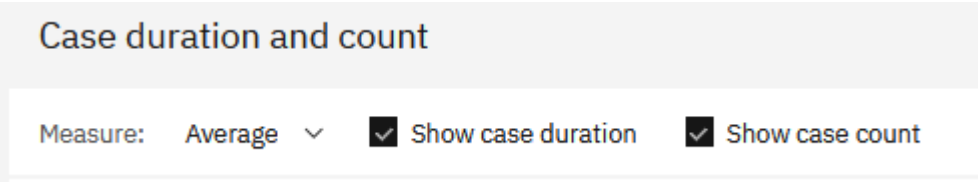
_4. The **Process details** view shows each customer's key statistics.

Process details

Measure: Average	A As-is	B To-be
Case count	35	22
Average case lead time	3hrs 24mins	1hr 35mins
Average case cost	EUR 619.64	EUR 644.55
Total case cost	EUR 21,687.50	EUR 14,180.17

We can use the information here to perform a deeper root-cause analysis in this view or other features of IBM Process Mining, such as the Dashboards or the Model view.

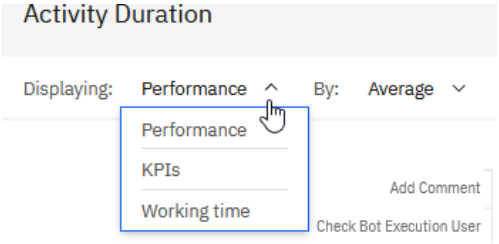
_5. The **Case duration and count** view shows the Average (or Median) duration of active cases and/or case count.



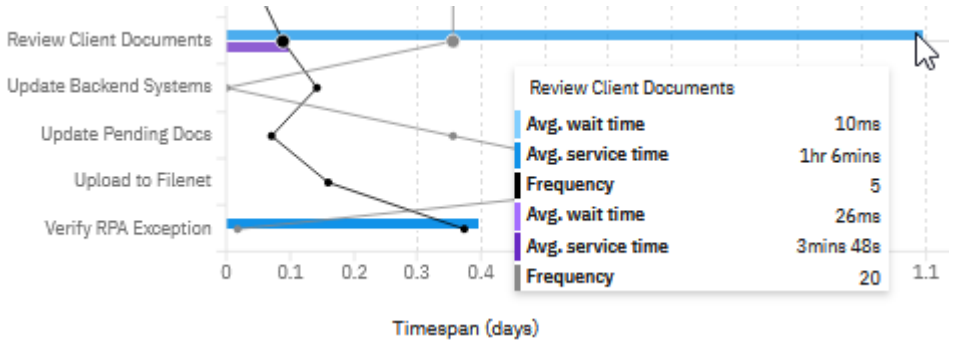
_6. **Hover over** the last spike to the right.

You see case count (block display) and average case duration (line display).

_7. The **Activity Duration** view displays average/median Performance, KPI's, Working time.

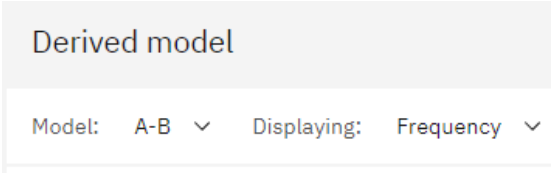


_8. Hover the mouse button over the **Review Client Document** (Human Activity) bar.

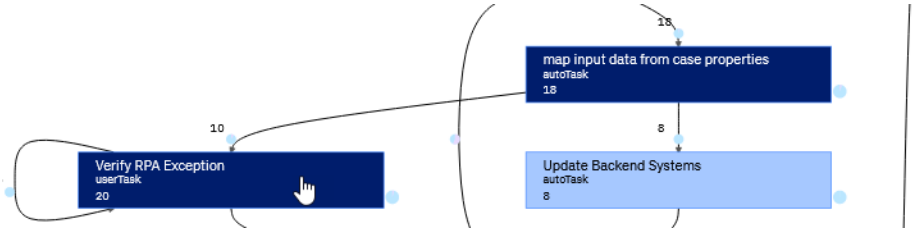


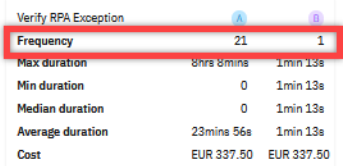
Business Insight: On average, we can see that it takes significantly longer to review documents when onboarding Automation Elite Inc. (blue bar) than for Legacy Consulting (purple bar).

_9. In the **Derived model** view, ensure Model **A-B** is selected.



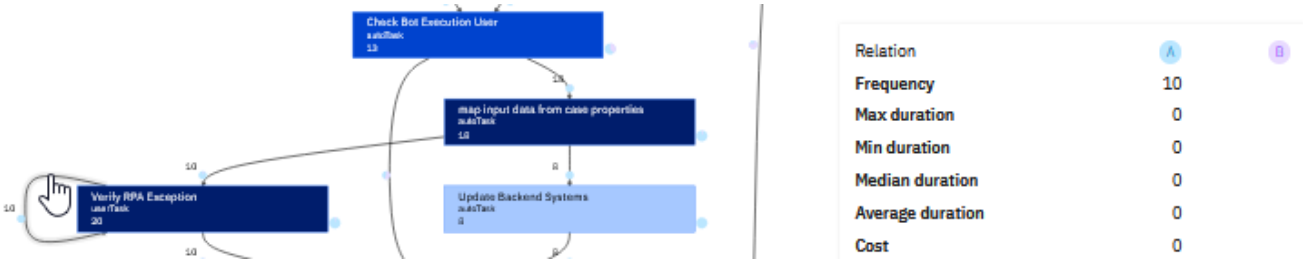
_10. Find and click **Verify RPA Exception** Activity.





Notice that Legacy Consulting onboarding shows only one Case in which the *Verify RPA Exception* Activity was executed. The *Verify RPA Exception* is a manual intervention to recover a failed bot.

_11. Hover over the **self-loop** on the **Verify RPA Exception** Activity.



Notice that Automation Elite Inc. shows 10 reworks, where the same Bot had to be fixed/retried multiple times!

Process Improvement Insight: IT needs to investigate what causes the Bot failures when Automation Elite Inc. is being onboarded.

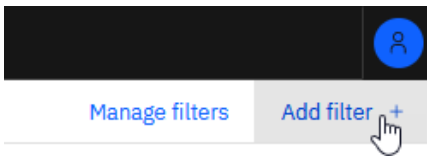
3.2.8.2 Compare the Performance of Focus Corp Employees

Let's compare how different Focus Corp employees (usr141 and usr143) complete Client Onboarding requests!

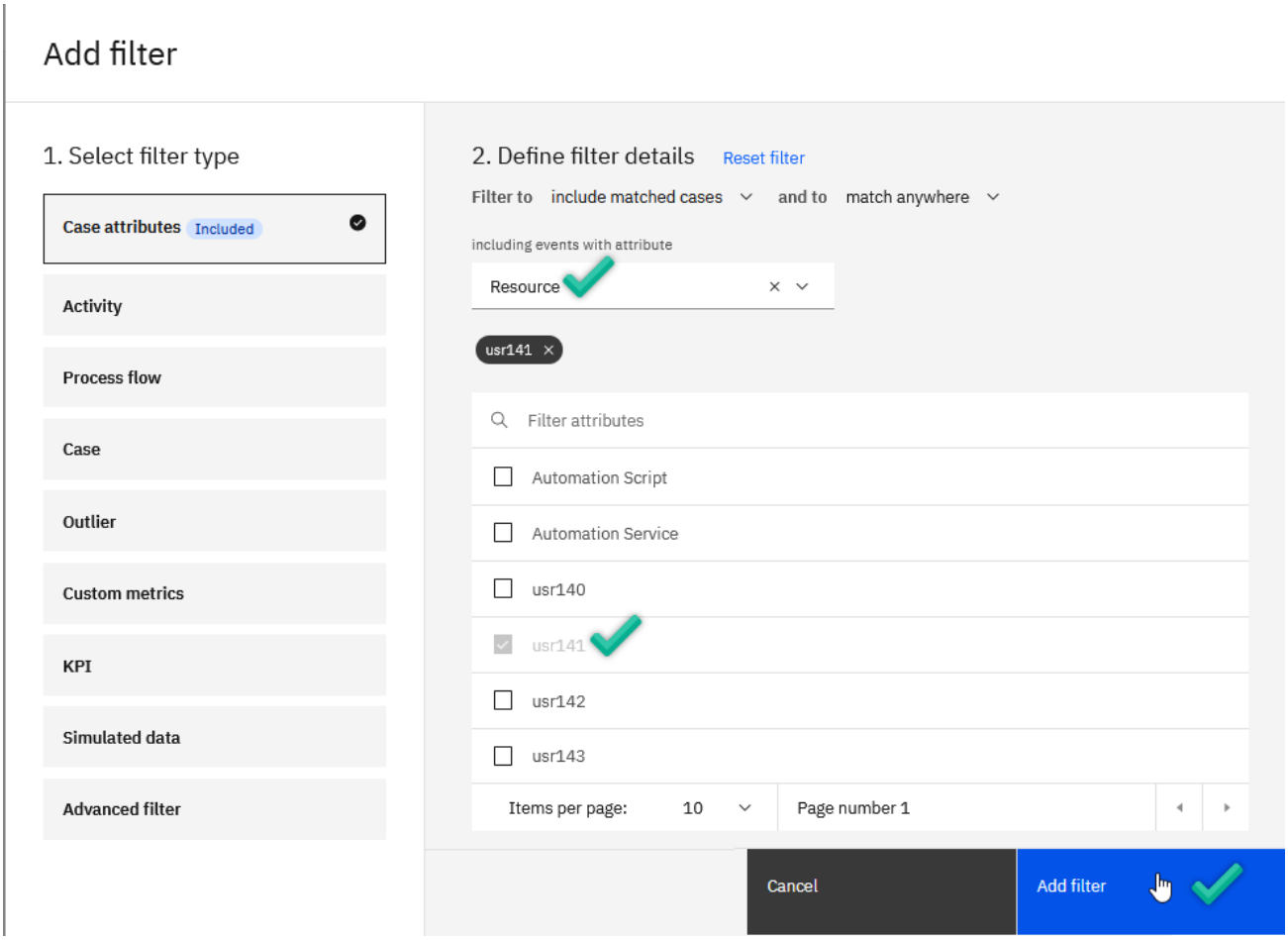
3.2.8.2.1 Create Filter Templates

Filters allow you to analyze the Process considering a limited subset of cases that answer a specific user request.

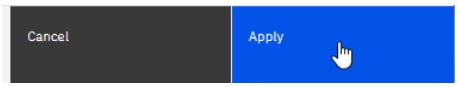
_1. Click **Add filter +** (top right of the page)



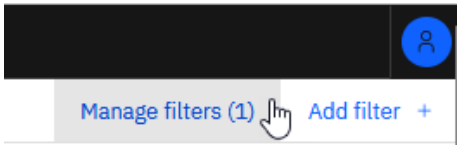
_2. For *including events with attribute,* select **Resource**; for *Resource,* select **usr141,** and then click **Add filter**



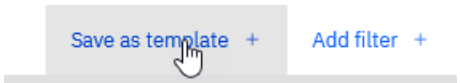
_3. Click **Apply**



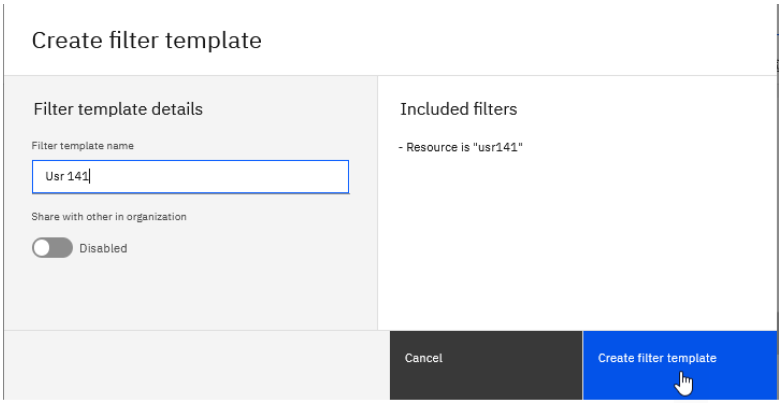
_4. Click **Manage filters (1)**



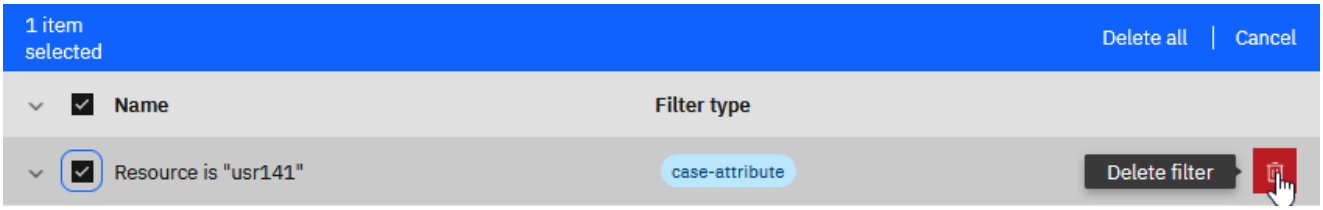
_5. Click **Save as template +**



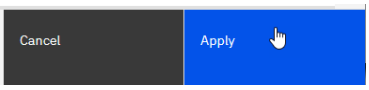
_6. For the *Filter template name*, enter **Usr 141** and then click **Create filter template.**



_7. Select **usr141** filter and click **Delete filter** (We do not want this filter to be our current filter!)



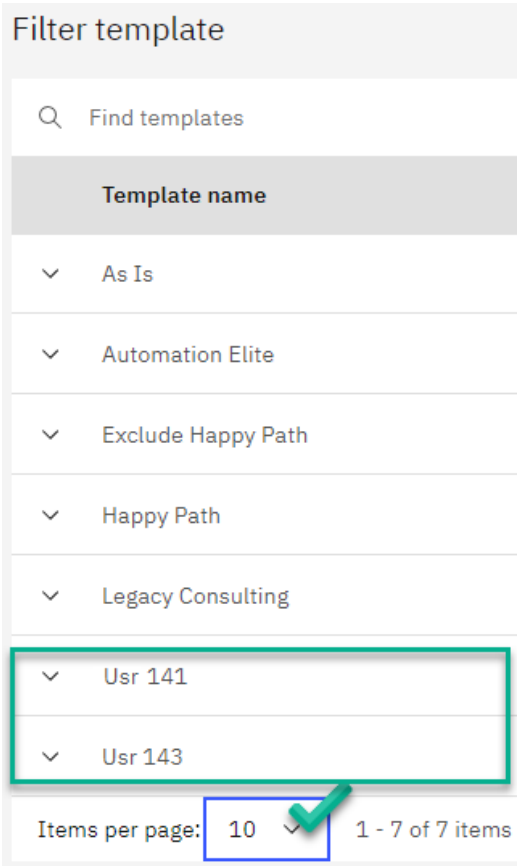
_8. Click **Apply.**



_9. Follow the above steps (1-8) to create **Usr 143** Template Filter.

To verify that you create the Filter Templates correctly, click **Manage filters** and change **Items per page** from 5 to 10.

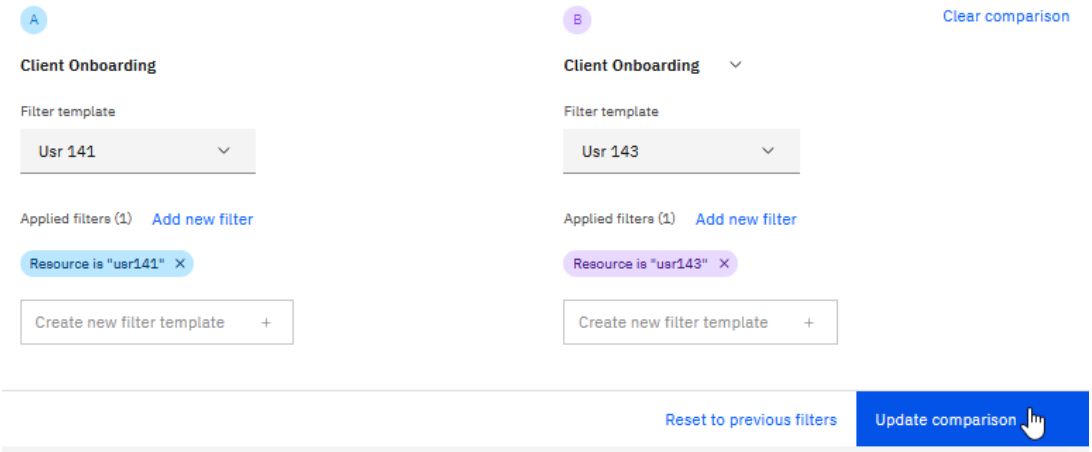
You should now see 2 new Template Filters.



3.2.8.2.2 Use Template Filter to Compare Employee Performance

Let's find out which employee turns out to be more productive! As you will find out, the answer is not simple.

_1. For As-is, select **Usr 141** for To-be, select **Usr 143,** and then click **Update comparison.**



_2. Let's examine the **Process details** view.

Process details

Measure: Average	A As-is	B To-be
Case count	12	10
Average case lead time	3hrs 48mins	2hrs 27mins
Average case cost	EUR 532.32	EUR 496.60
Total case cost	EUR 6,387.83	EUR 4,966.00

It looks like **Usr 143** performs better than **Usr 141**:

- **Usr 141** completes cases slower than **Usr 143**
- **Usr 143's** case cost is lower than **Usr 141's**.

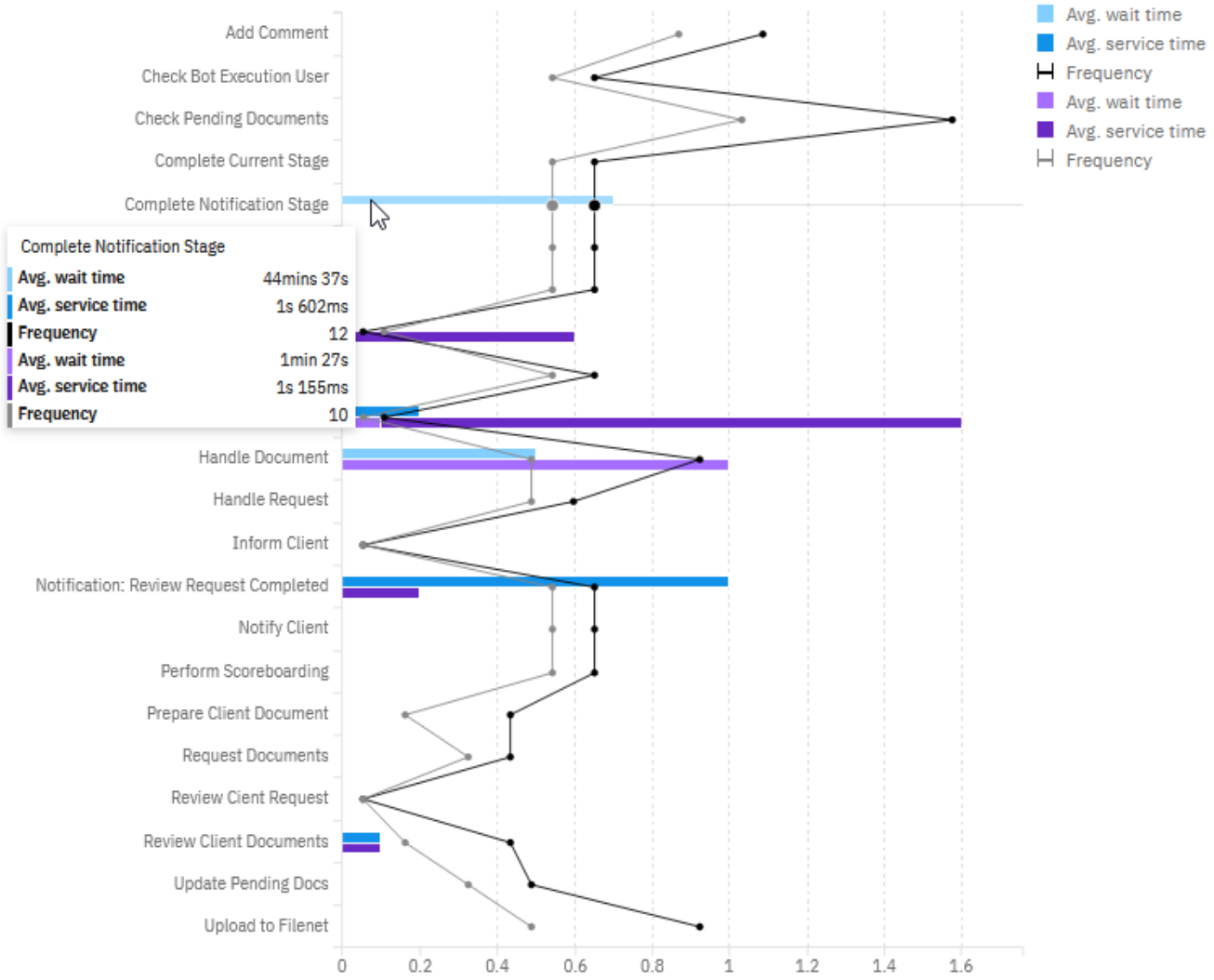
_3. Not the Case count numbers **12** for **Usr 141** and **10** for **Usr 143**. You will use these numbers later on to calculate the Average Activity Cost.

3.2.8.2.3 Gain Insights about Employee Lead Time

Let's examine the Activity Duration view to see why **Usr 141** completes cases faster than **Usr 143** and to identify any specific Actities that may be responsible for the performance differences,

_1. Hover the mouse over the horizontal bars, and you can compare the **Avg. wait Time** (how long an employee waits before starting an Activity) and **Avg. service Time** (how long an employee takes to perform an Activity)

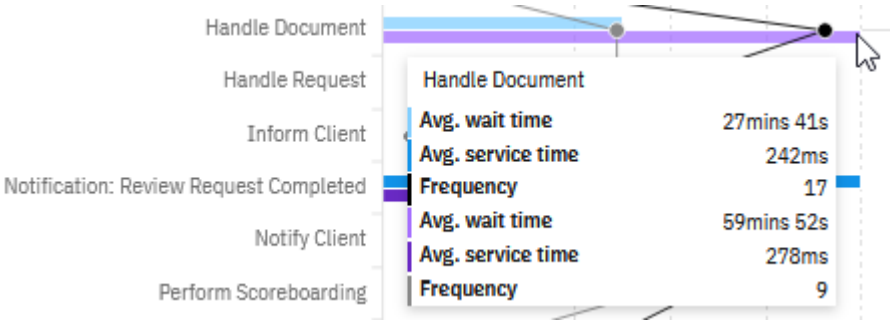
Specifically, if you look at the *Complete Notification Stage*, you will see that **Usr 141** experiences 40 times longer Average wait time than **Usr 143**.



3.2.8.2.4 Investigate Large Wait Time for a Specific Activity

Let's investigate the Handle Document Activity and explain why a long Wait Time may occur.

_1. Hover the mouse over **Handle Document** Activity.



Notice the high average wait time for the Handle Document Activity is significant for both users!

Let's examine the Review Document BPMN Process (which includes the Handle Document Activity) to explain the long wait time.

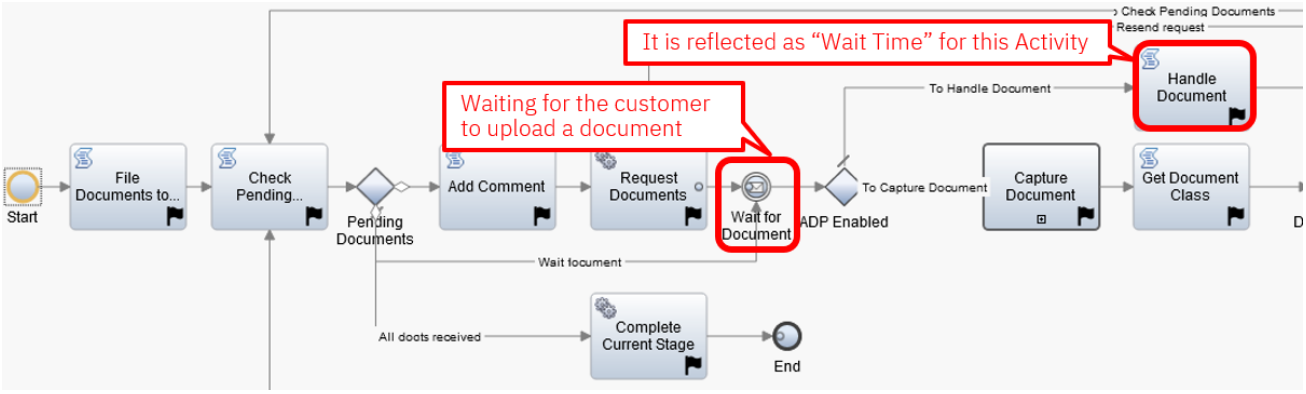


Figure 8. Impact on Waiting for Documents to be Submitted on Lead Time

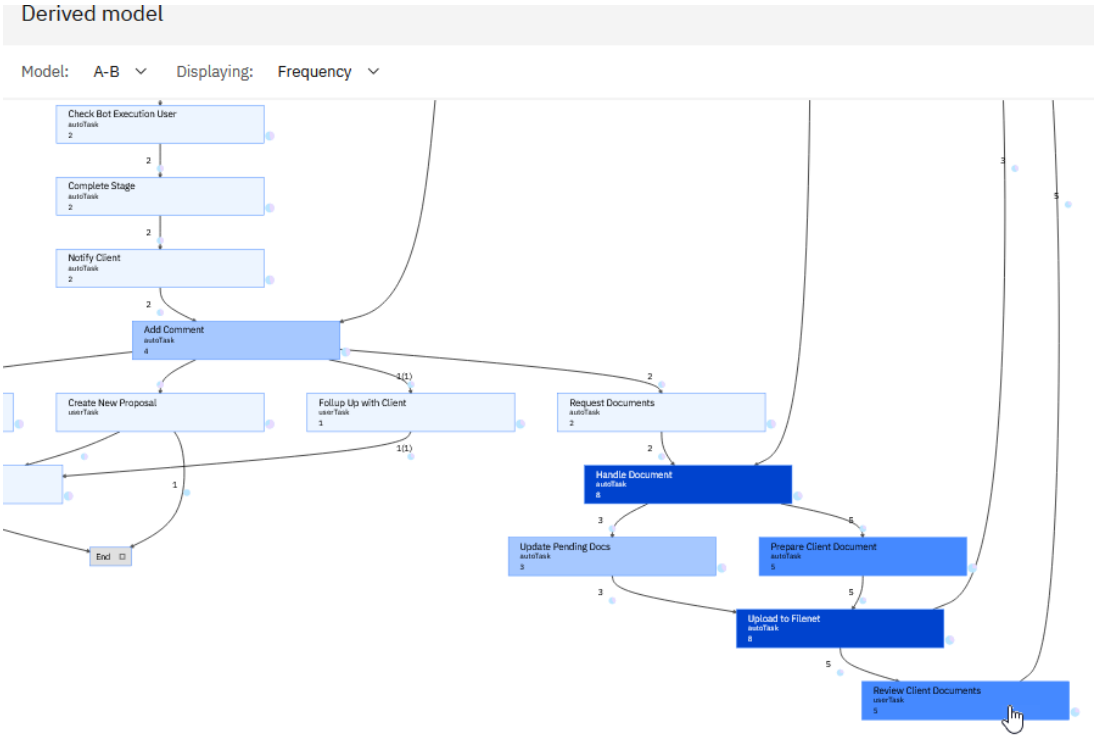
The Figure above shows that the **Wait for Document** message-receive Activity (not recorded in the Process Mining Model) must be complete before the **Handle Document** Activity can start! The **Wait for Document** message-receive Activity blocks the **Handle Document** Activity.

We discovered that waiting for customers to supply documents is the root cause of the employee's Case Lead KPI score. Interestingly, **Usr 143**, a better performer (lower Average case lead time), experiences longer wait times than **Usr 141**.

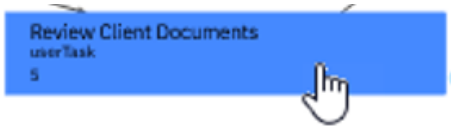
3.2.8.2.5 Case Cost Comparison and Explanation

Let's examine the Derived model view to see why **Usr 141** cost is higher than **Usr 143**

_1. Find the **Review Client Documents** Activity in the *Derived model* view (located at the bottom of the page).

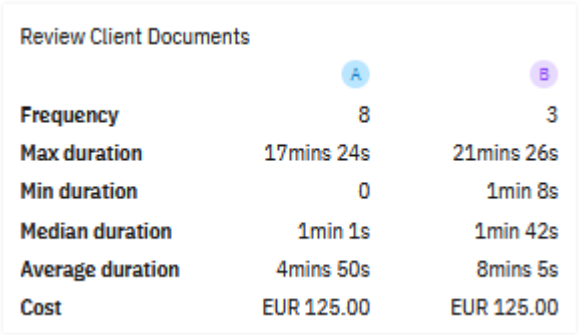


_2. Click **Review Client Documents** Activity



_3. Examine the legend in the top right corner of the view to identify

- The **Activity Frequency** numbers 8 and 3, and
- The **Cost** EUR 125.00



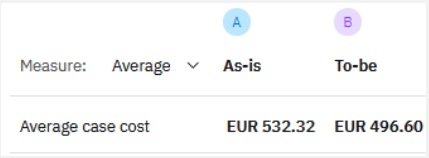
You will use these numbers later on to calculate Average Activity Costs.

For the **Number of Cases Completed**, you will use the numbers you saw in Steps 2: 10 and 12.

Let's use this formula to calculate the Average Cost of the Average Review Client Documents Activity:

Average Activity Cost = (Activity Frequency / Number of Cases Completed) * Activity Cost

The results are summarized in the table below:

Employee	Average Activity Cost	Conclusion
Usr 141	(8 / 12) * EUR 125.0 = EUR 63.3	The employee **Usr 141,** had to review documents more often than employee **Usr 143.** This explains why **employee Usr 141** has a higher average case cost. 
Usr 143	(3 / 10) * EUR 125.0 = EUR 37.5	

Process Improvement Insight:
(1) Comparing two clients. Two factors affected Automation Elite Inc.'s longer case lead time. Due to inaccurate or missing documents, it took significantly longer to review documents. Time-consuming manual intervention was required to recover a failed RPA bot that updated client information.
(2) Comparing the performance of two employees. Waiting for customers to supply documents is the root cause of both employees' poor Case Lead KPI score. The employee Usr 141, reviews documents more often. Since this is a costly activity, it had a more significant impact on the average case cost than for the employee Usr 143.

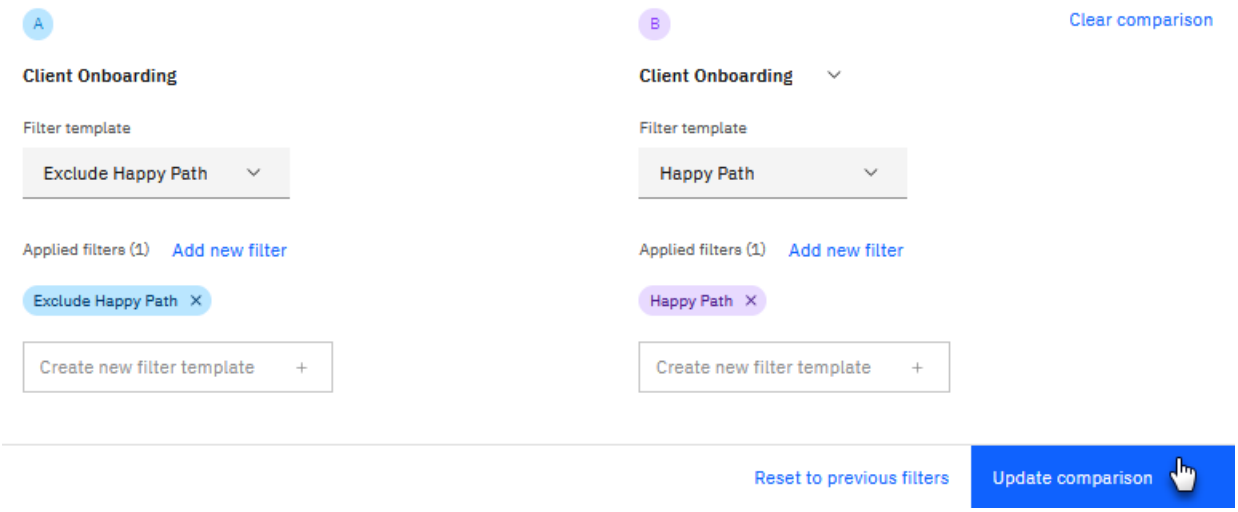
3.2.9 Happy Path Analysis for New Straight Though Workflow Candidate

In the Use Filter to Discover Happy Path, section, we discovered the "Happy Path" in the Client Onboarding Workflow. We will now evaluate it against instances that did not follow the "Happy Path." If the evaluation goes well, we will export the BPMN diagram and hand it to the IT Organization to consider using the Happy Path Process Variant as a fully automated Straight-Through-Process implementation!

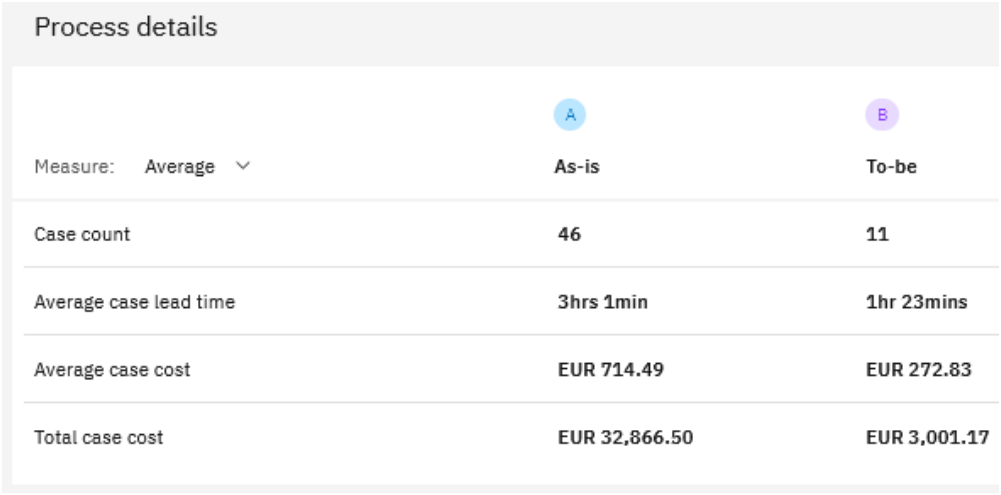
3.2.9.1 Happy Path Comparison

We have already created two filter templates for you to save some lab steps: Happy Path and Exclude Happy Path. We will use them to compare the Happy Path case variant with one that does not include the Happy Path cases.

_1. For As-is, select **Exclude Happy Path** for To-be, choose Path Happy**,** and click **Update comparison.**



_2. Let's examine the **Process details** view.



The "Happy Path" process variant is the winner! It has almost three times lower lead time and nearly three times lower average cost. It looks promising!

3.2.9.2 Generate Happy Path BPMN Process

We will create a BPMN Process diagram, export it to a file, and hand it to the IT Organization.

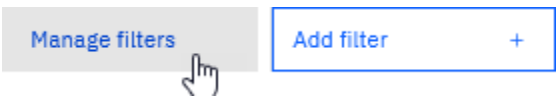
The exported BPMN model could be imported to any BPMN-compliant editor, including IBM Blueworks Live.

IBM Bluewoks Live processes can also be imported to IBM Process Mining to perform simulations based on the automatically generated event data. The BPMN import transformation maps the Work Time to Working time but does not use Wait time.

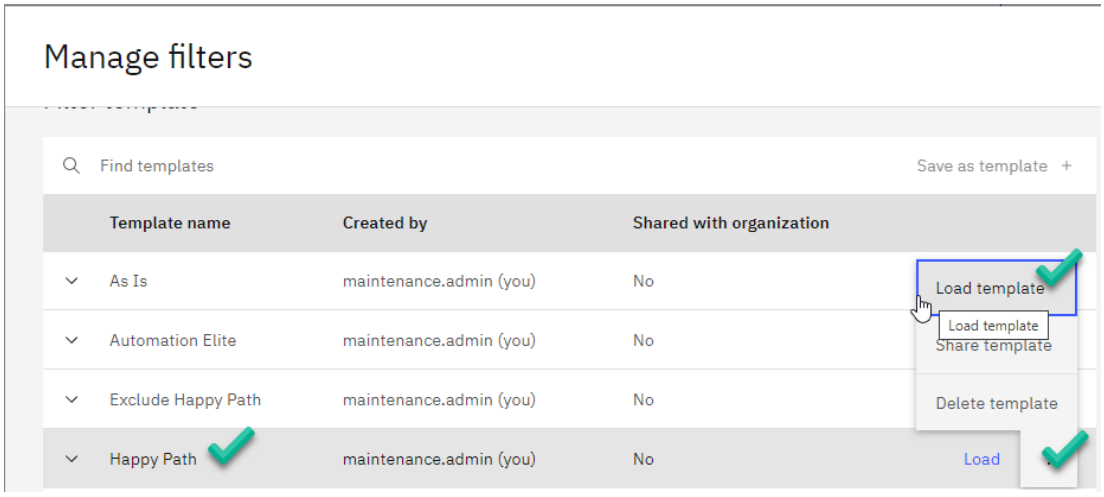
3.2.9.2.1 Create BPMN Diagram

First, we will apply the Happy Path filter to include only the Happ Path Cases.

_1. Click **Manage filters**



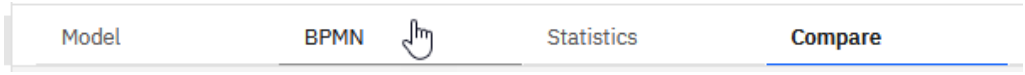
_2. Select the **Happy Path** filter, click **vertical ellipses,** and then select **Load template.**



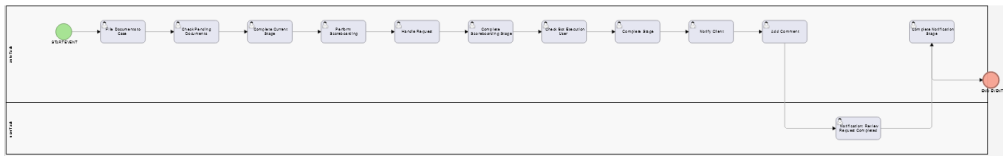
_3. On *Applying this template replaces all current filters* message box, and click **Continue.**

_4. Click the **Close** button to close the *Manage filters* window

_5. Click **BPMN** tab



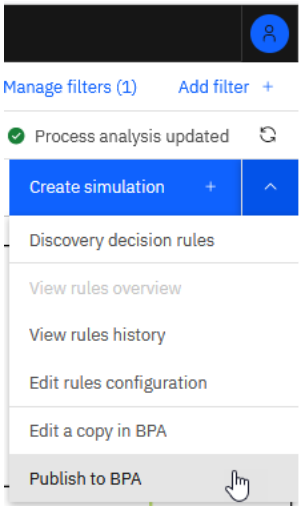
You should now see the BPMN diagram of the Happy Path process.



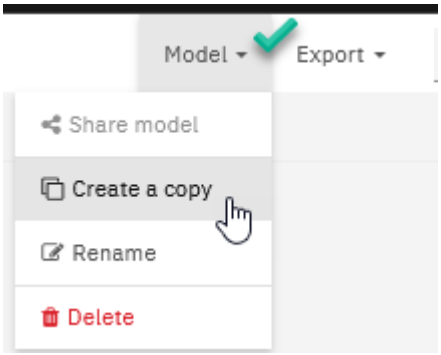
This BPMN diagram is a standard BPMN 2.0 model that is generated by IBM Process Mining automatically from actual data.. It does not contain any decisions. However, if it did, the Decision Rules Mining capability would automatically discover the correlations within the mined data and detect decisions governing the Process. The decision could then be exported in DMN format. DMN stands for Decision Model and Notation, see https://www.omg.org/dmn/) format.

3.2.9.2.2 Export BPMN Diagram

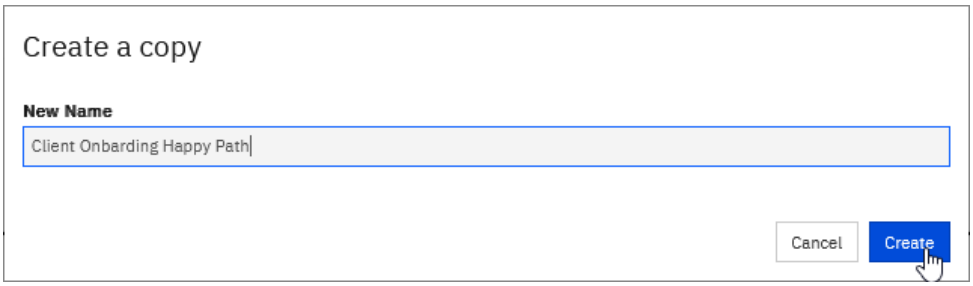
_1. Click the **dropdown** next to *Create simulation +* and then click **Publish to BPA.**



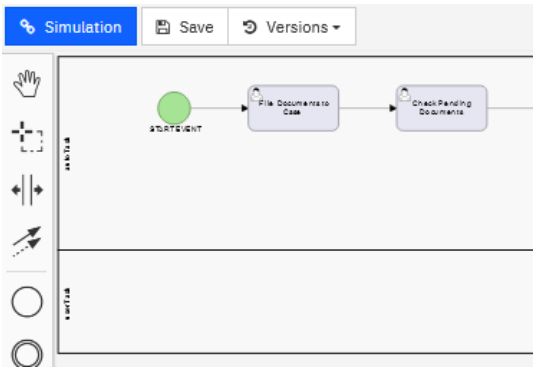
_2. Click the **Model dropdown**, and then click **Create a copy.**



_3. For *New Name* enter **Client Onboarding Happy Path** and then click **Create**



You should now see the BPMN diagram in edit mode, with the palette appearing on the left.



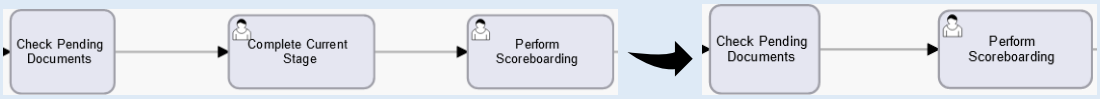
The following steps are optional high-level steps not required to complete the lab.

The next step would be to export the BPMN Process. Business Process Analysis (BPA) view includes a BPMN Editor. Before exporting the BPMN Process Model, we could now make some changes in the BPMN Editor. Or you could export the Process as is and make the changes to IBM Process Designer in Business Automation Studio.

If you prefer to make the changes in the BPMN Editor, follow these steps.

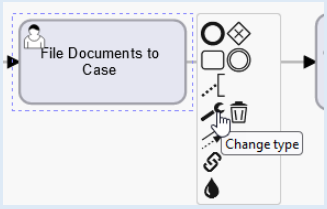
Change activity types from User Task to Manual Task

Remove Activities associated with Complete Case Stages (there are no stages in a Straight-Through-Process)

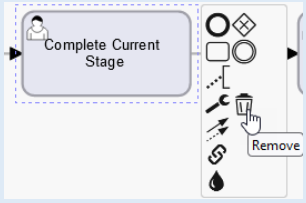


Making these model changes is not required to complete the exercise. But if you like to attempt it, here is how.

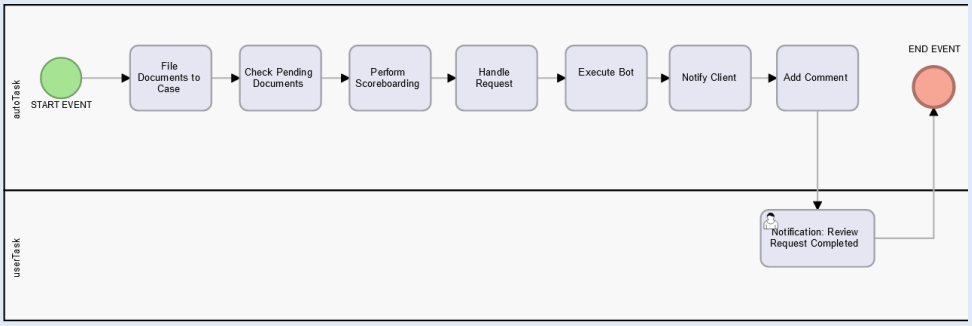
To change activity type



To delete an activity

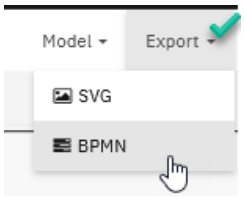


The edited flow should then look similar to this

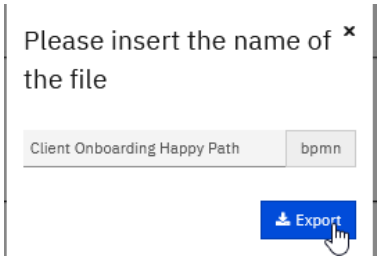


When you are done, click Save

_4. Click the **Export dropdown** and then select **BPMN.**



_5. Click **Export**

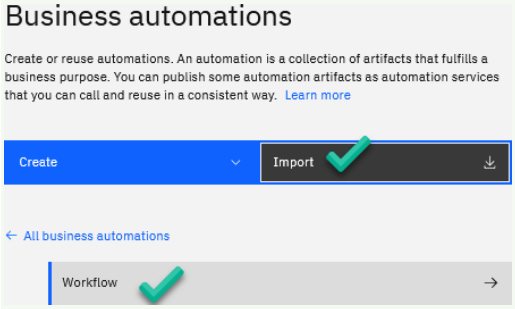


_6. If you plan to use the exported BPMN file later, select the folder and click **Save.**

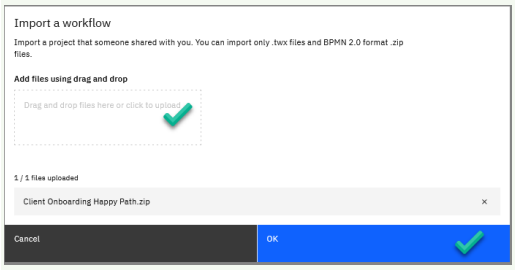
The following are high-level optional steps that are not required to complete the lab.

To import the BPMN file to Web Process Designer, switch to Business Automation Studio and follow these steps:

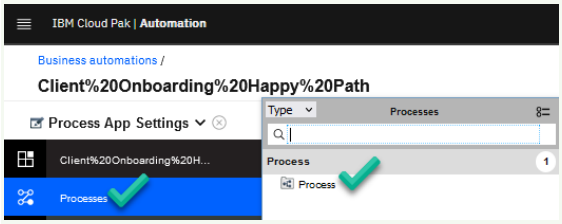
- Create a zip from the "Client Onboarding Happy Path.bpmn" file
- In Business Automations, select Workflow and then Import



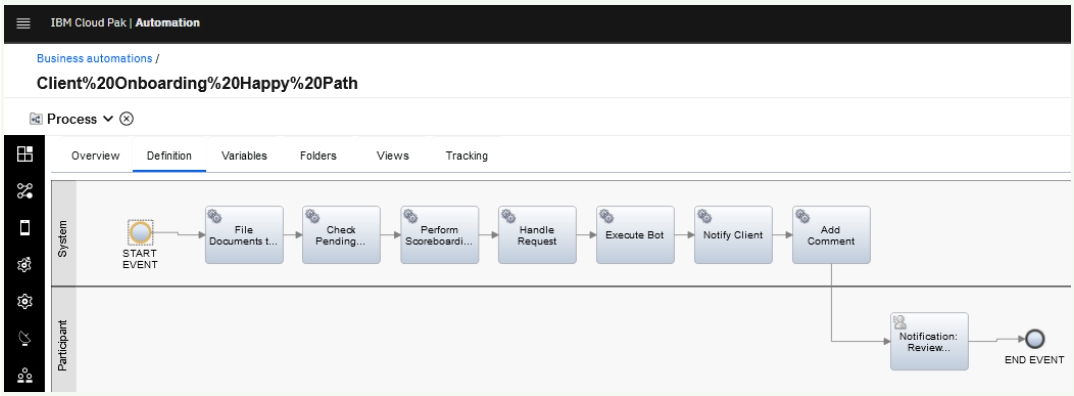
- Drag and drop "Client Onboarding Happy Path.zip" file and click OK



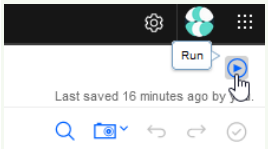
- When Process Designer opens, select Process and then click Process



- The imported Process is executable!

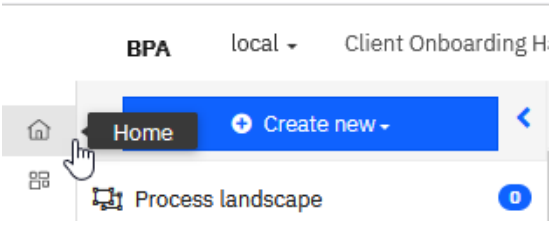


- Try executing it if you like.

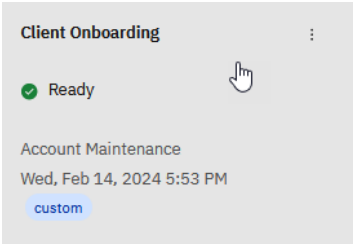


Of course, the Process does not do anything because none of the activities are implemented. This would be the next step to create a BPMN Straight Through Process.

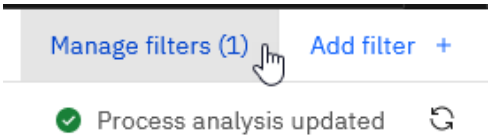
_7. Click **Home** to switch back to the Process Mining component.



_8. Reopen the **Client Onboarding** Process from the *Recent projects* list.

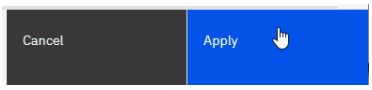


_9. Click the **Manage filters (1)**.



_10. Select the **Happy Path** filter and click the **Delete filter (garbage can).**

_11. Click **Apply.**



Process Improvement Insight:
The Compare feature provided the evidence (significantly lower Case Cost and Lead Time for 20% of all cases) to justify investment in creating a Straight Through Process (STP) version of the Client Onboarding Workflow.
When implementing the STP process, the IT organization could also consider automating the only remaining human task in the Process:

Removing this async Activity would make the Client Onboarding Happy Path Process a true STP process,.

3.2.10 Using Dashboards to Optimize Client Onboarding Workflow

Process Dashboards are a vital feature of the Analytics component of IBM Process Mining. For each IBM Process Mining process, it is possible to create one or more *Analytics* dashboards to provide critical business insights and enable the business user to monitor near real-time critical business metrics and, if needed, dive into a problem-solving mode immediately.

Below are handy definitions of some terms we will use in this part of the lab.

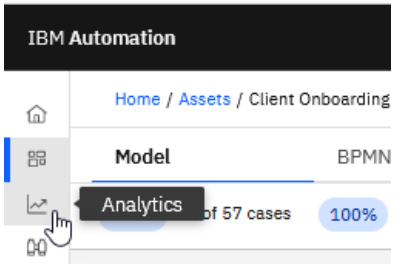
Throughput Time = Service time + Waiting Time

Service Time = End Time – Start Time

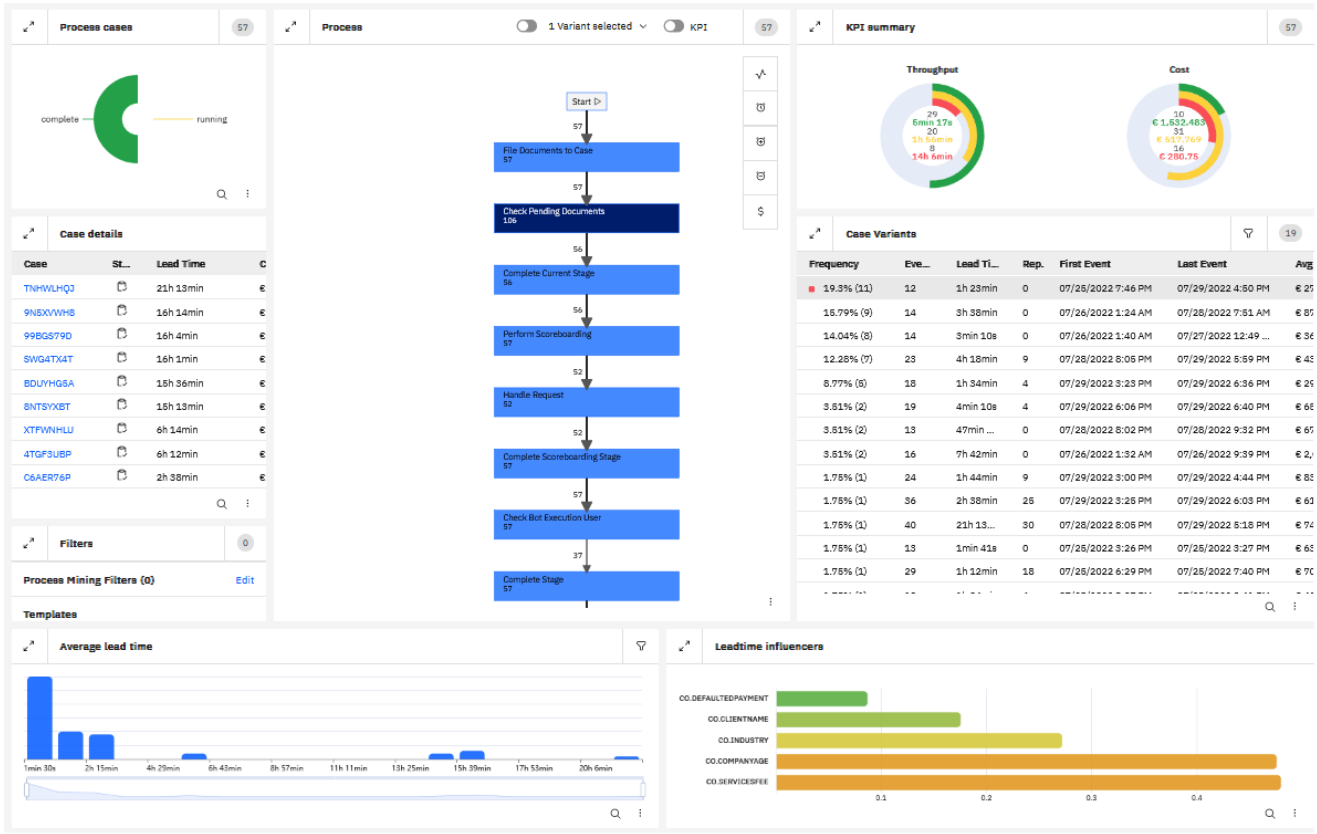
Waiting Time = Previous Activity Stop time – Next Activity Start Time

All the above metrics are available because the data is retrieved from IBM Business Automation Insights. Logs from systems that do not provide Activity End Time use different calculations for the above metrics.

_1. Click **Analytics** to switch to the Analytics component.



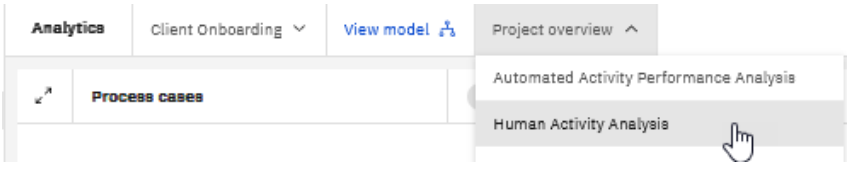
The Analytics view opens, displaying a system-generated *Project overview* Dashboard available to all projects. The default Dashboard cannot be deleted or changed but can be duplicated and modified.



3.2.10.1 Human Activity Analysis Dashboard

We built this custom dashboard for you to identify and analyze the impact of human activities on the process lead time and process cost.

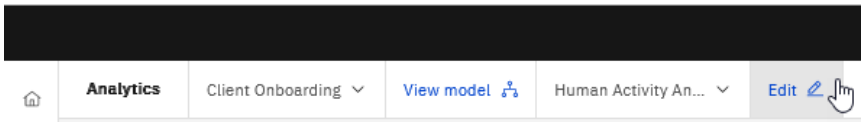
_1. Select **Human Activity Analysis**



3.2.10.1.1 Build Average Human Activity Service Time Chart

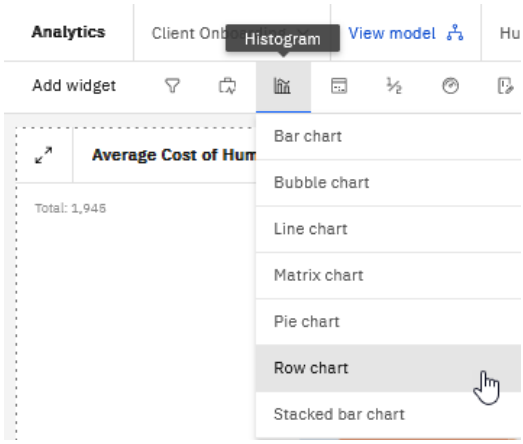
Before we proceed with the analysis, let's gain some practical experience building a chart related to Service Time.

_1. Click **Edit**

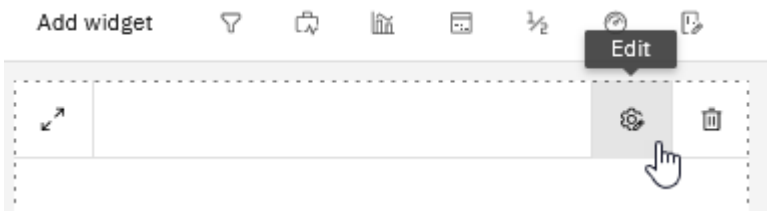


Custom dashboards are built from configurable pre-built widgets (the first six categories) or user-defined custom widgets requiring IT skills (the last category in the palette).

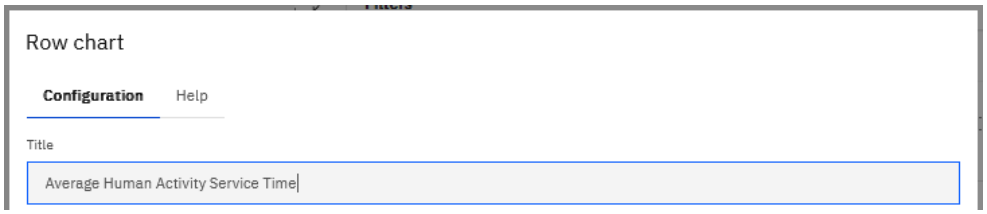
_2. From the palette, select **Histogram** and then choose **Row chart.**



_3. Click the **Edit** to configure the new widget.



_4. For *Title,* enter **Average Human Activity Service Time.**



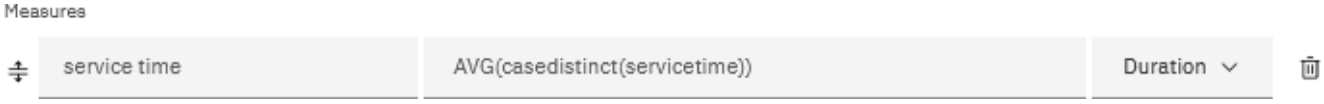
_5. For *Dimensions*, click **Add new dimension.**

_6. From the dropdown, select **Activity.**

_7. Click **Add new measure.**

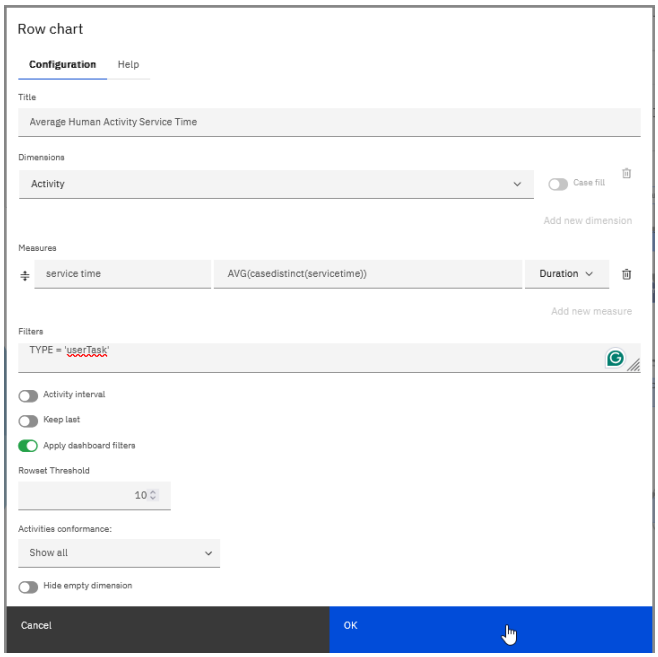
_8. For *Measures* enter the following values

Setting	Value
Name	**service time**
Expression	**AVG(casedistinct(servicetime))**
Data type	**Duration**

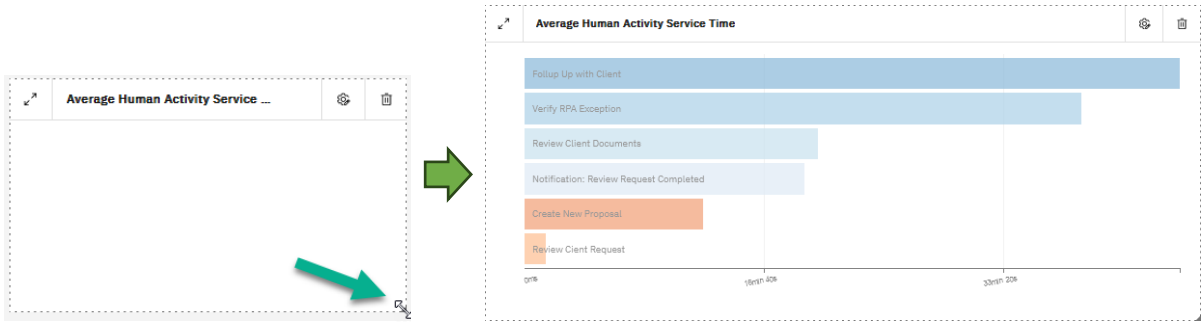


_9. For *Filters*, enter **TYPE = 'userTask'** to ensure we only include the Human Activities.

_10. The completed Chart should look exactly like this. Click **OK** to create it.



_11. Grab the **bottom right corner** of the Chart to expand it to the right and down,

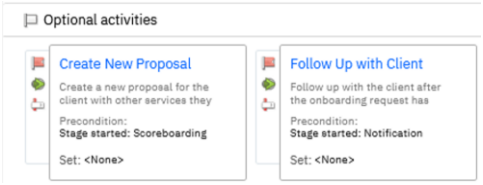


_12. Click **Save**

Click here to learn more about creating Dashboard Charts.

3.2.10.1.2 Human Activity Analysis

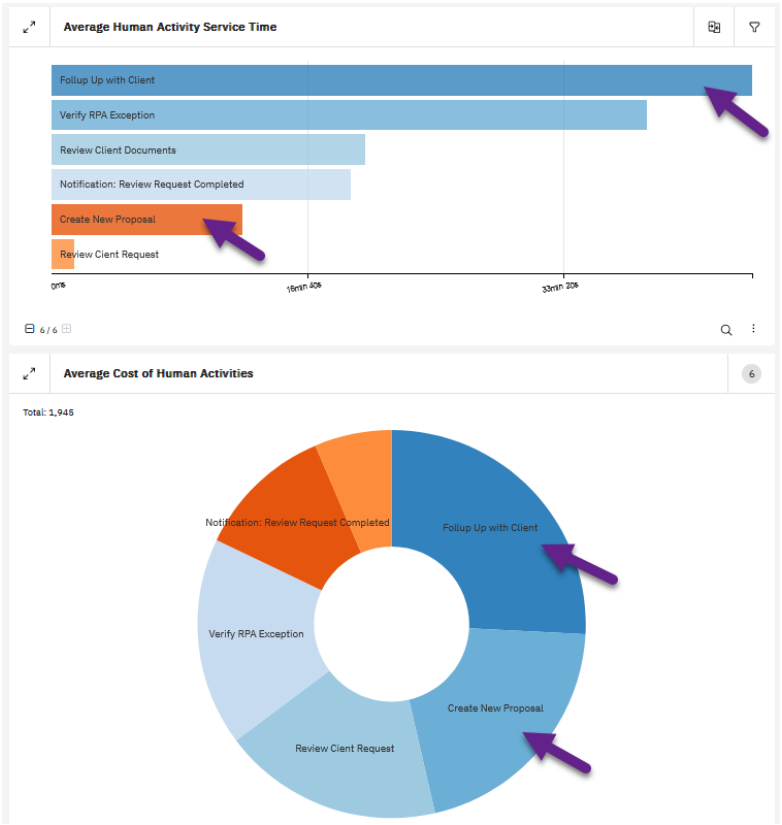
Let's focus on two Human Activities that implement the two optional steps in our Case Solution: **Create New Proposal** and **Follow Up with Client**.



_1. Notice that these two activities have both:

(1) high Service Time (shown in the row-chart you have just created) and

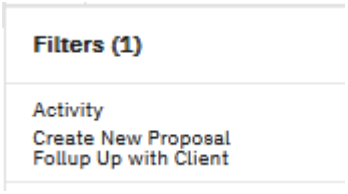
(2) high Average Cost (shown in the pie-chart already present in the Dashboard)



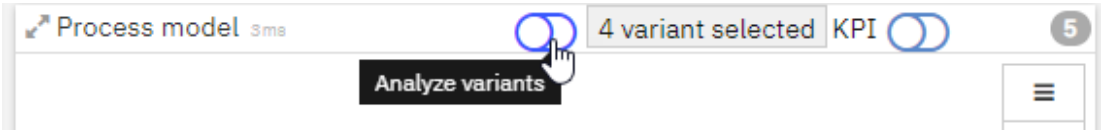
_2. In the pie chart, click **Create New Proposal.** Then **wait a few moments**. Then click **Follow Up with Client**.

_3. Note that this action filtered out the cases that do not include the above Human Activities.

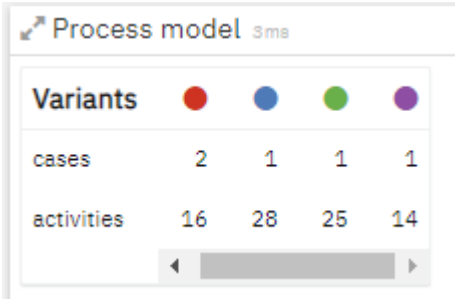
You should now see two filters applied to this dashboard. Note that the filters are internal only to this dashboard.



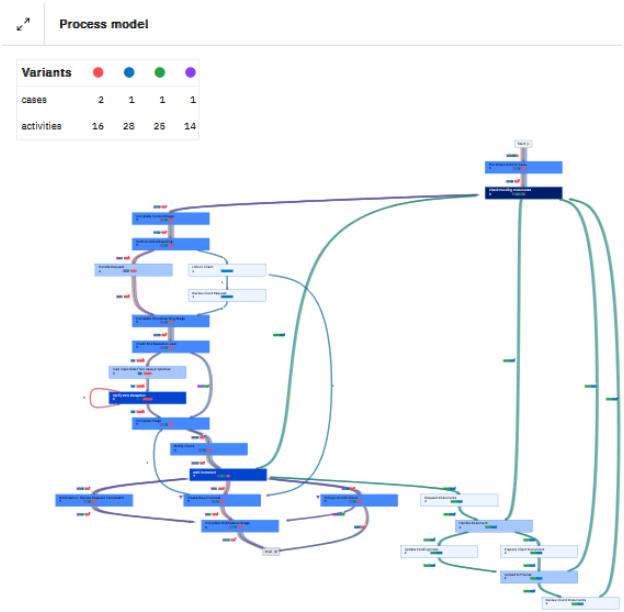
_4. In the *Process model* widget, click **Analyse variants**



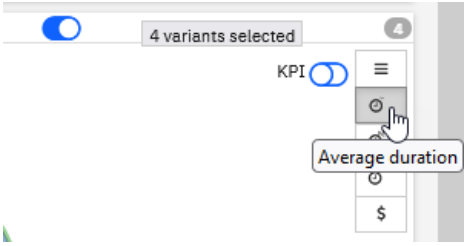
_5. Note that we now have 19 Variants. A different color represents each Variant's Path. Note that the blue Variant has only one Case.



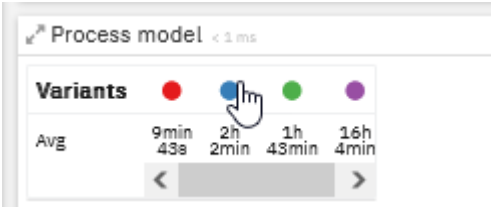
_6. Use the mouse wheel to adjust the *Model view* to fit the viewing area.



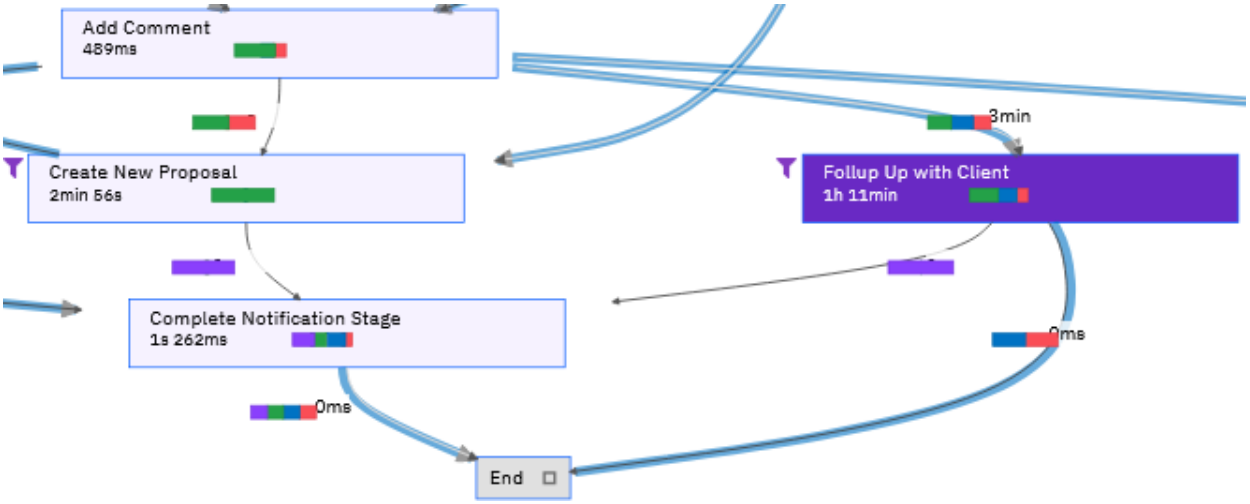
_7. Select **Average Duration** View



_8. Click on the **blue Variant.**



_9. Note that if you follow the blue Variant's process path, you can see what activities were executed in a single Case. Also, notice in this Variant. It took 1 hour 11 min to complete Follow Up with Client Activity

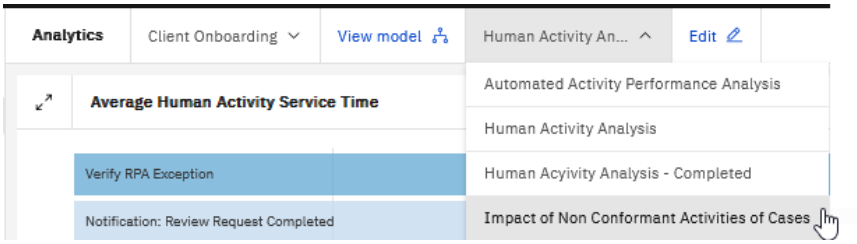


Process Improvement Insight:
We identified human Activities with comparatively large Activity Costs and Service Time. We then linked them to the Variants and Cases where they occurred and assessed their impact. This analysis typically leads to business initiatives such as automation or organizational changes. Later, in this lab, you will learn how any such process improvements we identified in Dashboards can be simulated to understand their impact on process metrics such as Cost and Lead Time.

3.2.10.2 Impact of Non-Conformant Activities on Cases Dashboard

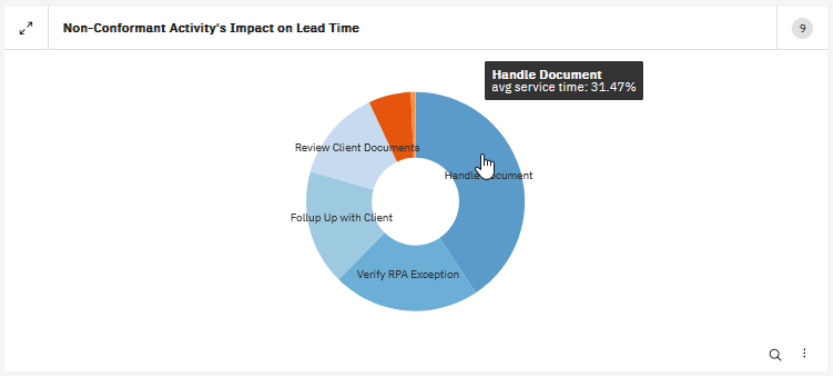
This dashboard helps assess the impact of non-conformant activities on the Case Lead Time and Case Cost.

_1. Select **Impact of Non Conformant Activities on Cases**

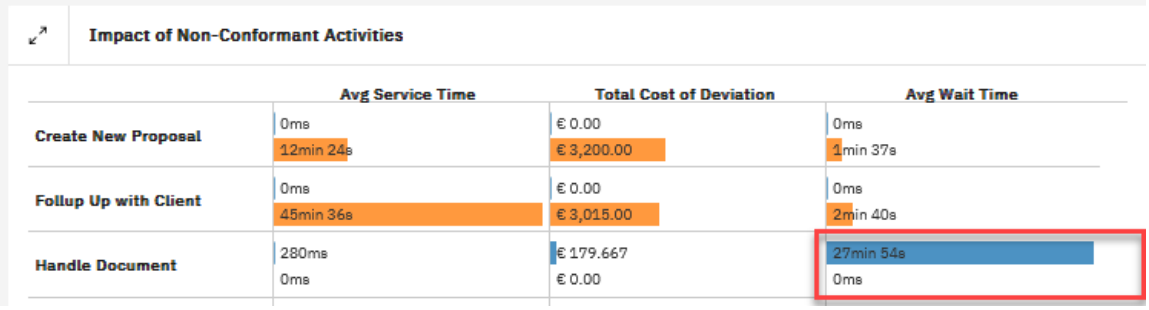


3.2.10.2.1 Case Lead Time

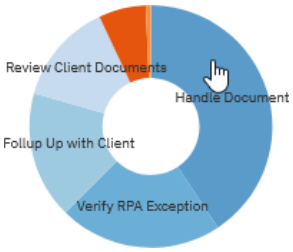
_1. Notice that the **automated** Activity called **Handle Document** contributes to Lead Time with 31.47%.



_2. Typically, automated activities are fast (low Service Time), but as shown in the Chart, they may have a considerable Wait Time.



_3. Click the **Handle Document** wedge in the pie Chart.

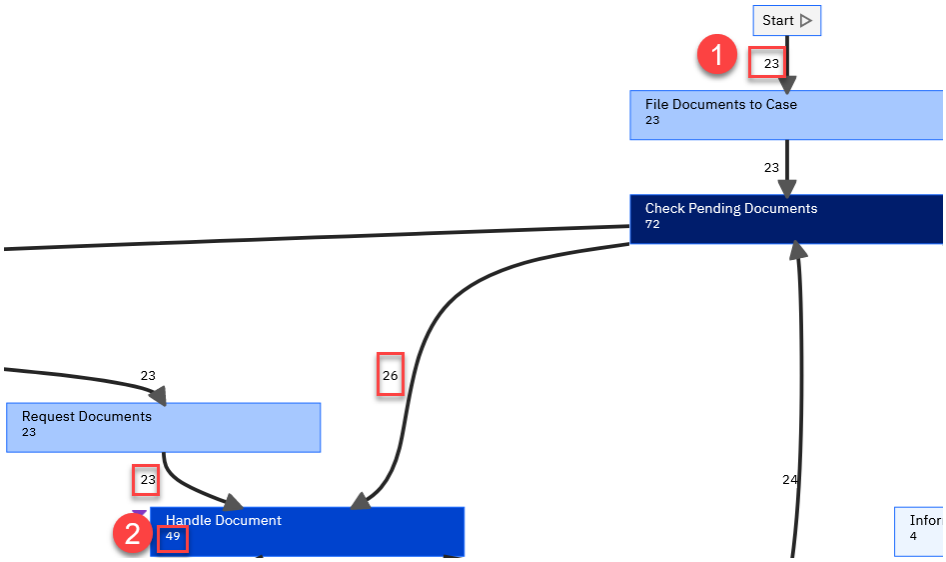


_4. Notice:

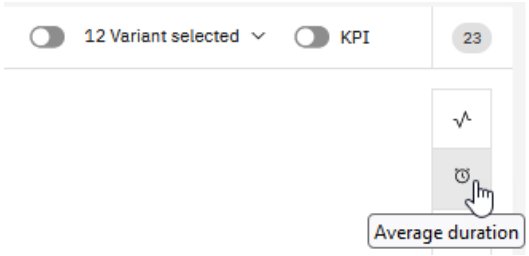
(1) we only have 23 instances,

(2) but Handle Document is invoked 49 times.

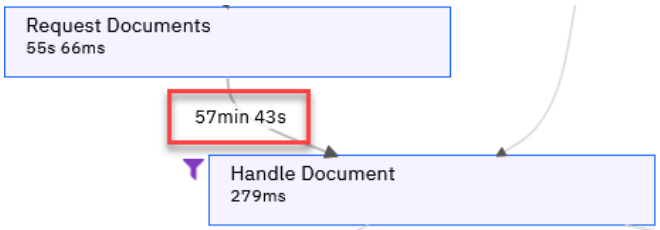
This means Rework, which adds to a Case lead time!



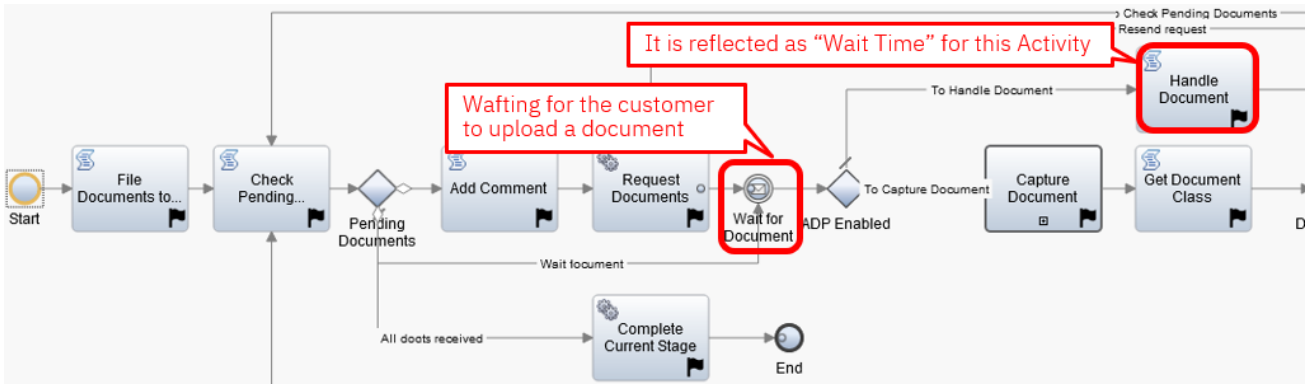
_5. On the *Process model*, select the **Average duration.**



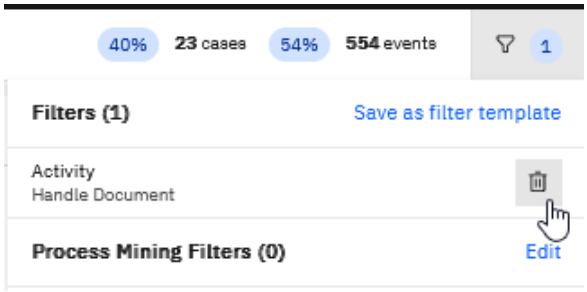
_6. Notice the long wait time!



Recall from the previous analysis that the **Wait for Document** message-receive Activity blocks the **Handle Document** Activity:



_7. Click the **Filter icon** and then the **garbage can icon** to remove the **Activity Handle Document** filter.

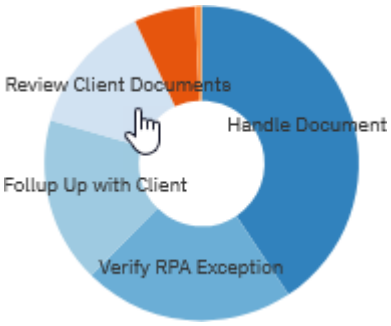


3.2.10.2.2 Case Cost

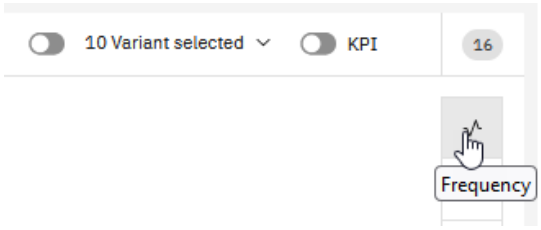
We have already investigated **Create New Proposal** and **Follow up with Client** (optional Activities).

Let's focus now on another non-conformant activity that is not optional**: Review Client Documents** Activity – it has a 3rd high Cost of Deviation!

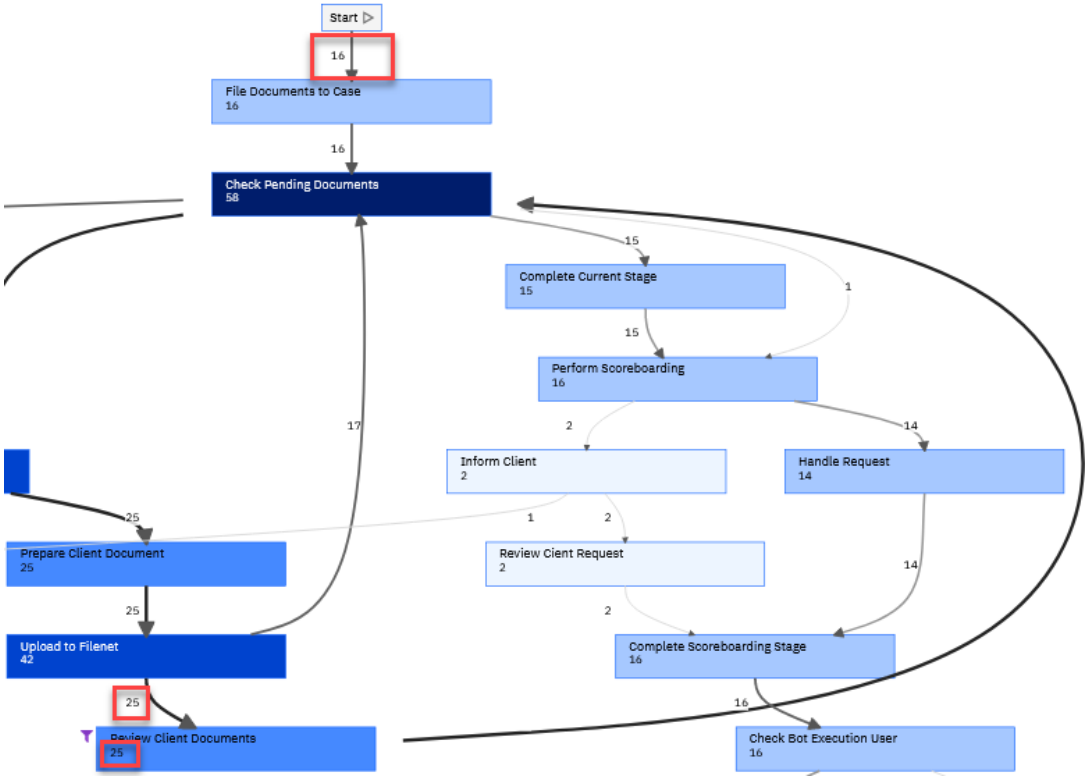
_1. Click the **Review Client Documents** wedge in the pie Chart to activate a Filter that shows only the Cases that include this Activity.



_8. In the *Process model* view, select **Frequency.**



_9. Notice we only have 16 instances, but the Review Client Documents Activity is invoked 25 times. This means Rework, which adds to a Case Cost.

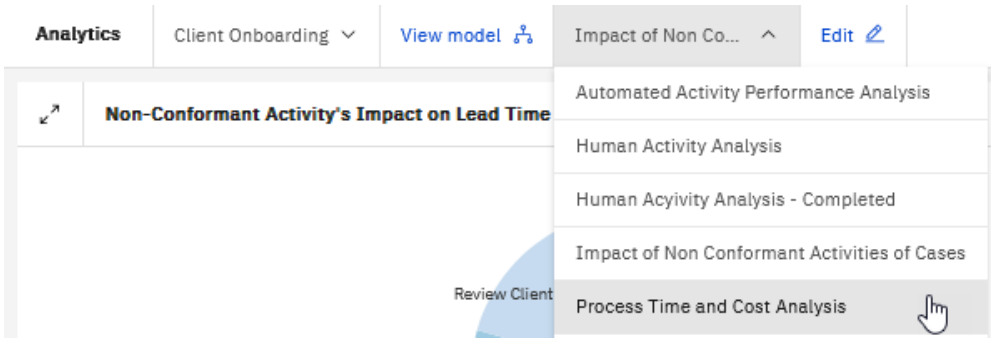


Process Improvement Insight:
(1) Case Lead Time. We discovered that the Average Wait time of an automated non-conformant Handle Document Activity was a key contributor to Case Lead Time in one of the Variants and, with the help of the IT organization, identified that waiting for clients to upload documents was the root cause.
(2) Case Cost. We discovered that the Cost of an automated non-conformant Review Client Documents Activity was a key contributor to Case Cost. Additionally, this Activity was involved in rework loops and contributed to high Case Costs.
Business action is to ensure the customer provides all documents and that the documents are correct when requesting a new service for the first Time.

3.2.10.3 Process Time and Cost Analysis Dashboard

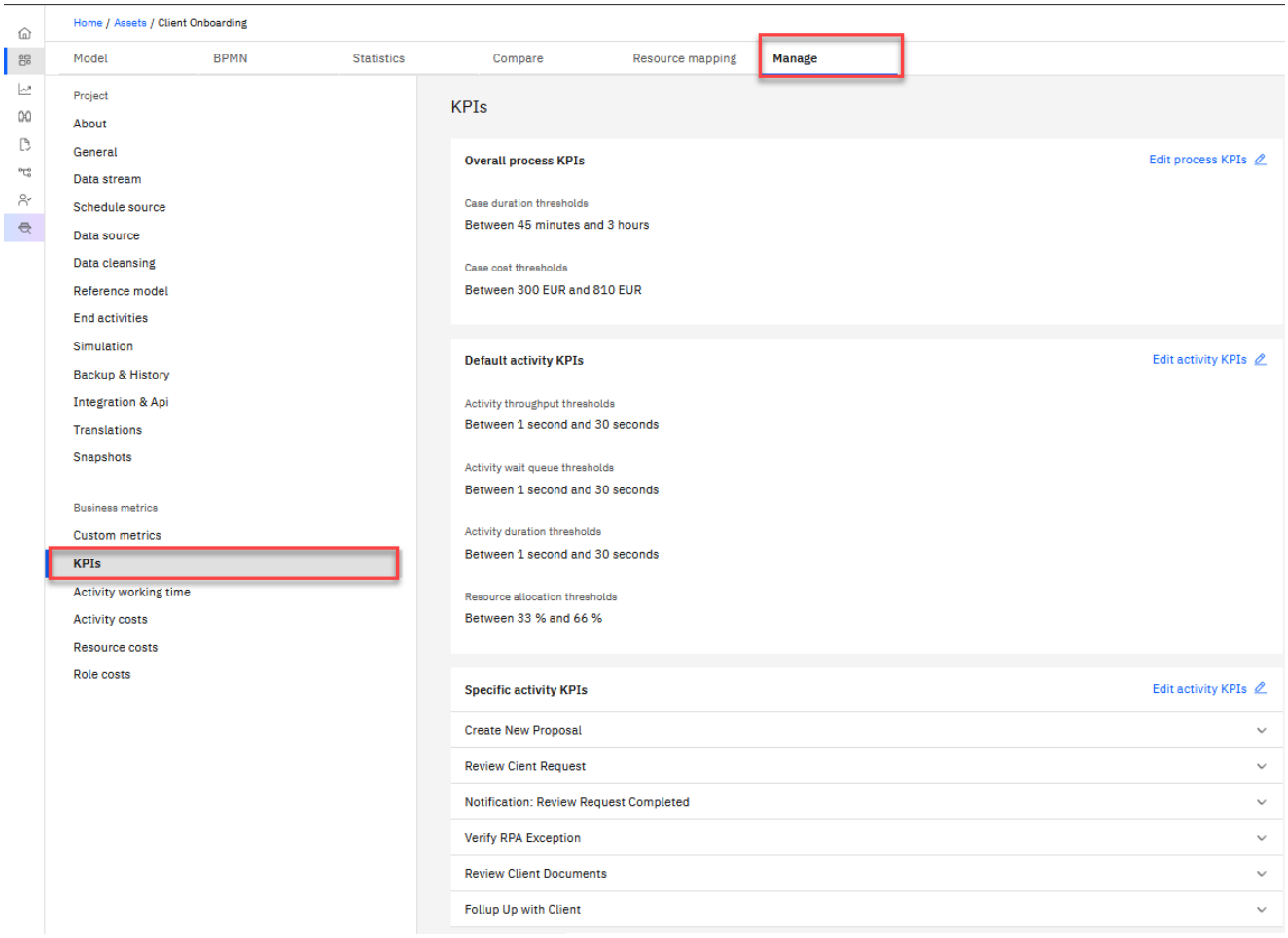
This dashboard focuses on individual case performance concerning Cost and Throughput KPI. It identifies KPI violators at the case level and enables drilling down to gain more insights into the root causes.

_1. Select **Process Time and Cost Analysis**



_2. Before we examine the widgets, it is worth mentioning where the Process ad Activity KPI settings used in the widgets come from.

The KPI Settings were defined in the Process definition **Manage > KPIs**.



_3. Let's examine the widgets to understand how they reflect the KPI settings.

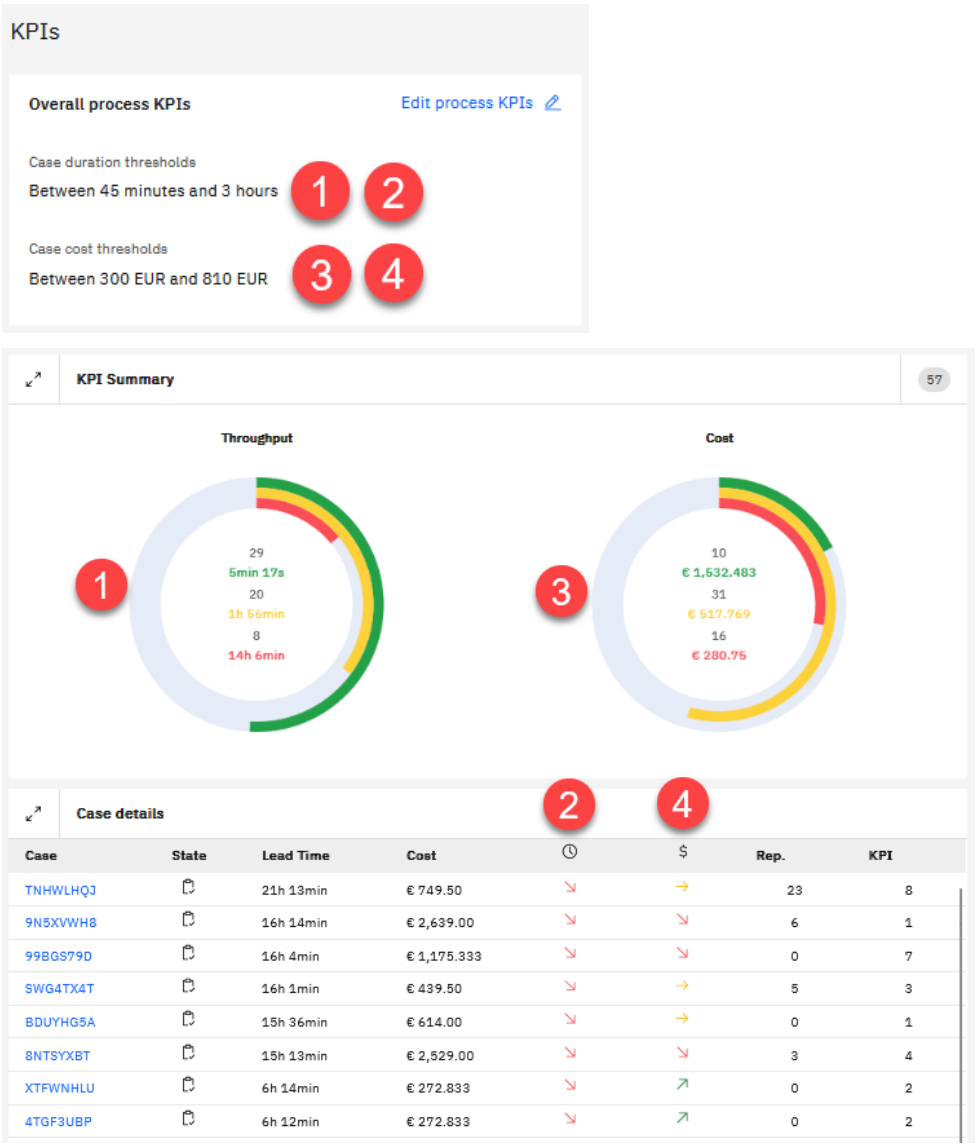


Figure 9. KPI Settings Relation to the Built-in Dashboards: KPI Summary and Case Details.

(1) **KPI Summary** shows coumnts of Cases that fall into different ranges of the Case duration thershold defined in the **KPIs.**

(2) **Case Details** displays the 8 Cases with Lead Time > 3 hours (marked with red arrow).

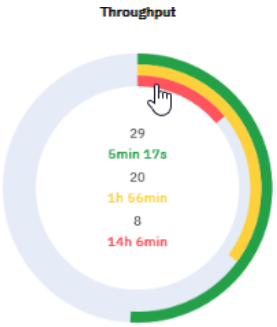
(3) **KPI Summary** shows counts of Cases that fall into different ranges of the Case cost threshold defined in the **KPIs.** ☹ The red and green labels are reversed. This is a defect we hope to fix in the next release.

(4) **Case Details** displays the 6 Cases with a Cost > EUR 810 (marked with red and orange arrow) and 2 Cases with a Cost < EUR 300 (marked with green arrow).

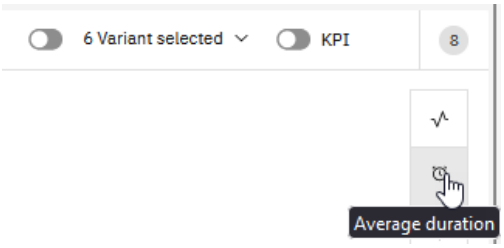
3.2.10.3.1 Drill Down into Throughput KPI Violators

Let's examine the cases that contributed to Throughput KPI violations.

_1. In the *KPI Summary*, click on the **red cresent** in the **Throughput** pie.

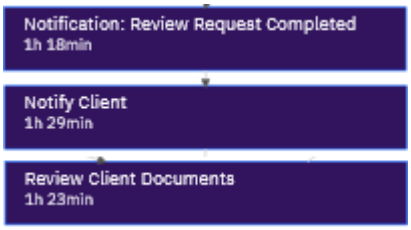


_2. In the *Process model* widget, click **Average duration.**



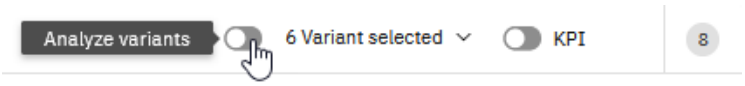
_3. There are three activities with excessive Service time:

- **Notify Client** (automated Activity): 1h 29m average duration
- **Notification: Review Request Completed** (human Activity): 1h 18m average duration
- **Review Client Doucments** (human Activity): 1h 23m average duration

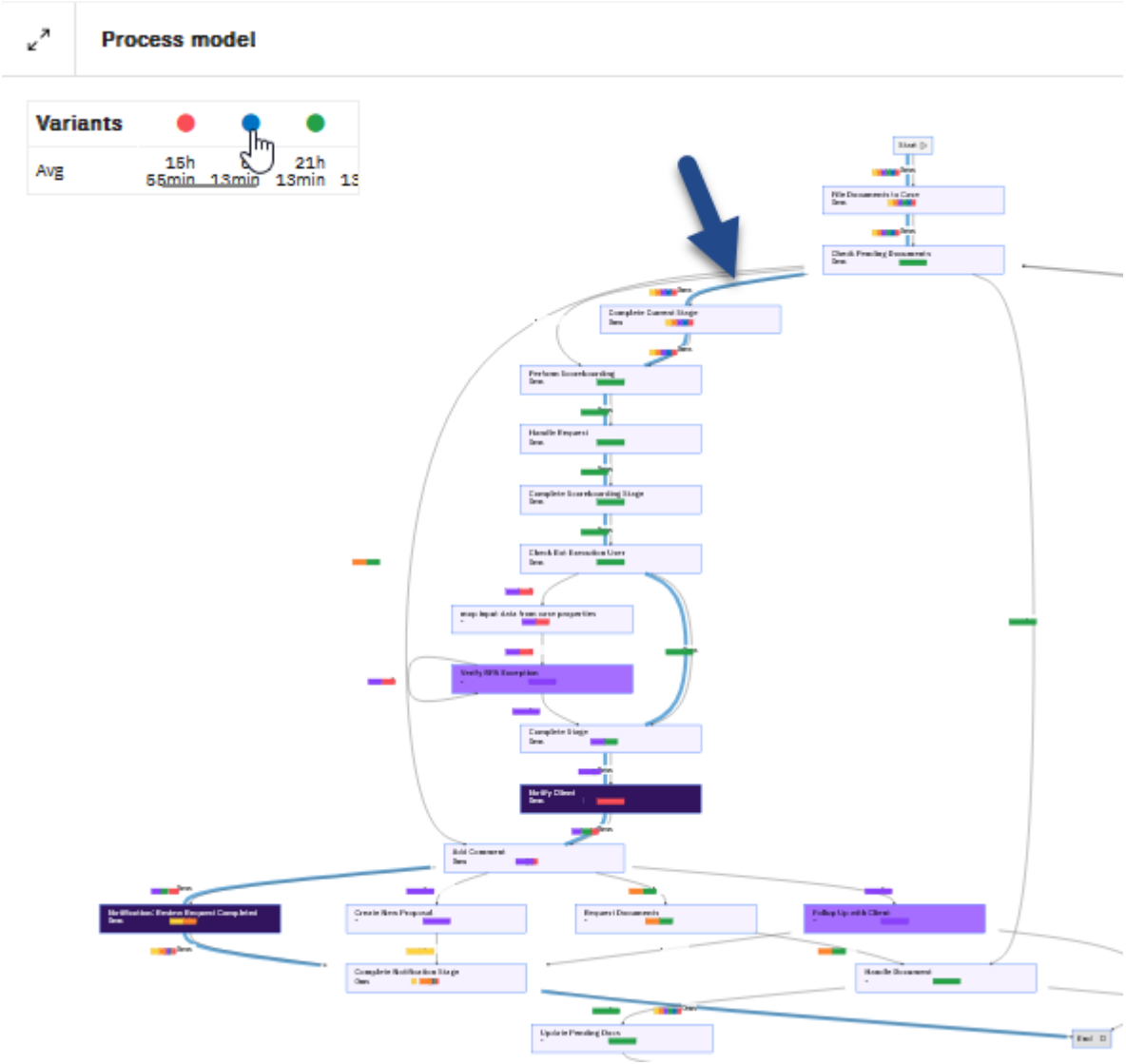


Later in this lab, we will use Simulation capability to determine if providing more computing resources to *Notify Client Activity* and automating the *Notification: Review Request Completed* Activity can help reduce the process cost and increase the throughput.

_4. Click **Analyze variants**

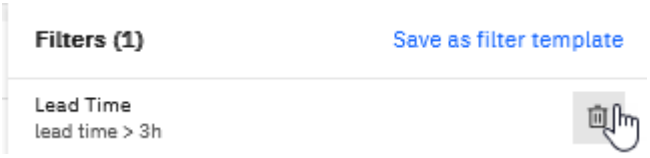


_5. Note that all six variants and 8 cases contributed to the Case Lead Time KPI violation. You can now analyze them separately by clicking on the colored dots. For example if you clikc the blue dot you see al the transtions for the blue variant (only the blue path is highlighted)



_6. Click the **Filters icon**

_7. Select the **lead time > 3h** filter and click the **Delete filter (garbage can).**



3.2.10.3.2 Examine a Specific Case with a High KPI Violation

Let's pick an individual case of interest and determine the root cause of throughput and cost KPI violations.

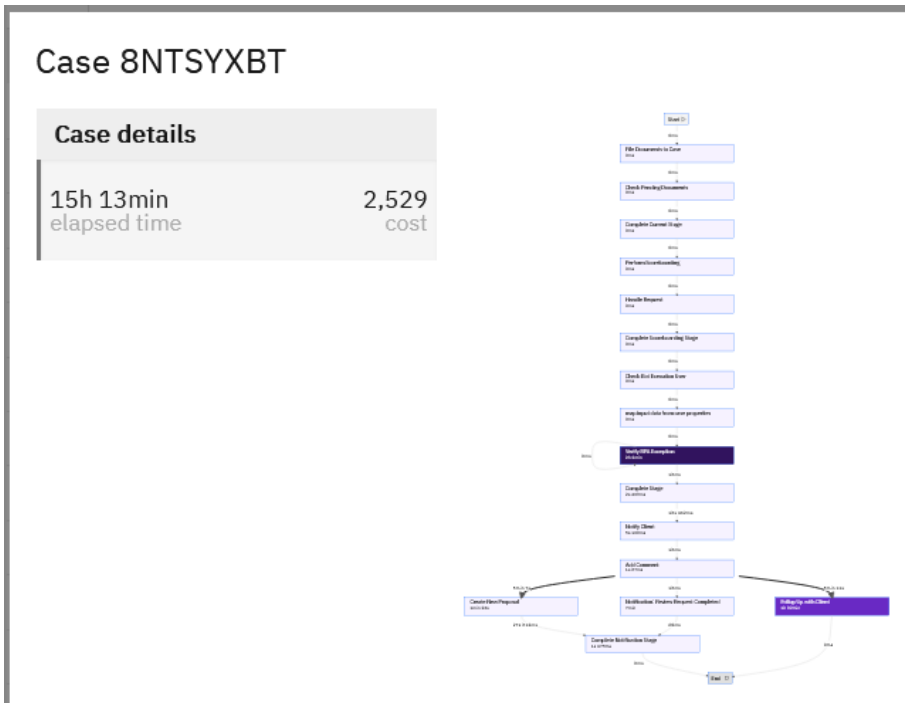
_1. In the *Case details* widget, click on the Case ID **8NTSYXBT (**This Case looks interesting as it has an alarming combination of undesirable metrics!)

Case details

Case	State	Lead Time	Cost		$	Rep.
TNHWLHQJ		21h 13min	€ 749.50	↘	→	23
9N5XVWH8		16h 14min	€ 2,639.00	↘	↘	6
99BGS79D		16h 4min	€ 1,175.333	↘	↘	0
SWG4TX4T		16h 1min	€ 439.50	↘	→	5
BDUYHG5A		15h 36min	€ 614.00	↘	→	0
8NTSYXBT		15h 13min	€ 2,529.00	↘	↘	3
XTFWNHLU		6h 14min	€ 272.833	↘	↗	0

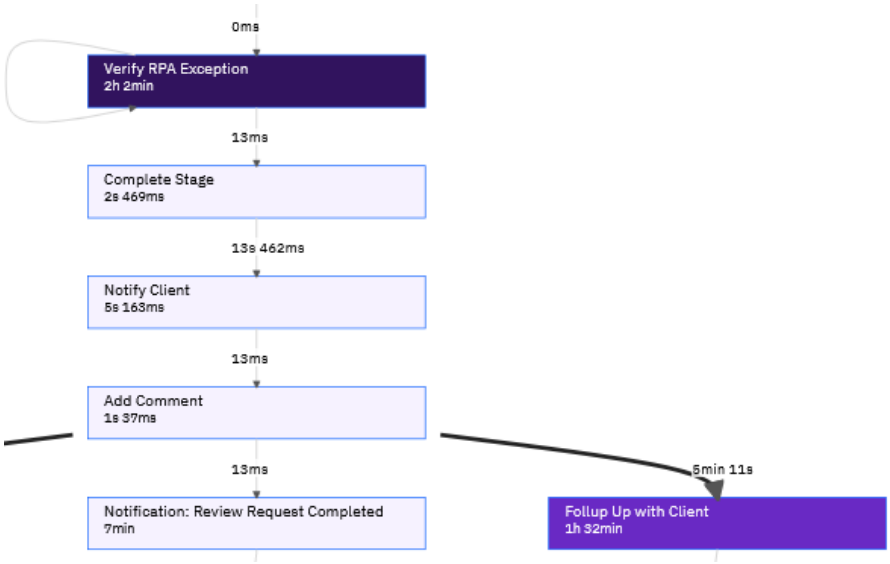
_2. A View showing the Model for the selected Case will appear.

Hint: Use the mouse wheel to zoom and the mouse right button to move the Process diagram.

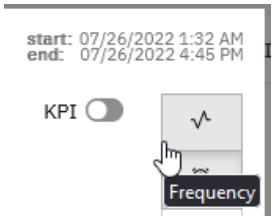


_3. Note that two **deeply colored** Activities contributed to the KPI Cost Violations:

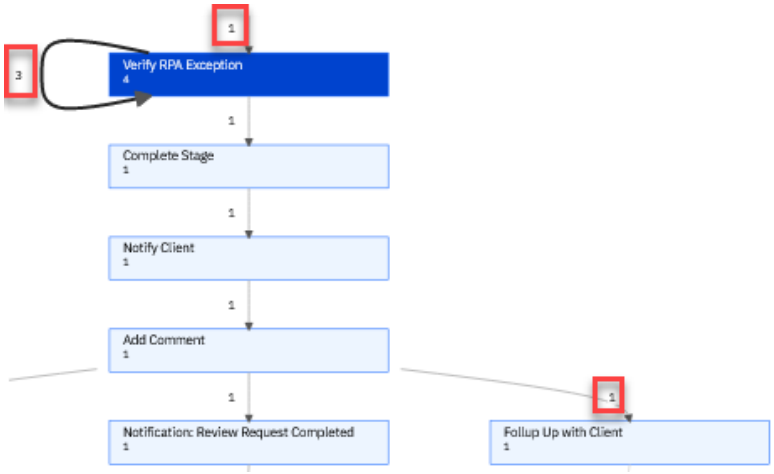
- **Verify RPA Exception** (avg) 2h 2min
- **Follow up with Client** (avg) 1h 32 min



_4. Click the **Frequency View icon**



_5. Due to Rework, *Verify RPA Exception* Activity was executed four times while *Follow Up with Client* was only once.



_6. We can now make our Case throughput calculations and compare them with Case details calculation.

Verify RPA Exception Duration * 4 + Follow Up with Client * 1 =

2h 2min * 4 + 1h 32min = 12h 8min + 1h 32min = 13h 40min

We now see that the above two activities combined with Rework account for 13 hours and 40 minutes of the combined case duration of 15 hours and 13 minutes.

Note: Similarly to the throughput analysis, you can now analyze the Case cost similarly if you like.
Hint: Use the cost view to identify the activities with high Costs.

_7. Click **OK** to close the Case View

Process Improvement Insight:
We analyzed the root causes of the Case lead Time KPI violations. We examined Variants (all cases that violated Case Lead Time KPI) and then focused on individual Cases with a high Case Lead Time and Case Cost. Just as before, we discovered that the root cause is a combination of Rework and performing high-cost optional non-conformant Activities.

3.2.11 Using Simulation Validate Business Case for Automation Candidate

The simulation feature makes future predictions by simulating the Return on Investment (ROI) before you implement any process improvement initiative, such as Robotic Process Automation (RPA).

You can create or manage simulation from the BPMN tab or use the BPA tool to access the existing simulations.

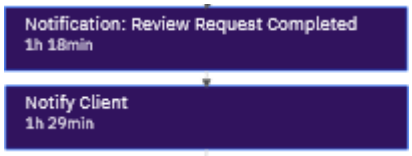
You create simulations based on the process models in the BPMN tab. In addition, the BPMN feature uses the process data to derive the BPMN model automatically.

You can also create simulations from scratch from the BPA page where you use BPMN from the external sources that integrates with IBM Process Mining.

3.2.11.1 Identify Activities for the Simulation

Earlier in this lab (in the Process Time and Cost Analysis Dashboard section) we identified two Activities with an excessive average duration.

- **Notify Client** (automated Activity): 1h 29m average duration
- **Notification: Review Request Completed** (human Activity): 1h 18m average duration



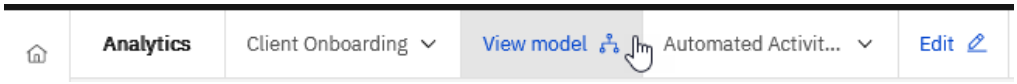
We will now use the Simulation capability to determine if providing more computing resources to the automated *Notify Client Activity* and automating the human-based *Notification: Review Request Completed* Activity can help reduce the process cost and increase the throughput.

In Self Looping Rework section, we discovered the impact of self-looping of Verify RPA Exception Activity.

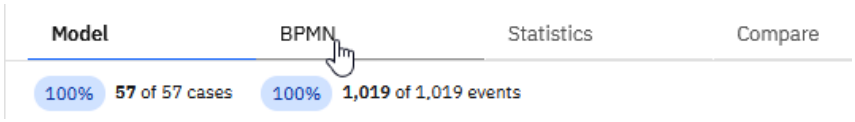
In the long run, we should be fixing the issue at the IT level. Tactically, however, we can immediately improve the performance of this Activity by adding more trained personnel to fix the failing robots.

3.2.11.2 Create New Simulation

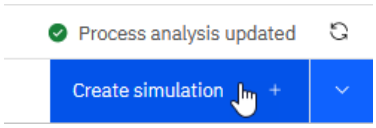
_1. Click the **View model** to return to the Model View.



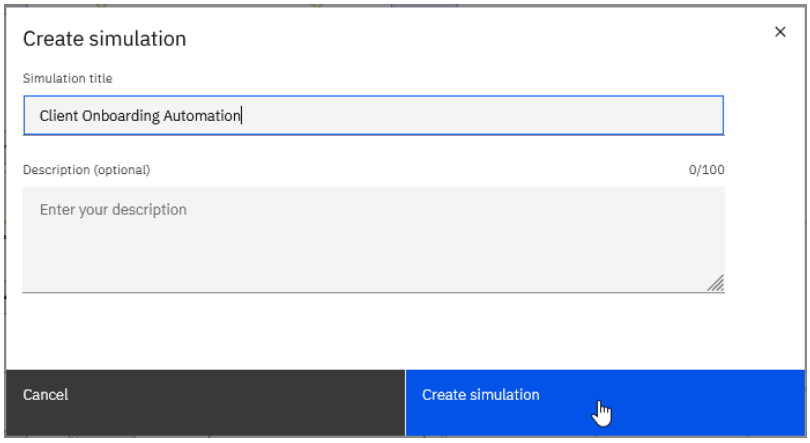
_2. Select **BPMN** tab



_3. Click **Create simulation +**



_4. For the *Simulation title* enter **Client Onboarding Automation** and then click **Create simulation**

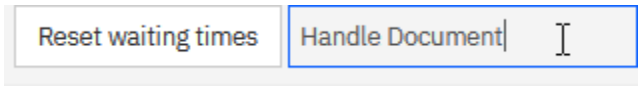


3.2.11.3 Configure Simulation

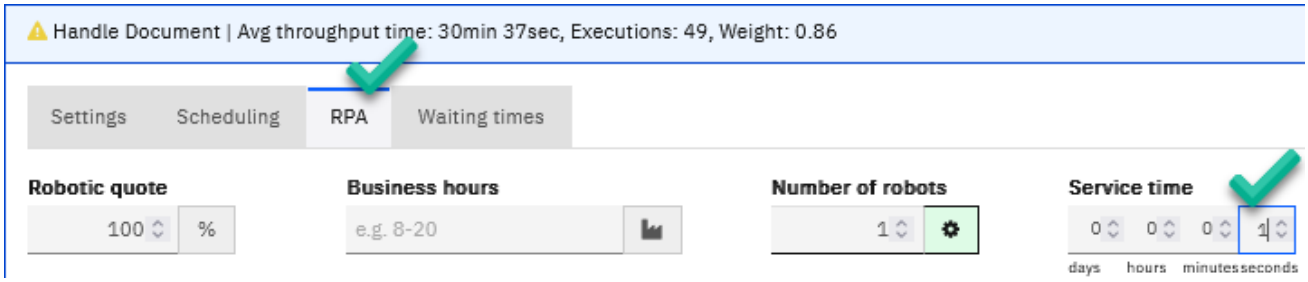
3.2.11.3.1 Initialize Incorrectly Configured Automated Activities

The Service Time on many Automated Activities is less than 1 second (i.e., 340 ms). IBM Process Mining rounds down the Working Time to seconds. As a result, Service Time and Working Time in the activity simulation settings become 0, which is not permitted. We must set the Working Time value to 1 if it is set to 0.

_1. In the *Search Box* enter **Handle Document,** and press Enter.



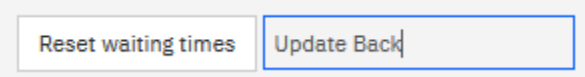
_2. Click the **RPA** tab and set *Service time* to **1**



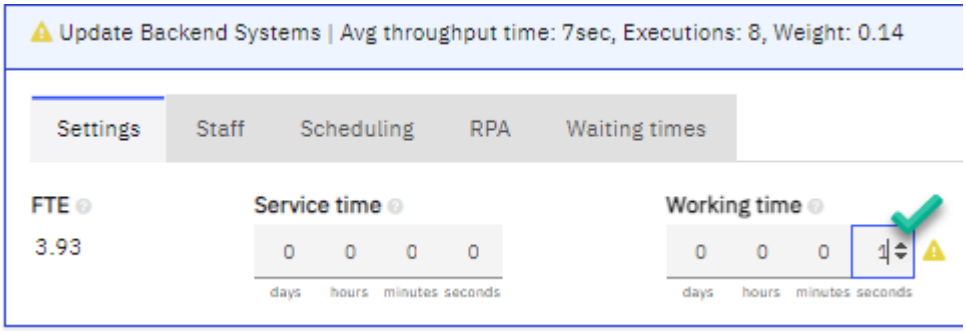
_3. Repeat the above steps for the following Automated Activities:

- **Prepare Client Document**
- **Update Pending Docs**
- **Update Backend Systems**
- **Check Pending Documents**
- **Handle Request**
- **Check Bot Execution User**
- **map input data from case properties**

_4. In the *Search Box* enter **Update Back,** and press Enter.



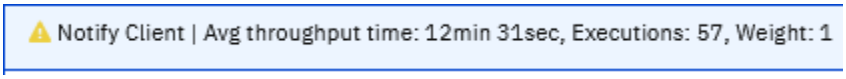
_5. Click the **Settings** tab and set *Working time* to **1**



3.2.11.3.2 Add More Computing Resources for Notify Client Activity

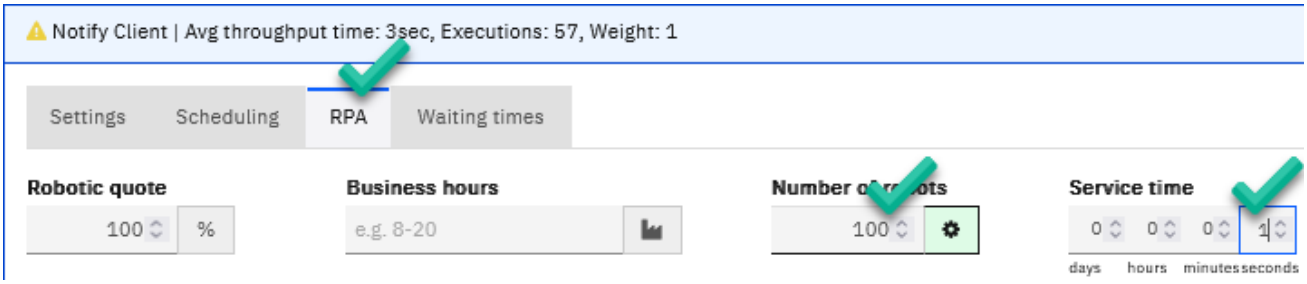
Notify Client Activity is already automated but has a service time of 12 min 29 seconds. Because of this, we determined that it has become a bottleneck responsible for significant Case lead times. Let's significantly increase the computing resources available and work with IT to decrease the Activity's Service Time to 1 second.

_1. Locate **Notify Client** Activity



_2. Click the **RPA** tab and set

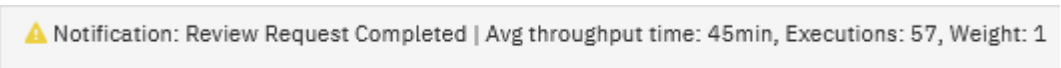
- *Number of robots* to **100**
- *Service time* to **1 second** (change it from 12 min to 29sec)



3.2.11.3.3 Automate Notification: Review Request Completed Activity

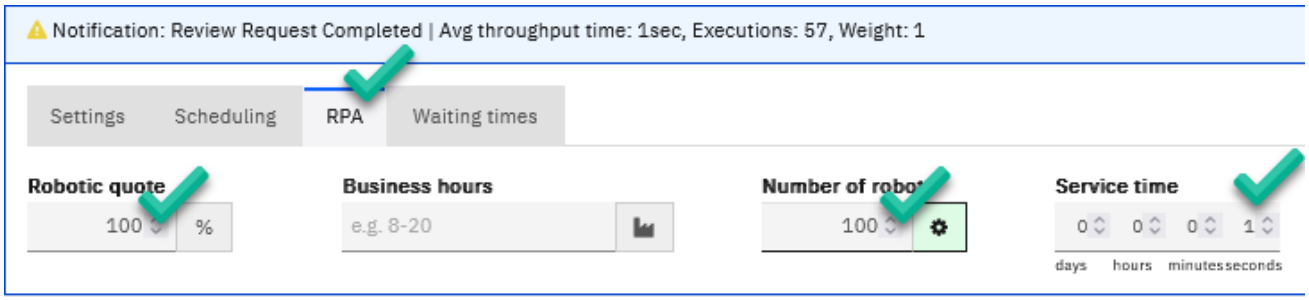
Notification: Review Request Completed is already automated, but we determined that it has become a bottleneck responsible for significant Case lead times. Let's make some changes to improve it. We will ensure 100% automation, increase the number of robots available, and make the robots faster.

_1. Locate **Notification: Review Request Completed** Activity



_2. Click the **RPA** tab and set:

- *Robotic quote* to **100** (this means the Activity is fully automated)
- *Number of robots* to **100**
- *Service time* to **1 second** (change it from 1 min to 1 sec)

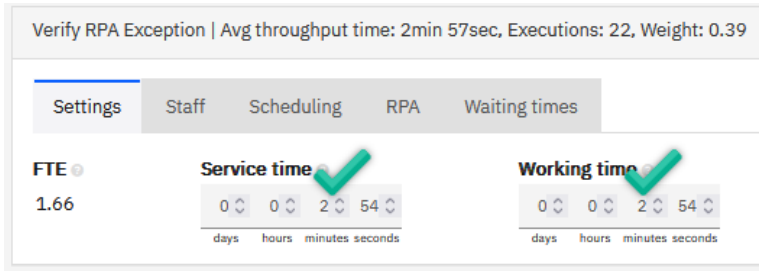


3.2.11.3.4 Verify RPA Exception Activity

Tactically, we create a dedicated team to handle bot exceptions and provide them with better training (this will reduce the Working Time).

_1. Locate **Verify RPA Exception** Activity and set:

- *Working time* to **2 minutes 54 seconds**
- *Service time* to **2 minutes 54 seconds**



3.2.11.3.5 Run Simulate

_1. Click **Run Simulation**

If you see the error message,

> In a robot activity processing time must be greater than zero

return to the section Initialize Incorrectly Configured Automated Activities and ensure all robot Activities have a non-0 Service time 1.

3.2.11.3.6 Verify Simulation Results

_1. Examine the **Simulation Details** view.

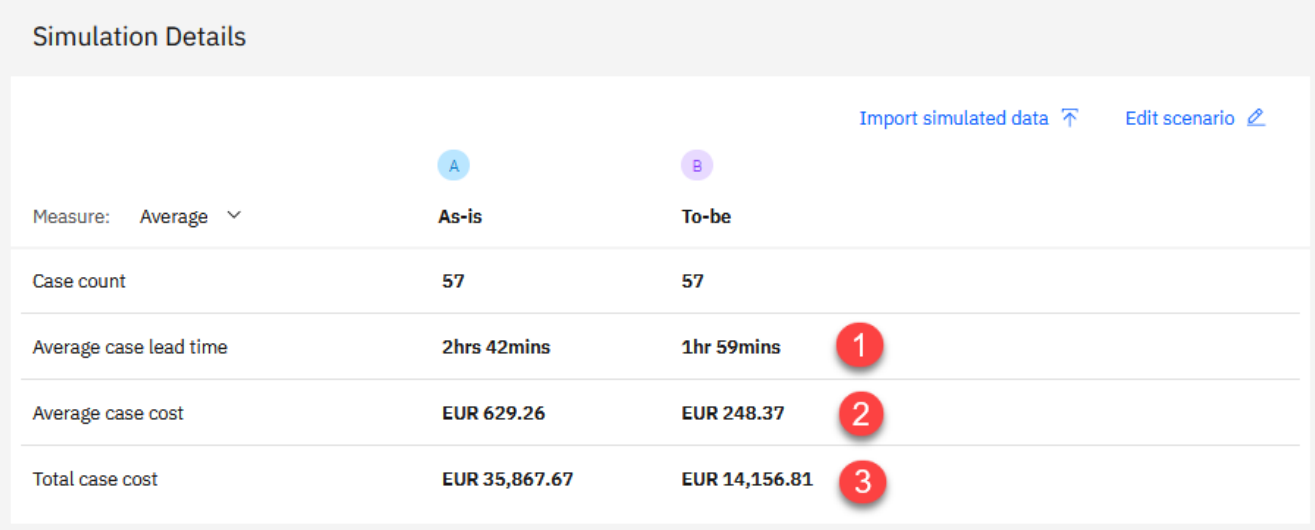
Note the improvements:

(1) A decrease in *Average case lead time*.

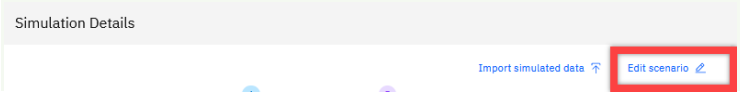
(2) There is a significant decrease in *Average case cost*.

(3) A significant decrease in *Total case cost*

We can use this data to support a business case for process improvement investment!



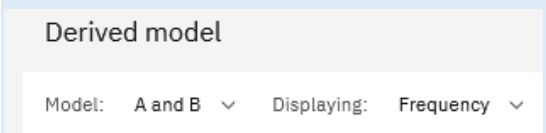
Note that because of the random nature of simulations, you may see results that are not exactly as shown in the screenshot below. If you click the **Edit scenario** button, you can rerun the simulation and see slightly different results.

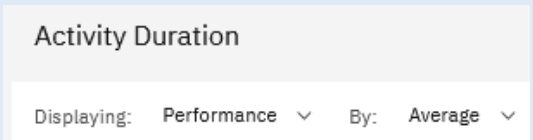


The following are high-level optional steps that are not required to complete the lab.

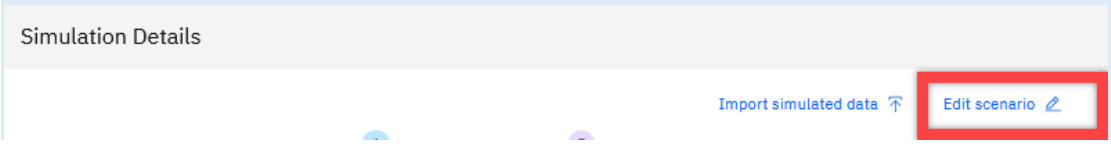
Optionally, if you want to explore another process improvement change, follow these steps:

Use the **Activity Duration** and **Derived model** views to gain insights into potential process improvement changes. For example, replacing Humans with Automated Activities, decreasing Activity Service Time, or increasing the number of resources (people or robots).





Once you have decided what changes you want to make, click **Edit scenario** to get back to the Simulation Setting view



Process Improvement Insight:
Through this lab, we discovered numerous process automation opportunities both at the IT and business levels. We then used the simulation feature to assess the impact of the proposed process improvements. We can use these results to calculate the ROI before implementing any process improvement initiative. We discovered that by automating tasks, adding more people to perform tasks, or improving training, we could achieve significant process cost savings and process lead-time improvements.

3.3 Lab Summary

This lab demonstrated how IBM Process Mining leverages the Client Onboarding event data captured in BAI to identify automation and business improvement opportunities.

The primary objective was to introduce you to the rich features and functions of IBM Process Mining through the experiential learning of identifying process improvement opportunities.

Thank you for completing this lab!

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