IBM Cloud Pak for Business Automation Demos and Labs 2021
IBM Process Mining

Use Process Mining to Improve Procure to Pay Process

V 3.2

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Table of Contents

1 Lab Setup

1.1 Reserve IBM Asset Repo Process Mining Asset

▌If you have already reserved Process Mining Environment on IBM Asset Repo, you can skip this step.

_1. Navigate to https://assetrepo.ibm.com/collection/60afd1b2bd0c01001f47acb1

▌Note, you may be asked to sign in with you IBM ID. In this case, after you sign in, click the above link again to enter the *Process Mining with Task Mining Demo Template V1.10.2.1* page.

_2. Click **Environments**
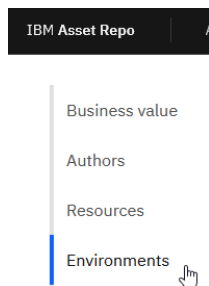
_3. Click **Process Mining with Task Mining Demo Template V1.10.2.1**

_4. Create a reservation.

When you receive "Your IBM Demonstration is Ready!" email, click the desktop asset information link included in the email.
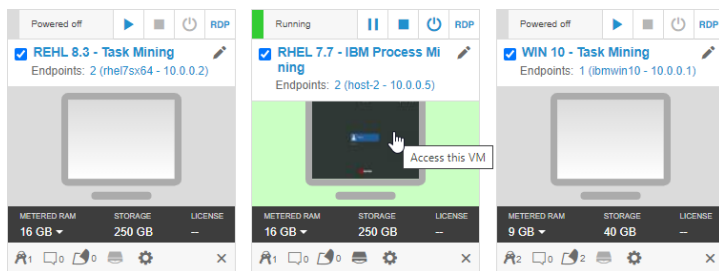

1.2 Start IBM Process Mining VM

▌If you have started IBM Process Mining VM, you can skip this step.

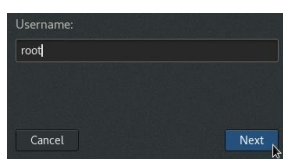_1. On *RHEL 7.7 – IBM Process Mining* click **Run tis VM** button
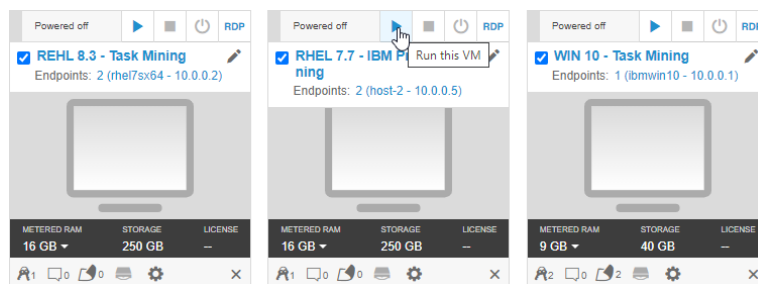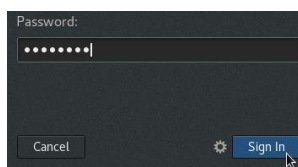

_2. When the VM is Running, click **Access this VM**

_3. Click **Not listed?**
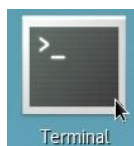
_4. For *Username* enter root and click **Next**

_5. For *Password* enter passw0rd and click **Sign In**

1.3 Start IBM Process Mining Server

If you have started IBM Process Mining Server, you can skip this step.

_1. On the desktop double-click **Terminal**

_2. In Terminal window enter **cd /opt/processmining/bin**

_3. Enter **./start.sh**

_4. Enter **sudo fuser -k 80/tcp**

_5. Enter **service nginx start**

_6. Enter **./start.sh**

You should see output like this:

```
[root@client ~]# cd /opt/processmining/bin
[root@client bin]# ./start.sh
Using tmp: /opt/processmining/repository/temp
Starting Jetty: 2021-05-27 08:34:24.184:INFO::main: Logging initialized @1475ms to org.eclipse.jetty.util.log.StdErrLog
2021-05-27 08:34:24.363:WARN:oejx.XmlConfiguration:main: Property 'jetty.secure.port' is deprecated, use 'jetty.httpConf
ig.securePort' instead
2021-05-27 08:34:24.574:INFO::main: Console stderr/stdout captured to /opt/processmining/jetty-web/logs/2021_05_27.jetty
.log
OK Thu May 27 08:34:26 PDT 2021
Using tmp: /opt/processmining/repository/temp
JETTY_ARGS: jetty.host=127.0.0.1 jetty.port=8070 jetty.ssl.port=7443
Starting Jetty: 2021-05-27 08:34:28.684:INFO::main: Logging initialized @1950ms to org.eclipse.jetty.util.log.StdErrLog
2021-05-27 08:34:28.873:INFO::main: Console stderr/stdout captured to /opt/processmining/jetty-engine/logs/2021_05_27.je
tty.log
OK Thu May 27 08:34:30 PDT 2021
Using tmp: /opt/processmining/repository/temp
JETTY_ARGS: jetty.host=127.0.0.1 jetty.port=9070 jetty.ssl.port=9071
Starting Jetty: 2021-05-27 08:34:32.217:INFO::main: Logging initialized @1304ms to org.eclipse.jetty.util.log.StdErrLog
2021-05-27 08:34:32.422:INFO::main: Console stderr/stdout captured to /opt/processmining/jetty-analytics/logs/2021_05_27
.jetty.log
OK Thu May 27 08:34:34 PDT 2021
[root@client bin]# sudo fuser -k 80/tcp
80/tcp:              1862
[root@client bin]# service nginx start
Redirecting to /bin/systemctl start nginx.service
[root@client bin]# █
```

_7. **Close** the Terminal Window

2 Introduction

2.1 About Process Mining

Process mining is a family of techniques in the field of process management that support the analysis of real business processes based on event logs. During process mining, specialized data mining algorithms are applied to identify trends, patterns, and details contained in event logs recorded by an information system. Process mining aims to improve process efficiency and understanding of processes.
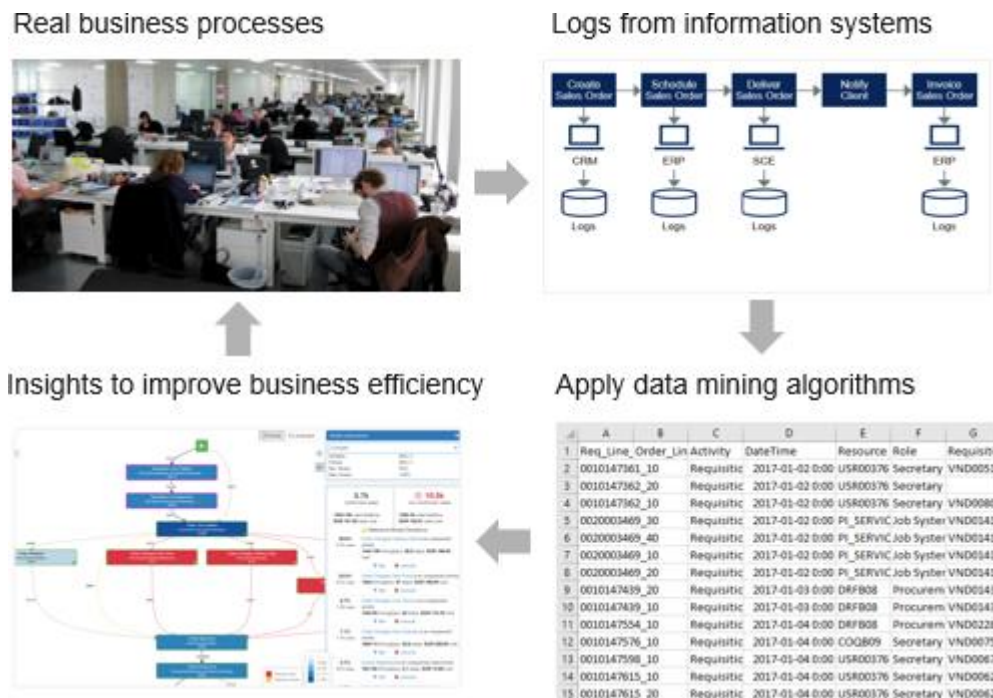

Figure 1. Process Mining

2.2 Process Mining Use Case Used in this Lab

2.2.1 Procure to Pay (P2P) Process

The Procure to Pay process, connects the procurement and entire supply chain processes within a company through the goods receipt process, and finally to the payment issued to the vendor.
In recent years, companies have carefully looked at their Procure to Pay processes to:

- Reduce overall supply chain and inventory costs
- Free up needed cash
- Improve operational performance
- Make improved financial decisions

In addition to reducing overall supply chain and inventory costs, improving the Procure to Pay process can add a visibility that allows management the opportunity to have better communication with the vendor as to where the items are in the delivery process, and payment to the vendor.

2.2.2 P2P Process – Process Improvement Areas

In this lab we assume the role of an automotive manufacturer (JK Auto Inc.). JK Auto Inc.'s process improvement team wants to analyze their Procure to Pay process using IBM Process Mining to identify process improvement opportunities.
There are five areas of P2P processes where process analyses can derive greatest value. The figure below shows a high-level P2P process and highlights the key process improvement areas we will tackle in this lab. Note the potential cost savings or that can be achieved, and losses avoided!
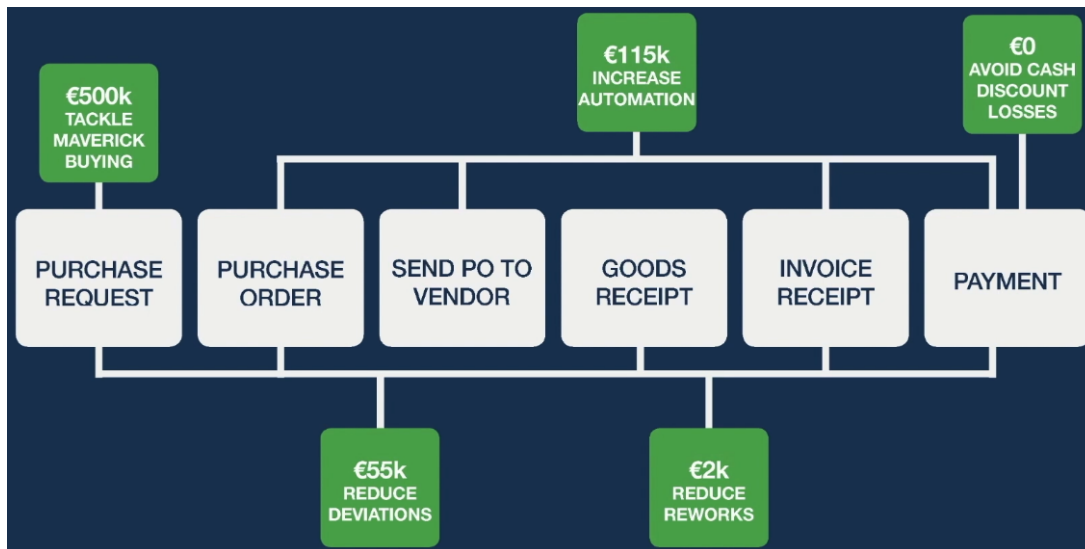
Figure 2. P2P Process Improvement and Automation Opportunities

2.2.3 P2P Process – Multi-Level Process Mining

The P2P process is SAP based. The data comes from SAP transaction logs and was gathered over a 12-month time period. The four key P2P processes and a typical set of SAP transactions required to complete them are shown in the figure blow.

Purchase Requisition	Purchase Order	Goods Receipt	Invoice Receipt
ME51N	ME21	ME22N	MIRO
ME52N	ME21N	MIGO	MIR4 F-53
ME53N	VL31N	MB31	ME23N
ME54N	VL32	MB01	MR01
ME5A	VL60	MB0A	MR00
ME51			MR02
ME52			MRHR
ME53			
ME21N			
ME54			

Case Statistics

- Purchase Requisition 24,134
- Purchase Order 29,672
- Goods Receipt 36,218
- Invoice 20,507

Figure 3. Multi-Level P2P Processes Shown as Case Statistic in Process Mining Model View

Typically each distinct process is completed by executing a set of related SAP transactions in varying order including rework. For example Purchase Order process typically involves execution of ME21, ME21N, VL31N, VL32 and VL60.

Here is an example SAP GUI screen of ME21 (Create Purchase Order) transaction:

2.3 Lab Objectives

The purpose of this lab is to enable you to demo (or just to explore and learn) how IBM Process Mining can be applied to improve and gain insights into JK Auto Inc.'s P2P process.

After completion of this lab you will be able to deliver a live demo recorded in this video: https://ibm.box.com/v/Lab2ProcessMiningVideo. Note that the video may not depict the process exactly as you will see it in this lab.

2.4 Open IBM Process Mining Application

_1. On the Linux desktop double-click **Firefox**
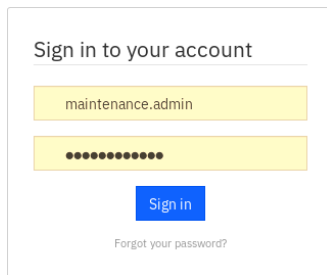
_2. If you do not see the login page, click on **process mining | Sign in**

> Note: if you get an error, please wait for few minutes for the IBM Process Mining runtime to start and try again.
>
> Unable to connect

_3. For *user type* **maintenance.admin** and for *password* enter **TM/admin1** and click **Sign in**

Sign in to your account

maintenance.admin

••••••••••••

Sign in

Forgot your password?

3 Process Mining Insights

In this part of the lab we will show you how to identify process improvement and business improvement opportunities by analyzing the data captured from JK Auto Inc.'s SAP-based processes. IBM Process Mining uses standard SAP BAPI-based scripts to extract business and process data that can then be imported as csv files for process analysis.

3.1 Visualize Process Model

You can instantly gain process improvement insights just by analyzing the multilevel P2P processes in a single view.

3.1.1 Open Procure to Pay Process (P2P)

The P2P process was prebuilt and is ready to run various process mining tools.

_1. Click in **P2P** box
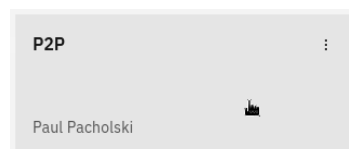
This will open a pre-created P2P process. In the P2P process the event log file has already been loaded, and all the process mining settings and configuration were already done for you!

> Note: To learn how to create and configure a Process take a look at Lab 1 "Use Process Mining to Create and Explore Processes Models" - https://ibm.box.com/v/ProcessMiningLab1

3.1.2 Model View

After you open the P2P process, you will see the process Model in Frequency view.
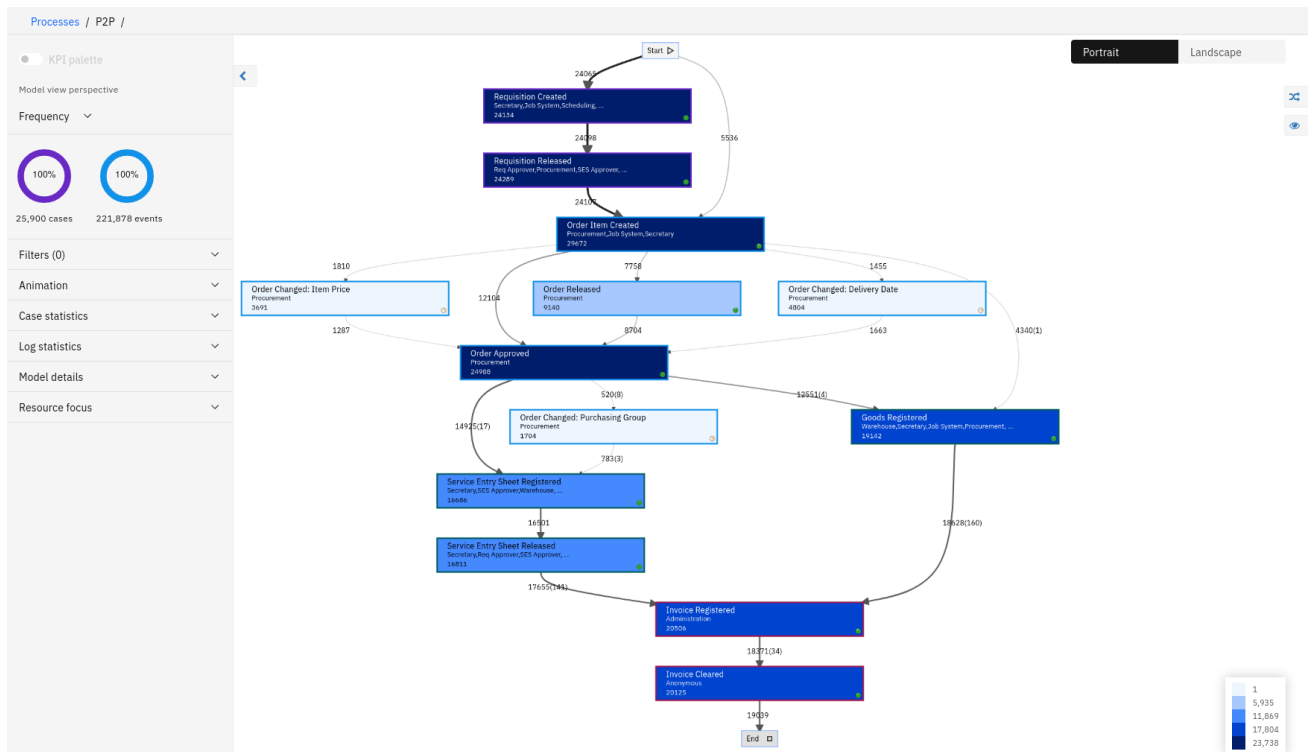
> **Hint:** Use the mouse wheel to zoom and mouse right-button to move the Process diagram.
> The Model automatically displays the frequency analysis. The dark blue color highlights the most frequent activities, whilst the bold arrows highlight the most frequent transitions. In this way, the most frequent paths between activities of the process can be identified.

- The numbers next to the lines shows how many times that specific process flow has been followed.
- The numbers within the rectangles shows the number of times that the activity is performed
- The description in the rectangles indicates the name of the activity and the roles by which the activity is carried out. They could be more than one role (multiple roles followed by dots are displayed).
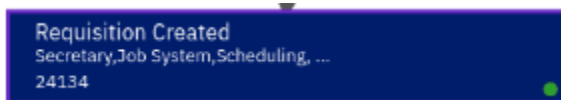
- The green circle at the bottom right corner of the activity rectangle indicates the Model coverage (100% indicates that the Model details cover all the possible relationships of that activity. The percentage indicates how many possible relationships you are currently visualizing. The level of relations is adjustable)
- The color saturation of Activity reflects how often an activity was invoked (the frequency). The legend gives you the frequency coloring detail
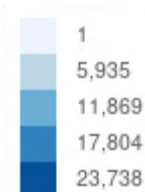
3.1.3 Multi-level Process View

Traditional process mining techniques analyze multilevel processes separately. Unique to IBM Process Mining, multi-level process mining provides a holistic view of the entire P2P process allowing to discover and correlate sub-processes and their dependencies in a single tool.

_1. Open the **Case Statistics** legend to decipher the color scheme.

Case statistics   ^

■ Purchase Requisition   24,134
■ Purchase Order   29,672
■ Goods Receipt   36,218
■ Invoice   20,507

The colors of the Activity borders reflect the multilevel nature of the process. For example, the first two activities correspond to the Purchase Requisition process which represents potentially several SAP transactions!

Service Entry Sheet Released
Secretary,Req Approver,SES Approver, ...
16811

17655(141)

Invoice Registered
Administration
20506
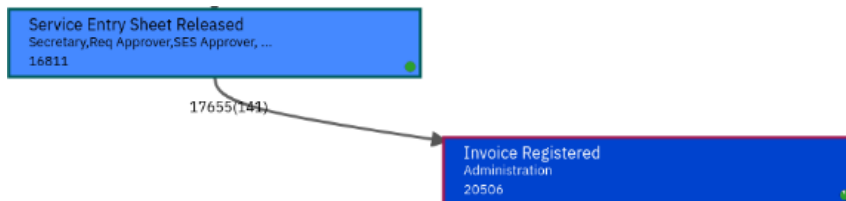
By default, the visualization does not show all the captured from data relationships and activity instances. This is to reduce any unnecessary complexity that may impair visualizing and exploring the process.

_2. To see all the activities that are part of the Purchase Requisition process, select **100%** for Activities in Model details

Model details   ^

Activities   100%

Relations   1%

_3. Click **Landscape**

Portrait   Landscape

Note that now another Purchase Requisition process activity called *Requisition Reversed Activity* appears.
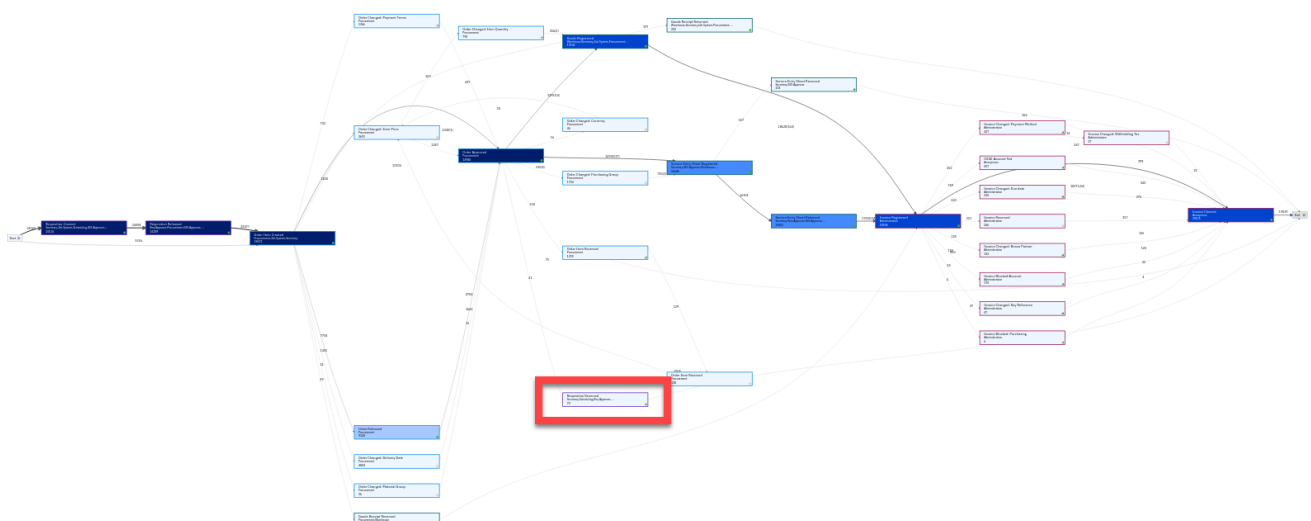
This is telling us that Requisition Reversal step is rarely invoked in the Purchase Requisition process!

_4. Click **Portrait**

Portrait	Landscape
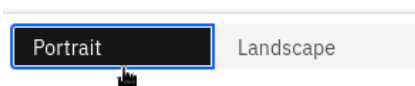
_5. Set the Activities frequency back to **20%**

Model details

Activities   20%
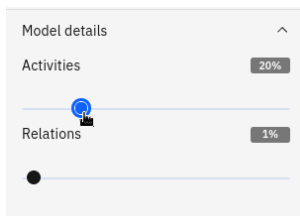
Relations   1%

Similarly if you set the Relations to 100% you will see a bewildering spider web of connections that show all the transitions between process activities! Do not forget to reset Relations it back to 1%.

3.1.4 Process Paths (Case Variants)

_1. Click the **tangled-arrows icon** in the top right corner.

Portrait	Landscape

_2. The Case variants view enables you to select what is shown in the Model. To select process paths by their frequency, click the top variant: **31.5% (8,171)**

Case variants (2,530)

Zoom	Filter	▼

Case structure   ∨   Q

Frequency ⬇   Throughput

31.5% (8,171)   9 relations
                       113d
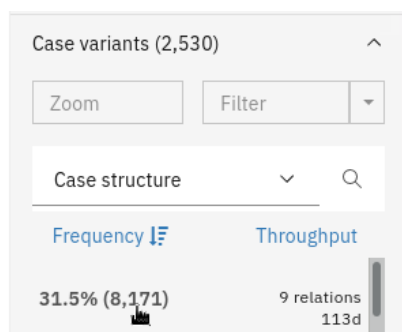
Note that now the Model shows only the selected process variant (process path).
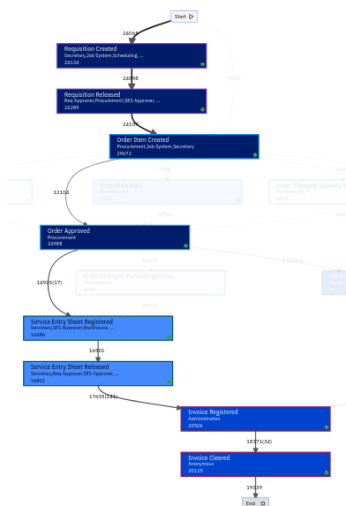
_3. Use **Ctrl key** to select the **first five** variants

Notice now you see fewer process paths in the model. This is useful when you want to enhance the model readability or focus only on the process paths you want to optimize.
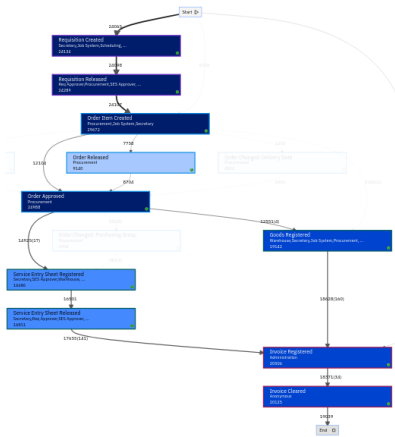
As you will see in the next step, it is possible to create a "top-five variants" filter for some later use

_4. **De-select** the all the variants.

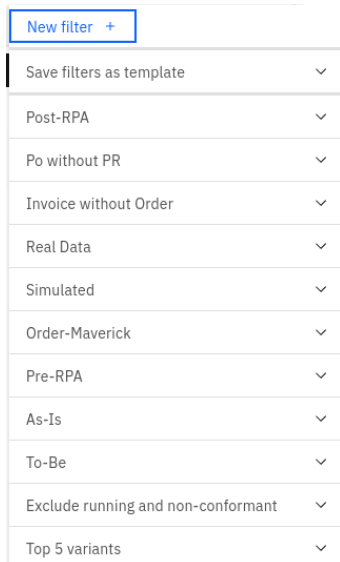_5. Click the **tangled-arrows icon** to close the Variants view

_6. Click **Filters**
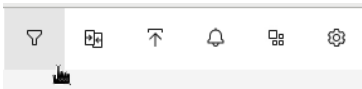
Let's examine the Filters feature...

When working on process and business improvements you typically you want to only work with top 3-5 most frequent process variants or exclude running and non-conformant cases. To do this you can create and save filters that satisfy these or any other requirements you may have.

Note that we have already create some filers for you, including the top-5 variants filter.

We have already done this for you in this lab. You will be using this filter later in this lab.

If you like you can now, click **New filter +** button to create your own filters!
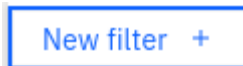
3.1.5 Process Performance -Bottlenecks

You can use the Duration View to determine which activities and tasks are creating critical bottlenecks and whose automation will lead to the biggest overall process time improvement.
Let's find bottlenecks in our P2P process!

_1. Change the View from Frequency to **Average duration**
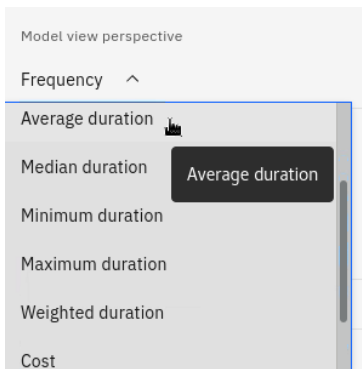
_2. **Zoom and center** on **Order Changed: Purchasing Group** activity
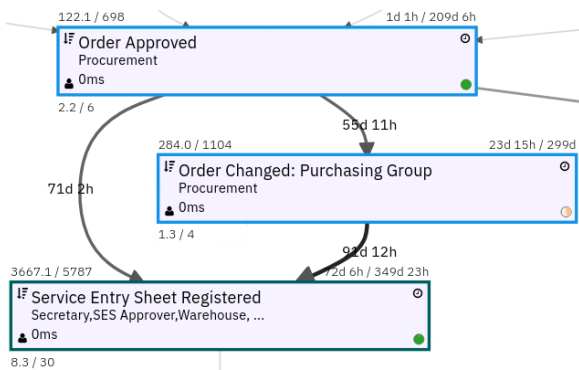
Since we are looking for process bottlenecks, we have selected the activities with the "thickest" transition arrows which indicate longest wait times.

The arrows connecting the activities include Wait Time values. Note that the longer the waiting time, the thicker the line. For example, longest wait time in our example is 91d 12h to start of Service Entry Sheet Registered activity after completion of the Order Changed activity.

The wait times between the activities shown above is significant and can be considered a process bottlenecks worthy further investigation. One possible root cause for the excessive wait time could be lack of sufficient human resources available to start working on the Service Entry Sheet Registered activity.

_3. change the View back to **Frequency**
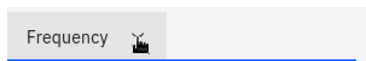
3.2 Tackle Maverick Buying

Maverick buying is a term describing are purchase orders without requisition, or invoices without purchase order. This includes off-contact methods of procurement or non-authorized purchases. Maverick buying makes the agreement with the supplier more expensive because of the volume of the framework agreement decrease or because goods are purchased at a higher price.

In our P2P process we can use process mining to help business analysts identify maverick buying by looking for:

1) Orders without a purchase requisition
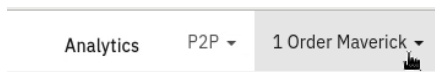2) Invoices without an order

3.2.1 Orders without a Purchase Requisition

We will now examine some of the prebuilt dashboards specifically designed to tackle the Maverick Buying problem.
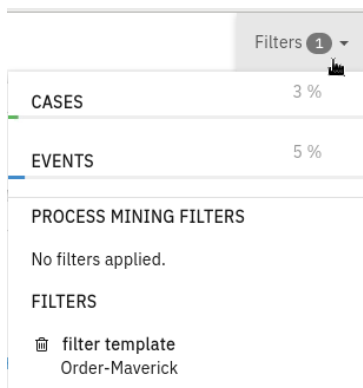
_1. Click the **chess-board icon** and then click **Analytics**
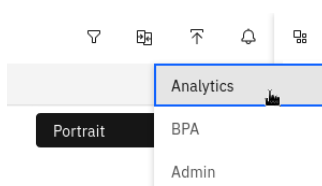
_2. If not already selected, select **1 Order Maverick** dashboard

_3. Click **Filters**

Note that this dashboard has the "Order-Maverick" filter applied. This filter includes only the Cases that fulfill the following criteria:
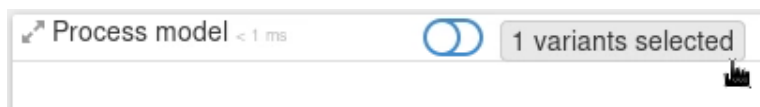
☐ Activity is not "Requisition Created"

☐ Exclude running cases

☐ Activity is "Order Item Created"

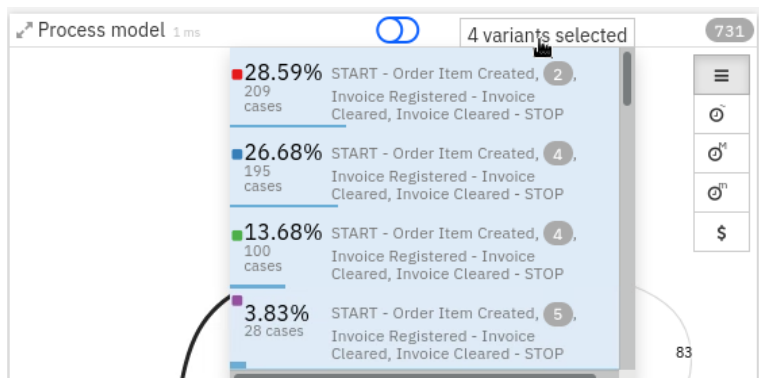The filter includes only the Cases where Order was created without a requisition!

3.2.1.1 **Variants**

This view shows all the variants of the Cases that have Maverick Buying problem.

_1. Click **1 variants selected**

_2. Use **Ctrl** key to multiply select first 4 variants

You should now see a more complex Process model view. Note you can use the "expand icon" to maximize the Process model view
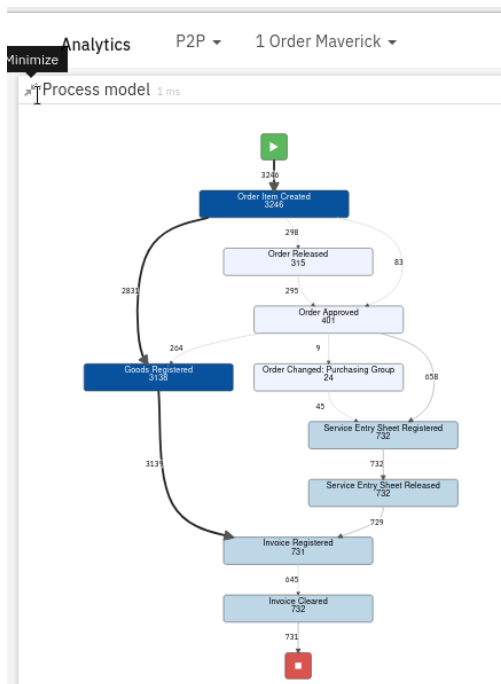
3.2.1.2 Order details

Shows the expected savings.

Note that the Order Details chart was created using these calculations:

The "Expect Savings" are calculated as the missed discounts.

3.2.1.3 Trend Order Maverick

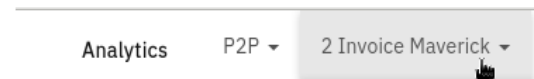Shows volumes and dates of Maverick orders versus compliant orders.
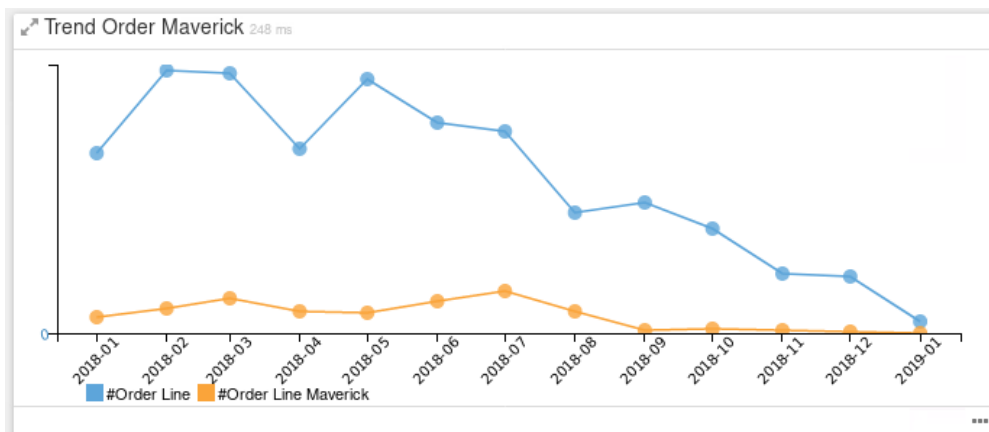
3.2.1.4 Maverick Orders by Purchasing Group

Shows order amount (the darker the color the larger the amount), vendor and purchasing group.
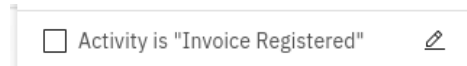
3.2.2 Invoice without an Order

_1. For dashboard, select **2 Invoice Maverick**

Note that the filter has changed,
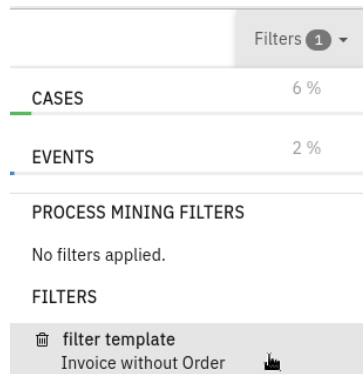
and we are now showing only Cases that include "Invoice Registered" activity which is only required when an Invoice without an Order is received!
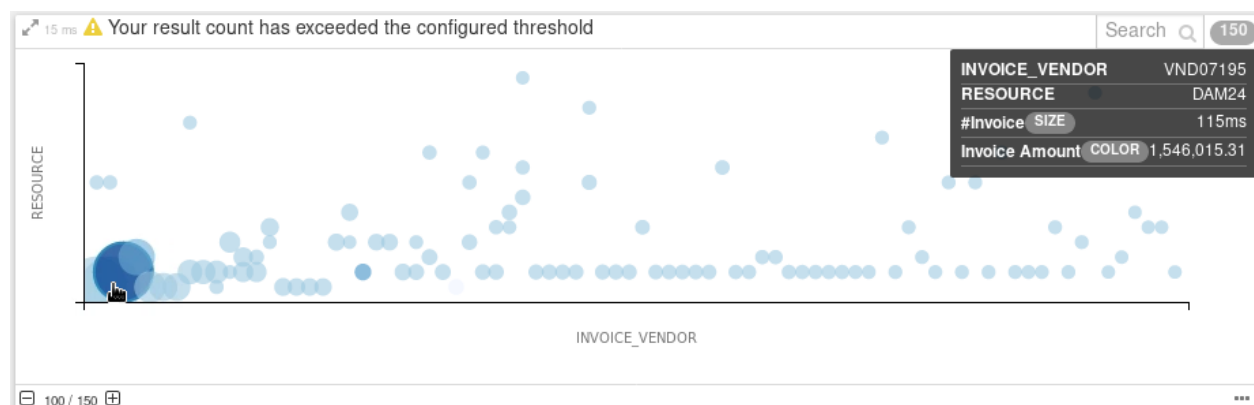

3.2.2.1 **Invoice Details**

Shows the expected savings.

Invoice Details 122 ms		
#Invoice 1,642	Total Amount 12,630,723.61	Expected Saving 252,614.47

3.2.2.2 **RESOURCE vs INVOICE-VENDOR dashboard**

_1. In the **RESOURCE vs INVOICE-VENDOR** dashboard select **the darkest dot**.

Note the total Invoice Amount of User DAM24 buying from vendor VND07195 without an invoice!

3.2.2.3 Order Details

Shows the vendors (Vendors) and most importantly the users (Resource) who processes invoices without orders!

Order Details 14 ms ⚠ Your result count has exceeded the configured threshold			Search 🔍 150
INVOICE_ID	Vendor	Resource	Registration Date
2017030262_2017_IT10	VND05820	USR00953	01/02/2018
3017005717_2017_IT10	VND07630	USR00084	01/03/2018
3017005722_2017_IT10	VND07630	USR00084	01/03/2018
2018012689_2018_IT10	VND05120	DAM24	07/06/2018
2017030542_2017_IT10	VND04728	CONS0120	01/04/2018
3017005739_2017_IT10	VND03950	DAM78	01/04/2018
2018012707_2018_IT10	VND07910	DAM24	07/06/2018

3.3 Reduce Deviations

We can use process mining to identify process path deviations and discover the root causes and the impact of those deviations such as a cost associated with extra resources and process delays.

Process deviations are discovered by comparing model discovered from process mining data with a reference model that could come from Blueworks live or other BPM tools.
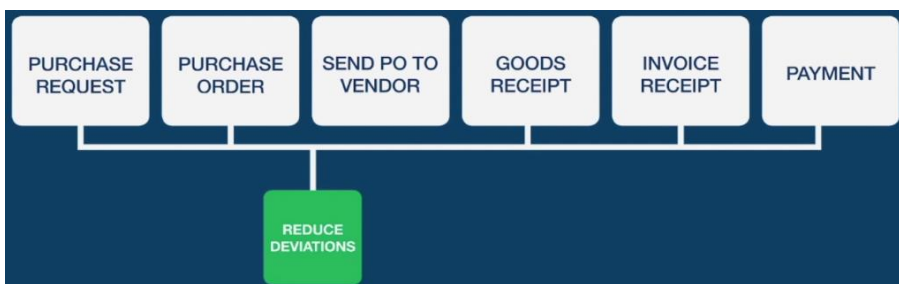
3.3.1 General Insights

Let's examine first the cost of non-conformance and how pervasive the non-conformance is in the P2P process.

_1. Click the chess-board icon and then select **Process Mining** to get back to Model view.
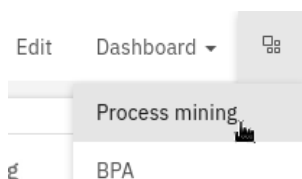
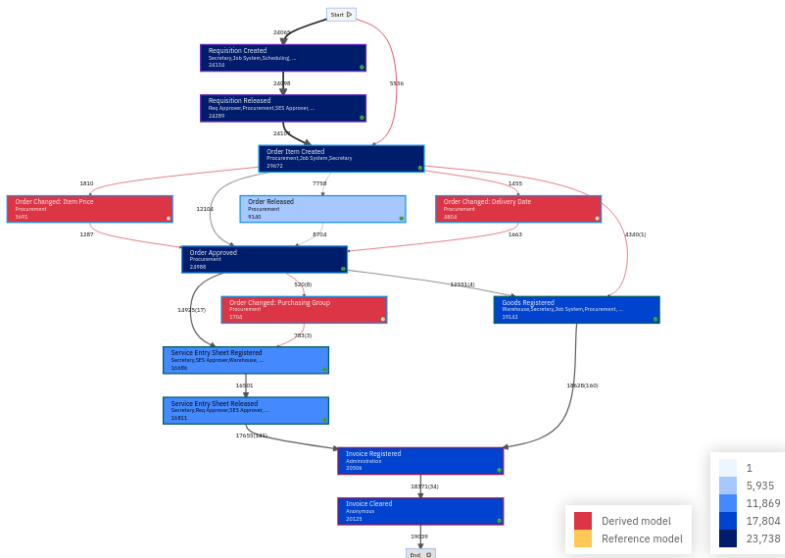_2. Click the **left arrow** icon to hide the Model palette

_3. Click the **eye icon**

Portrait	Landscape

_4. It is easy to identify how pervasive the non-conformance in P2P process is:

- the non-conformant activities can be identified by the red background color
- the non-conformant transitions are also set to red

_5. Let' look at the Model conformance summary view to see the negative impact of the P2P process non-conformance on business.

Note the following:
- 12800 instances (Cases) were not conforming to the reference model
- The average lead time (Lead Time is the amount of time between process initiation and completion) of non-conformant processes is about 21 days longer (subtract 97 from 118).
- The average cost of non-conformant process is about EUR 16 higher per case (subtract 52 from 68).

3.3.2 Root Cause Analysis

Once we identify non-conformant activities or transition, we can use the Root Cause Analysis feature to obtain some information derived from the custom fields in the dataset. For example we can determine if a non-conformance involves a particular resource, role, supplier, product, company, etc.

_1. Click **Order Changed: Item Price** – the most frequent non-conformant deviated activity.

12.3% Order Changed: Item Price is an unexpected
3.2k cases activity
157d 17h throughput, 13.8 steps, EUR 96.45 cost

▼ filter   ⊖ exclude

_2. Note that in the root-cause analysis section there are information about how many cases (where the deviation is present) involve a specific resource, role, supplier, product, company, etc. Depending on the criticality of the root-cause, it may be colored red, yellow or grey.

Note the rich details available to determine the root cause of the Order Changed: Item Price activity being executed as part of the P2P process.

You can see the specific Department, Resource, Material Type and Vendor

Depending on the criticality of the root-cause, it may be colored red, yellow or grey.

_3. Click the eye icon Click the **eye icon**

3.3.3 Cost of Deviations

We will now examine some of the prebuilt dashboards specifically designed to tackle the Cost of Deviations problem.

_1. Click the **chess-board icon** and then click **Analytics**
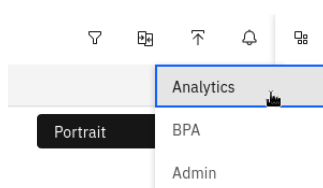
_2. Select **3 Deviation Cost Monitoring** dashboard
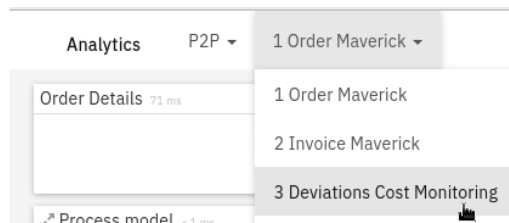
_3. Let's examine three charts in the Deviation Cost Monitoring dashboard

3.3.3.1 **Deviation Cost: Manual Events**

Shows the expected savings that can be achieved if the deviations were to be eliminated.

	#Events	#Human Involved	Total Human Cost	Expected Saving
	15,878	138	111,146	55,573

3.3.3.2 **Deviations**

Shows the activities that were identified as deviations from the refence model, including frequency and the total cost incurred. For example you can see that the *Order Changed: Delivery Date* activity and *Order Changed: Item Price* activities are most frequent and costly.

	#Events	Total Event Cost
Order Changed: Delivery Date	4,804 0	33,628 0
Order Changed: Item Price	3,691 0	25,837 0

3.3.3.3 **Resource Monitoring**

Shows what users completed activities that were identified as deviations including frequency and the associated costs.

▌ Note: Click the Total Cost or #Event column to sort in descending order

RESOURCE	Total Cost	#Event
BATCH_P0E	66,976	9,568
USR01202	59,108	8,444
DST25	49,315	7,045
ACQ01	32,760	4,680

This view allows you to identify the users (RESOURCE column) that performed activities in the process paths that were found to deviate from the reference model. The other columns show the total costs and the frequency. The first step eliminate the deviations would be to investigate why the users felt necessary not to follow the process paths defined by the refence model.
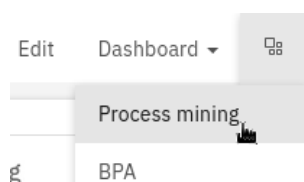
3.4 Reduce Rework

Activities that are repeated more than once in the same process instance are defined as rework. Activities with reworks typically reveal errors when filling-out forms, and can become candidates for automation by RPA.
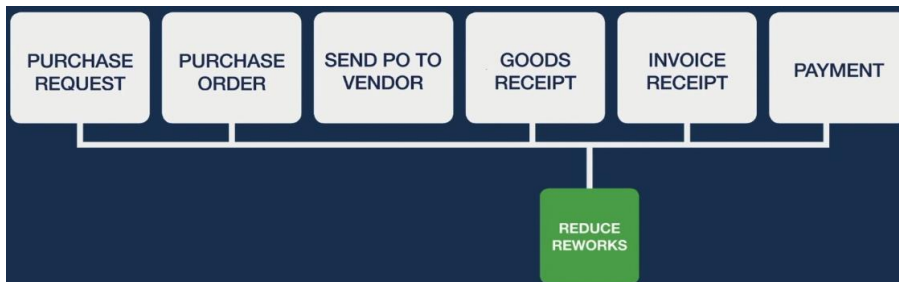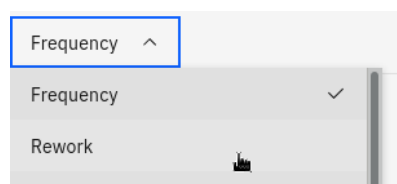

3.4.1 Rework View

_1. Click the **chess-board** icon and then **Process mining** to get back to Model view.

_2. Select **Rework** to change from Frequency to Rework view


There are two kinds of rework:

- if you can see an arrow that goes out and falls into the same activity it is called a **self-loop**;
- when, in the same process instance, the activity is repeated several times this is also called a **rework**.

3.4.1.1 **Rework**

Activities with rework are marked according to the legend. The darker the activity color the more time a rework occurred in the same process instance.
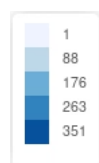
_1. Let's examine the activity with highest rework ratio in **Order changed: Delivery Date** Activity
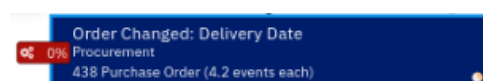
- The were 438 instances that caused rework
- On the average the activity is repeated during each case 4.2 times.
- This activity has 0% automation and considering the rework possibly due to errors, it may be a good candidate for RPA automation!

_2. Note that the red badge on the **Order Item Create** activity.

It shows the automation ratio for the activity. In 32% of the instances (cases) in the P2P process this activity was completed by a robot. Also not the light background color which indicates lower level of rework. Could this be the effect of higher automation ratio?
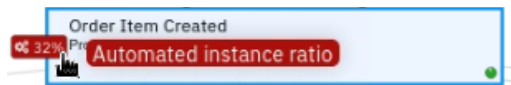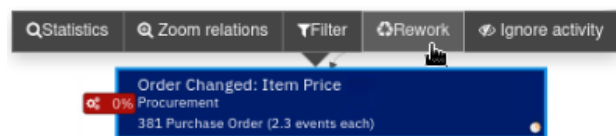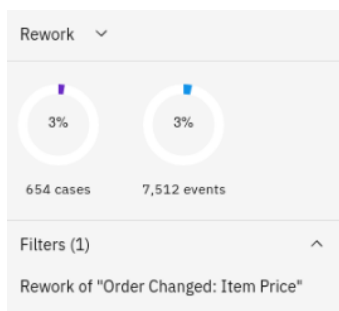

3.4.1.2 **Self-loop**

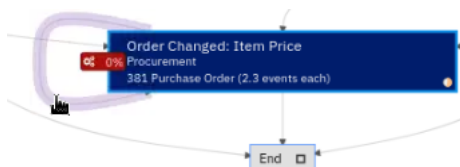_1. Click **Order Changed: Item Price** activity. This is another Activity with high rework ratio,
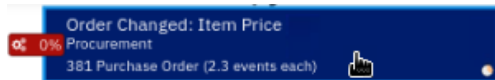
_2. Click **Rework**

This action create a Filter. Note that 3% or 654 instances (Cases) include this rework.

_3. Click the **self-loop link** on the **Order Changed: Item Price** activity
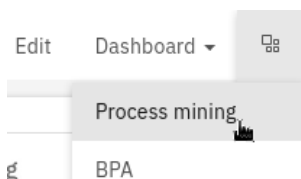

_4. Click **Analytics**

_5. Select **Order Approval Monitoring** dashboard
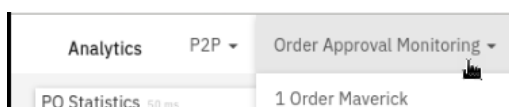
Note that you can examine the impact of the reworks in this activity on the Order Approval KPI such as AVG Order Approval Time or identify what resources (people) were involved in reworks of this Activity.
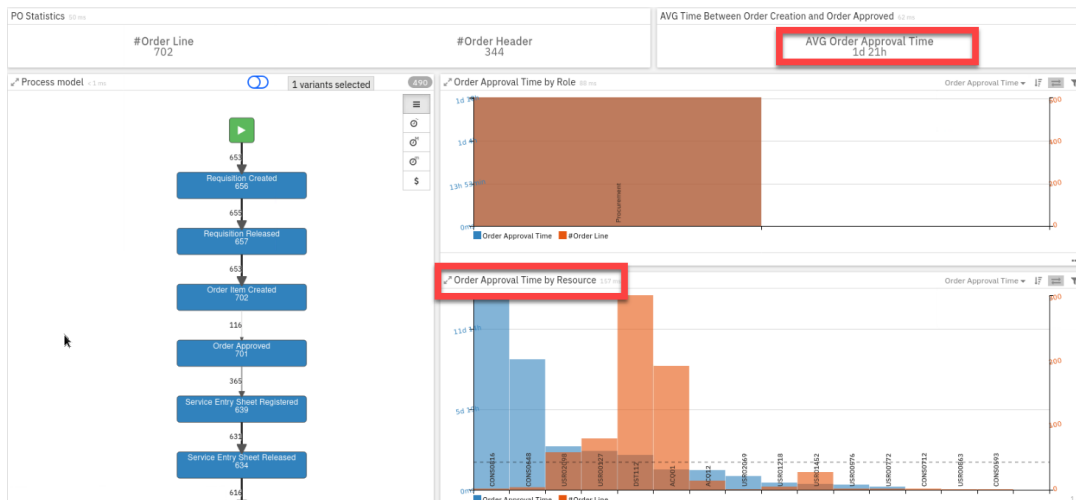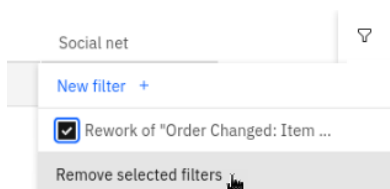
_6. Click the **chess-board** icon and then **Process mining** to get back to Model view.

_7. To remove the Filter, click **Filter icon**
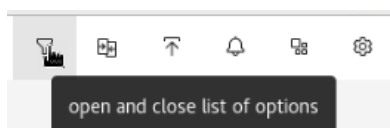
_8. Select **Rework of Order Changed: Item ...** and then click **Remove selected filters**

_9. Select **Yes** on *Remove project filters* Window.

3.5 Increase Automation

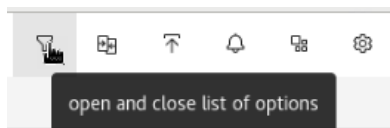We will explore two ways to use process mining insights to automate JK Auto Inc.'s P2P process:
- Automation of Activities
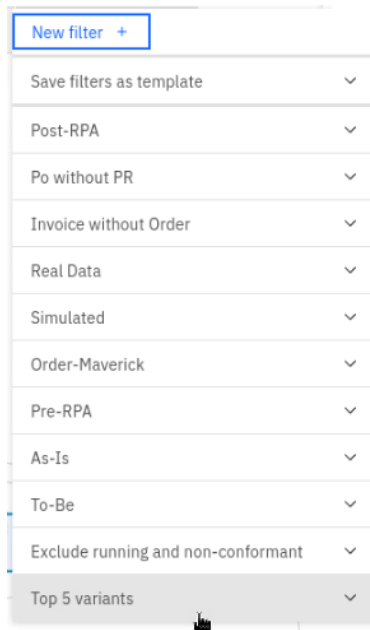- Understanding and optimizing process paths

3.5.1 Increase Automation Analysis Setup

In our automation opportunity analysis, let's focus only on the top 5 variants only and exclude the outliers (less frequently executed process paths.
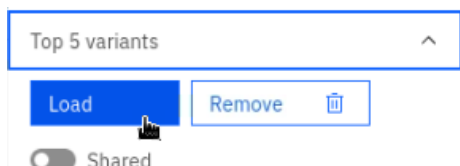
_1. Click **Filter icon**

open and close list of options

_2. Select **Top 5 variants**

_1. Click **Load**

3.5.2 Automation of Activities

In this part of the lab you will explore two IBM Process Mining capabilities:

- **Ability to identify automating candidates.**

  First, we will identify most impactful automation opportunities with respect to the process KPI such as Costs reduction or Lead Time reduction.

- **Simulation**.

  Once the candidates for automation are identified, we will use **the what-if simulation capabilities** to understand the impact of the automation by comparing the simulation data to the original data captured from the logs. This will enable process owners to determine the ROI before implementing any process improvement initiative, such as Robotic Process Automation.

3.5.2.1 **Identify Automation Candidates**

_1.   Click the **chess-board icon** and then click **Analytics**
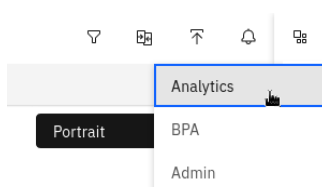
_2. Select **4 Automation** dashboard
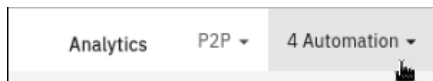
Note the three most costly activities.

The first two Activities have not been automated. The third Activity has been automated using RPA but not entirely, it could benefit from increased automation by investing in more RPA bot licenses.
In the next step we will perform a simulation to see the ROI and the benefits the three most costly activities.

3.5.2.2 **Use Simulation Results to Determine ROI**

Let's create and configure a simulation.

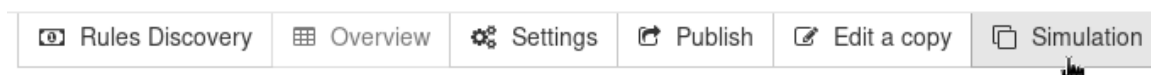*3.5.2.2.1 Create Simulation*

_1. Click the **chess-board** icon and then **Process mining** to get back to Model view.
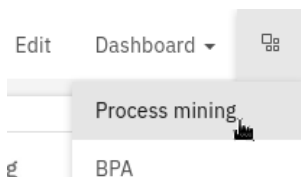
_1. Click **BPMN** tab

_2. Click **Simulation**

_3. For Simulation Title enter **P2P Automation** and click **Confirm**

3.5.2.2.2 Configure Simulation

Recall that we discovered automation opportunities for the three activities shown below with the highest total cost:

_1. Set Number of instances to **12,958** (to match the number of instances we have after applying the filter)

_2. In the Settings section of the **Requisition Created** activity. Reduce Staff availability from 14 to **1**

_3. Click **RPA** tab

_4. Set Robotic quote to **90**, Number of robots to **12** and Working time to **1** minute

_5. Locate *Order Approved* activity

Order Approved | Avg throughput time: 1d 7h 13min, Executions: 10905, Weight: 0.84

_6. Change the following settings:

- Settings > Staff availability: **1**
- RPA > Robotic quote: **90**
- RPA > Number of robots: **12**
- RPA > Working time: **1**

_7. Locate *Invoice Registered* activity

Invoice Registered | Avg throughput time: 16d 1h 56min, Executions: 11622, Weight: 0.90

_8. Change the following settings:

- Settings > Staff availability: **1**
- RPA > Robotic quote: **90**
- RPA > Number of robots: **12**
- RPA > Working time: **1**

_9. Click **Run Simulation**

Current lead time
93d 10h 10min 20sec

A Run Simulation   ↺ Versions ▾

_10. Wait for the Simulation in progress to close

↺ Simulation in progress

_11. Since you just set up a new simulation, go to Examine Simulation Results

3.5.2.2.3 Examine Simulation Results

The Process overview table provides a summary of key metrics. **A** represents the as-is process and column **B** represents the simulation results

Process details

Process overview	A	B
Case count	12,958	12,958
Average case lead time	93d 10h	88d 16h
Average case cost	EUR 50.41	EUR 39.69
Total case cost	EUR 653,219.00	EUR 514,363.80

Notice that decrease in *Average case lead time*, decrease in *Average case cost,* and finally decrease in *Total case cost*!

3.5.3 Optimization of Process Paths

There are two ways the decision logic information gained through process maiming can be used to increase automation:
• Leveraging DMN data to implement decision automation
• Changing decision gateway settings in IBM Process Mining simulation future

3.5.3.1 Leveraging DMN Data to Implement Decision Automation

Decisions gateways in BPMN process diagram control process paths. The Decision Rules Mining (DRM) capability can automatically discover the correlations within the data that was uploaded and mapped onto IBM Process Mining. This DRM capability enables IBM Process Mining to automatically detect the decision rules that govern the process.
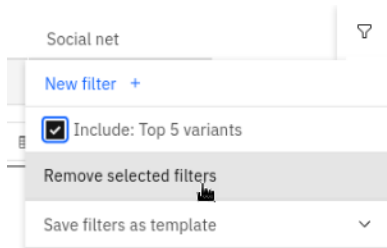
_1. Click **BPMN**

Model	**BPMN**	Activity map

_2. Click **Filter icon**
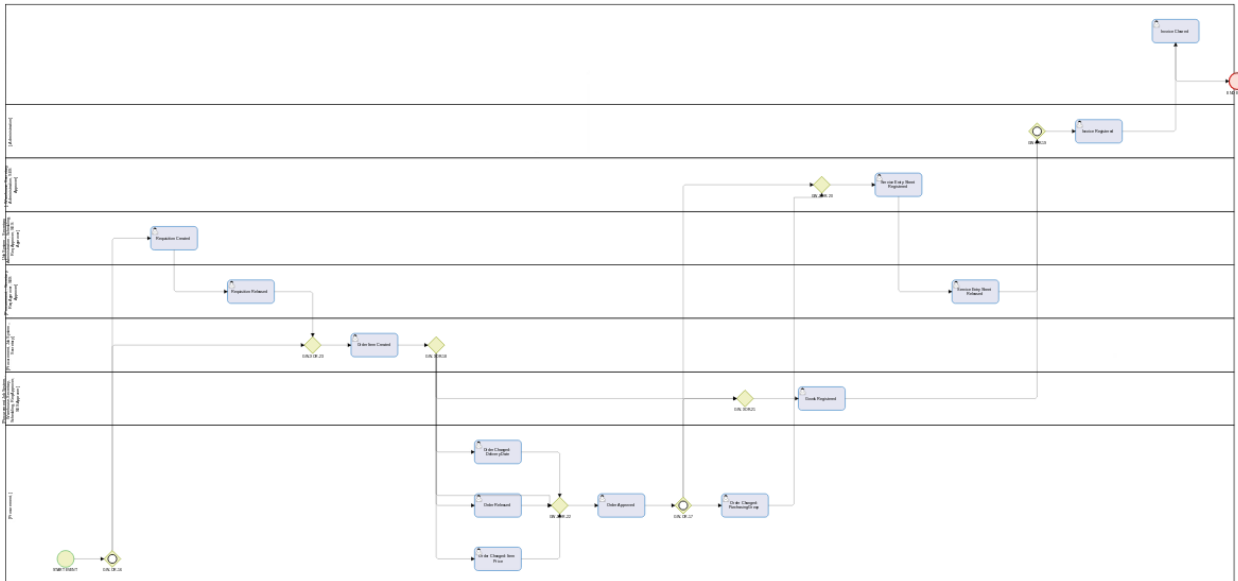
open and close list of options
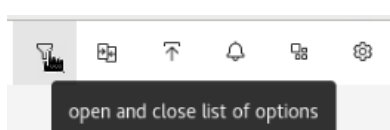
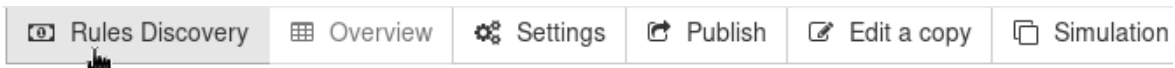_3. Select **Top 5 variants** and then click **Remove selected filters**

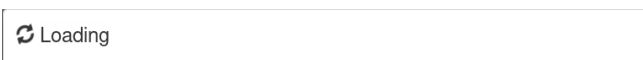_4. Select **Yes** on *Remove project filters* Window.

You should now see a more complex BPMN diagram than includes all process paths.
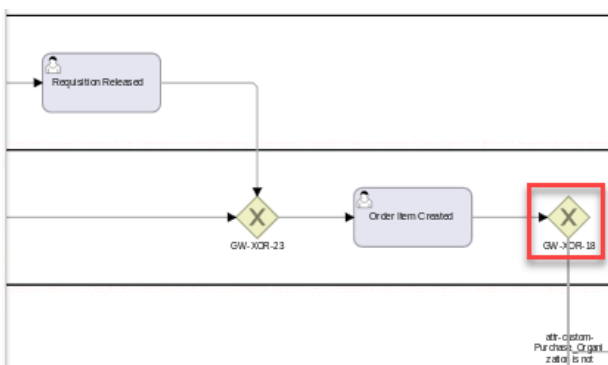

_5. Click **Rules Discovery**

_6. Wait for the *Loading* message to clear, this may take few minutes.
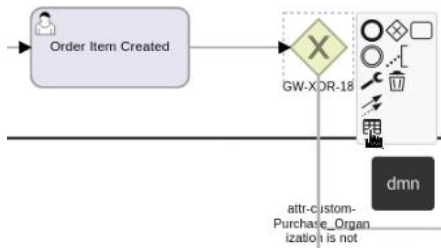

_7. Click **Edit a copy**

_8. Find Gateway **GW-XOR-18**, use the mouse wheel to zoom.

_9. Click Gateway **GW-XOR-18** and select **DMN**

_10. Click **Promote as a decision table**

_11. For Decision name enter **Order Item Decision**, for Output variable name enter **order_item_decsions** and click **Save**

_12. Click **X** to close the decision table

_13. Select and click DMN > local > Order Item Decision
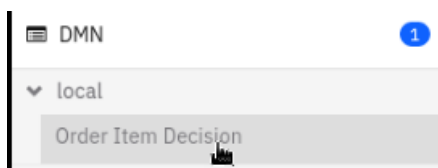
Note that this DMN decision table is fully editable including the ability to add or change the rules (rows in the DMN table). Also note that the columns correspond to the custom variable defined for this process model in the input CVS file.

Order Item Decision

	attr-custom-data_gr_ipo	attr-custom-Purchasing_Group	attr-custom-Material_Group
U	string	string	string
1	-	-	-
2	-	not("II3", "IIB", "III", "IIO", "IS1")	-
3	-	not("IIH", "III", "IIJ", "IIM", "IIO", "IS1")	-
4	-	"III", "IIO", "IS1"	"S310-1761", "S999-9999"
5	-	-	-
6	-	"II3", "IIB"	-
7	-	"IIH", "IIJ", "IIM"	-
8	not("2018-07-23", "2018-09-27", "2018-11-19	"III", "IIO", "IS1"	-
9	-	-	-
10	-	-	-
11	-	-	-
12	"2018-07-23", "2018-09-27", "2018-11-19"	"III", "IIO", "IS1"	-
13	-	-	-
14	-	-	-
15	-	"III", "IIO", "IS1"	not("S310-1761", "S999-9999")
+	-	-	-

Add Rule

_14. **Scroll to the right** to see the last table column

order item decsion	Annotation
Order Changed: Delivery Date	-
Order Approved	-
Order Approved	-
Order Approved	-
Order Released	-
Order Released	-
Order Released	-
Order Released	-
Order Changed: Item Price	-
Order Changed: Item Price	-
Order Changed: Item Price	-
Order Changed: Item Price	-
Goods Registered	-
Goods Registered	-
Goods Registered	-

The last column represents the DMN output variable is the name of Activity to execute next according to the BPMN process diagram.

> Note, you can export the BPMN process to orchestrate the activities captured by process mining and then use the DMN decision table has been captured in the Process Model to implement decisions directly in the BPMN process or externally using IBM Automation Decision Services.
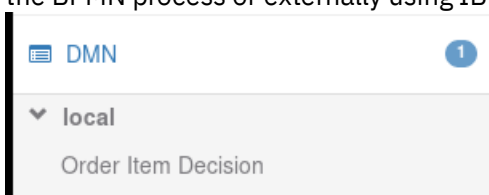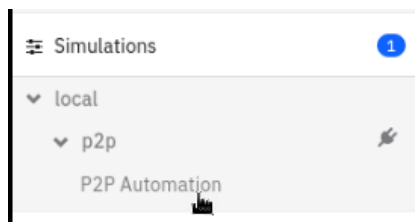

> You can export the BPMN model from this view:
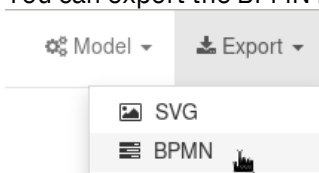
> The exported BPMN model will include the DMN decision table information. It is not a DMN export.

3.5.3.2 **Changing decision gateway settings in IBM Process Mining simulation future**

_1. Select **Simulations > local > p2p** and click **P2P Automation**

_2. **Scroll to the end** of the Simulation page

The Gateways simulation configuration section in Simulation configuration allows to change the distribution of the Gateway outputs. Note that simulation does not take under consideration the actual values of the business data.

3.6 Avoid Cash Discount Losses

To support JK Auto Inc.'s Spend Under Management (SUM) initiative, process mining can be used to improve the transparency of the purchasing process. We will now explore how to use process mining to monitor and better manage payments to suppliers.
There are two aspects of SUM that JK Auto Inc. wants to focus on:

- Late Payments of Supplier Invoices. A costly inefficiency with large business impacts:
  - o   Detrimental to organization's valuable supplier relationships.
  - o   Poor relationships and missed opportunities for preferable terms on key goods and services in the future.
  - o   Additional interest payments
- Early payments. Another costly inefficiency with significant business impacts:
  - o   Paying early can yield substantial benefits in situations where suppliers offer discounts or rebates for early payment.
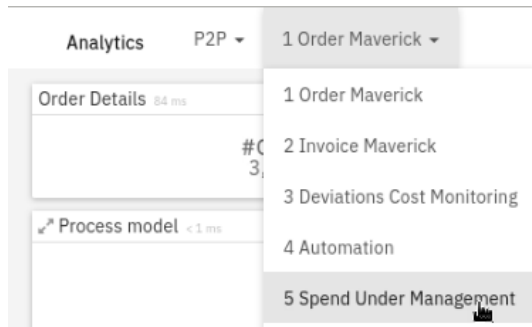 - o   Cash discount loses result when early payment option is not exercised
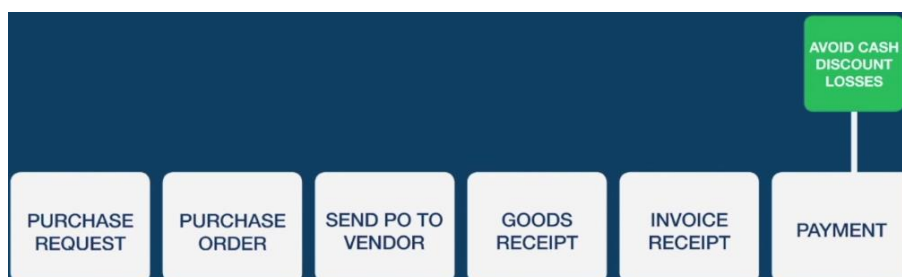
_1. Click the **chess-board icon** and then click **Analytics**
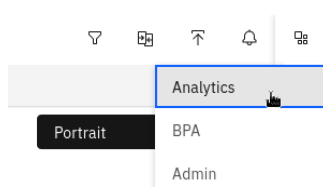
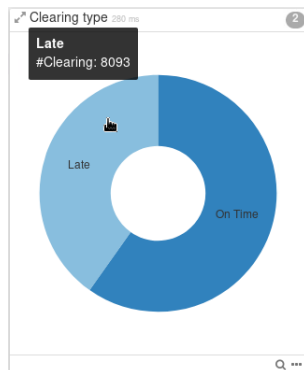_2. If not already selected, select **P2P** project
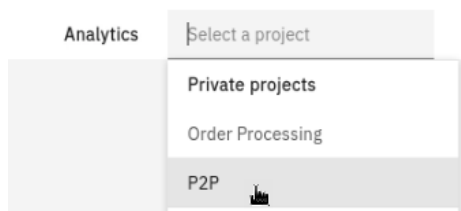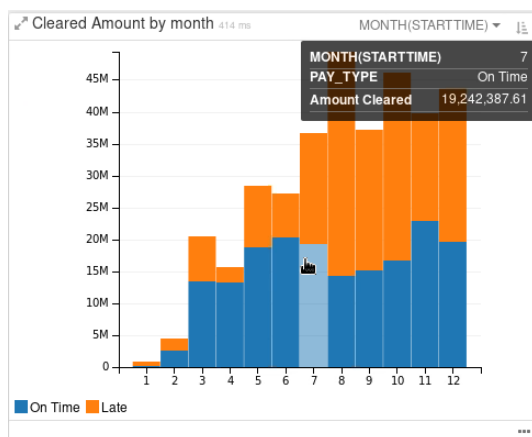

_3. Select **5 Spend Under Management** dashboard


3.6.1 Late Payment

Clearing type – this view shows instances that incurred resulted in late payment of vendor invoices.

Cleared Amount by month – this view shows the payment amounts of late (orange) versus on-time (blue) per month
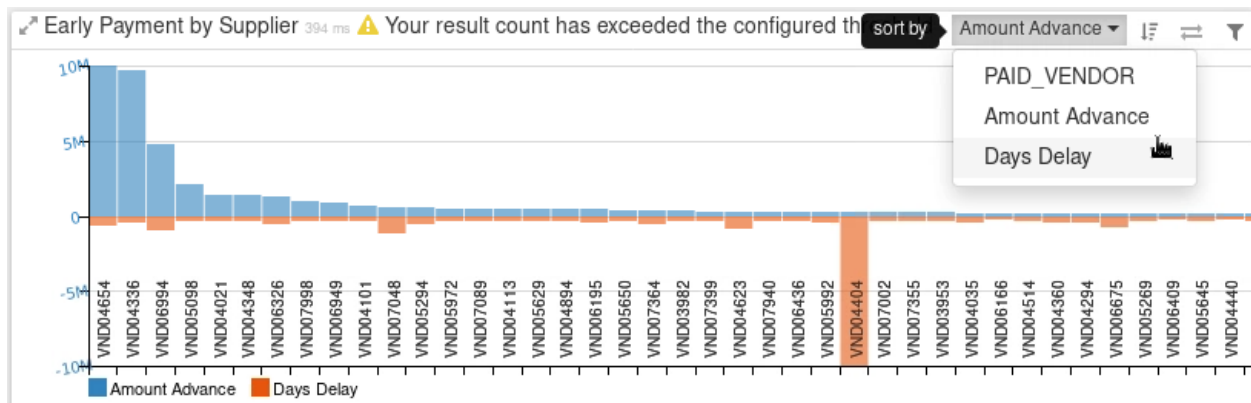

Late Payment by Supplier – this view shows the late payment data by supplier. For example, the first suppliers have the largest late payment proportion and amounts.
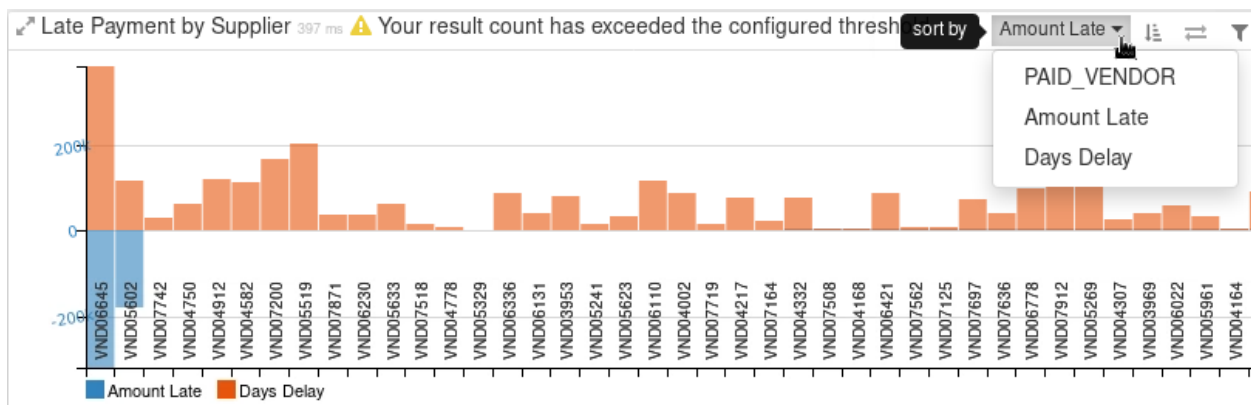
3.6.2 Early Payment

Early Payment by supplier – this view shows if JK Auto Inc. is taking full advantage of discounts or rebates for early payment offered by suppliers.

3.7 Lab Summary

You have just learned how IBM Process Mining can be applied to improve and gain insights into JK Auto Inc.'s P2P process.
You should now be able to deliver a live demo recorded in this video:
https://ibm.box.com/v/Lab2ProcessMiningVideo.

Congratulations, you have successfully completed Use Process Mining to Improve Procure to Pay Process Lab