

Co-funded by the
Erasmus+ Programme
of the European Union



Case Study

Big Data and Audit

Friedrich-Alexander-University Erlangen-Nürnberg
Germany



supported by Ernst & Young Germany

Big Data and Audit

Systems generate large amounts of data. However, without analytics, the information remains meaningless. The **traditional audit approach** relies on auditors bringing personal experience to review a company's processes and policies.

Yet, with the adoption of automation, auditors can create **new audit procedures**. Software-based systems using analytical algorithms, enabling dashboards, and applying artificial intelligence can make the classical audit more reliable, faster and/or cheaper. They also increase the probability to early detect fraud and provides the opportunity of continuous – i.e. very timely - audits.



Therefore, the auditor of the future will have to acquire some skills of data scientists!

Big Data and Audit

Big data is high-volume, high-velocity and/or high-variety information assets that demand cost-effective, innovative forms of information processing that enable enhanced insight, decision making, and process automation. (Source: Gartner)

Volume	Variety	Velocity	Veracity	Value	Variability
The amount of data from a vast number of sources.	The types of data: structured, semi-structured, unstructured.	The speed at which big data is generated.	The degree to which big data can be trusted.	The business value of the data collected.	The ways in which the big data can be used and formatted.

Big Data and Audit

The audit profession accepted **sampling** as an audit procedure as it was not feasible to investigate every transaction. However, **full-population testing** would theoretically be superior to support the assurance that the auditor is expected to provide.



Celonis, founded 2011 in Munich, specializes in process mining software. Process mining is a technique to **discover real processes from a company's data** (e.g. from ERP systems), compare them with planned processes, and subsequently monitor and improve them.

In this case study, you will learn about process mining and apply it yourself **on real company data**, provided by our partner EY Germany, thus creating your own dashboards and perform auditing procedures.

Time schedule

Thursday	14:00 – 14:15	Introduction to the case „Big Data and Audit“ (<u>Plenary session</u>)
	14:15 – 15:00	Part A: Introduction and process audit (<u>Group session</u>)
	15:00 – 15:15	Short break
	15:15 – 16:15	Part A: Digital twins, ERP-Data, event logs and process mining (<u>Group session</u>)
	16:15 – 16:30	Short break
	16:30 – 17:30	Part A: Software training (Celonis) (<u>Plenary session</u>)
Friday	9:30 – 11:00	Part B: Compliance / Finance / Fraud (<u>Group session</u>)
	11:00 – 11:30	Coffee break
	11:30 – 13:00	Part B: Fraud (continuation) / Operations / Final presentations (<u>Group session</u>)

Reminder: Preparation for the case

1. Signup

Please sign up for the academic version of Celonis using the following link:

<https://www.celonis.com/academic-signup>

You will receive access to your own Celonis Intelligent Business Cloud (IBC) workspace, yet, in order to gain access to the data for our case study, it is necessary for you to be added to our workspace.

2. Invitation

We kindly ask you to send an e-mail containing your Celonis e-mail with the reference “Celonis STAMP-Online Big Data and Audit” to be provided access to the Celonis workspace to the following e-mail-address:

maico.schoene@fau.de

You will receive an invitation to the Celonis team “maico-schoene”.

Group meetings

Please join the group meeting you were assigned to. You can find the group allocation as well as the case documents at <https://stamp.projects.uvt.ro/case-4-big-data-and-audit/>.

Group 1: Klaus Henselmann

<https://meet.google.com/jrp-itgj-pnj>

Group 2: Michael Dimmer

<https://meet.google.com/bfp-ksux-dgu>

Group 3: Maico Schöne

<https://meet.google.com/fip-frak-hqj>

Outline

„Your Career Story“

A. Training

1. Introduction
2. Process audit
3. Digital twins, ERP-Data and event logs
4. Process mining
5. Software training (Celonis)

B. Your first client

1. Compliance
2. Finance
3. Fraud
4. Operations

Final presentation

Your Career Story

After successfully completing your degree in Business Studies, you convinced an accounting firm of your expertise in working with emerging technologies. Thus, you were recruited for an entry level position on their assurance team.

Your first tasks will include auditing the processes of your company's clients as part of the annual audit. In order to prepare you for this job, you are going to receive an introductory training on process audits and process mining (**Part A**). Your employer is applying this new technology to make the audit more efficient and analyze the actual occurring processes throughout the company.

After being prepared for your job, you will audit your first client, Erasmus PLC, thus applying process mining on real data (**Part B**).

A. 1. Introduction

Read the introduction (slides 11 to 16) and keep the following questions (= Task) in mind:

1. Who is responsible for the preparation of financial statements and what is the role of the auditor?
2. Which different opinions can the auditor express?
3. Does an unqualified opinion guarantee that everything is 100% correct?
4. Why is the audit approach risk-oriented?
5. What are the steps that must be performed throughout an audit?

A. 1. Introduction

Aims and results of auditing (1):

Financial statements of corporations have to be audited regularly. The audit is statutory for annual accounts and consolidated accounts of these corporations. Audits were invented due to the separation of the owners/shareholders and the management of a company. This separation is also referred to as the principal-agent-problem, as information asymmetries might occur. Audits are intended to reduce the information asymmetry between the management and the shareholders. The aim of a financial statements' audit is to ensure that the information provided by the management (financial statement) is in accordance with the relevant national or international accounting principles and provides a true and fair view onto the company's economic situation.

A. 1. Introduction

Aims and results of auditing (2):

It must be stressed that the company is responsible to prepare the financial statements. However, as an output of the audit, the auditor has to provide an opinion whether the financial statements are stated in accordance with the relevant accounting standards or not.

The financial statements' audit has to be conducted in a way that allows the auditor to build an opinion with reasonable assurance if the audited financial statement includes material misstatements. The term 'reasonable assurance' indicates that the assurance is not absolute and that – although the auditor has done a 'good job' – the financial statement can still include misstatements. The term 'material misstatements' refers to those misstatements that might affect the decisions of the addressees or users of financial statements. Therefore, the auditor has to define materiality – to find out if misstatements are material or immaterial.

A. 1. Introduction

Aims and results of auditing (3):

If a financial statement does not include material misstatements, the auditor issues an unqualified opinion. Otherwise – if the financial statement includes material misstatements – the auditor has to issue a modified audit opinion. A modified audit opinion includes qualified opinions, an adverse opinion and a disclaimer of opinion. The auditor would express an appropriately modified opinion e.g. if the financial statement is not free from material misstatements, but the error is limited in scope and size. An adverse opinion would apply if the limits of the error(s) are not clear. Disclaimer of opinion might result if the auditor was not able to complete the planned audit.

If misstatements occur, auditors are aimed to classify it either as an error (= unintended) or as fraud (= purposeful). Furthermore, auditors have to keep their professional scepticism – however, they are not primarily searching for fraud.

A. 1. Introduction

Risk-oriented audit approach (1):

Auditing needs a compromise between the time/costs of an audit and the reliability of its findings (was the audit opinion correct?). Against this background, it is a good idea to spend more time/costs on areas where the risk of material misstatements is expected to be higher. This is called the risk-oriented audit approach.

Therefore, the risk assessment is of immense relevance within an audit. It can be found in the five phases of the audit process:

- Phase I – Client acceptance
- Phase II – Planning an audit
- Phase III – Testing and evidence
- Phase IV – Evaluation and reporting
- Phase V – Quality assurance

A. 1. Introduction

Risk-oriented audit approach (2):

Within phase I, the auditor has to decide if the client is accepted. To decide this, information about the potential audit client has to be gathered. For accepting a client, the auditor needs to have sufficient time, staff and administrative resources to handle the audit.

If the client is accepted, planning activities and analytical audit procedures have to be performed. In phase II, the auditor has gained an understanding of the client's business and industry to assess the client's business risk. Based on the knowledge about the company's business risks, the auditor has to decide about the detection risk, which is usually determined by the inherent risk, the control risk and the relevant overall audit risk.

Phase III includes testing and gathering evidence, in order to gather sufficient appropriate evidence. The following figure shows the audit procedures that lead to sufficient appropriate evidence:



A. 1. Introduction

Risk-oriented audit approach (3):

Phase IV of the audit process includes the finalization of the audit procedures and wrap up procedures to draw final conclusions. Further, a final overall judgement using all audit documents and results that have been gathered throughout the audit process has to be made. Based on that overall judgement, the auditor has to decide about the appropriate audit process opinion and report this decision to the management and to those charged with governance. Lastly, the audit opinion has to be issued. The audit opinion (also called audit report) is the only thing that most users see in the audit process.

After the audit procedures are conducted and the audit opinion is issued, the (internal and external) quality assurance takes place (phase V). Internal quality assurance includes various procedures and mechanisms that are implemented within the audit firm, e.g. internal quality reviews by another partner that was not involved into the audit. By external quality assurance mainly the activities of the Auditor Oversight Bodies are meant.

A. 1. Introduction

Presentation of group solutions to this Task:

1. Who is responsible for the preparation of financial statements and what is the role of the auditor?
2. Which different opinions can the auditor express?
3. Does an unqualified opinion guarantee that everything is 100% correct?
4. Why is the audit approach risk-oriented?
5. What are the steps that must be performed throughout an audit?

A. 2. Process audit

For planning the Financial Audit, frequently, an **Information Technology Audit** takes place.

An Information Technology Audit is the examination and evaluation of an organization's information technology infrastructure, applications, data use and management, policies, procedures and operational processes against recognized standards or established policies. Audits evaluate if the controls to protect information technology assets ensure integrity and are aligned with organizational goals and objectives.

Effective management of information and IT has become of critical importance to the survival and long-term success of any organization. This has arisen because of the increasing dependence on information. In addition, the increasing potential from threats such as information warfare or cyber terrorism has added a new awareness. At the same time, technology creates new business opportunities and offers the chance to reduce costs.

Among its **results** it shows the ERP system the company uses, ways how to access the data, parts of the work that are performed manually or automated, and manual or automated controls that are – theoretically! - in place.

A. 2. Process audit

Internal control as defined by the Committee of Sponsoring Organizations of the Treadway Commission (COSO) is a process, affected by an entity's board of directors (trustees), management, and other personnel, designed **to provide reasonable assurance** regarding the achievement of objectives in the following categories:

- Compliance with applicable laws and regulations
- Effectiveness and efficiency of operations
- Reliability of financial reporting

They include a wide range of activities that occur throughout the organization, by supervisory and front-line personnel. Typically, management is responsible for **developing** an appropriate system of internal controls, but every employee is responsible for **following and applying** those practices.

A. 2. Process audit

In order to assess risks, the auditor performs an assessment of the internal control systems by recording processes, making inquiries, observations as well as samples. The scope and key focus areas of the internal control audit is then decided on the basis of this initial assessment.

An overview of the internal controls is necessary in order to identify significant errors that may occur in the accounting and reporting process. The experience of the auditor regarding internal controls is essential in the assessment and audit of internal control systems.

Information Technology General Controls Review (ITGC) Audit Program

2012 Internal Audit Work Plan
Project:

Prepared by:
Date Prepared:
Reviewed by:

Objective:

IT General Controls (ITGC) address the overall operation and activities of the IT function and its management and governance. The ITGC audit will identify and assess general controls throughout the organization's IT infrastructure. The auditor(s) will inquire, observe, and gather evidence to obtain an understanding of the IT control environment. COBIT provides the general framework for the assessment and is augmented as necessary with applicable regulations, legislation, standards, policies, agreements, and related guidance.

Reference:

Section	Procedures	Workpaper #	Date	Auditor and Comments
A	General			
A.1	Review prior assessments, audit reports, findings, and recommendations of IT activities for two years to include: • External audit reports • Internal audit reports • Regulatory agency reports • Consulting reports Assess appropriateness of corrective actions has taken. Document the action taken for each recommendation and determine whether any prior year's comments should be carried forward to the current year's comments.			
A.2	Identify the technology platforms in use and the applications processed on each platform. Platform information for includes: • Equipment manufacturer and model • Quantity Software applications information includes: • Application vendor and name • Version / Release			
A.3	Review Board of Directors and Committee agenda and minutes from the past year for content relevant to IT. Establish and document follow-up plans as appropriate.			

A. 2. Process audit

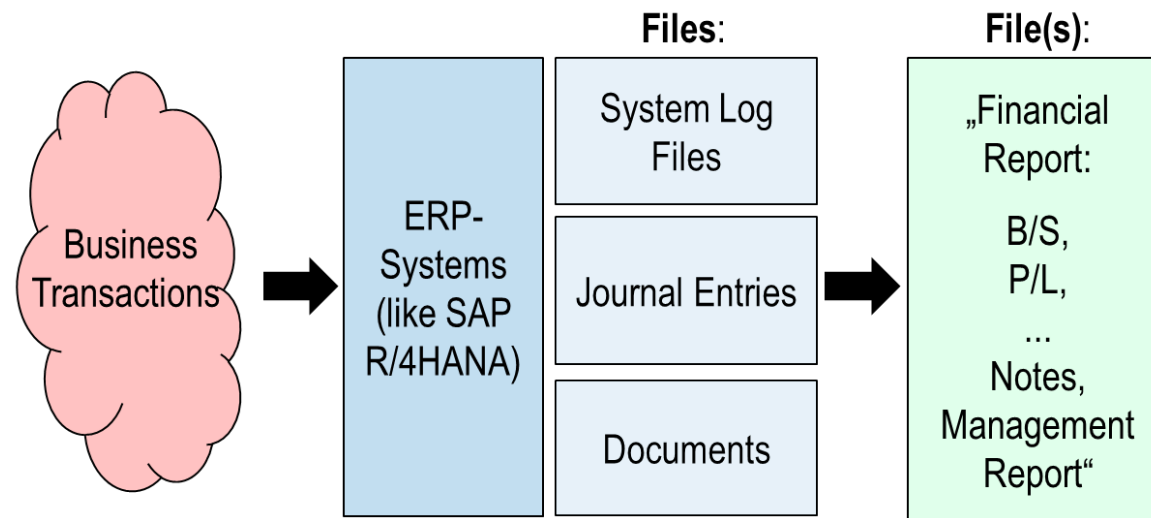
One of the most important processes within a company, that is also part of the audit, is the **purchase-to-pay process (P2P)**. It encompasses the company's entire purchasing process, from product acquisition to vendor payment. For the following task you are asked to demonstrate your general understanding of businesses, which you have gained throughout your studies.

Task:

1. What are the most relevant steps of the purchase-to-pay process?
2. Which elements might be of potential interest for an auditor like you?

A. 3. Digital twins, ERP-Data and event logs

Nowadays, in companies all real-life transactions are mirrored in digital form (“digital twins”). They are processed in ERP systems and stored in databases. The databases also contain documents and bookkeeping journal entries. The ERP system records all activities.



A. 3. Digital twins, ERP-Data and event logs

ERP-Systems are software solutions for companies that help to increase the structure and automate internal work processes.

ERP systems usually **link different areas of an organization**, such as suppliers and customers, operations, logistics, equipment, human resources, finance, etc., into a tight incorporated system with shared data and visibility. For instance, ERP systems present seamless incorporation of processes across functional areas with better workflow, standardization of a variety of business practices and access to real-time up-to-date data.

A successful ERP system can be the backbone of business intelligence for an organization because it can provide managers an integrated analysis of the processes involved within it.

A. 3. Digital twins, ERP-Data and event logs

Tagging processes according to their type categorizes the processes based on their role within the enterprise in terms of whether they are

- essential management,
- process supporting processes, or
- represent a primary process within the enterprise.

This is identified and correctly used in competency modeling, business model design, as part of the value chain, accountability, or operating model view. Management processes will appear in the accountability view and may be subject to decisions about how activities are designed and implemented.

A. 3. Digital twins, ERP-Data and event logs



Management processes are engaged in planning, budgeting, control, oversight, and monitoring of main or supporting processes. Main processes are processes within a process that deliver the output.

Supporting processes are processes that are necessary to ensure the main process is given everything it needs to meet the purpose for which it was designed, deployed and is operated.

Main processes produce the products/services for customers. Support processes provide resources for main processes. Together, they constitute the hierarchy or process architecture of an organization.

A. 3. Digital twins, ERP-Data and event logs

Data available in **digital, machine readable form** can be used to ensure a reliable and efficient audit. The aim of process mining in an audit context lies in the discovery, monitoring and improvement of real processes – not assumed ones – by the extraction of knowledge from various event logs.

In the audit context, **process mining** may be used wherever individual steps of a process, that are relevant for the audit, are stored in an IT system, to be able to trace the coherence and chronology of these steps. This traceability is ensured by a process log (also called event log) and ensures additionally that there is no possibility to rewrite history.

Instead of sampling small sets of cases, it is now possible for the auditor to **examine the whole process with every single instance** in a continuous way. The techniques of process mining deliver a higher compliance and ensure the reliability and validity of the information given from the organization about the core processes.

A. 3. Digital twins, ERP-Data and event logs

All process mining techniques assume that it is possible to **sequentially record** events, usually by a “*time stamp*”, such that each event refers to an **activity** (i.e., a well-defined step in some process) and is related to a **particular case** (i.e., a process instance).

Event logs may store additional information about events. In fact, whenever possible, process mining techniques use extra information such as the **resource** (i.e., person or device) executing or initiating the activity, the exact timestamp of the event, or **data elements** recorded with the event (e.g., the size of an order).

Case id	Case attributes		Event id	Event attributes				
	Age	Type		Time	Activity	Transition	Resource	Instance
1	33	Gold	1	2016-1-4 8:00	A	Start	John	1
			2	2016-1-4 9:15	A	Complete	John	1
			3	2016-1-4 10:12	B	Complete	Bob	2
			4	2016-1-4 14:00	C	Start	Sue	3
			5	2016-1-4 14:05	C	Complete	Sue	3
2	27	Silver	6	2016-1-6 10:43	A	Start	Bob	4
			7	2016-1-6 11:00	A	Complete	Bob	4
			8	2016-1-7 09:33	B	Complete	John	5
			9	2016-1-7 09:35	C	Start	Sue	6
			10	2016-1-7 09:35	C	Complete	Sue	6
3	18	Silver	11	2016-1-7 9:27	A	Start	John	7
			12	2016-1-7 10:40	A	Complete	John	7
			13	2016-1-7 15:03	B	Complete	Bob	8
4	1	Gold	14	2016-1-7 12:10	A	Start	Bob	9
			15	2016-1-7 12:24	A	Complete	Bob	9
			16	2016-1-8 08:47	B	Complete	John	10
5	41	Silver	17	2016-1-8 15:32	A	Start	Bob	11
			18	2016-1-8 15:51	A	Complete	Bob	11
...	...	...	...	...	...	...	...	...

A. 3. Digital twins, ERP-Data and event logs

Case ID	Activity	User	Timestamp
Case 1	Activity A	Alex	9-3-2021:15.01
Case 2	Activity A	Valerie	9-3-2021:15.12
Case 1	Activity C	Jonas	11-3-2021:9.35
Case 2	Activity B	Theodor	12-3-2021:16.05
Case 2	Activity C	Mela	15-3-2021:8.19
Case 1	Activity B	Caroline	15-3-2021:17.34

Task:

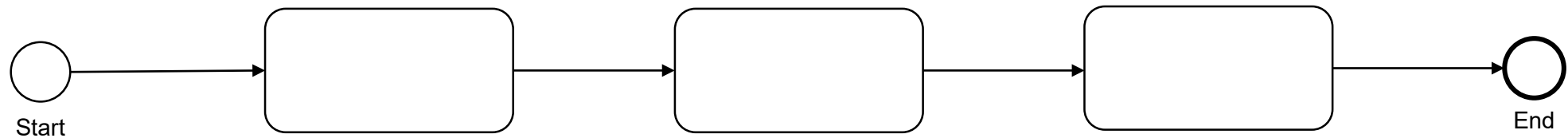
The table on the left shows an example of a simplified event log. For this exercise you are being asked to fill out the templates on the next slide and compare the activity flow for cases 1 and 2 to the to-be-process.

A. 3. Digital twins, ERP-Data and event logs

to-be-process



Case 1:



Case 2:



A. 4. Process mining

Process mining is a discipline that sits between computational intelligence and data mining on the one hand, and process modeling and analysis on the other hand. The **idea of process mining** is to discover, monitor and improve real processes (i.e., not assumed processes) by extracting knowledge from event logs readily available in today's information systems.

Process mining includes

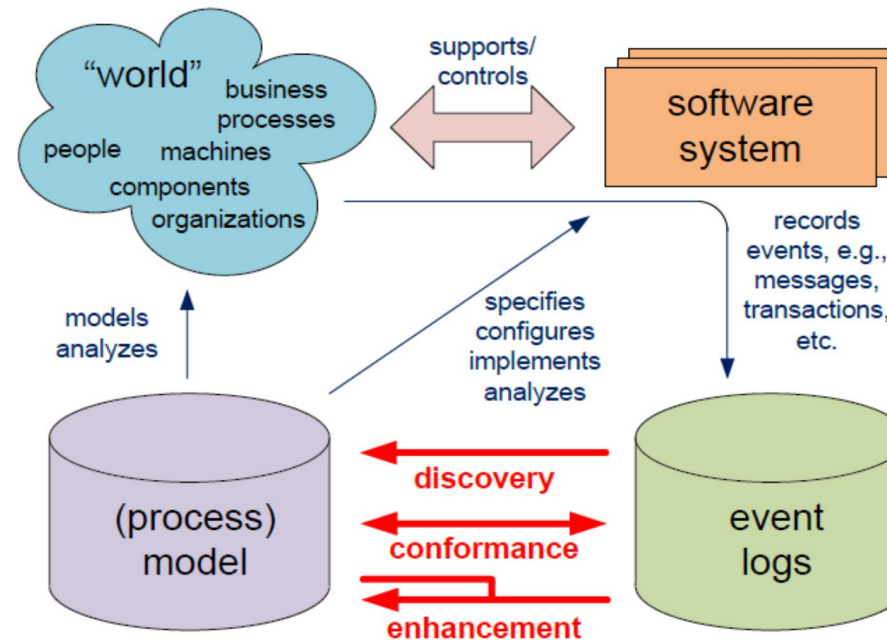
- (automated) **process discovery** (i.e., extracting process models from an event log),
- **conformance checking** (i.e., monitoring deviations by comparing model and log),
- **process enhancement** (i.e. change the process to get “better” results in the future)

and other analytical possibilities such as social network/organizational mining, automated construction of simulation models, model extension, model repair, case prediction, and history-based recommendations.

A. 4. Process mining

There are three (main) types of process mining techniques:

- process discovery
- conformance checking
- process enhancement



A. 4. Process mining

Discovery:

Process discovery techniques are used to create process models by using a learning algorithm based on the event logs. A major challenge in this discovery is to find algorithms that can produce a model that is representative of the behavior seen in these event logs. An exemplary albeit simple algorithm for such purposes is the α -algorithm, which was one of the first process discovery algorithms and produces a petri net to replay the event logs. However, this algorithm has problems dealing with noise and infrequent or incomplete behavior, which lead to the development of more sophisticated algorithms for process discovery tasks.

A. 4. Process mining

Conformance:

Conformance checking is possible in cases where both a process model and an event log are available and relates events in the event logs to those in the process model, thus comparing them to find commonalities and discrepancies between modelled and observed behavior. Conformance checking is relevant for business alignment and auditing as well as performance measurement. Business alignment ensures that the information systems and the real business processes are well aligned so that people in processes are supported by information systems and not incentivized to circumvent them. Audits are performed to examine whether business processes are executed within the boundaries set by management, government and other stakeholders.

A. 4. Process mining

Enhancement:

Through process enhancement, the existing process model can be improved and adapted by considering the information recorded in event logs.

A. 4. Process mining

Task:

In the following word puzzle you can find nine words related to process mining, which were mentioned throughout the introductory part. Find them and try to remember their meaning.

E	V	E	N	T	L	O	G	C	Y	T	M	R	S
C	A	T	N	E	M	E	C	N	A	H	N	E	N
T	N	C	E	C	O	E	A	H	N	O	P	S	I
R	I	S	T	M	E	C	E	E	E	R	E	D	E
C	E	M	D	I	R	O	P	M	O	T	T	E	C
N	O	S	E	V	V	T	T	C	E	E	D	M	N
S	D	E	L	S	A	I	E	T	R	C	I	E	A
P	S	E	E	M	T	S	T	C	P	A	S	N	M
O	T	T	O	O	S	A	A	Y	S	S	C	V	R
O	V	M	E	M	N	E	M	V	Y	E	O	T	O
S	P	O	O	E	N	O	A	P	S	I	V	V	F
S	C	D	D	E	T	O	Y	E	T	D	E	R	N
M	E	R	M	A	O	T	E	M	E	S	R	V	O
L	R	I	G	I	O	S	T	E	M	M	Y	N	C

A. 4. Process mining

Task:

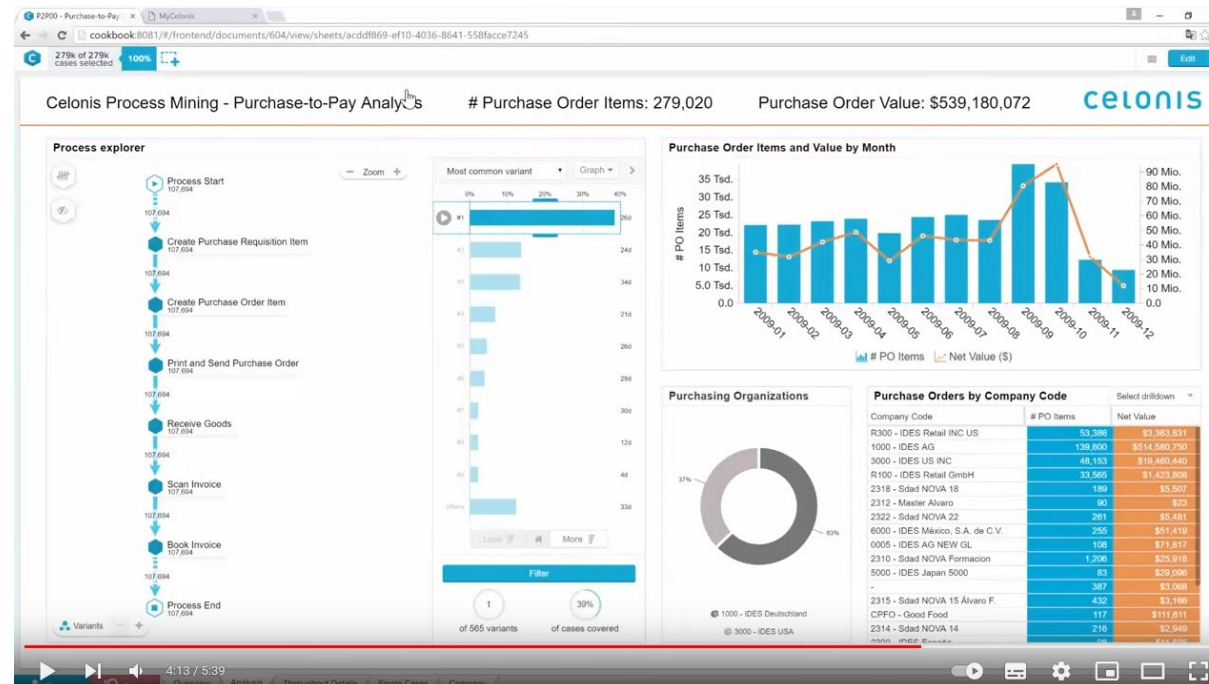
1. Skim over essential parts of the paper “*The case for process mining in auditing: Sources of value added and areas of application*” by Mieke Jan, Michael Alles, and Miklos Vasarhelyi, International Journal of Accounting Information Systems, 14 (2013) 1–20.

https://www.researchgate.net/publication/257590289_The_case_for_process_mining_in_auditing_Sources_of_value_added_and_areas_of_application

2. Explain the disadvantages/limitations that could occur without the use of process mining in auditing. What could be overlooked?

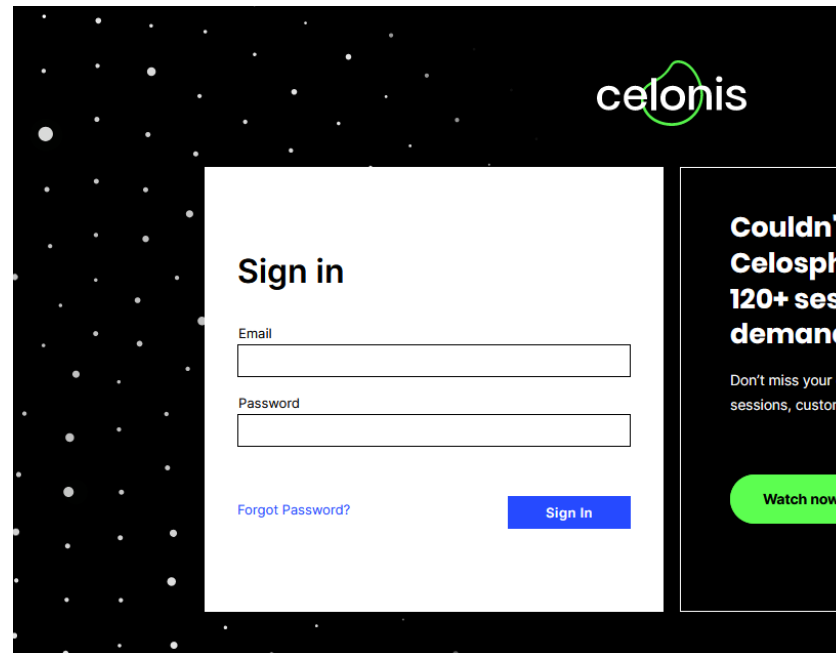
A. 5. Software training (Celonis)

Begin by watching the following introduction video about applying process mining on the analysis of the purchase-to-pay process: <https://youtu.be/wyIWqrQWYb4>

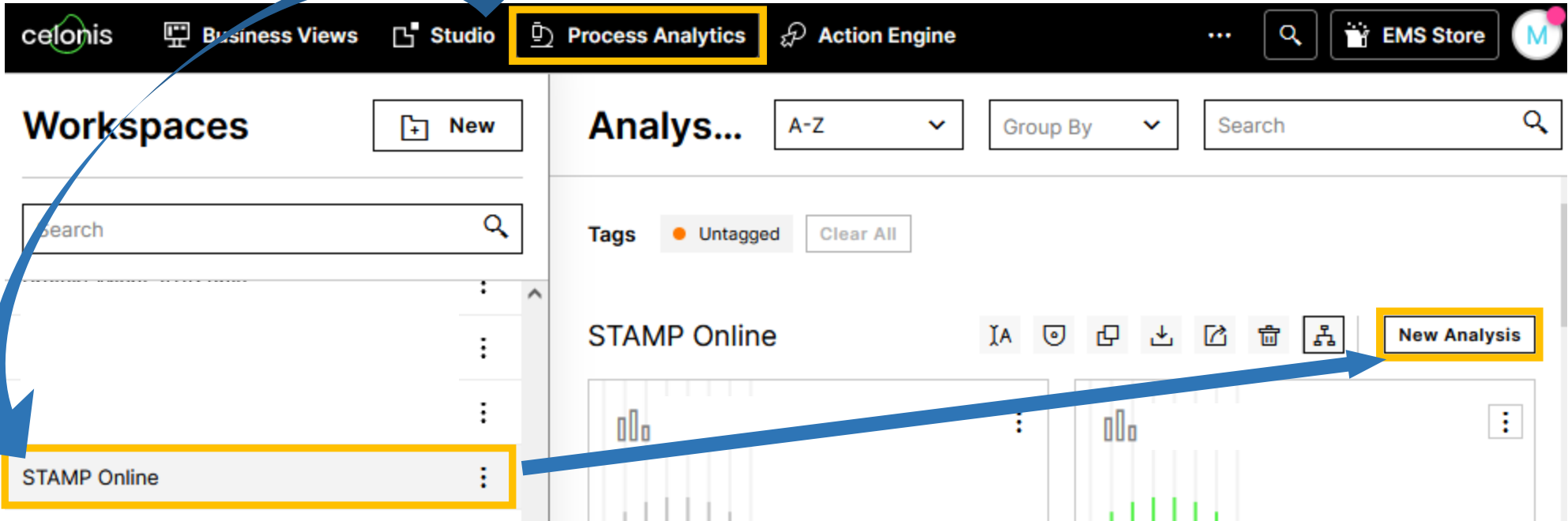


A. 5. Software training (Celonis)

Please log into your Celonis Academic account using the following link and, **if possible**, follow the training within Celonis while listening: <https://academic-maico-schoene-fau-de.eu-2.celonis.cloud/>



A. 5. Software training (Celonis)



The screenshot displays the Celonis Process Analytics interface. The top navigation bar includes the Celonis logo, 'Business Views', 'Studio', 'Process Analytics' (highlighted with a yellow box), and 'Action Engine'. The left sidebar shows a 'Workspaces' section with a search bar and a list of workspaces, including 'STAMP Online' (highlighted with a yellow box). A blue arrow points from the 'STAMP Online' workspace to the 'New Analysis' button in the main content area. The main content area shows the 'Analys...' section with filters for 'A-Z', 'Group By', and a search bar. Below these, there are 'Tags' (Untagged, Clear All) and a 'STAMP Online' section with a 'New Analysis' button (highlighted with a yellow box). A blue arrow points from the 'STAMP Online' workspace in the sidebar to the 'New Analysis' button in the main content area.

Create a new analysis and name it after yourself.

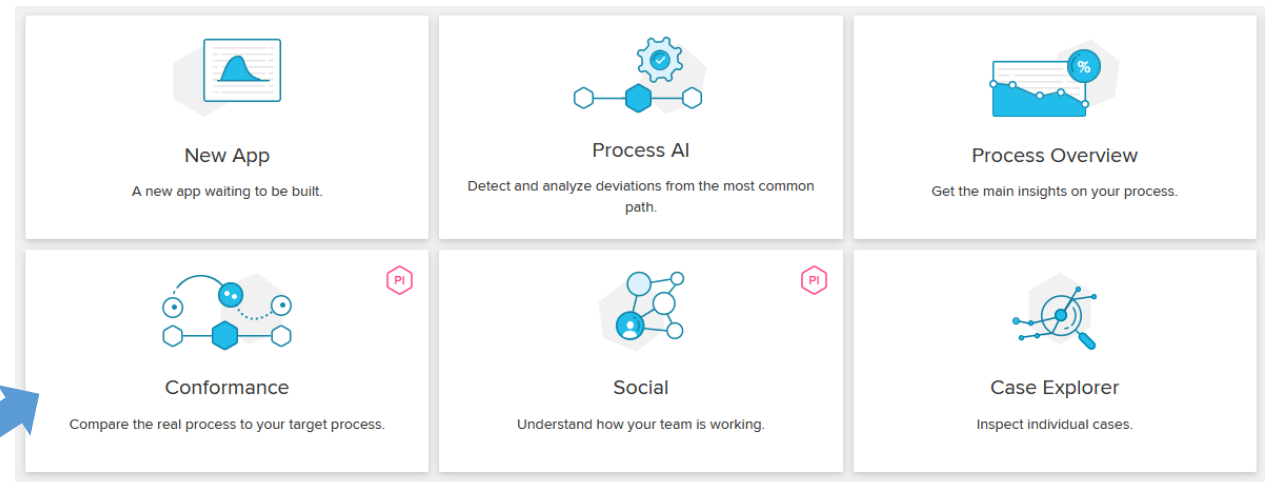
A. 5. Software training (Celonis)

Basics: Manage Analysis

Add components, toggle the edit mode or publish your analysis in the top right corner of your screen.



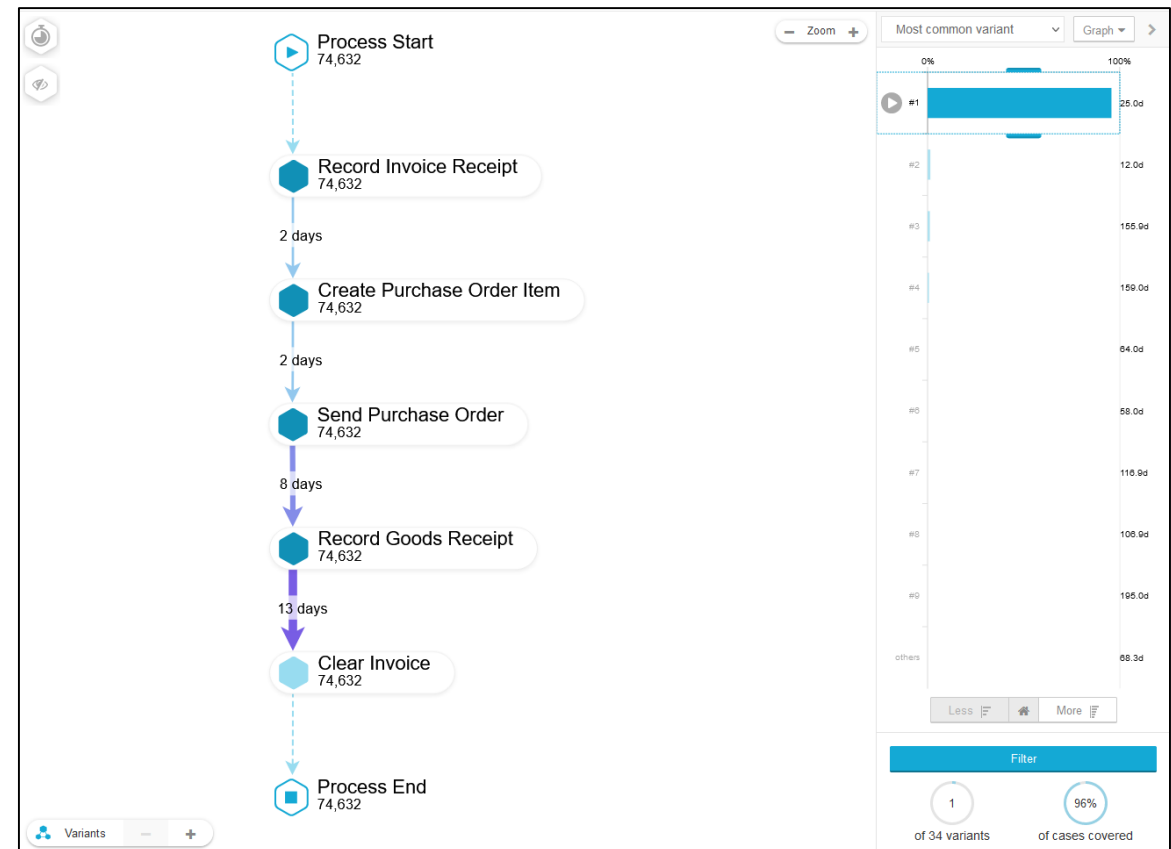
Manage different analysis sheets on the bottom of your Celonis window.



A. 5. Software training (Celonis)

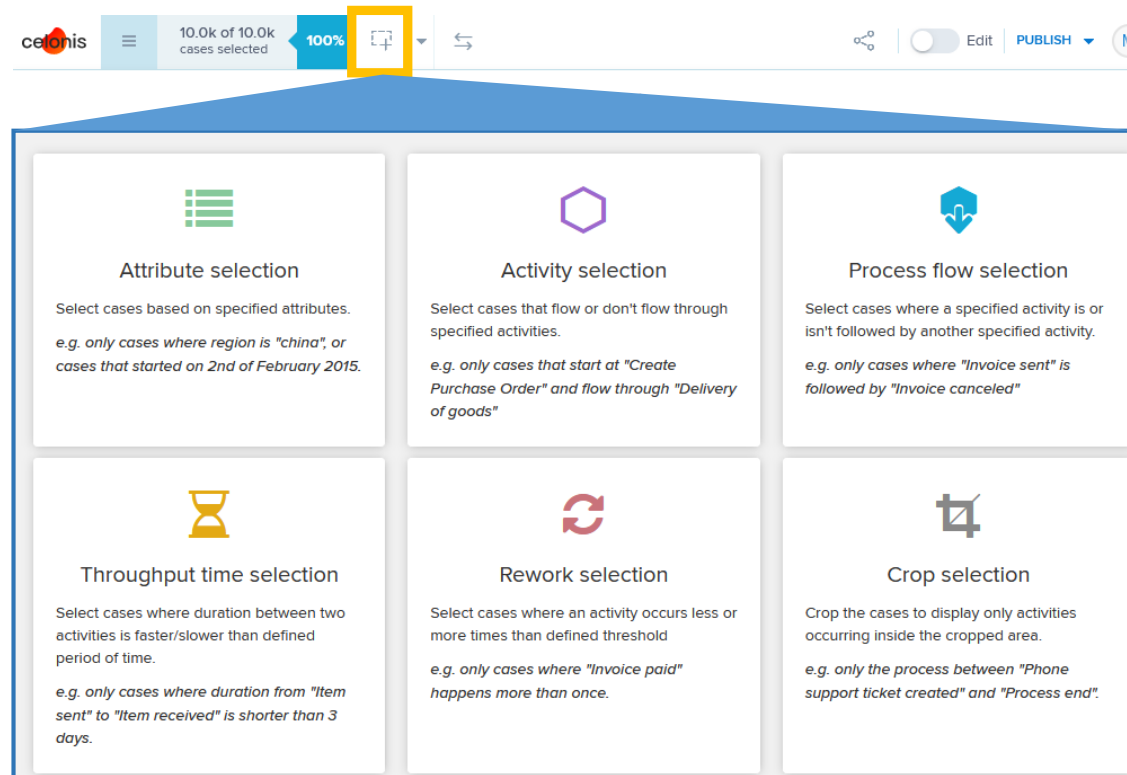
Process/Variant-Explorer

The core element of Celonis process mining, it enables visualization and analysis of processes. The process explorer was designed to show processes as a process model with activities being displayed as nodes and transitions between activities as edges. It is also able to show different KPIs and even animate the process flow. By selecting more variants in the variant explorer, less frequent process flows can be observed and analyzed.



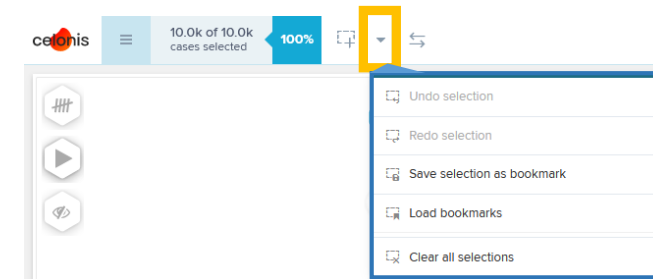
A. 5. Software training (Celonis)

Basics: Selections and bookmarks



The image shows the Celonis software interface with a selection menu open. The menu lists six selection criteria:

- Attribute selection**: Select cases based on specified attributes. *e.g. only cases where region is "china", or cases that started on 2nd of February 2015.*
- Activity selection**: Select cases that flow or don't flow through specified activities. *e.g. only cases that start at "Create Purchase Order" and flow through "Delivery of goods"*
- Process flow selection**: Select cases where a specified activity is or isn't followed by another specified activity. *e.g. only cases where "Invoice sent" is followed by "Invoice canceled"*
- Throughput time selection**: Select cases where duration between two activities is faster/slower than defined period of time. *e.g. only cases where duration from "Item sent" to "Item received" is shorter than 3 days.*
- Rework selection**: Select cases where an activity occurs less or more times than defined threshold. *e.g. only cases where "Invoice paid" happens more than once.*
- Crop selection**: Crop the cases to display only activities occurring inside the cropped area. *e.g. only the process between "Phone support ticket created" and "Process end".*



The image shows the Celonis software interface with a selection menu open. The menu lists five options:

- Undo selection
- Redo selection
- Save selection as bookmark
- Load bookmarks
- Clear all selections

A. 5. Software training (Celonis)

OLAP table

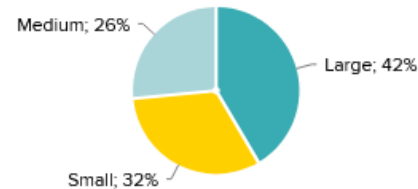
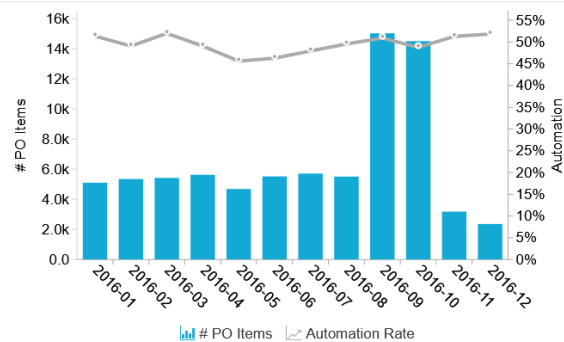
OLAP tables consist of a number of columns that are either dimensions or KPIs. The viewer can interact with the table, e.g. searching for specific text or add sorting rules by clicking on the respective column. It is even possible to put coloring rules into place, depending on the value of box (as demonstrated with the automation rate in the example on the right).

Purchase Order Items by Vendor Select drilld... ▼

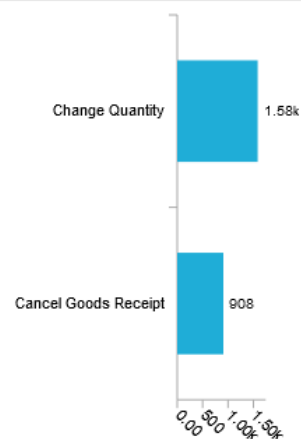
Vendor	# Purchase Order... ↓ 1	Automation
Unisono AG	6,360	50%
IDES Consumer Products	6,256	58%
Sapsota Company Limited	6,220	37%
SCT Inc.	5,044	57%
SKF Americas	4,660	42%
C.E.B. BARCELONA	4,464	40%
PAQ Deutschland GmbH	4,276	43%
MOBILE Inc.	4,168	60%
EGS America	2,628	63%
Gusswerk US	2,600	47%
Allfresh Inc.	2,404	60%
IDES Furnitures Inc.	2,156	60%
Wollner AG	2,016	39%
Umbrella Corporation	1,796	41%
AluCast	1,684	41%
Destec Office Supplies	1,672	59%
Tiefland Glass AG	1,600	37%

A. 5. Software training (Celonis)

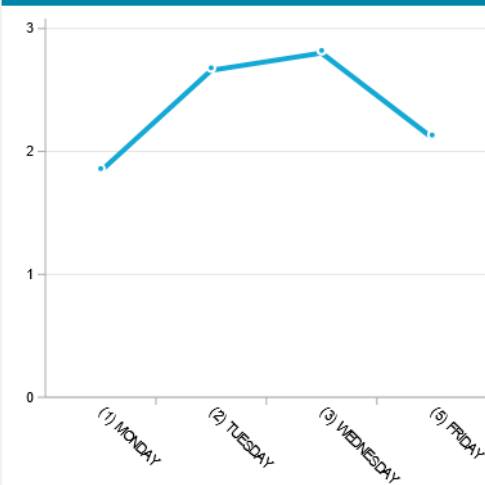
Purchase Order Items and Automation Rate by Month



Defined Rework Activities



Average CS per weekday



Charts

Charts are used to illustrate certain data in an intuitive way. On the left, you can see examples that are available in Celonis.

A. 5. Software training (Celonis)

Selection and design components

Selection components provide an intuitive method for entering certain selections. For example with a dropdown, date picker, cropping or search component. Finally, design components can be used to enrich your analysis sheets with various design features, e.g. text, buttons, images or logos.

Start date
YYYY-MM-DD

End date
YYYY-MM-DD

Purchase Order It...

Net Order Value

78.0k

230M €

Select drilld...

Vendor

Material

Material Group

Company Code

Purchasing Organization

Document Type

Purchase Amount

Open Action Engine

Part B: Your first client – Erasmus PLC

Erasmus PLC is an automotive supplier, producing parts for new climate friendly electric vehicles to be sold in the European Union. Erasmus PLC has two places of production, which are located in Germany as well as in Switzerland.

Your auditing firm was provided with the event log for the purchase-to-pay process. The audit manager entrusts you with the analysis of this important process. As part of the preliminary audit, one of your goals is the identification of all factors relevant to the conduct of the overall audit. For the process analysis you decide to focus on the following four major areas: *Compliance*, *Finance*, *Fraud* and *Operations*.

Each of those areas contributes to the understanding of the purchase-to-pay process of Erasmus PLC. By extracting the as-is-process from the provided data, process mining technology is applied to support the audit and you finally have the opportunity to demonstrate the skills you acquired in the training phase.

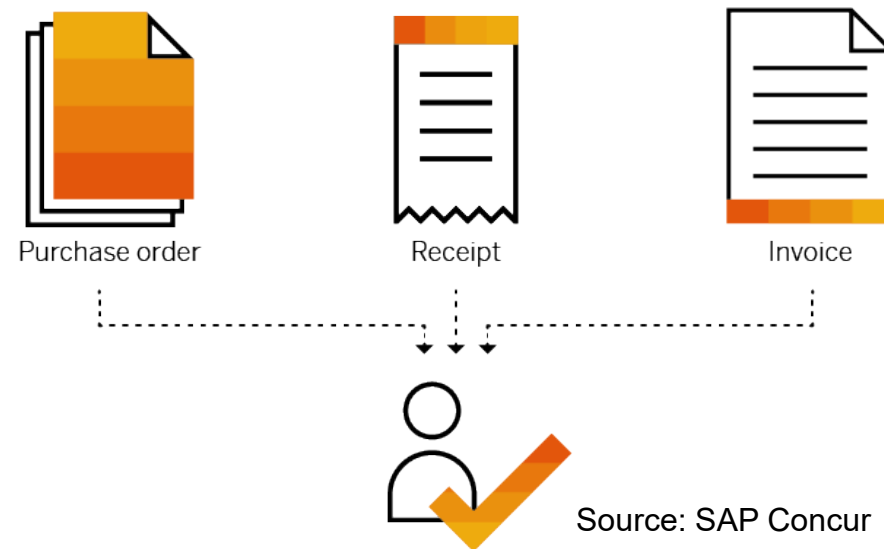
Part B: Your first client – Erasmus PLC

Additional information:

- The event log was provided for the period from January 2015 until March 2019 with a total of 10,000 cases for the purchase-to-pay process.
- The most important attributes within the data, which should be used, are the case ID, event name, event time, user ID, quantity and local amount.
- For your analyses, please use the “*local amount*” only. These (local) order amounts are always stated in the local currencies of Erasmus PLC.
- Local currencies are EUR and CHF. As a means of simplification, they are to be used interchangeably throughout the case. All values are to be declared in “local currency” (Assuming 1 EUR = 1 CHF) without differentiating between them.

B. 1. Compliance

3-way match: The process of comparing the purchase order, the goods receipt note and the supplier's invoice before approving the invoice for payment.



B. 1. Compliance

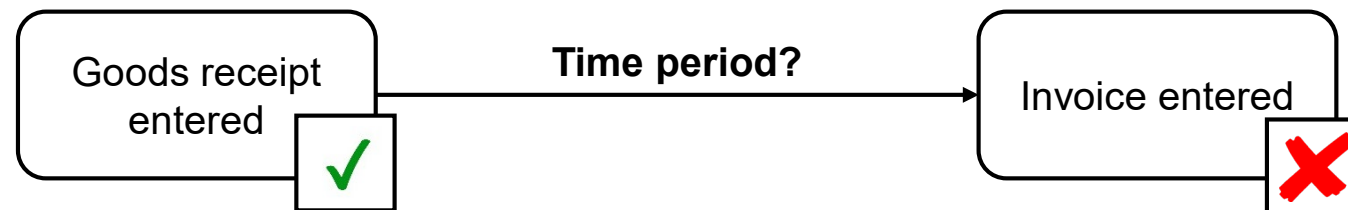
Goods Received Not Invoiced (GRNI):

Goods have been received, probably matched to a purchase order, but there is no corresponding invoice. In most cases, the invoice is the last thing to arrive before a 3-way match, so every transaction will appear as an GRNI at some point. Yet, it becomes an issue, if an invoice does not appear in a timely fashion after the receipt of goods. The absence of an invoice after a prolonged amount of time points to a systematic problem with the purchase-to-pay process and should draw attention of the auditors.

B. 1. Compliance

Task:

Take a look at the purchase-to-pay process of Erasmus PLC using Celonis. Analyze whether Goods Received Not Invoiced (GRNI) exist within the data and provide further detail for identified cases. Please put together a dashboard for future use of your audit colleagues, which is able to show the amount of GRNI orders as well as the total order amount. The same dashboard is to be used and/or extended throughout the remainder of your audit.



B. 1. Compliance

Segregation of duties (SOD):

An internal control whereby tasks are apportioned between different departments in order to reduce the likelihood for fraud and error.

For the purchase-to-pay process this could for example be relevant for the approval of purchase orders. Should the employee that creates the purchase order also be the one that approves it, this would violate compliance standards.

B. 1. Compliance

Task:

For this task you should look into cases, where the purchase order is created, yet was subsequently rejected. How many cases fit this sequence? And for how many of them has the purchase order never been approved? Use the *process explorer* and *OLAP table* for your solution. Can you identify a pattern with the users involved in both activities of the same case?



B. 2. Finance

Large invoices without a purchase order:

A purchase order (PO) adds clarity and visibility to a business transaction. It's a document created by a buyer showing what he hopes to acquire from a supplier. The purchase order should include a clear description, quantity, price, payment terms as well as necessary delivery details. Thus, POs serve a valuable function, as their primary purpose is to create an agreement between buyers and sellers. Invoices without a purchase order (Non-PO invoice) are the result of spend outside a regulated procurement process. Problems might occur as these orders are not following the process as intended.

B. 2. Finance

Task:

Identify all cases with invoices that do not comprise the creation of a purchase order. Then, set a filter for the largest invoices within these cases. Additionally, your dashboard should contain an overview of the total invoiced amounts of the respective cases.



B. 3. Fraud

Process Mining and Fraud Discovery?

There are several options for analysis, e.g. do you have “suspicious” cases, in which there were deviations from the standard procedure? This can be a hint for errors or fraud.

Companies are required to prepare and issue financial statements that fairly reflect their performance and financial position. While most public companies provide financial reports that are free from material misstatements; fraud continues to exist. In the literature, two types of accounting frauds are identified: (i) fraud committed by top management to maintain an illusion of high performance by the company (e.g. in order to raise capital for their firms or to mislead investors, board of directors and the general public), and (ii) fraud committed by management at all levels or staff for personal gain, to earn bonuses and enhanced compensation.

B. 3. Fraud

Accounting fraud is an issue of great concern to the business community including: (a) auditors who are engaged to render an opinion as to whether the financial reports fairly present the company's financial position and results of operations in conformity with established standards; (b) board of directors who bear the primary responsibility for the preparation and content of the financial reports; (c) investors and potential investors; (d) corporate managers; and (e) the general public, and as a result, regulators, legislators and other public policy makers. These parties all have an interest in preventing and detecting fraud before investment decisions are made on materially misstated financial statements.

Accounting fraud differs from other frauds in that it is committed usually by management to deceive financial statement users while misappropriation of assets is committed against an entity, most often by employees. Accounting fraud is the intentional, material misstatement of financial statements or financial disclosures or the perpetration of an illegal act that has a material direct effect on the financial statements or financial disclosure. The classification of an action as being fraudulent may depend on the motivation behind it.

B. 3. Fraud

Accounting fraud does not start with dishonesty; rather, it may begin with pressure to meet financial targets and the fear that failure to meet these targets will be viewed as unforgivable. Alternatively, the perpetrator of fraud may be driven by dishonesty and personal gain (for example, to protect bonuses) rather than by pressure from the organization. This resonates with Cressey's fraud triangle which identifies three factors: private non-shareable incentives or pressure, contextual opportunities to commit fraud; and ability to rationalize fraud.

Task B.3:

Together with your team, think of possible cases of fraud that might occur in a company like Erasmus PLC und decide whether process mining would be able to detect this particular behavior?

B. 4. Operations

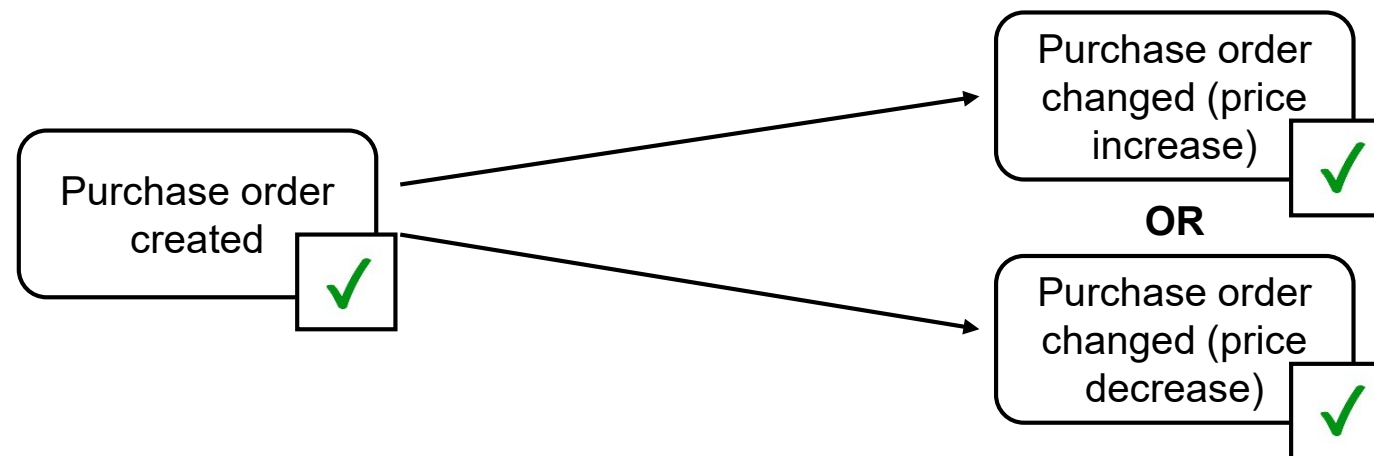
Price change analysis:

Some purchase orders are changed after they have been created. Possible changes include the ordered quantity, but also the price of the item. This means, that there is a manual interference in the process, which can be quite costly for the affected company. For the auditor, these changes could mean that the process is not always followed as intended and humans are interfering with relevant data later on. Here, process mining can be an extremely valuable tool to keep track of these changes and their extent.

B. 4. Operations

Task:

Take a look at all cases containing changes to the price after the purchase order was created (increases or decreases). How many cases comprise increases or decreases of the price respectively? Moreover, you are asked to not only identify the case count, but also how often these activities occur in these cases. Show two different ways to obtain this information.



B. 4. Operations

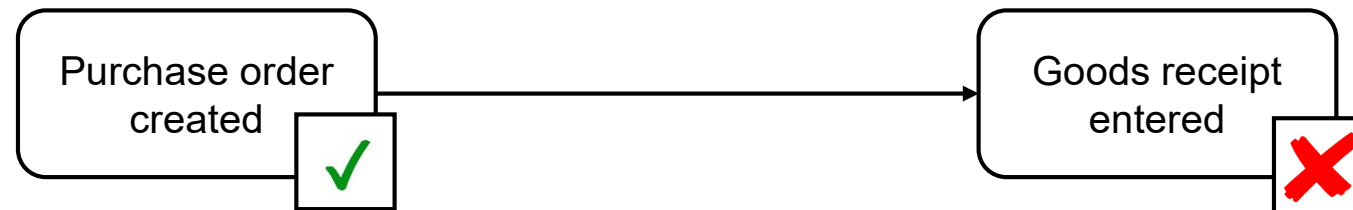
Open purchase orders without goods receipt:

Goods receipt generally includes the process of matching the received goods with the purchase order. It involves checking whether the goods are suitable for the purpose they were ordered and are in good condition. There might be purchase orders without any corresponding goods receipt. Exhibiting a large number of purchase orders, without the goods being received yet, could indicate a faulty process layout prone to errors.

B. 4. Operations

Task:

Analyze all cases with purchase orders missing goods receipt. When were these purchase orders created? How much is their total order amount?



Final discussion

For the final discussion your team is asked to:

1. Briefly show your work done in Celonis (dashboard for compliance, finance and operations analyses)
2. Talk about difficulties your team encountered while working for the first time with this technology
3. Express an opinion on the future importance of process mining for auditing