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HOCHSCHULE MAINZ
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APPLIED SCIENCES

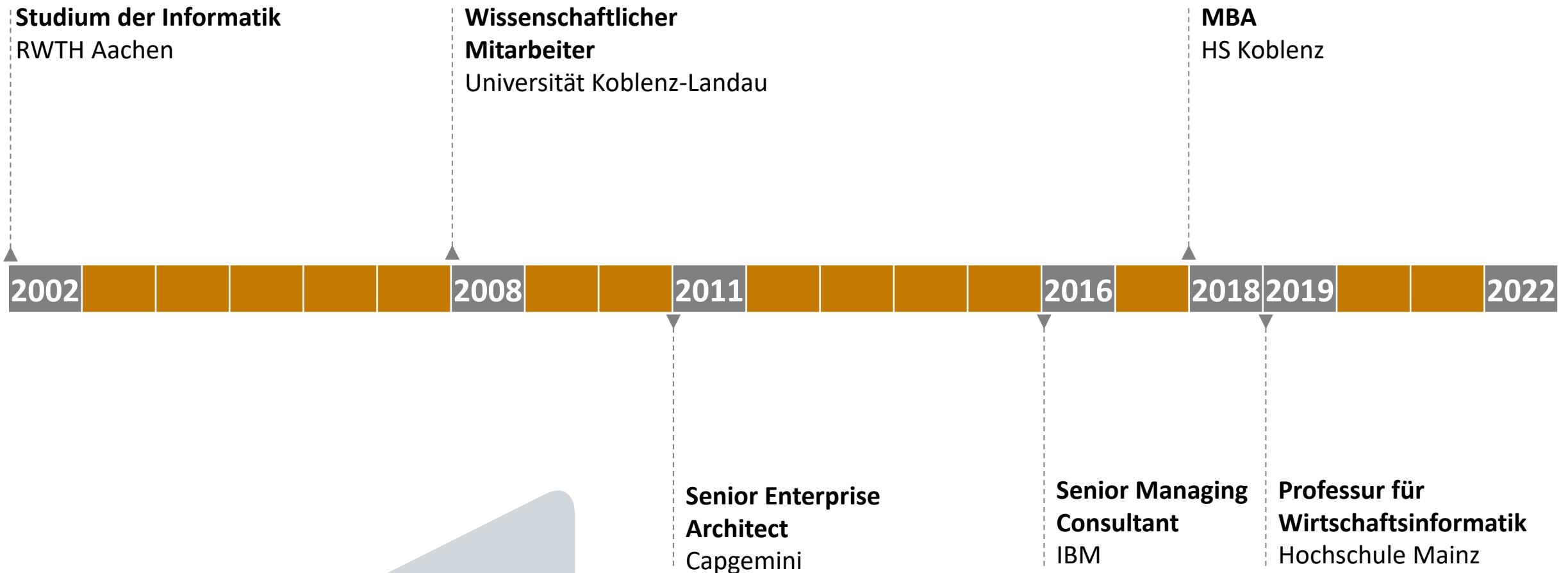
Process Analytics – Transparente Analyse und Vorhersage von Prozessabläufen

Process Analytics - Transparent analysis and prediction of process flows

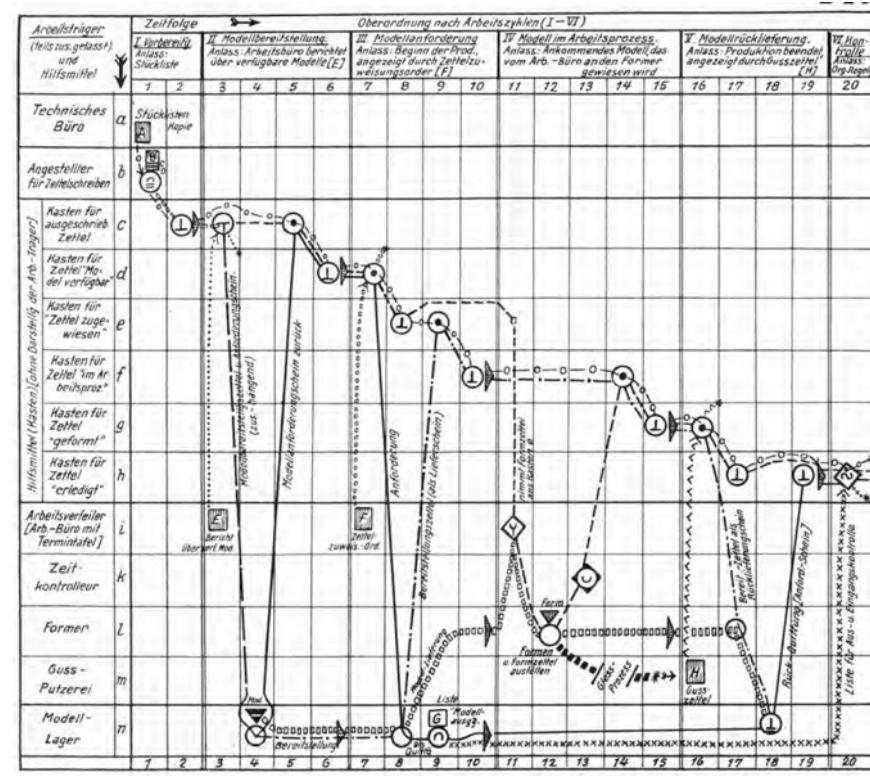
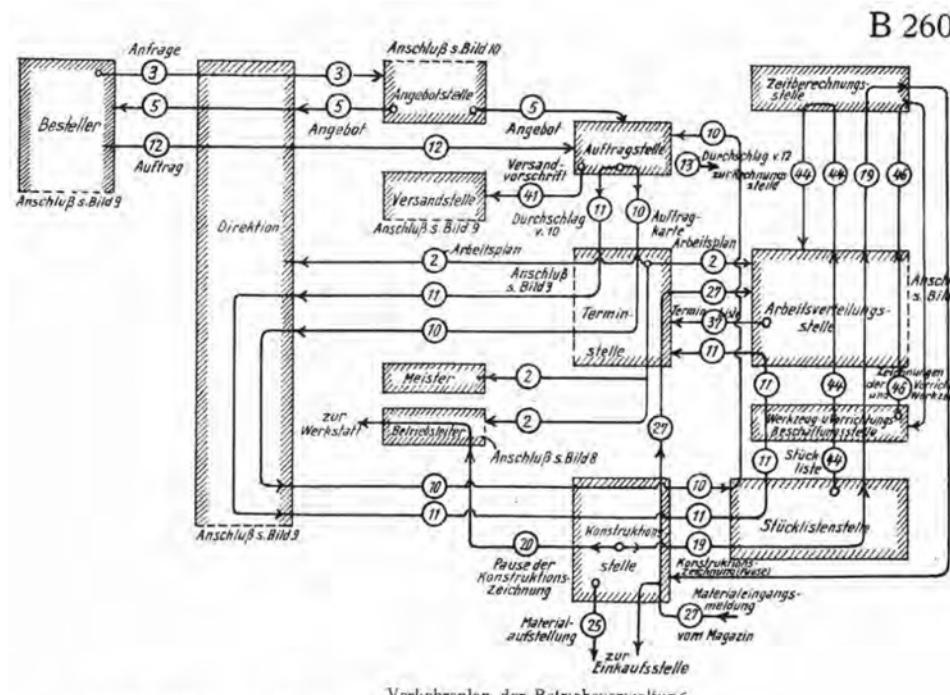
Prof. Dr. Tobias Walter

Mainz, 23.02.2022

Persönliche Vorstellung



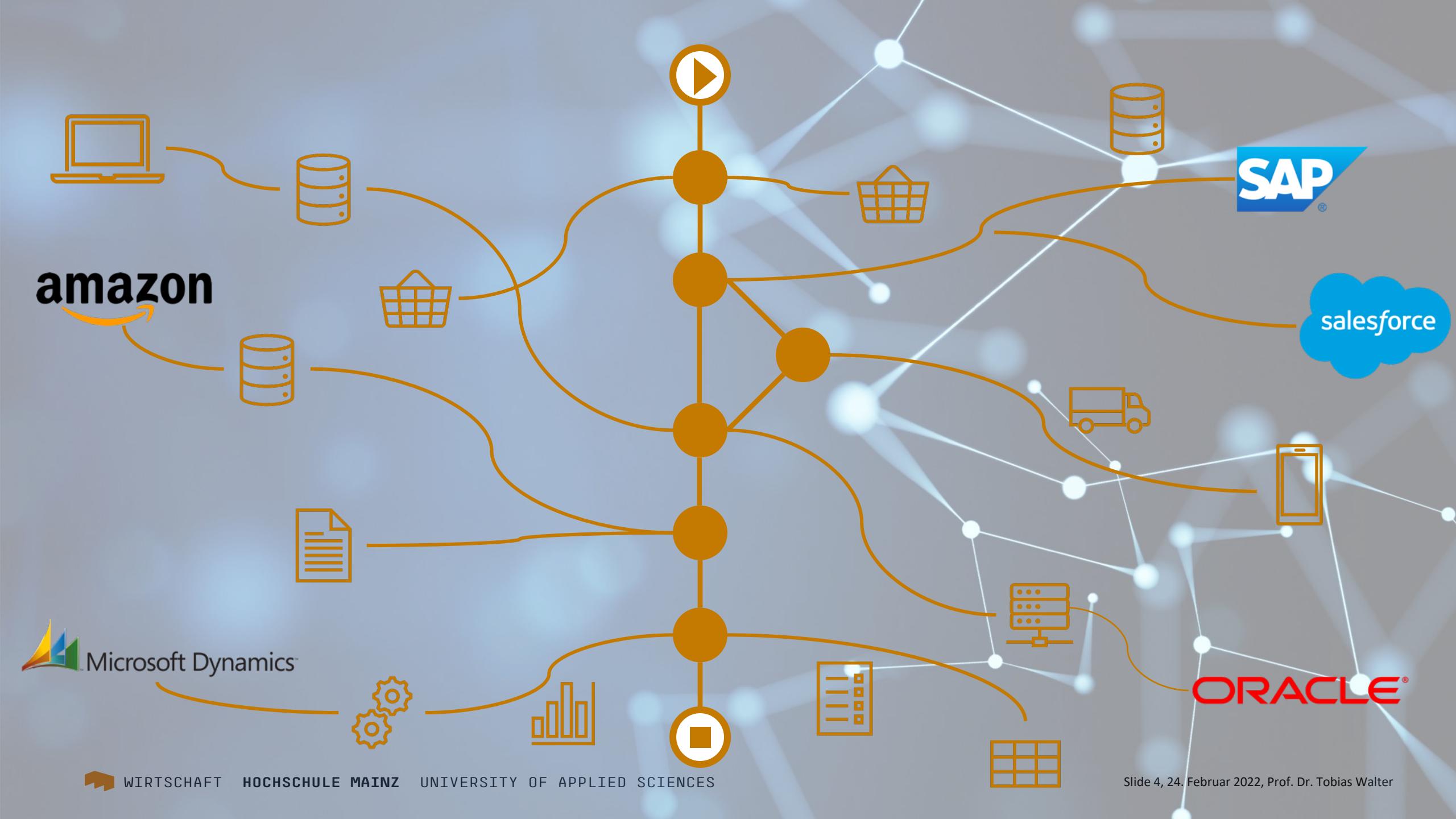
Business process modelling in the 1930's



Zusammengefasster Arbeitsablaufplan für die M

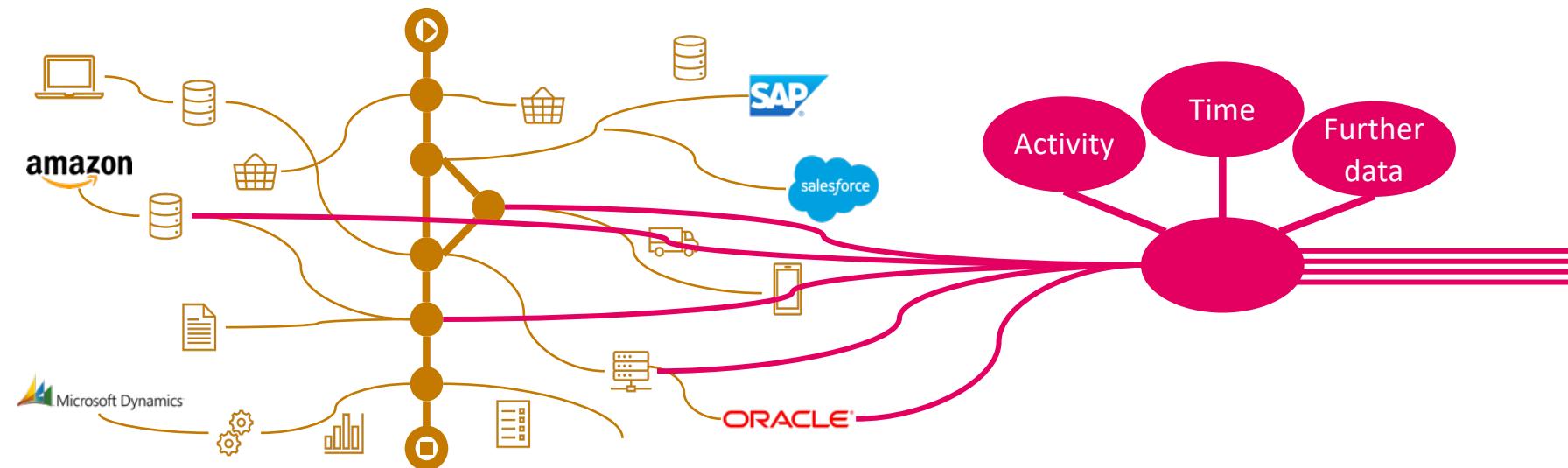
Gezeichnet auf Grund der

Workflow and work cycle modelled in the 1930's by Fritz Nordsieck
in his PhD thesis (Nordsieck (1932)) reflected by (Mendling (2021))



We are living in a digital world...

... where we leave digital traces



IT systems support us in our daily work

We leave traces - **digital footprints** - in the system

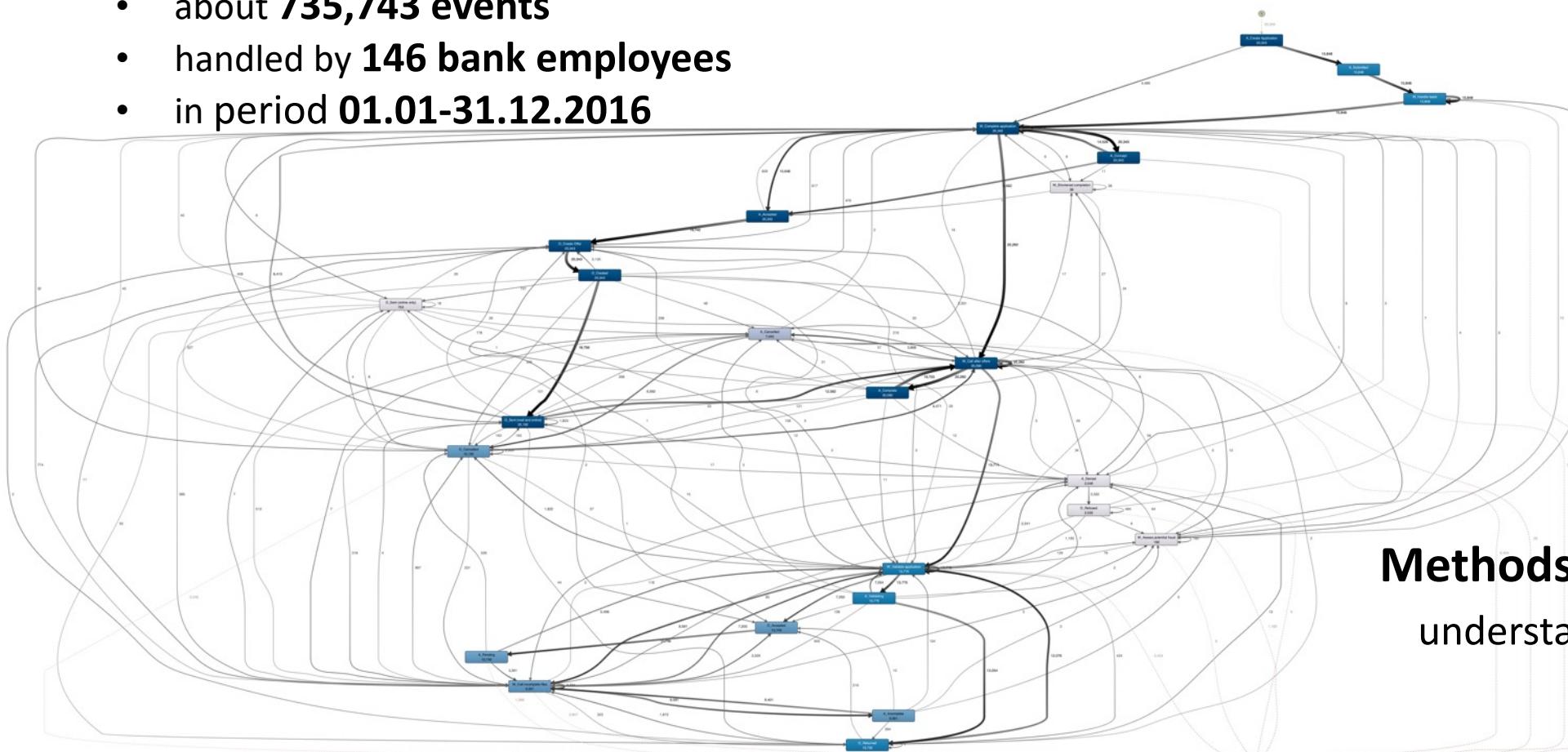


All traces combined provide **information about the behavior** of those involved in processes - data ensures a **complete transparency**

Example: Digital footprints for a Credit Application Process

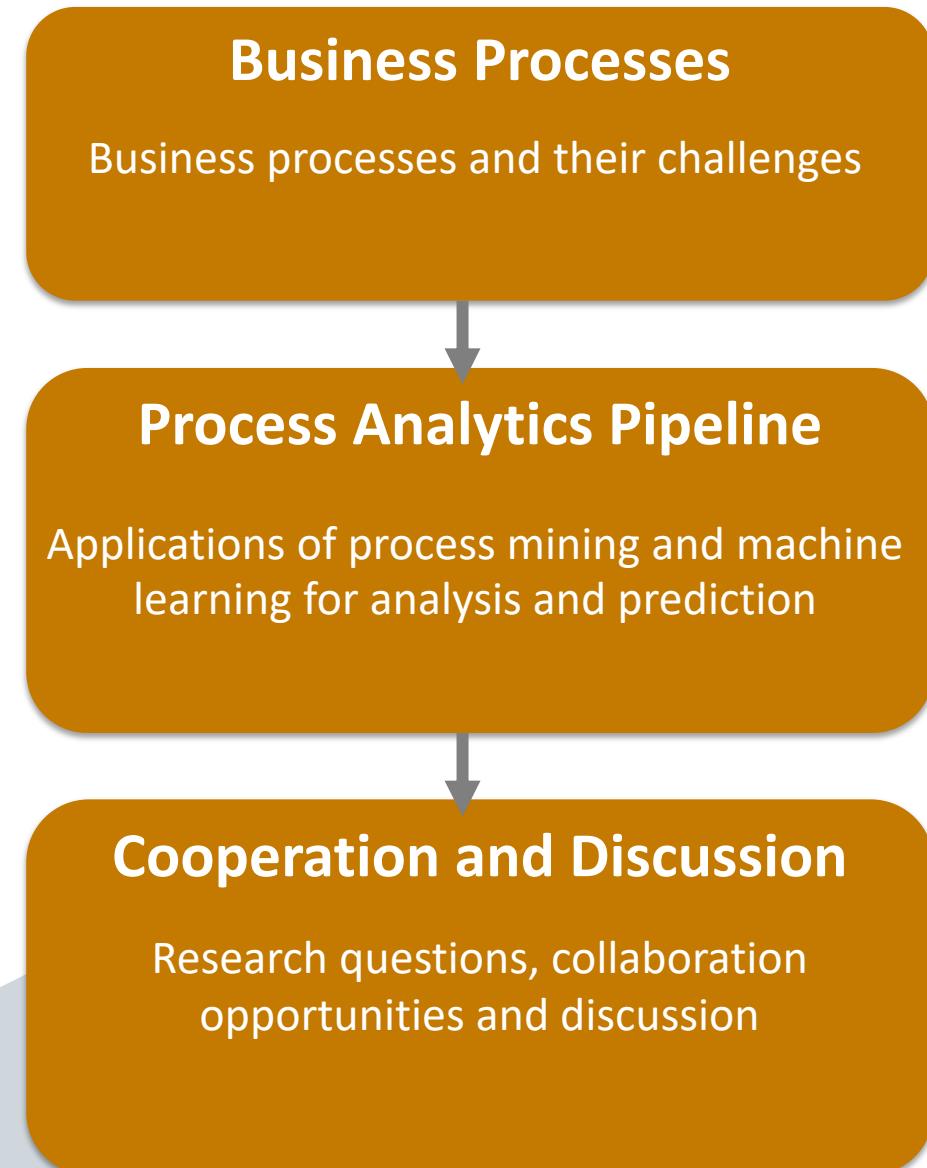
Credit Application Process data contains

- **20,343 digital traces** for processing credit applications
- about **735,743 events**
- handled by **146 bank employees**
- in period **01.01-31.12.2016**

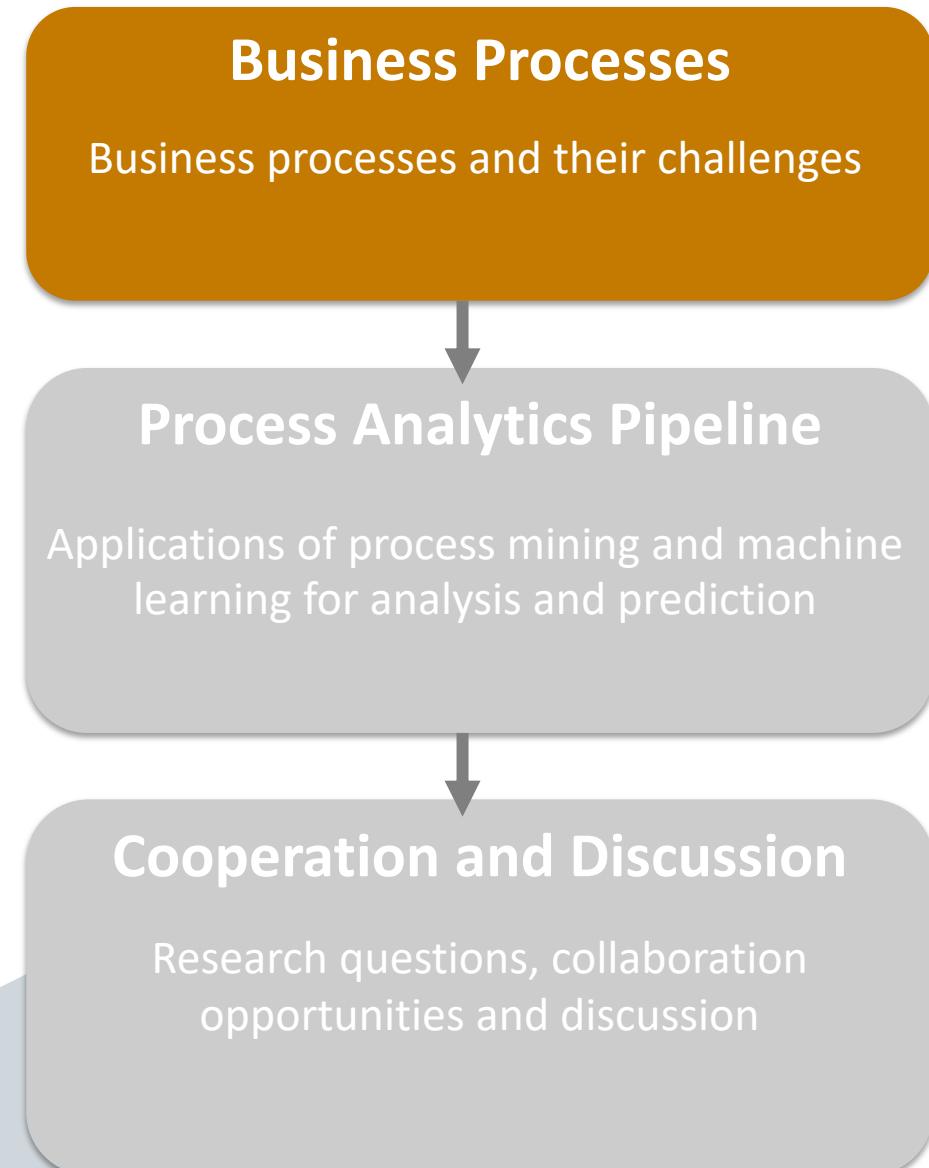


Methods and tools are needed to understand the **as-is behavior** of people involved processes

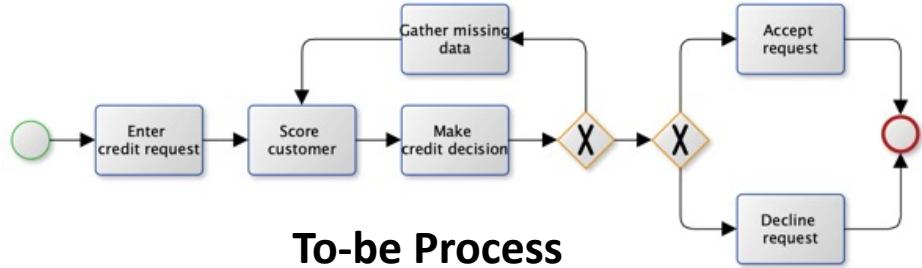
Agenda



Agenda



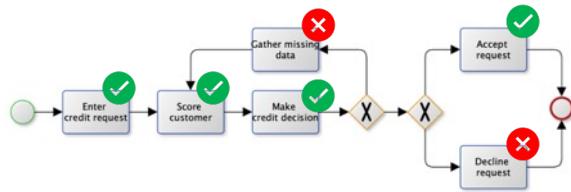
What is a classic business process today?



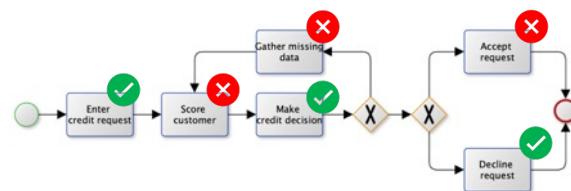
Definition:

A business process consists of a **set of activities** that are **performed in coordination** in an organizational and technical environment [...]. (Weske (2019))

(1234, Miller, Car Loan Type, 50,000 €, Accepted)



(2345, Johnson, Home Loan Type, 100,000 €, Declined)



...

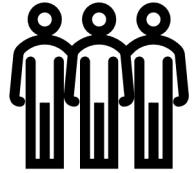
...

(more than 20,000 cases for the Credit application process)

Definition:

A business process instance represents a **concrete case** in the operational business of a company, consisting of activity instances. Each business process model acts as a blueprint for a set of business process instances [...]. (Weske (2019))

Is the classic business process still alive?

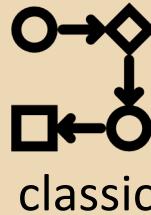


human behavior

process may have
hundreds or thousands
of variants



business process



classic



actual process improvements

transforming insights into
actions (not models or Office
documents)



data-driven systems

information systems having
thousands of tables with
complex recordings what
people really do

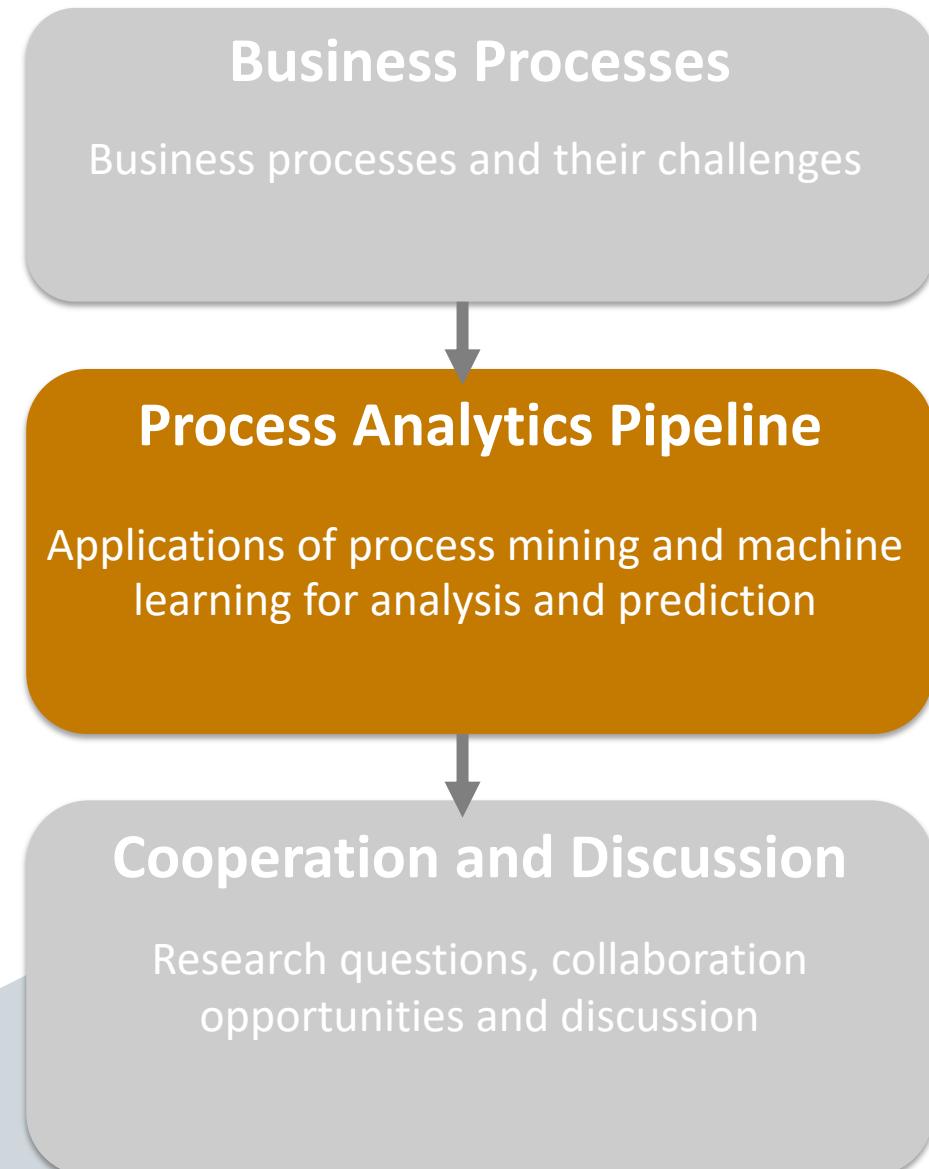
New challenges arise...

Can traditional approaches to analyze processes deal with such requirements?

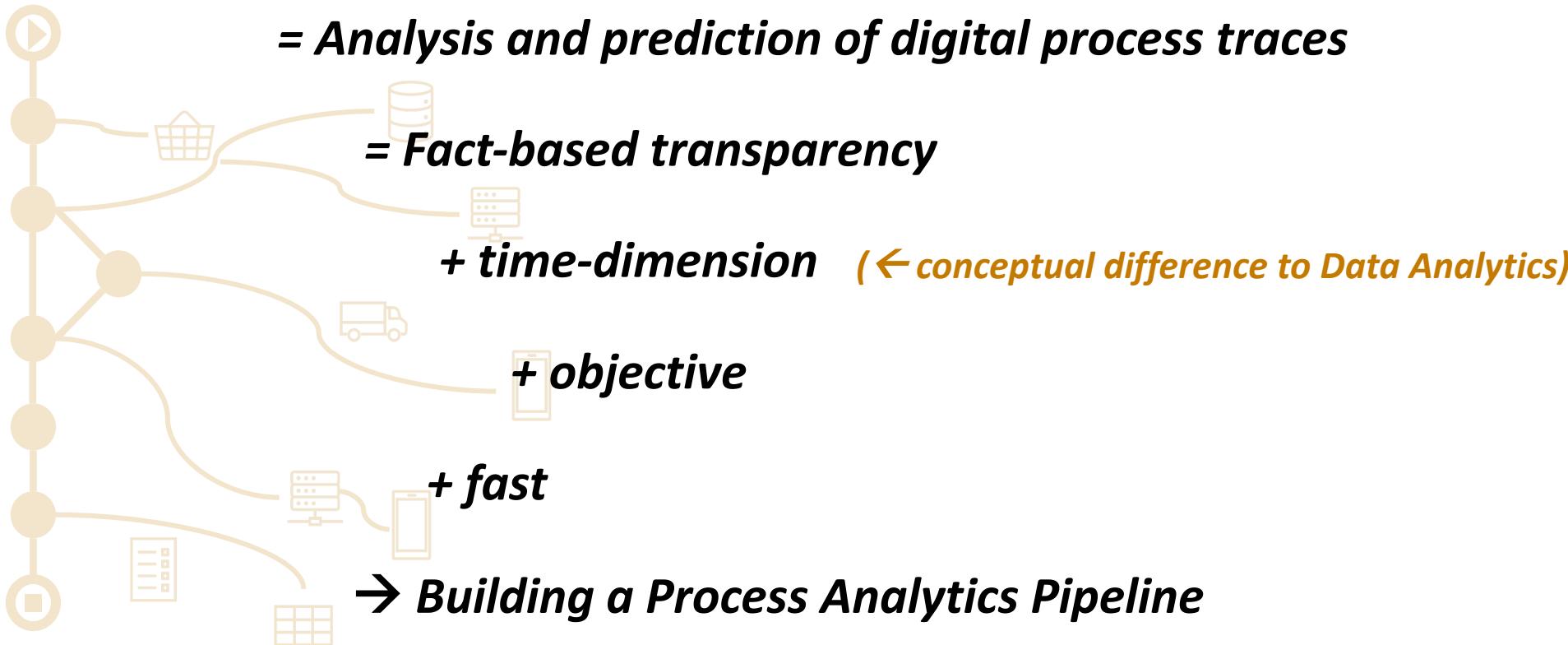
Can a common consensus be formed from many subjective opinions on the process?

Is it enough to rely on processes and their documentation?

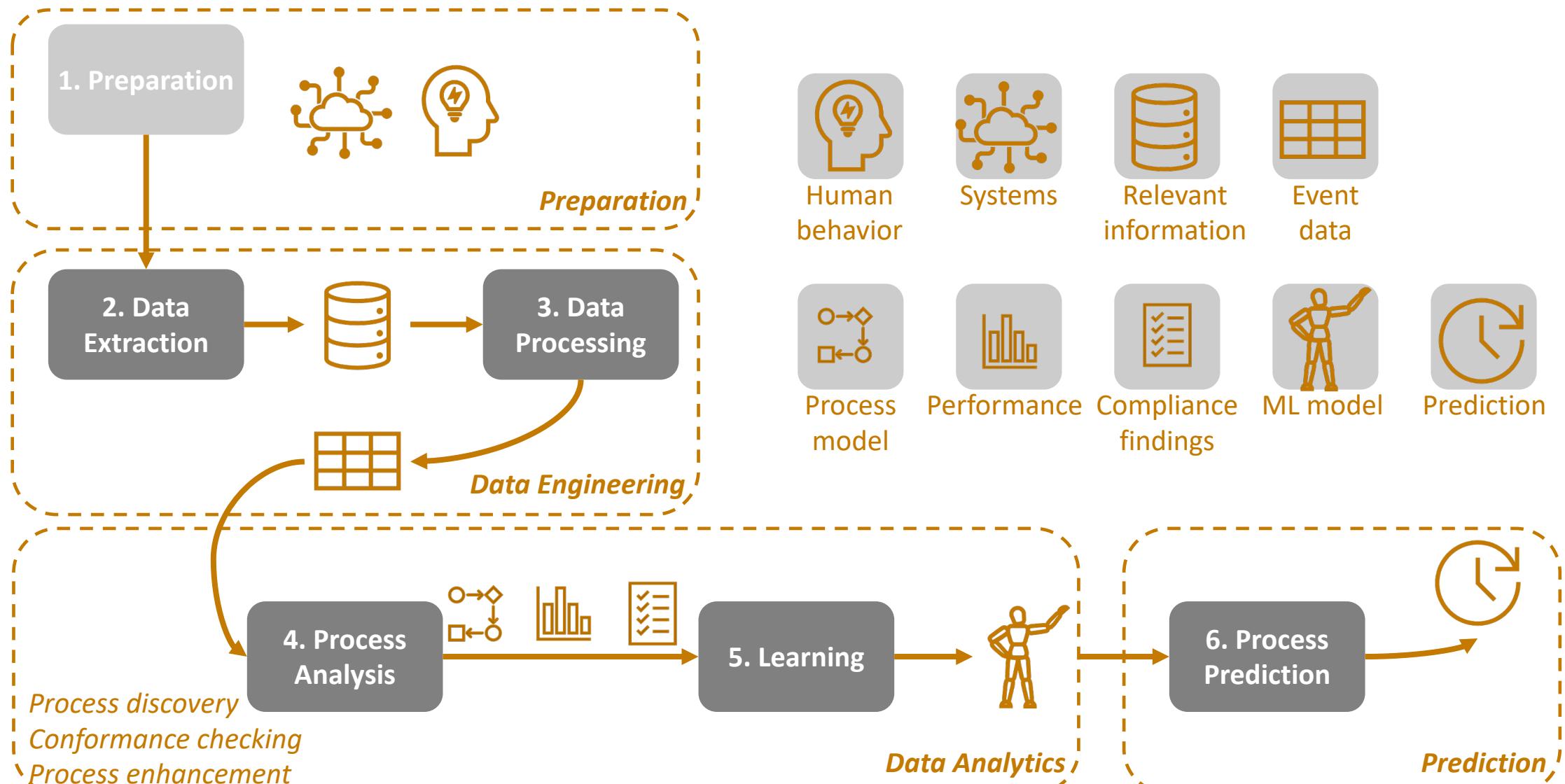
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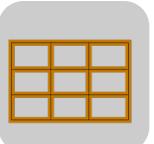
Process Analytics



Process Analytics Pipeline



Event data: data on how processes were executed



Event
data

case id	timestamp	event/activity
1	2020-10-01.6:00	Enter credit request
1	2020-10-01.7:30	Score customer
1	2020-10-01.8:00	Make credit decision
1	2020-10-01.9:00	Accept request
2	2020-10-01.8:00	Enter credit request
2	2020-10-01.9:45	Score customer
2	2020-10-01.10:15	Make credit decision
2	2020-10-01.12:00	Accept request
3	2020-10-01.11:00	Enter credit request
3	2020-10-01.12:00	Gather missing data
3	2020-10-01.12:30	Score customer
3	2020-10-01.14:45	Make credit decision
3	2020-10-01.16:00	Score customer
3	2020-10-01.17:30	Make credit decision
3	2020-10-01.18:00	Decline request
4	2020-10-01.14:00	Enter credit request
4	2020-10-01.14:15	Score customer
4	2020-10-01.14:45	Make credit decision
4	2020-10-01.17:00	Decline request
...

- A **digital trace** represents all events that occur for a given correlated case
- All events that have occurred for one process in a time period are summarized in an **event log**
- Structure of an event log (columns)
 - A process consists of **cases**
 - A case consists of **events/activities** such that each **event relates to precisely one case**
 - Events/activities within a case are **ordered** (typically by a timestamp)
 - Events can have **attributes**. Examples of typical attribute names are **activity**, time, costs, and resource.

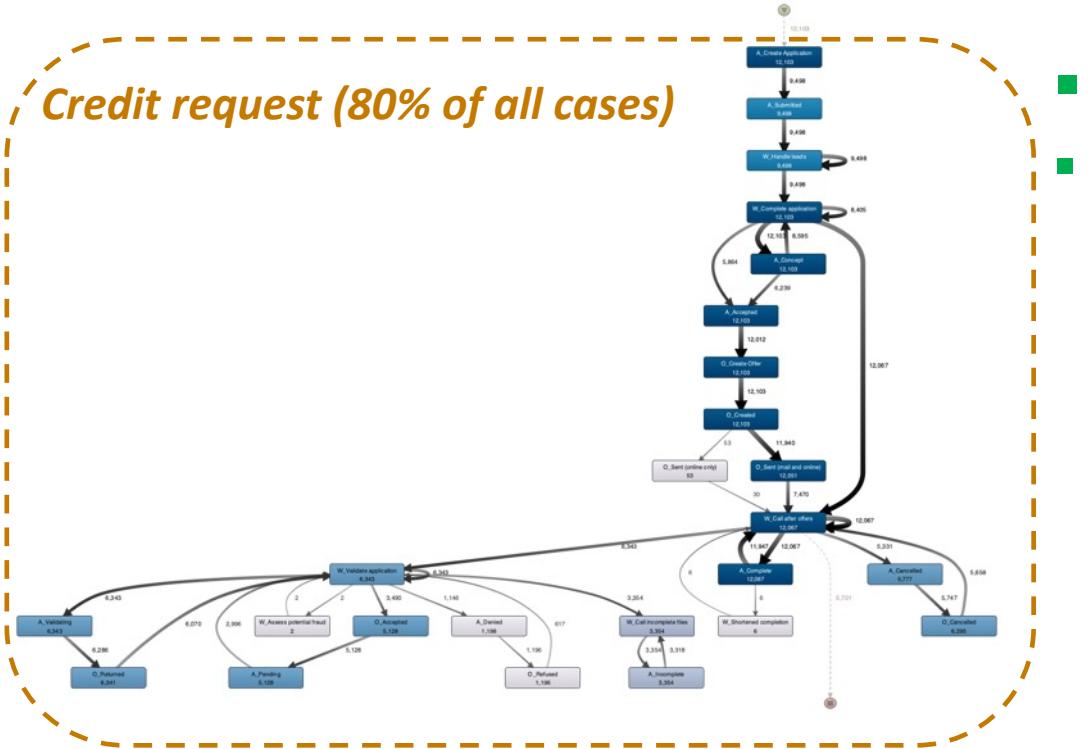


Human
behavior

Human behavior: The 80% / 20% rule

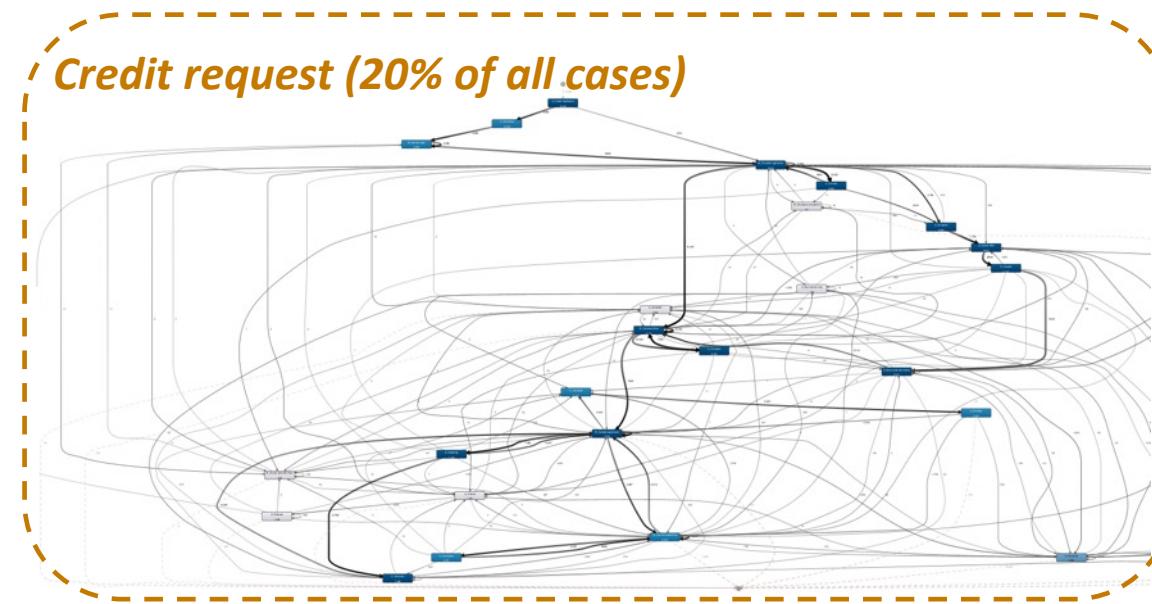
Credit request (80% of all cases)

- **80% of the cases** are described by **20% of the variants**.
- 80% of the cases cause **only 20% of the friction** (rework, complaints, etc.).



- The remaining **20% of the cases** account for **80% of the variants**.
- The remaining 20% of the cases account for **80% of the friction** (rework, complaints, etc.).

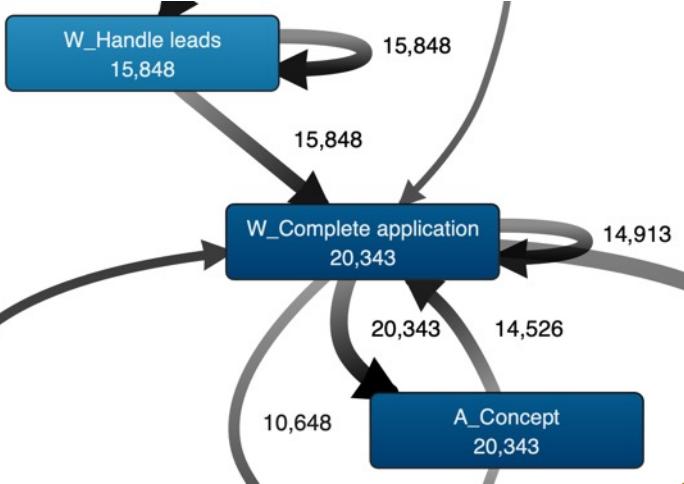
Credit request (20% of all cases)



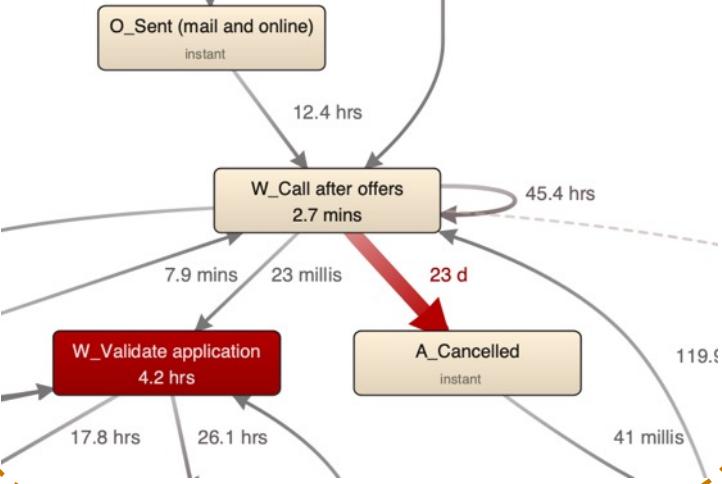
Process Analysis: Transparency of what really happened



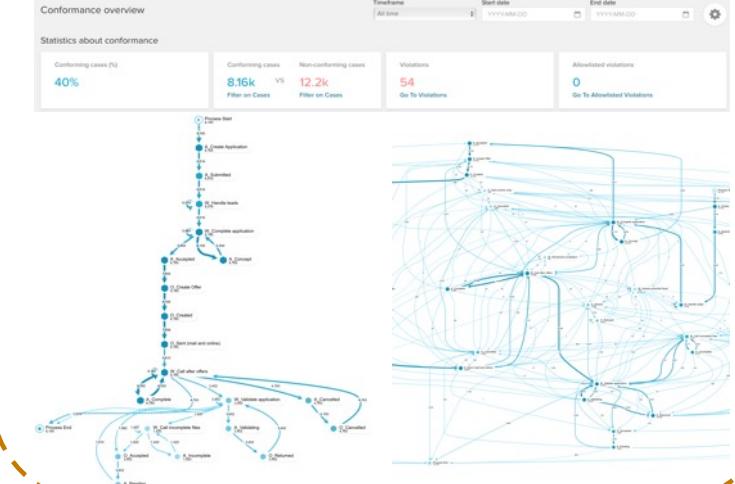
Process Discovery



Process Performance



Process Conformance

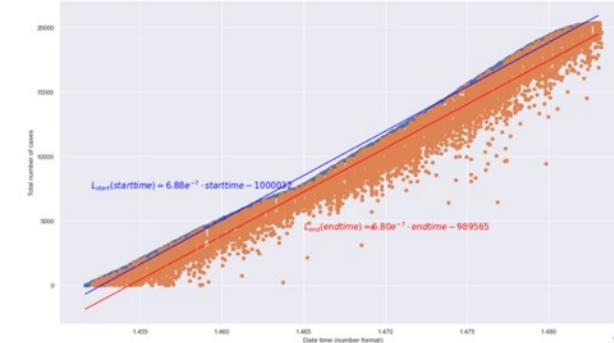


Process prediction: examples for business processes based on their data



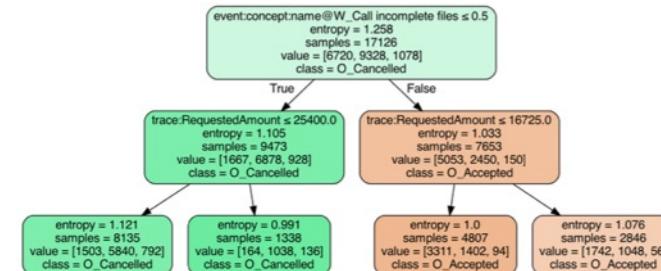
- Improving **resource allocation** in business processes (Martin, et al., (2021)):

- How many credit applications are submitted in the future?
 - How long needs a case in the future?



→ **Linear Regression** may make predictions for resource allocation

- **Predicting outcomes** of running cases (Martin, et al., (2021)):
 - What is the outcome of a loan request which is still in progress?



→ **Decision trees** may make predictions for process outcomes

Conclusion

The business process is still alive...

... but new technologies are needed for analysis and automation:

- *Process Mining*
- *Robotic Process Automation (RPA)*
- *Machine Learning and Artificial Intelligence*

And: Accept people and systems as they are!

- *Use event data to understand people*
- *Do not start from scratch, focus on improvements and note the 80/20 rule*

Agenda

Business Processes

Business processes and their challenges

Process Analytics Pipeline

Applications of process mining and machine learning for analysis and prediction

Cooperation and Discussion

Research questions, collaboration opportunities and discussion

Next steps...



Process Analytics Pipeline: Our research questions (selection)

Grundlagenforschung: Konzeption einer Process Analytics Plattform

- Wie ist eine Process Analytics Pipeline definiert? Wer sind Bereitsteller und Nutzer von Daten und Diensten einer solchen Pipeline Plattform?
- Welche Komponenten und Dienste bietet eine Process Analytics Pipeline (klassifiziert und strukturiert als fachliche und technische, produktunabhängige Architektur)?
- Welche Bedeutung hat die Informationstechnologie (in Form von Daten, Systemen und Infrastruktur)?

Angewandte Forschung: Spezifikation einer Process Analytics Pipeline

- Wie stellen Prozesse ihre Daten bereit?
- Welches abgeleitete oder vorhergesagte Wissen erwarten Prozesse zur automatisierten Entscheidungsfindung?

Daten und Prozesse

Dienste und Methoden

Technologien

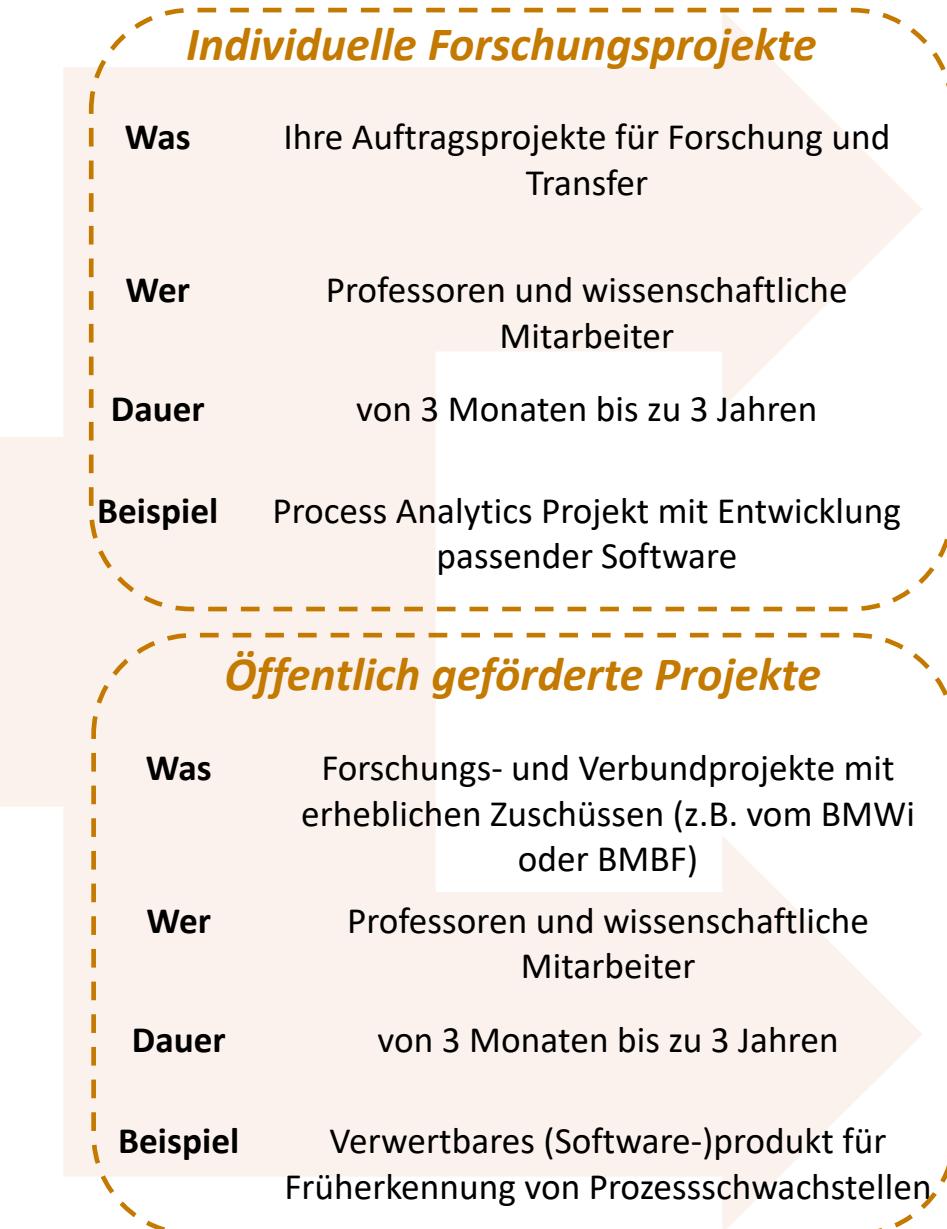
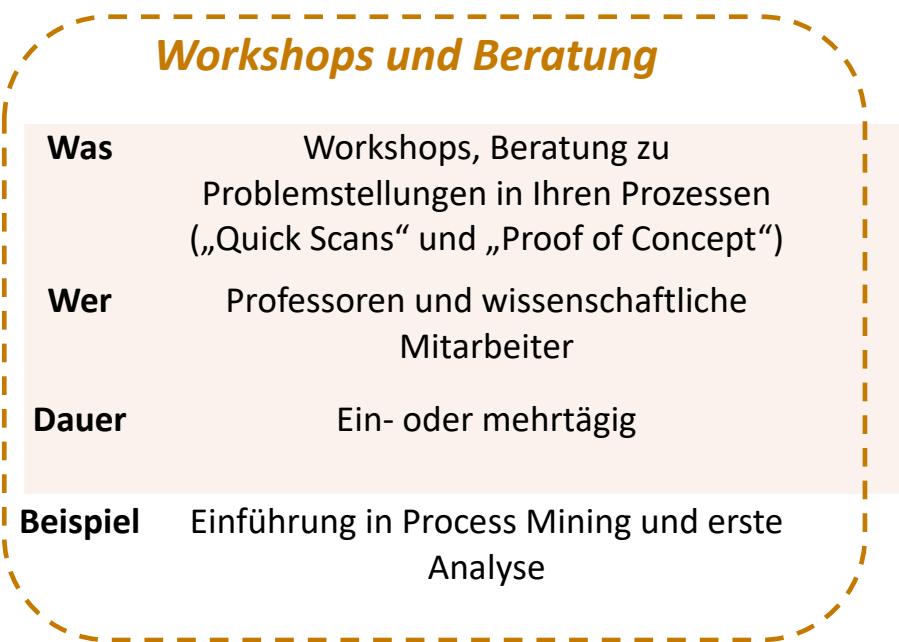
- Wo und in welchen Informationssystemen werden Daten gewonnen?
- Welche konkreten Aufgaben im Rahmen des Data Pre-processing müssen in Abhängigkeit von Systemen durchgeführt werden?
- Welches Wissen zur Entscheidungsfindung erwarten welche Partner und deren Prozesse aus speziellen Branchen?

- Welche Komponenten einer solchen Plattform werden z.B. für Partner und Kunden entwickelt und bereitgestellt?
- Wie lässt sich der Nutzen und Erfolg einer Process Analytics Plattform messen?

- Welche Standard-Technologien und Cloud-Anbieter (z.B. Google, AWS, Azure) unterstützen eine Umsetzung?
- Wie sehen die IT-Organisation und deren IT-Prozesse für eine solche Plattform aus?



Formen der gemeinsamen Zusammenarbeit



Thank you
for your attention!

Any Questions?

Contact

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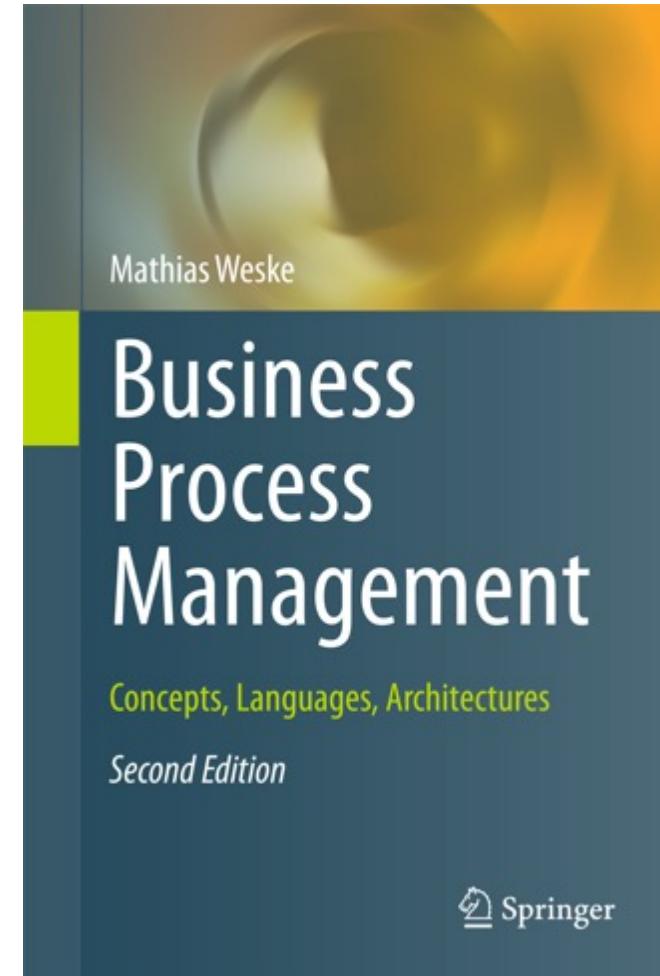
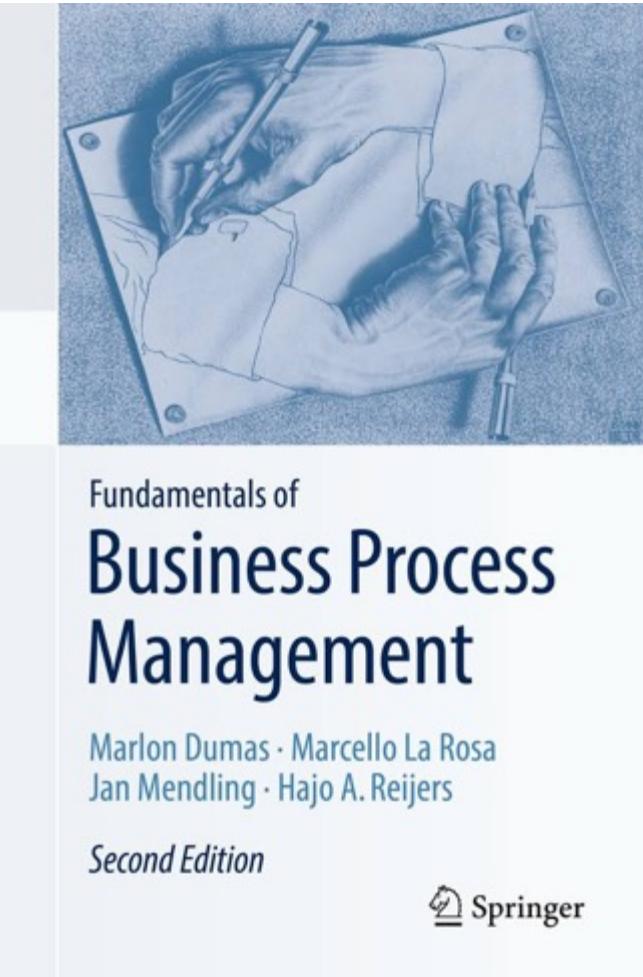
Twitter: <https://twitter.com/TobWal>

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- Jan Mendling (2021). Business Process Modeling in the 1920s and 1930s as reflected in Fritz Nordsieck's PhD Thesis. Enterprise Modelling and Information Systems Architectures (EMISAJ), 16, 6-1.

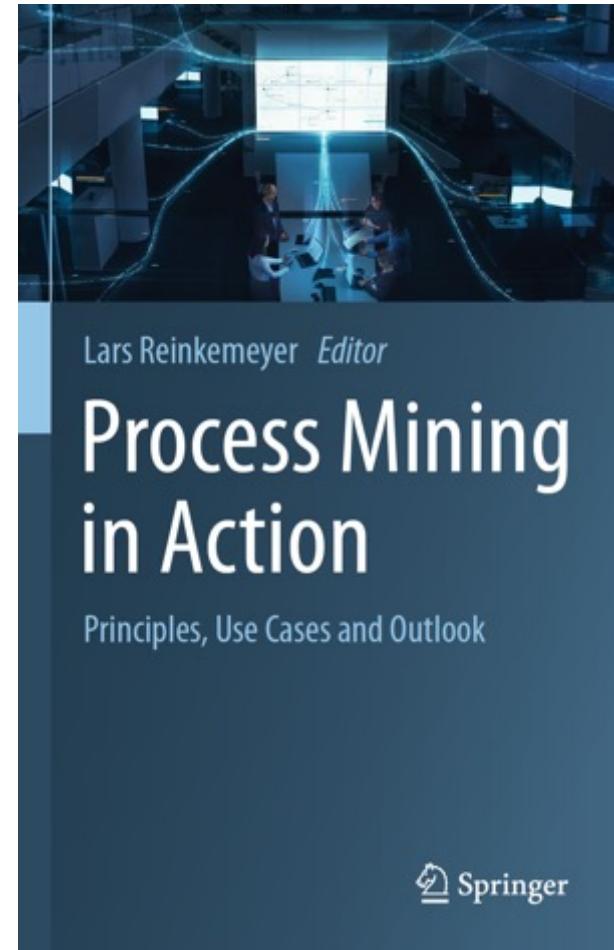
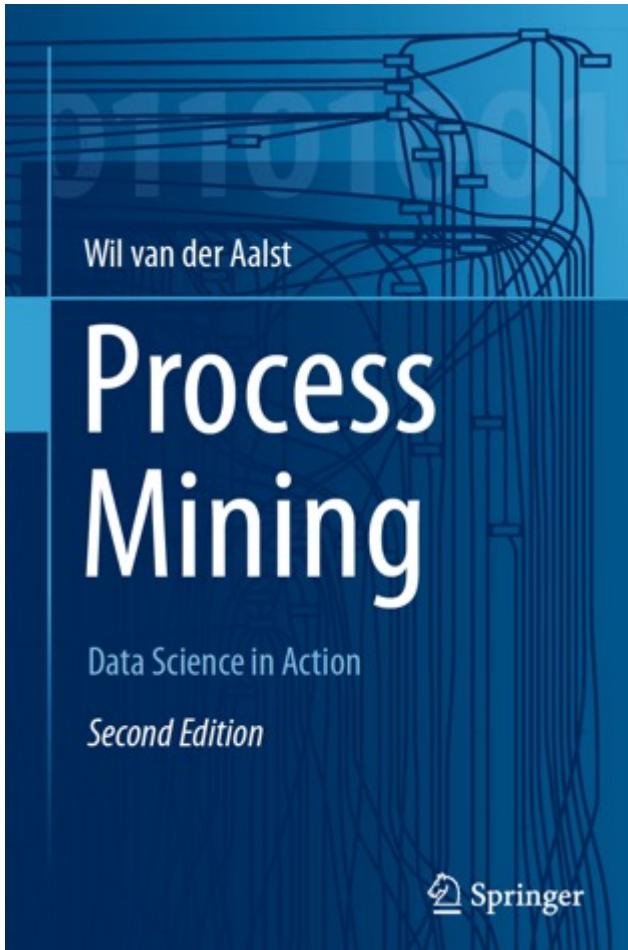
Literature

- Business Process Management



Literature

- Process Mining



Literature

- Machine Learning / Data Science

