



GreenKG: Digital Transformation

Process automation in administration

Prof. Dr. Martin Schultz
martin.schultz@haw-hamburg.de

Agenda

A graphic of a dartboard with several darts hitting the bullseye, overlaid on a clock face. The darts are positioned to the left of the agenda items.

1 Business Process Management Overview

2 Process Identification for Digitalization

3 Process Implementation using IT

Digitalization and processes

- In the context of discussions on digitalization/digital transformation, the redesign of an **organization's processes** is often seen as an **important driver**
- digitalization describes how IT or digital technologies can be used to **alter existing business processes**

What does a university need to be successful in digital?



1. Robust and secure technology infrastructure, regularly upgraded and improved



2. Effective processes for managing investment and change



3. Strong stakeholder engagement and customer focus



4. Digitally aware executive leadership



5. Development of all stakeholders' digital skills and capabilities



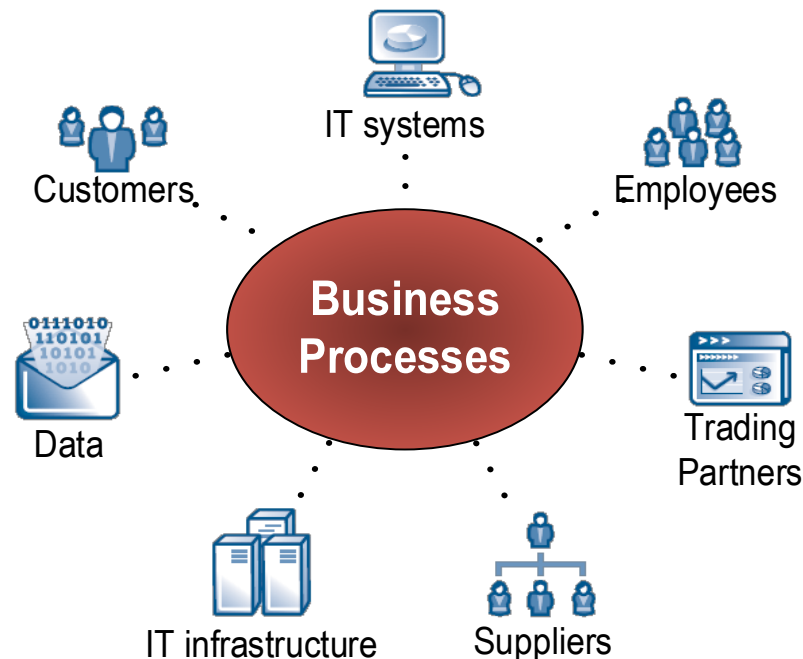
6. Evidence-based centres of expertise in digital research and education.

(Skelton/ Jisc 2023)

Business Process Management (BPM)

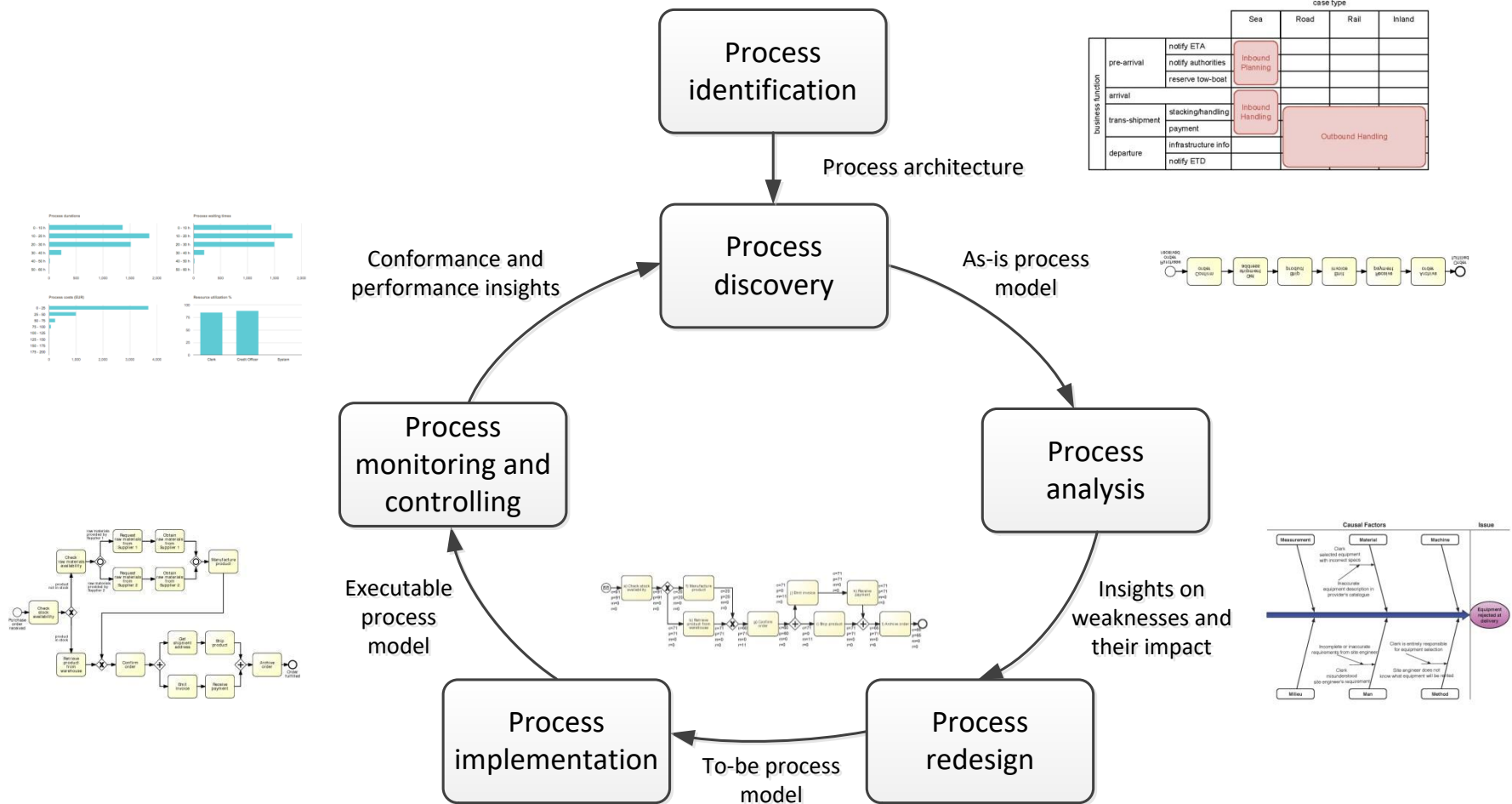
Management discipline of systematically overseeing and supervising business processes, and resources to achieve organizational goals and objectives

Body of principles, methods and tools to design, analyze, execute and monitor **business processes**, with the aim of **improving** their performance.



BPM Life Cycle

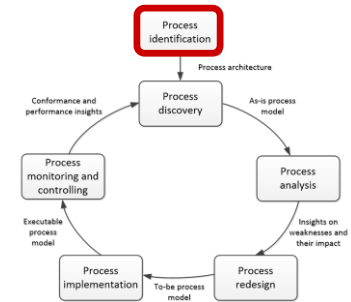
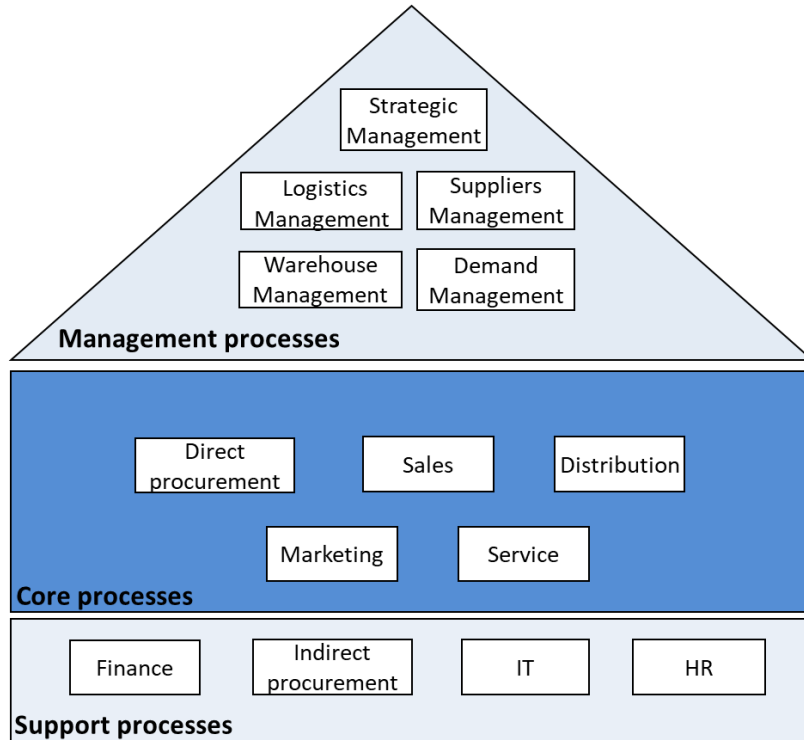
Managing processes is an iterative processes consisting of several steps



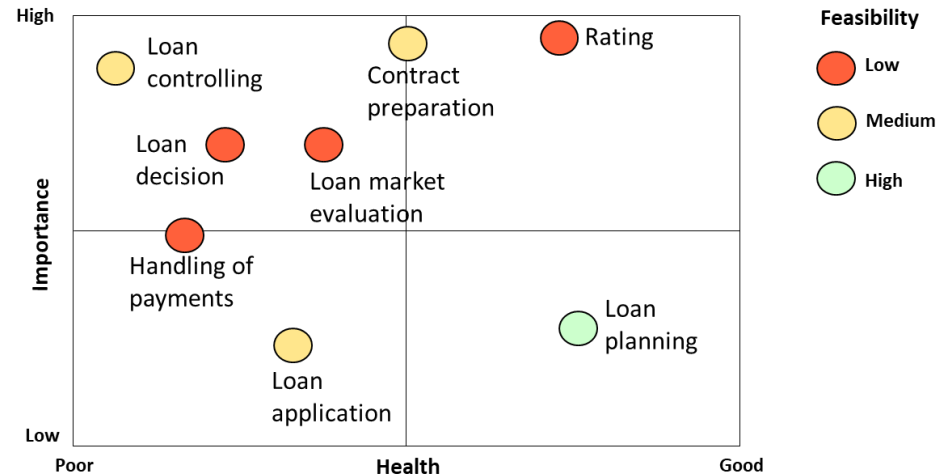
(vom Brocke 2010)

BPM Life Cycle: Process Identification

Process landscape/ architecture

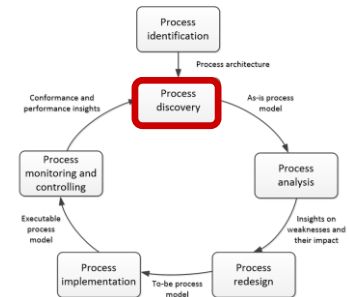


Prioritization (Example: Bank)

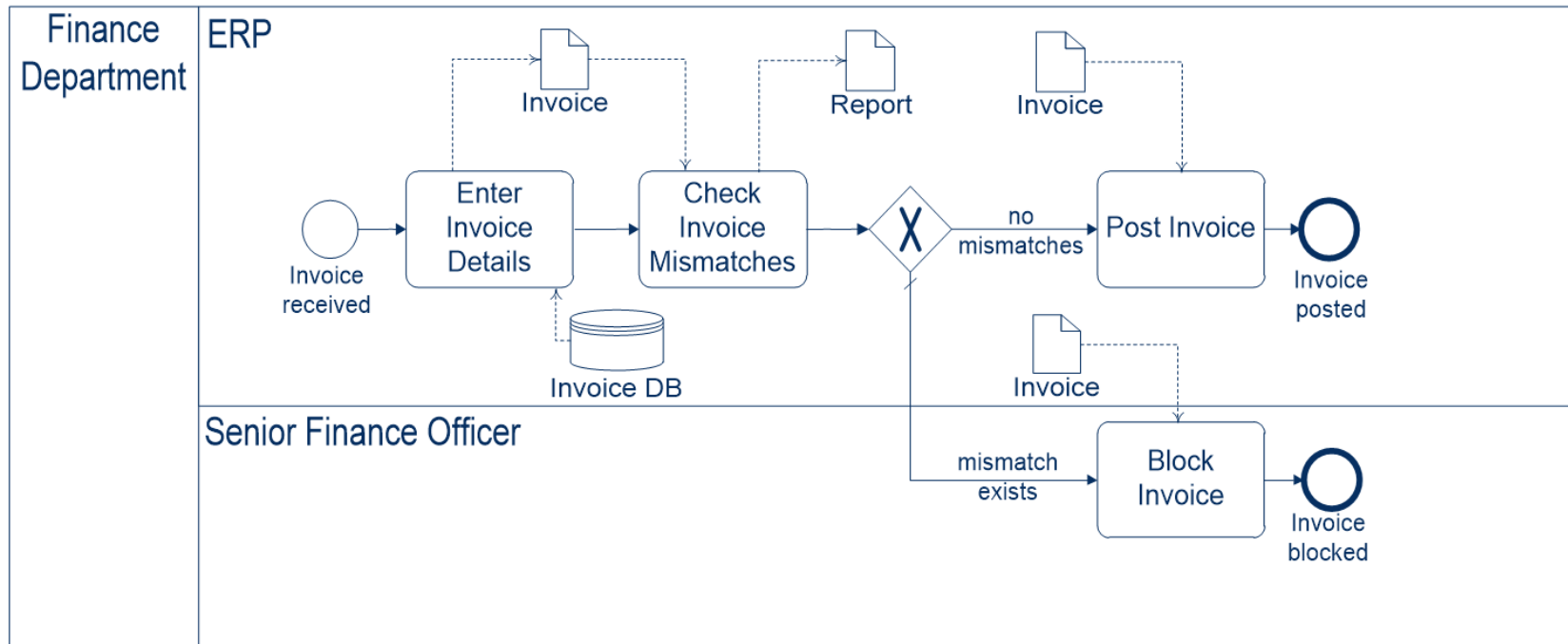


BPM Life Cycle: Process Discovery

- survey actual processes
- modelling As-is processes

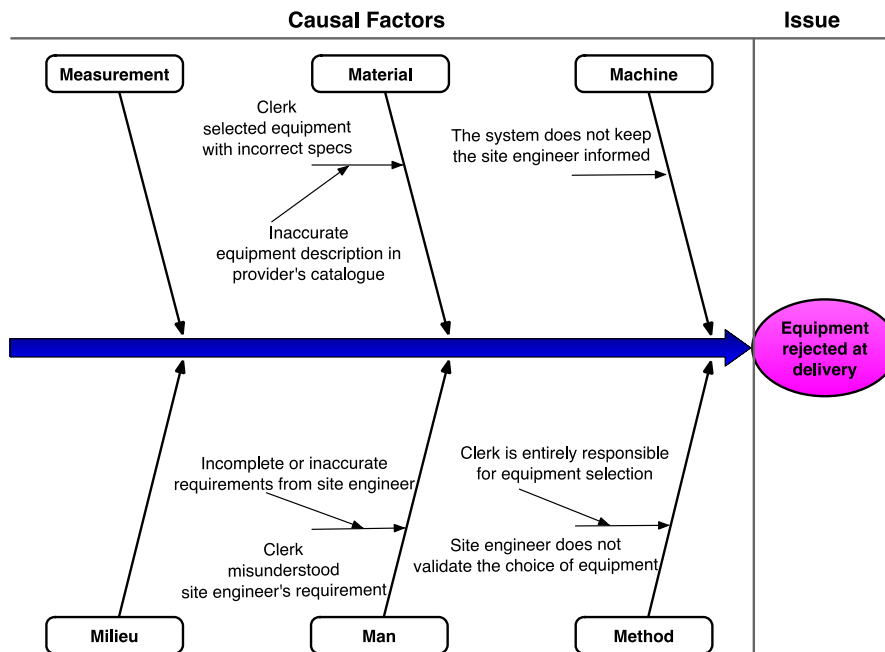
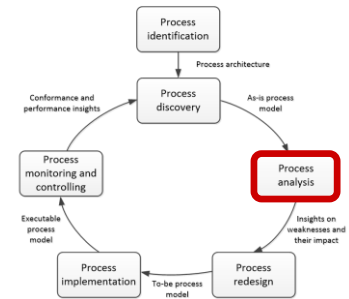


Example (BPMN): Incoming Invoice Workflow

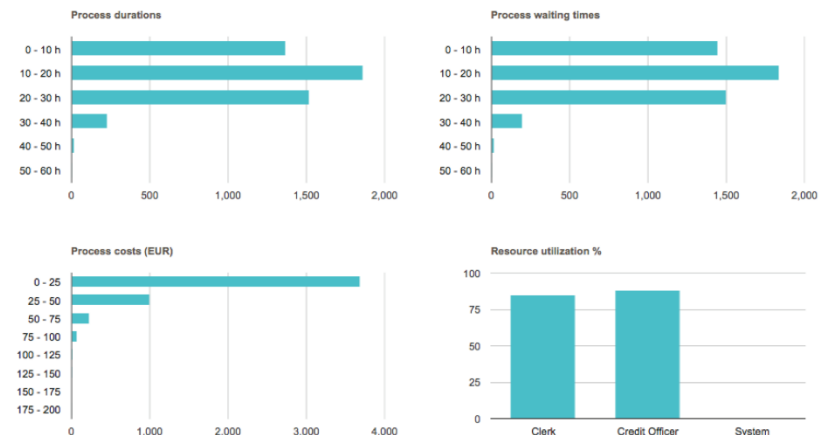


BPM Life Cycle: Process Analysis

- Quantitative and qualitative analysis of As-is processes

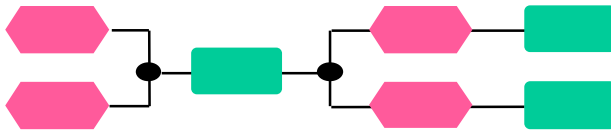


Process simulation

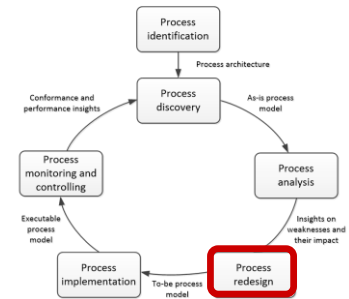
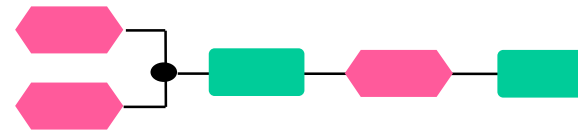


BPM Life Cycle: Process Redesign

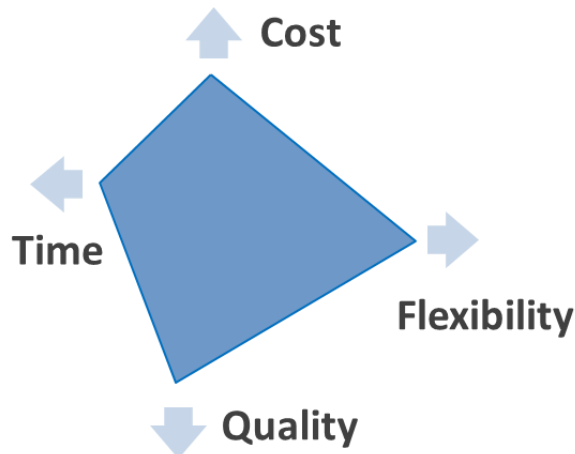
As-is process model



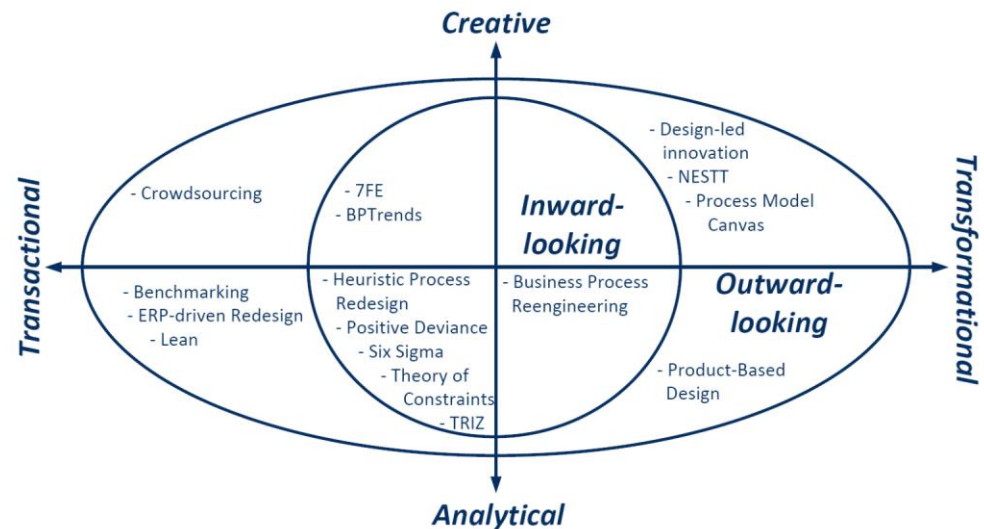
To-be process model



Goals for process redesign

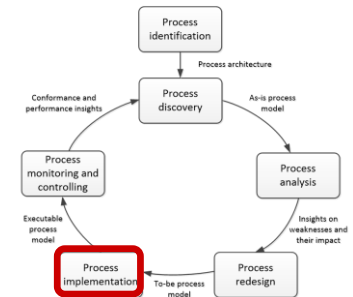


Range of methods for process redesign



BPM Life Cycle: Process Implementation

In this phase, the changes required to move from the As-is process to the To-be process are prepared and performed

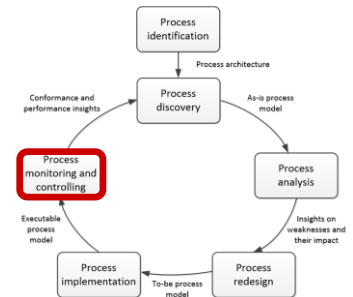


It covers two aspects:

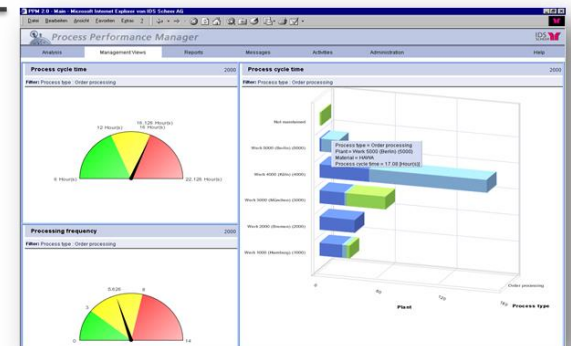
- **Organizational change management:** refers to the set of activities required to change the way of working of all participants involved in the process
- **Process automation:** refers to the development/ deployment of IT systems (or enhanced versions of existing IT systems) that support the To-be process

BPM Life Cycle: Process Monitoring

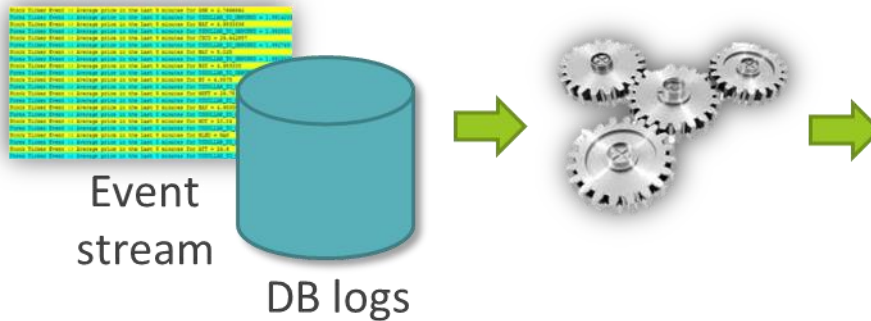
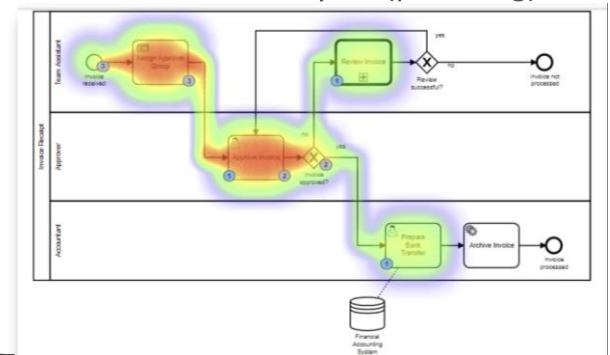
- Continuous monitoring of relevant key figures of one or more processes



Dashboards, alerts & reports



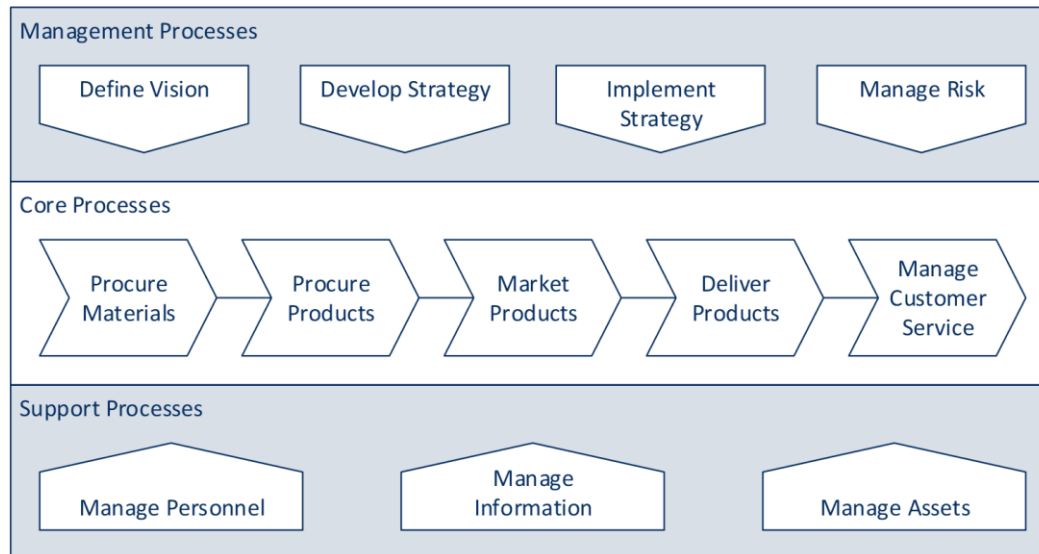
Model-based analytics (p. mining)



Process identification

- set of activities aiming to systematically **define** the set of business processes of a company and establish clear criteria for **prioritizing** them.
- The output of process identification is a ***process landscape***, which represents the business processes and their interrelations. A process architecture serves as a framework for defining the priorities and the scope of process modeling and redesign projects

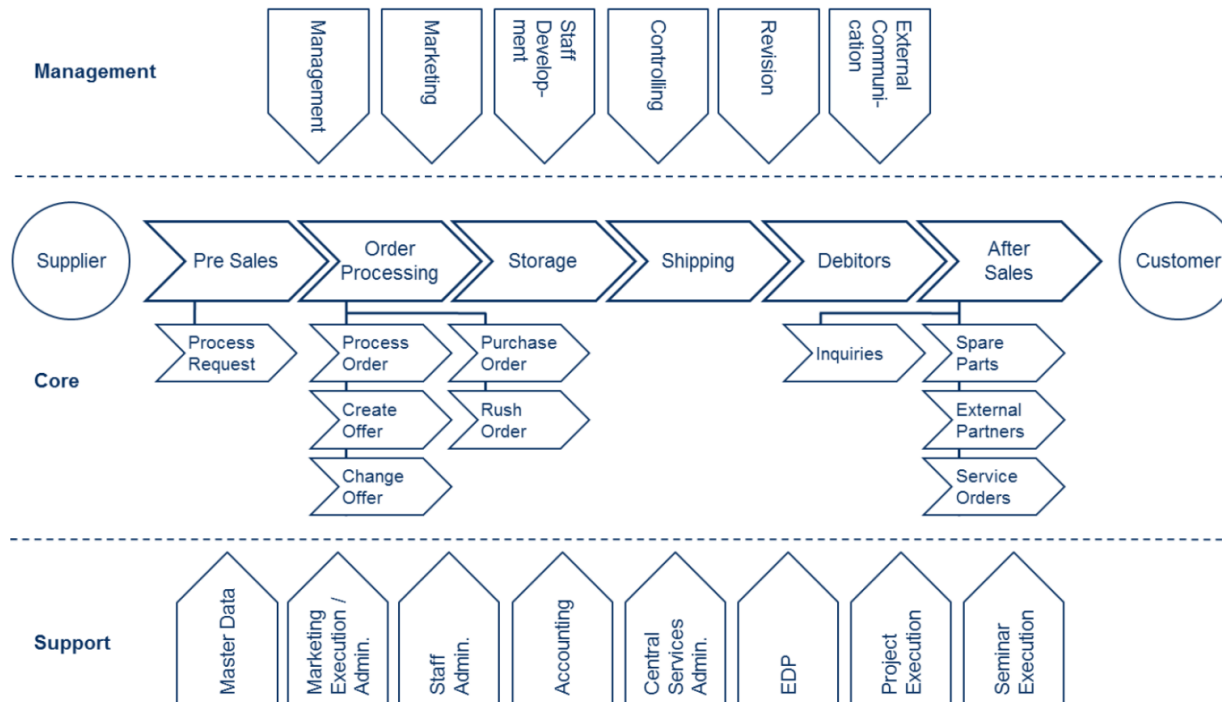
Process Categories



(Dumas 2014)

Process landscape

- key concept for providing an overview of an organization's processes
- visualize the main relationships between processes and facilitate a basic understanding of how the organization operates.
- creating a process map is typically the first task when introducing BPM into an organization as it provides an abstract view of all processes

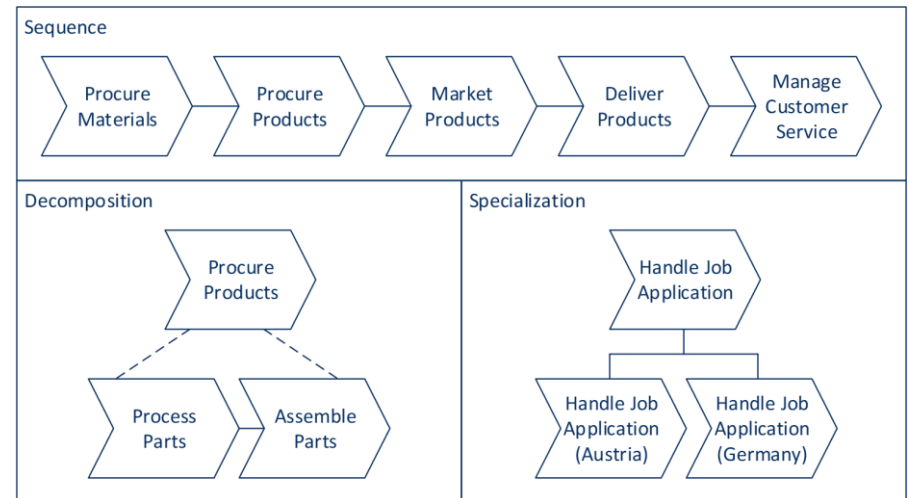
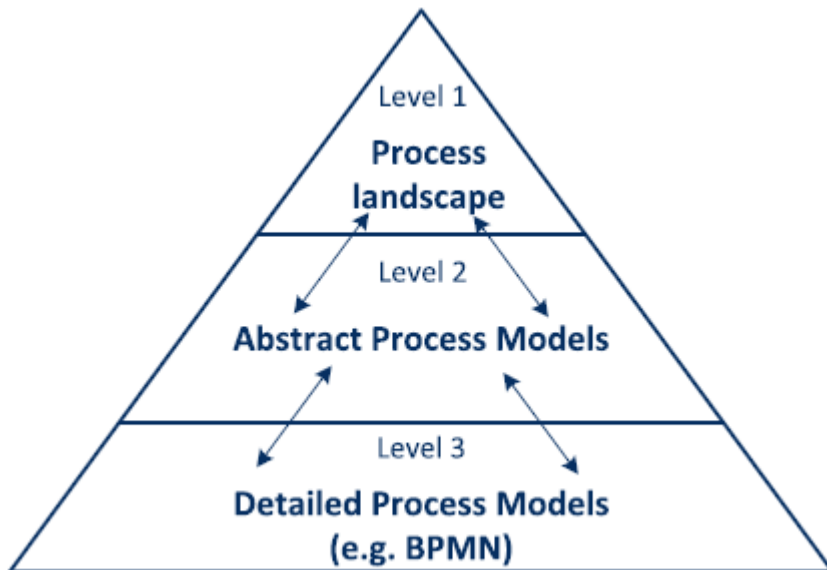


(Malinova 2015)

Process architecture

A process architecture is shows the processes of an organization and makes their relationships explicit in terms of

- consumer–producer relation
- levels of detail

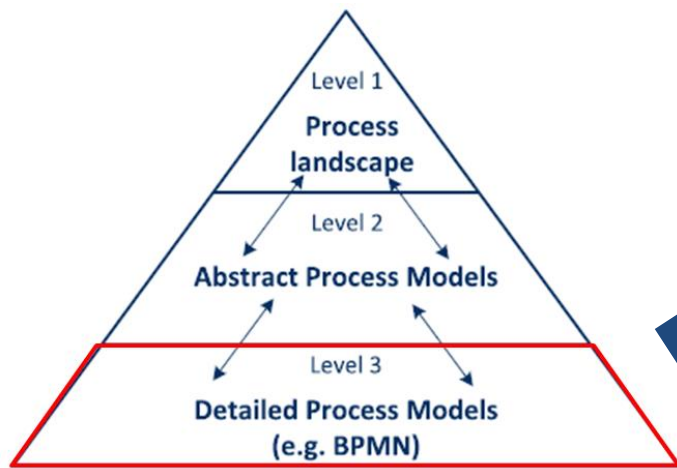


(Dumas 2014)

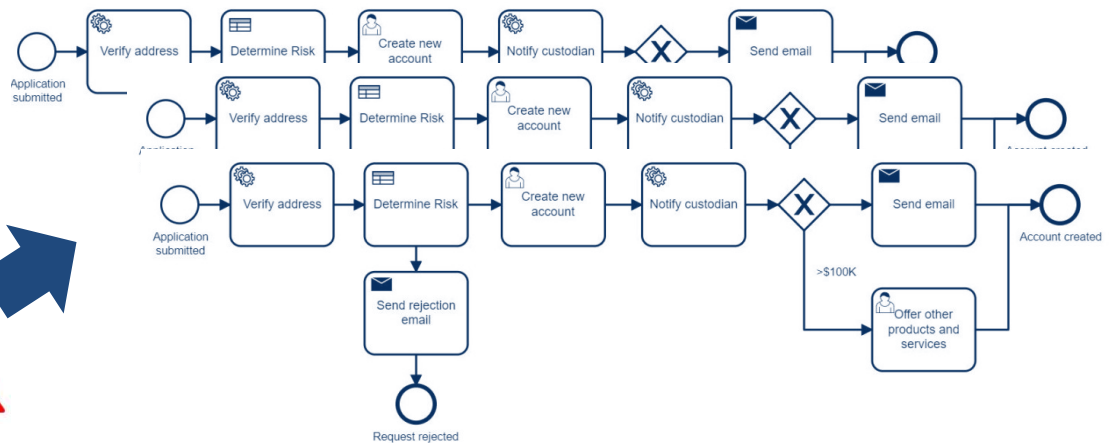
Process Modeling

On the lowest level of the process architecture the current state of each of the relevant processes is documented, typically in the form of one or several as-is process models

→ *Process discovery (also called as-is process modeling).*



Set of detailed process models



(Dumas 2014)

Criteria for process prioritization

Strategic Importance:

- Find out which processes have the greatest impact on the strategic goals.
- Consider profitability, uniqueness, or contribution to competitive advantages.
- Select those processes for process management that relate to strategy.

Health (Dysfunction):

- Determine which processes are in deepest trouble.
- These processes may profit the most from BPM initiatives.

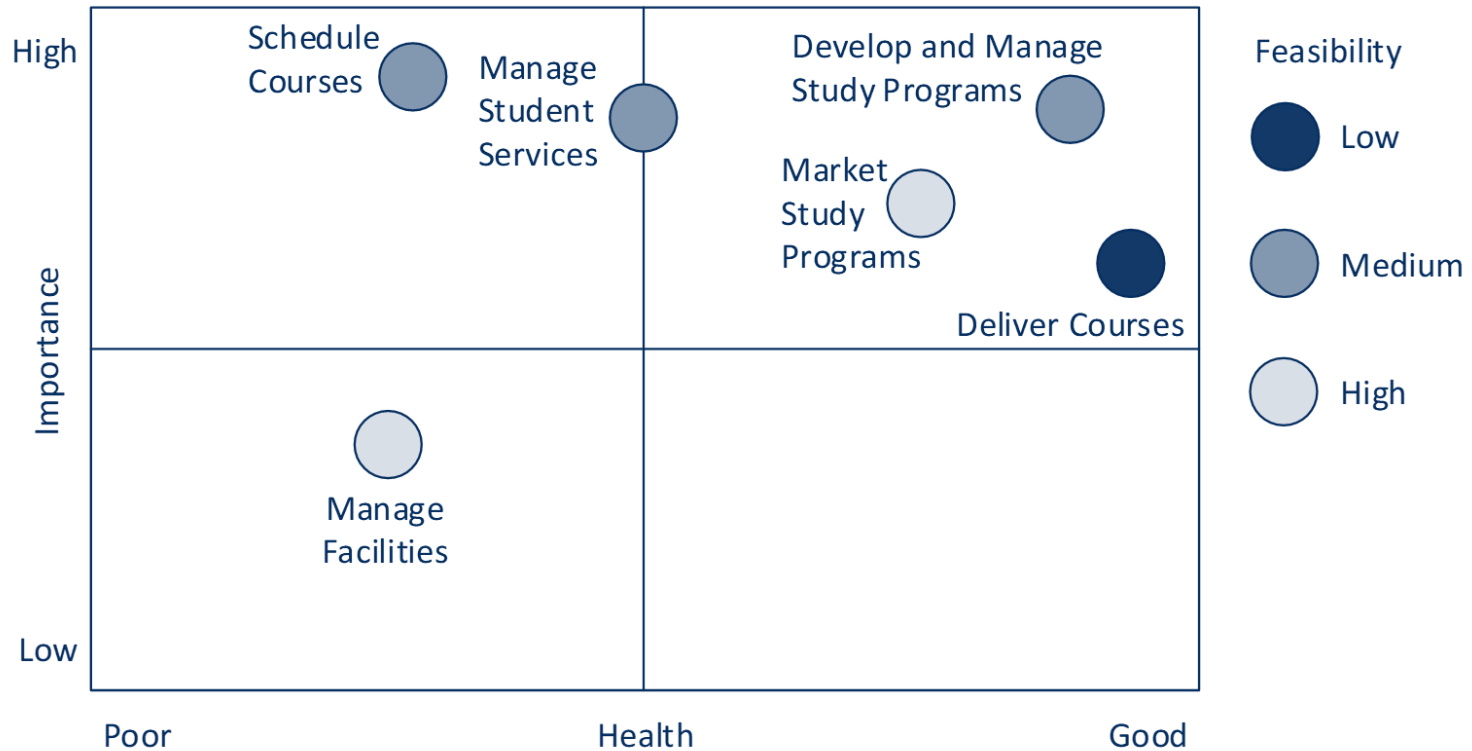
Feasibility:

- Determine how susceptible process is to BPM initiatives, incidentally or continuously.
- BPM should focus on those processes where it is reasonable to achieve benefits.

(Dumas 2014)

Criteria for process prioritization - Process portfolio

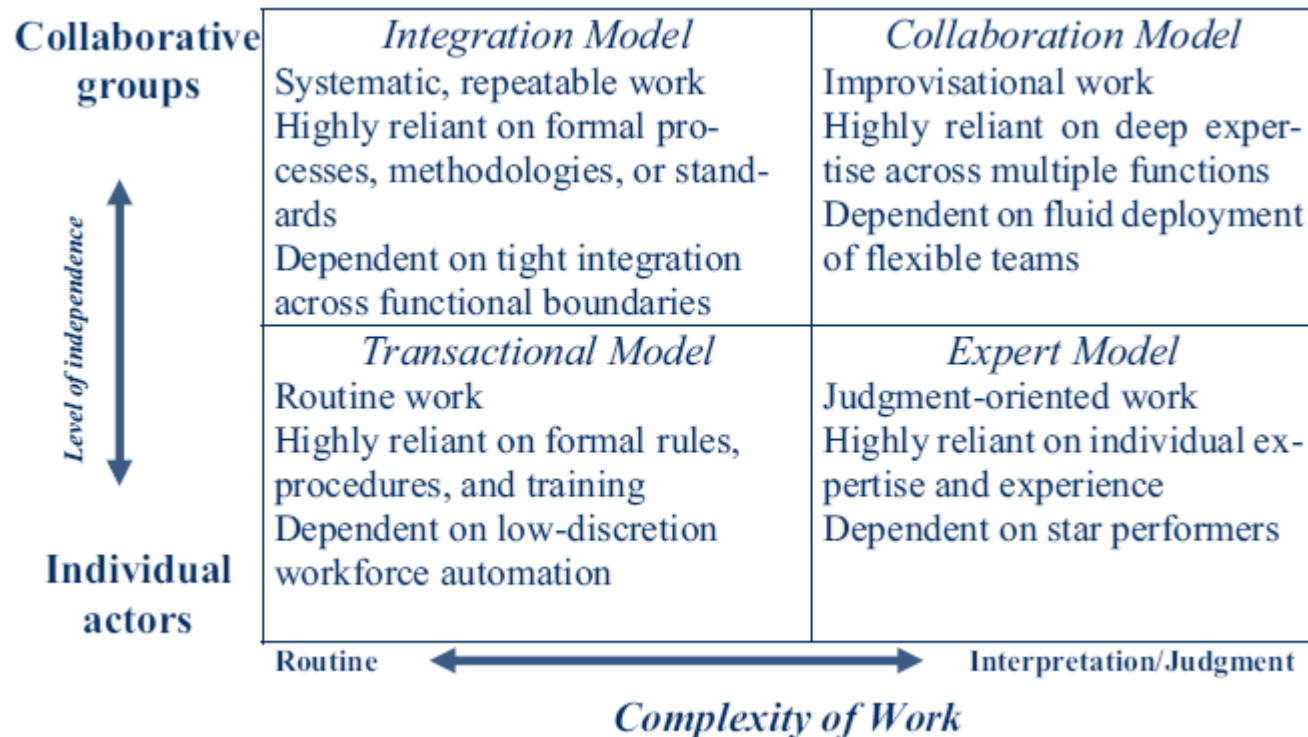
Example: process portfolio for an university using Strategic Importance, Health, and Feasibility as criteria



(Dumas 2014)

Selecting processes for Digitalization

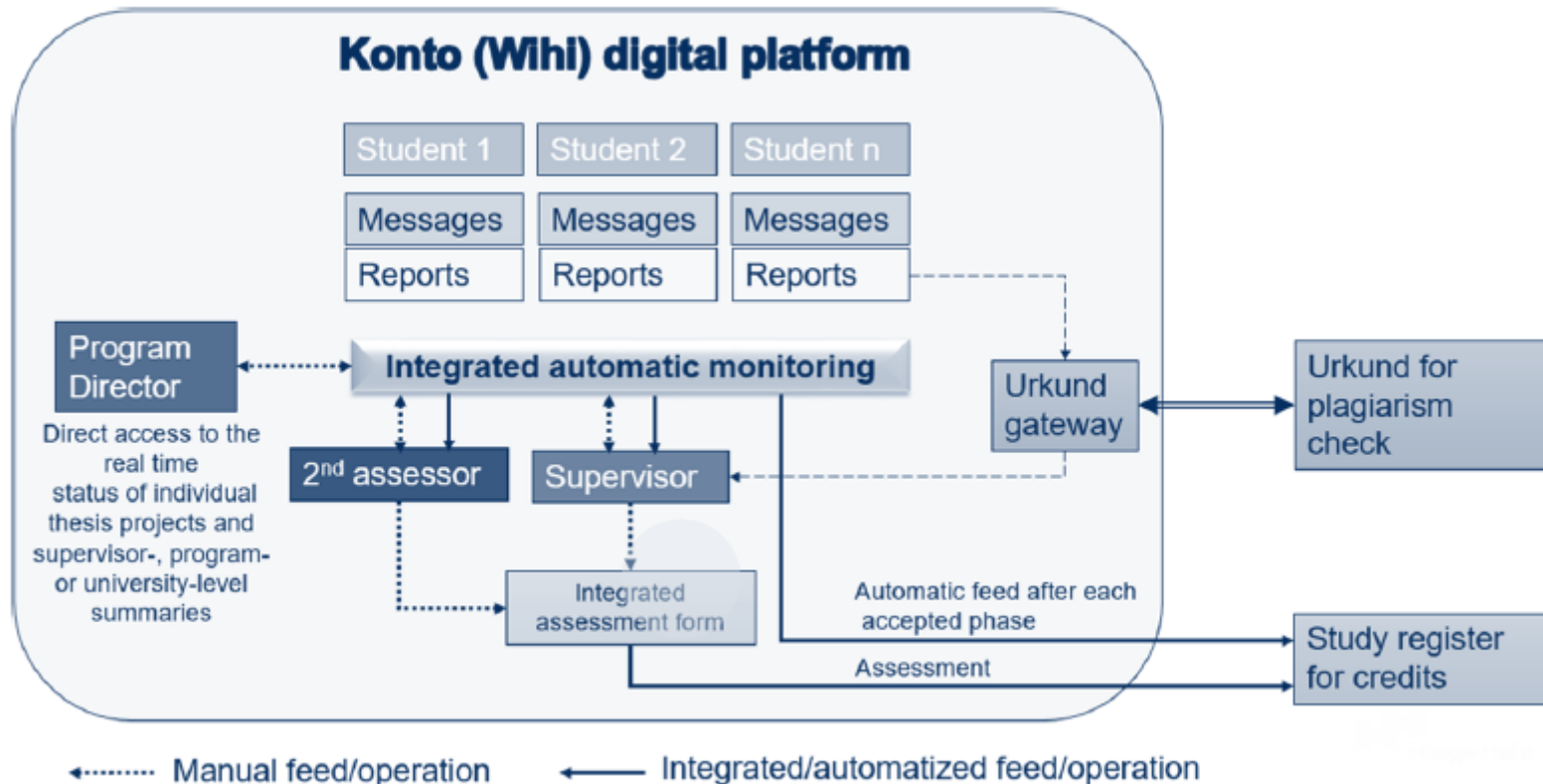
When it comes to digitalization, it is not sufficient to consider the organizational level: individual levels must also be taken into account, especially in regard to knowledge work



(Davenport 2010)

Selecting processes for Digitalization - Example

Case study (university in Finland) regarding the digitalization of the “thesis process”



(Lagstedt 2020)

Selecting processes for Digitalization - Digital Technologies

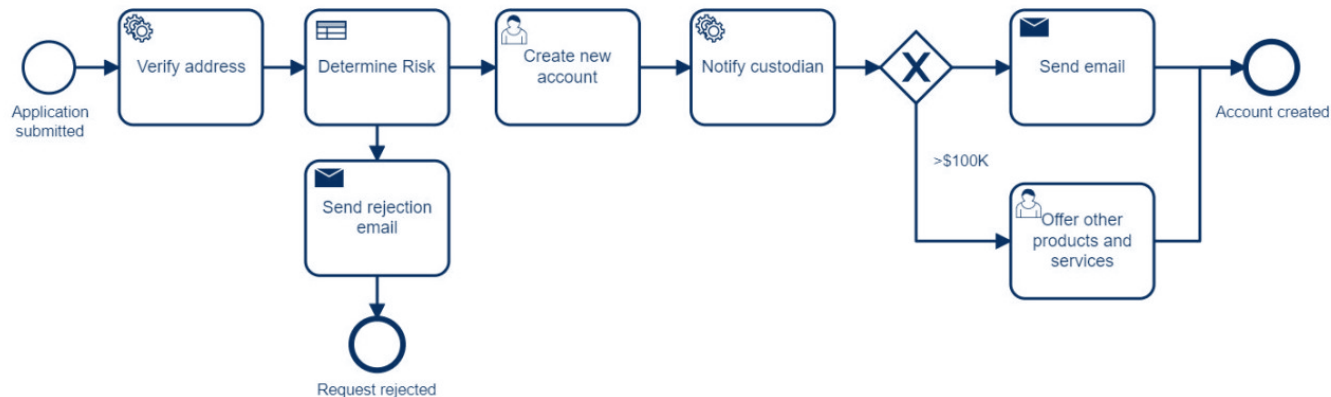
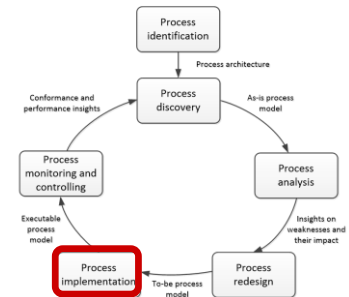
Besides the selection of suitable processes, also appropriate digital technologies must be determined

Activity (E.1)	Technique (E.2)	Tool (E.3)	Role (E.4)
Activity 1: Selection and modelling of business process	Select and model business process of interest	Established business process modelling language (e.g., BPMN) Evaluation matrix for pairwise comparison of sub-processes based on a rating scale (i.e., AHP scale)	Process owner Selected process participants BPM expert (if available and necessary)
	Focus on behavioral process perspective and include end-to-end perspective		
	Determine relative importance of sub-processes		
Activity 2: Preselection of suitable digital technologies	Select digital technologies appropriate for process in focus (medium list)	Evaluation matrix for assessment of digital technologies based on a rating scale (i.e., AHP scale)	Process owner Selected process participants Technology experts
	Determine extent to which these technologies can support sub-processes		
	Choose digital technologies with highest potential for the process in focus (shortlist)		

(Denner 2018)

Options for Process Implementation using IT

- **Office software/ e-mail:** Processes are not formalized and are not implemented in a dedicated system. They are carried out with the help of Office applications.
- **Standard software (Off-the-shelf):** e.g. Student information systems (SIS) readily provide best practices for common administrative processes in higher education
- **Individual software:** Use of conventional technologies (programming languages, web application) to implement your own processes in a self-developed software solution
- Using a **business process management Systems (BPMS)** and/ or **Robotic Process Automation**



Standard software for higher education

- **Student information system (SIS):** core system of record for higher education institutions that serves as the central hub for storing, organizing and processing student academic and administrative activities
- **Learning Management System (LMS):** central hub for teaching and learning technologies, offering access to a variety of tools and services both inside and outside of the platform



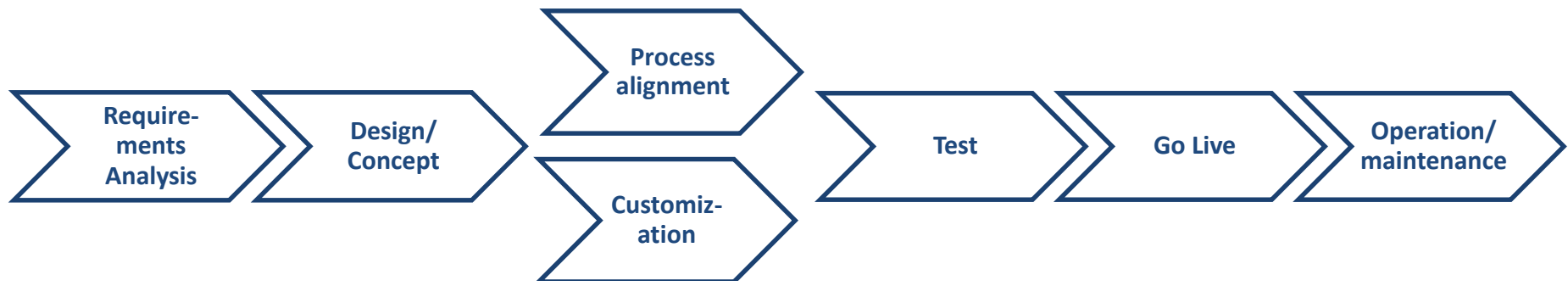
(Gartner 2023, Margain 2017)

Standard software - Implementation process

- As with other software projects, several phases can be observed in the implementation of standard software



- But, the implementation step is replaced
 - Alignment between **to-be processes** and **reference processes** of the standard software
 - adaptation of the standard software (**customizing**)

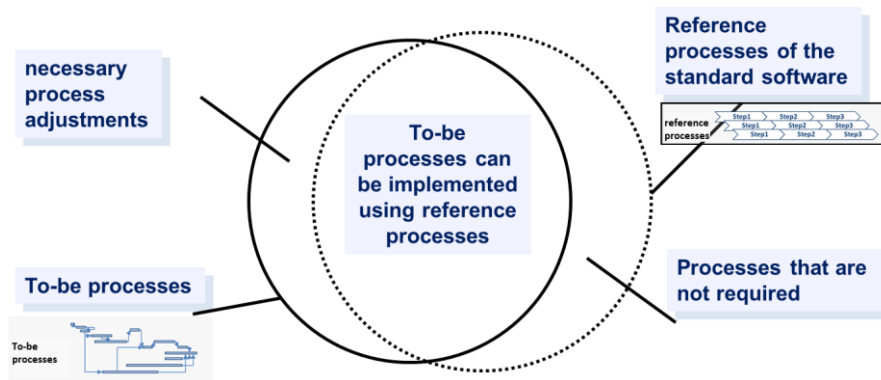


(Gadatsch 2012)

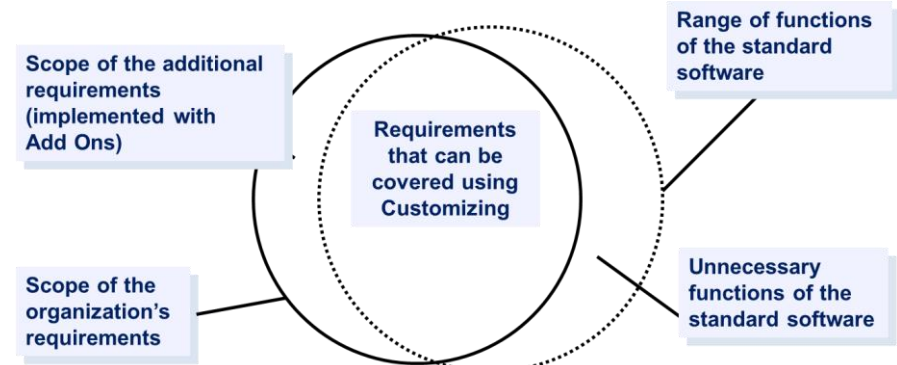
Standard software - Process Alignment and Customization

- Using standard software for implementing processes often involves customization
- Customization:** is a socio-technical activity of modifying the properties of standard software, so that “the resulting information system converges with the requirements of the target organization”

Process Alignment



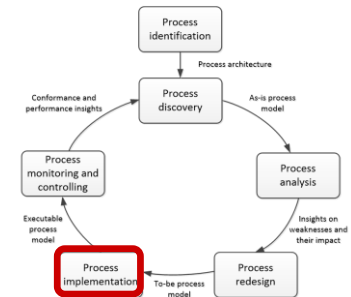
Customization



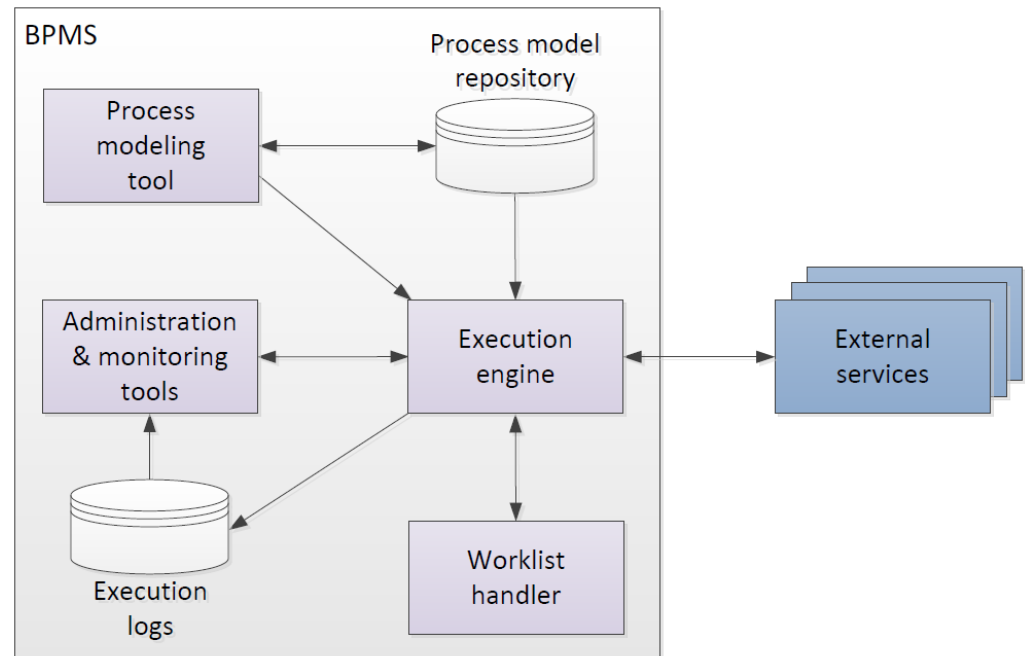
(Gadatsch 2012, Nordheim, 2004)

Business Process Management System (BPMS)

- is an **information system** that enables the planning, control and logging of business processes
- It enables people to work on process instances depending on their roles in an organization.
- Workflows are derived from **modelled business processes** consisting of a set of elementary activities.

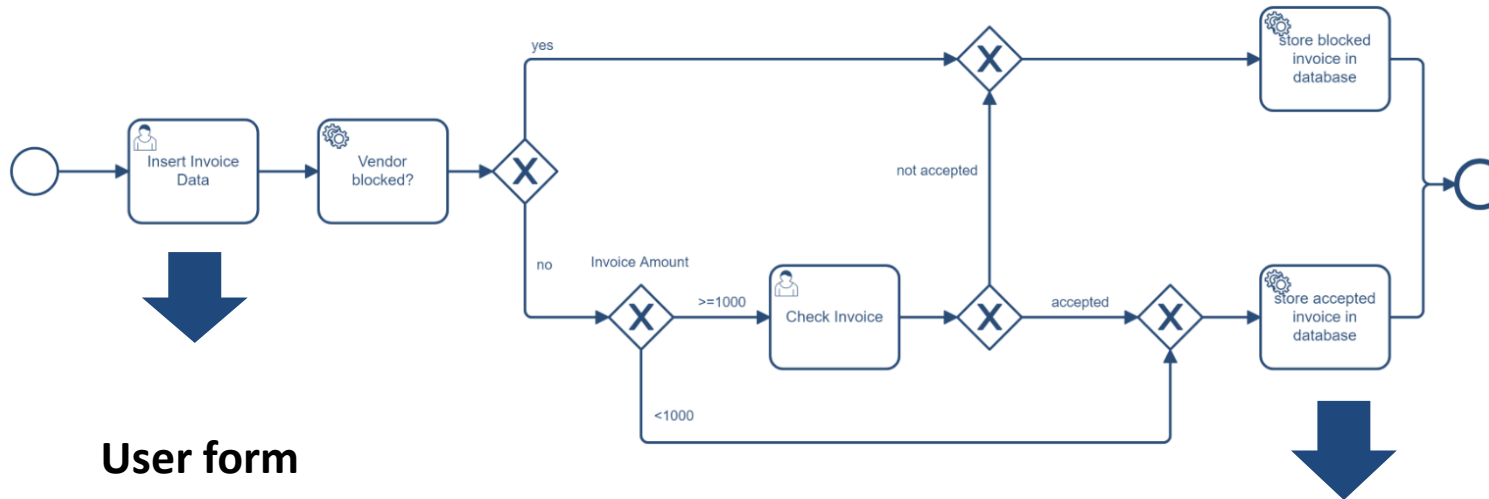


Generic architecture of a BPMS



Business Process Management System (BPMS) - Demo

- Example: Incoming invoice workflow (BPMN)



User form

My Tasks (1)

Filter Tasks

1

My Group Tasks

Accounting

John's Tasks

Mary's Tasks

Peter's Tasks

All Tasks

Insert Invoice Data

IncomingInvoiceWorkflowMySQL720

Created a few seconds ago

Demo Demo 50

Insert Invoice Data

IncomingInvoiceWorkflowMySQL720

Set follow... Set due d... Add groups Demo De...

Form History Diagram Description

VendorName

InvoiceDate

InvoiceAmount

Clerk db_schultz

Save Complete

Implemented/ Automated process step

```

src
├── main
│   └── java
│       ├── haw
│       │   └── mpi
│       │       └── IncomingInvoiceWorkflow
│       │           ├── CamundaBpmProcessApplication.java
│       │           ├── DBConnection.java
│       │           ├── GetBlockedInvoicer.java
│       │           ├── LoggerDelegate.java
│       │           ├── ProcessConstants.java
│       │           └── ProcessInvoice.java
    
```

Business Process Management System (BPMS) - When to use?

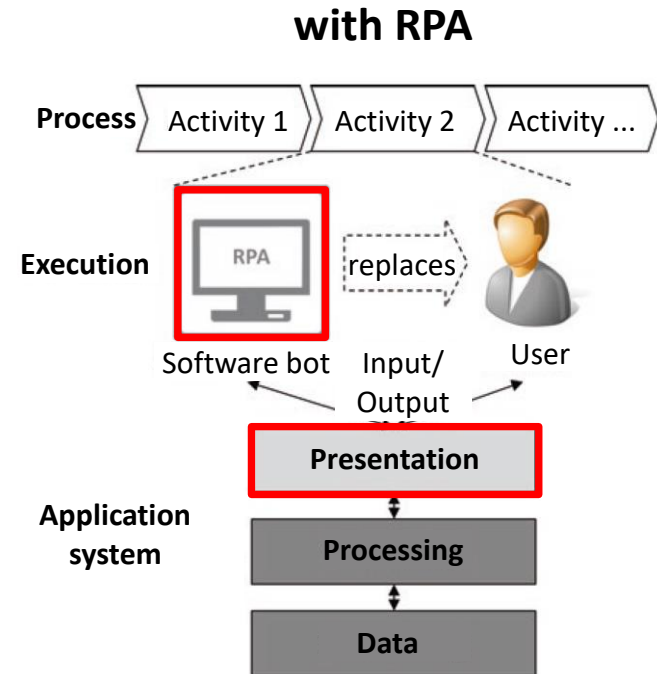
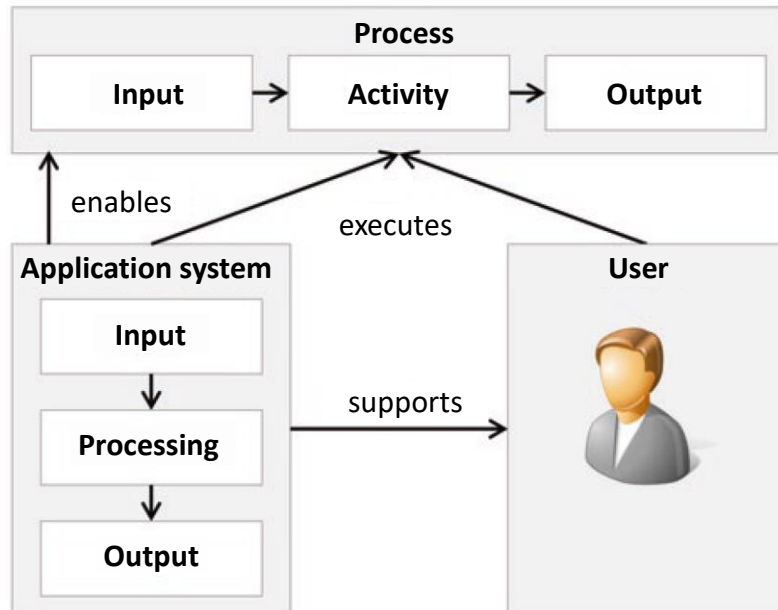
High number of repetitions: the cost of automation is only worthwhile if a corresponding number of instances are executed, as otherwise the development costs will far exceed any process costs saved.

Standardization: If processes are only weakly structured and always run differently, an engine is out of place. The majority of instances must therefore follow the **same pattern**.

Information intensity: In principle, “**information-heavy**” processes are better suited to automation. If physical objects are often moved, automation is usually difficult.

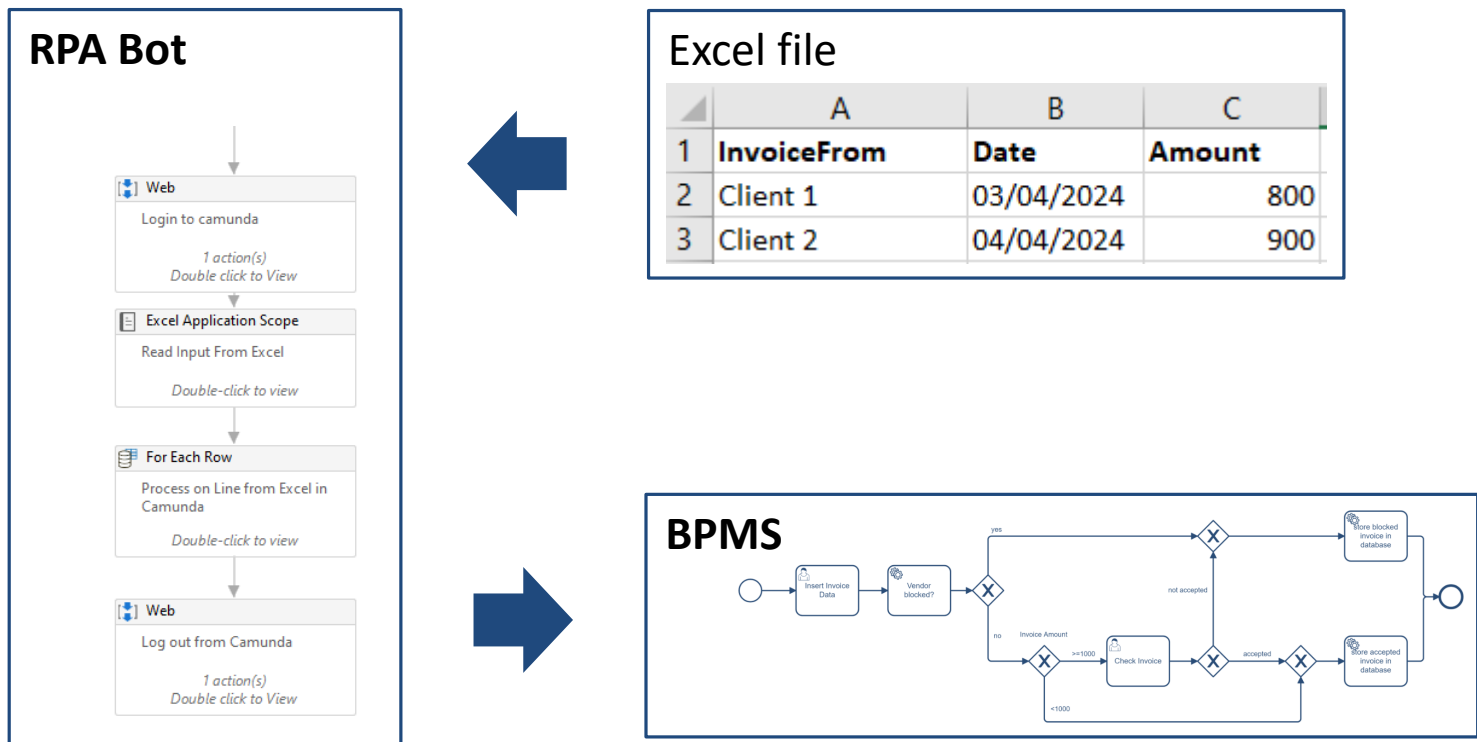
Robotic Process Automation (RPA) - Definition

- RPA is an umbrella term for tools that operate on the **user interface** of other computer systems in **the way a human would do**. (Aalst 2018)
- RPA tools perform [if, then, else] statements on structured data, typically using a combination of **user interface interactions**, or by connecting to APIs to drive client servers, mainframes or HTML code. (Gartner 2017)



Robotic Process Automation (RPA) - Demo

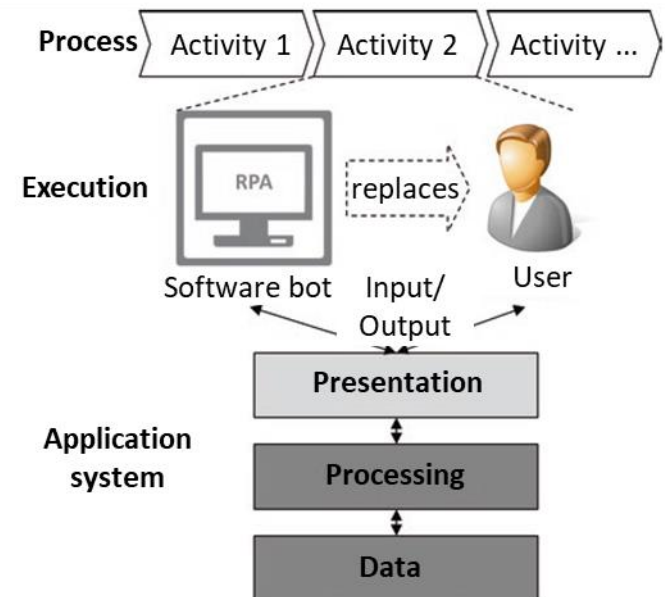
- The strength of RPA lies in the integration of processes that run across multiple applications
- **Example:** Input of invoice data from an excel file to an invoice workflow implemented in an BPMS



Robotic Process Automation (RPA) - Typical tasks

There are typical tasks in public administrations which can be solved by RPA applications, e.g. data integration or transformation and process integration

- **Fill in masks**, e.g. when available data needs to be filled into an electronic form
- **Reading and writing in databases**
e.g. when information needs to be updated in a administrative information system
- **Extract data**, e.g. from electronically submitted applications or forms
- Login and **access data** from enterprise resource planning (ERP) systems
- **Integrate data** from different information systems
- Access and process e-mails
- etc.



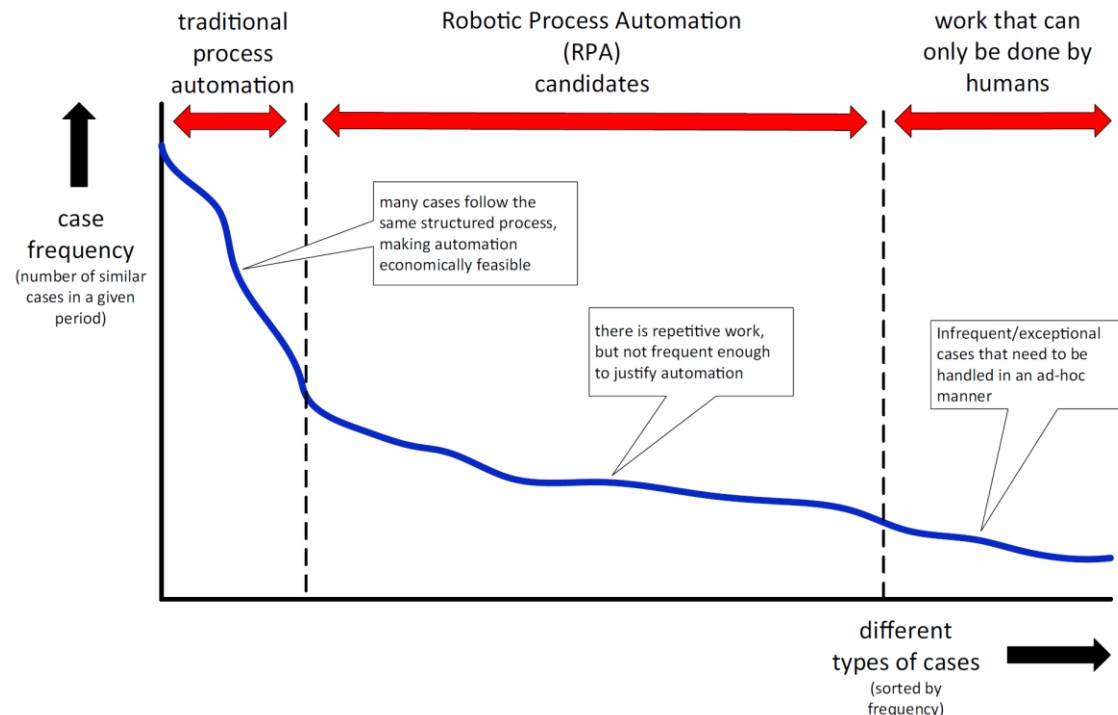
(Houy 2019)

Robotic Process Automation (RPA) - When to use?

- **well-structured, highly standardized processes with high process volumes.**
Due to the elimination of programming effort, the automation of a process with RPA already pays off if two to three employee capacities can be replaced
- Various complex, **non-integrated application systems** are used during process execution.
- Processes that contain series of **fairly simple, repetitive work steps** that can be described with the help of **clear rules**.
- For work steps that have been carried out by users with the help of user interfaces, whereby **data is transferred manually from one system to another**.

Which processes should be automated - Selection criteria

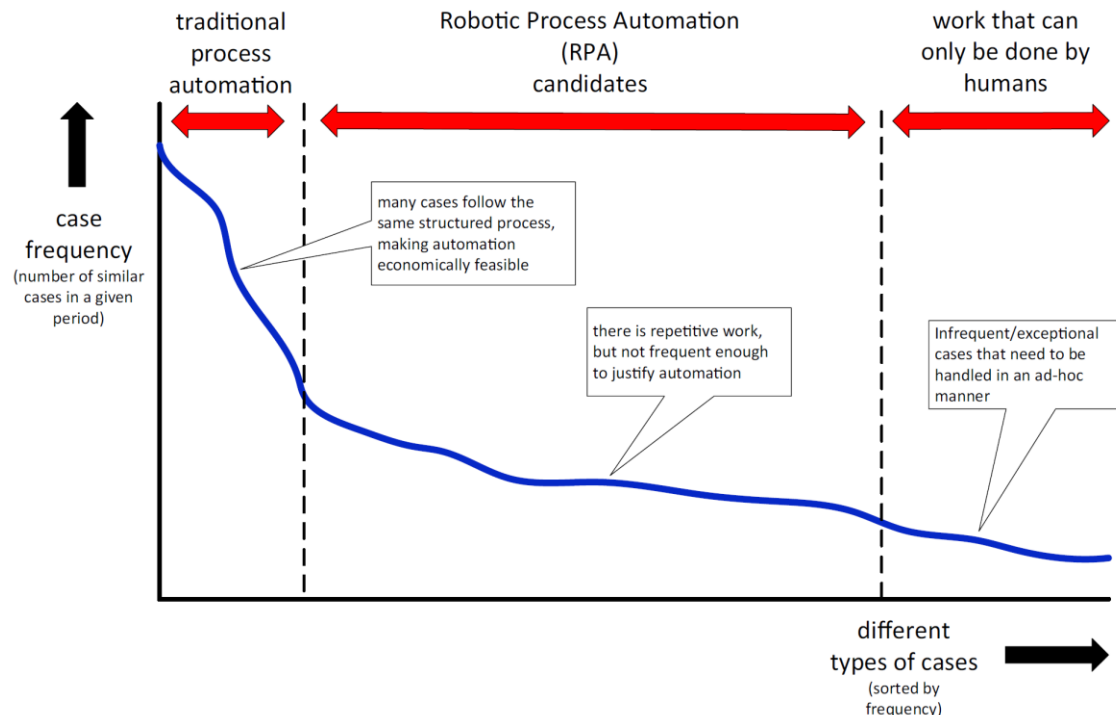
- **Case Type:** Business transactions are of the same case type if they can be processed in the same way (process variants)
- **Case Frequency:** number of business transactions per case type
- often 80% of the business transactions in an organization can be processed with 20% of the case types → these case types are target of traditional process automation (e.g. BPMS, standard software)



(Aalst 2018)

Which processes should be automated - Selection criteria

- Less frequent case types are often not considered for traditional process automation as the **effort** for automation **exceeds the (monetary) benefit**
- These case types cover 20% of business transactions, but manual activities by people are still necessary → „Humans serve as the glue between different IT systems“



(Aalst 2018)

Which processes should be automated - Selection criteria

(Asatiani 2016)

Criteria	Description
High volume of transactions	Task considered is performed frequently or includes high volume of sub-tasks.
Need to access multiple systems	Task involves accessing multiple systems . <i>Example:</i> copying data from a spreadsheet to a customer registry.
Stable environment	Task is executed within predefined set of IT systems that remain same every time a task is performed.
Low cognitive requirements	Task does not require creativity, subjective judgment or complex interpretation skills.
Easy decomposition into unambiguous rules	Task is easy to break down into simple, straightforward, rule-based steps , with no space for ambiguity or misinterpretation. <i>Example:</i> Allocate all incoming invoices from Company X with value 3000€ or more to category Y.
Proneness to human error	Task is prone to human specific error, not occurring to computers. <i>Example:</i> Matching numbers across multiple columns.
Limited need for exception handling	Task is highly standardized . Little or no exceptions occur while completing a task.
Clear understanding of current manual Costs	Company understands current cost structure of a task and is able to estimate difference in cost and calculate return on investment (ROI) of RPA.

Which processes should be automated - Selection criteria

Not all processes that are suitable for automation can actually be fully automated

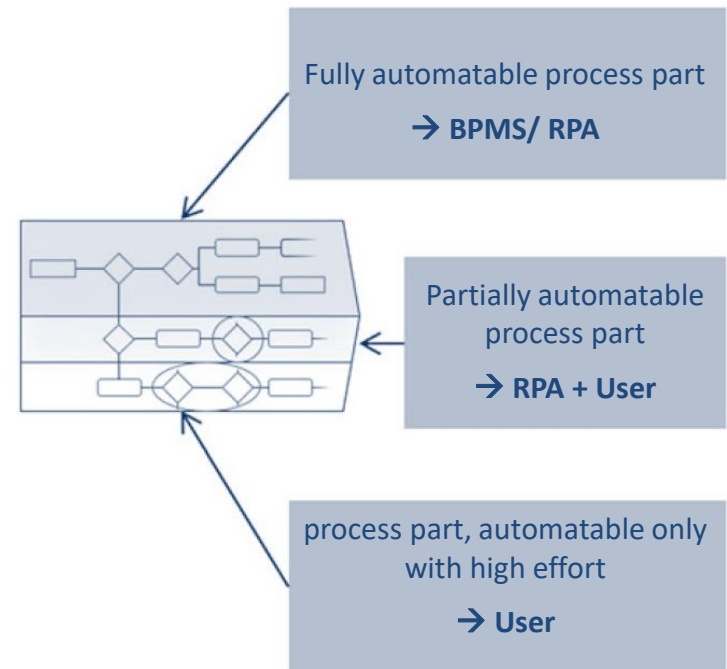
- Only less than 5% of all activities - across all industries - can be 100% automated.

(McKinsey Global Institute 2017)

- In contrast, 60% of all activities have a share of at least 30% that can be automated.

BPMS/ RPA are **not necessarily a complete replacement** for human labor, but a useful supplement/support for simple, repetitive activities

When selecting a process for automation, it makes sense to **divide the process up**



(Smeets 2019)