



Business Process and Decision Automation:

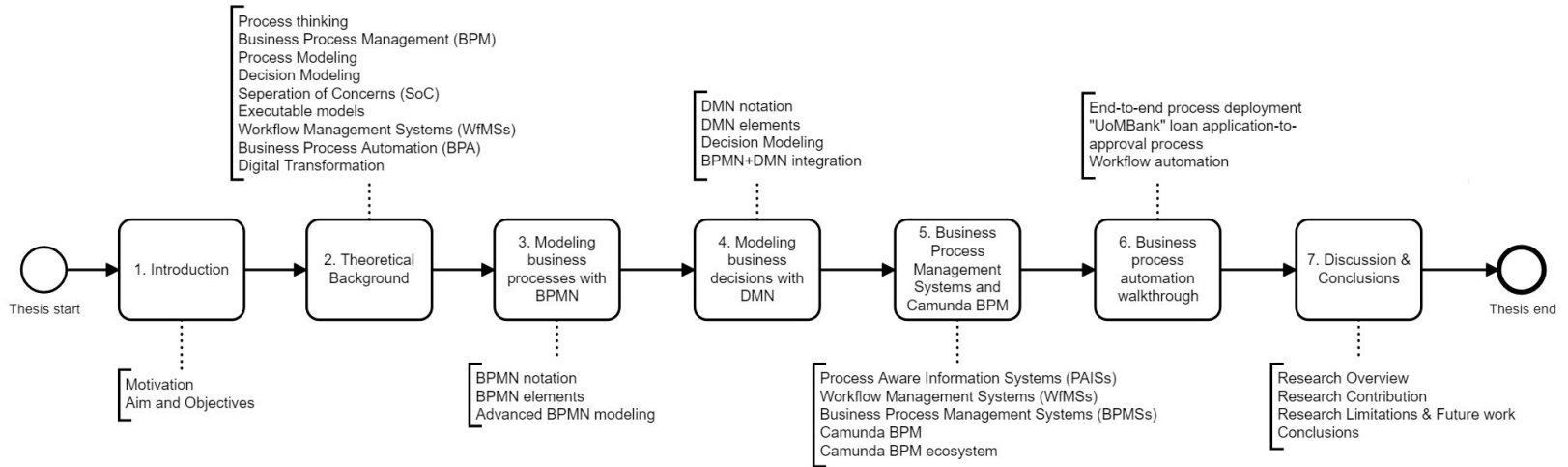
*End-to-end deployment with a BPMN and
DMN-based workflow engine*

MSc Thesis Presentation
Nikolaos Nousias
mai20046@uom.edu.gr
Supervisor: Dr Kostas Vergidis

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Thesis Layout



1 Introduction



Research Motivation

- 1 Undergoing trend towards **process and decision automation**, where human intervention can be eliminated and business processes can be accelerated.
- 2 In the previous years, the most common approach for executing processes and decisions in an automatic way, was in a **classical programming language**, where the **logic was hidden inside thousands of lines of code**, thereby **decreasing the transparency** of business processes.

Thesis Aim

Workflow automation based on executable notations, namely the BPMN and DMN notations, achieving high transparency of processes and decisions.

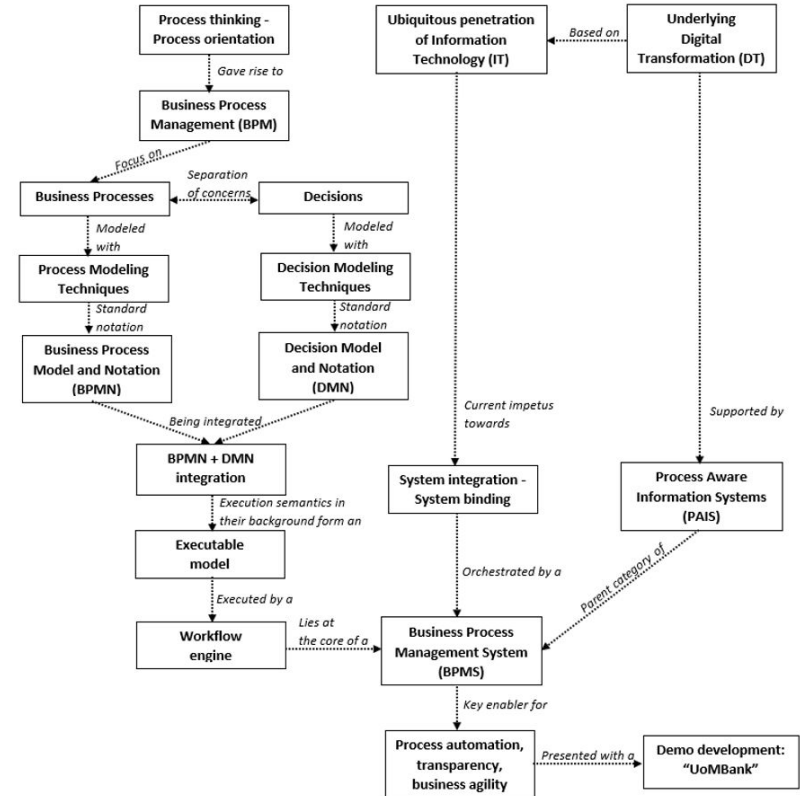
Objectives

- 1 Present the **expressive power of BPMN** to render business processes in a graphical, yet executable way
- 2 Display how **the decision logic of BPMN models can be externalized to DMN models**
- 3 Render **how BPMN and DMN notations can be integrated** in end-to-end business processes
- 4 Automate a business process with a BPMN and DMN-based workflow engine.

2 Theoretical Background

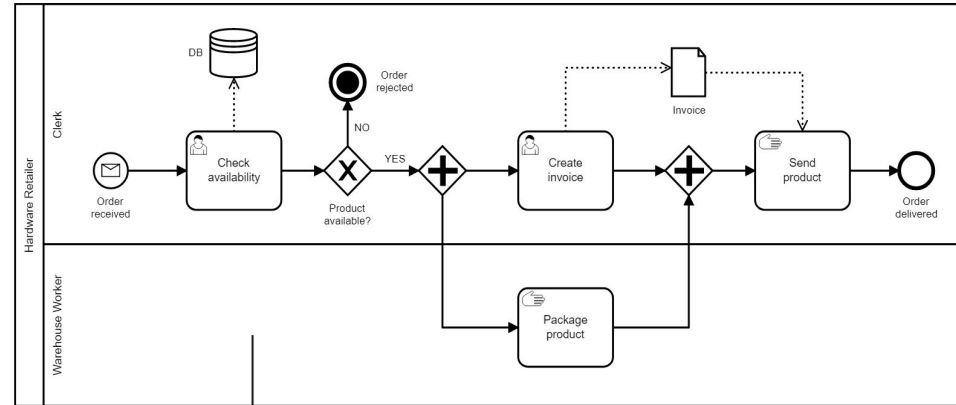
Driving forces of business process automation

- 1 The emergence of **process thinking** notion
- 2 The ubiquitous penetration of **Information Technology (IT)** on the BPM spectrum
- 3 The underlying **digital transformation** of today's organizations.



3 Business Process Model and Notation (BPMN)

- 1 Administered by the **Object Management Group (OMG)**. Currently, **BPMN 2.0** version.
- 2 Constitutes the **de facto technique** for modeling business processes.
- 3 Accepted as an **ISO (ISO/IEC 19510:2013)** standard.
- 4 Developed with the ultimate goal to be **understandable by all business users** and **bridge the gap between the business process design and process implementation**.
- 5 With the advent of **BPMN 2.0**, a **standardized serialization and interchange format**, as well as **standardized execution semantics** for all BPMN elements, were thoroughly introduced.



```
<?xml version="1.0" encoding="UTF-8"?>
<bpmn:definitions xmlns:bpmn="http://www.omg.org/spec/BPMN/20100524/MODEL" xmlns:bpmndi="http://www.omg.org/spec/BPMN/20100524/MODEL-DI" id="Collaboration_0xroy69">
  <bpmn:collaboration id="Collaboration_0xroy69">
    <bpmn:participant id="Participant_08yqc4p" name="Hardware Retailer" processRef="Process_09bgi77" />
    <bpmn:participant id="Participant_08yqc4p" name="Warehouse Worker" processRef="Process_09bgi77" />
    <bpmn:process id="Process_09bgi77" isExecutable="true">
      <bpmn:laneSet id="LaneSet_1687xle">
        <bpmn:lane id="Lane_1vlyqt6" name="Clerk">
          <bpmn:flowNodeRef>StartEvent_1</bpmn:flowNodeRef>
          <bpmn:flowNodeRef>Gateway_03kx7uk</bpmn:flowNodeRef>
          <bpmn:flowNodeRef>Gateway_1n9r5gw</bpmn:flowNodeRef>
          <bpmn:flowNodeRef>Activity_1htsopd</bpmn:flowNodeRef>
          <bpmn:flowNodeRef>Gateway_1ded9c8</bpmn:flowNodeRef>
          <bpmn:flowNodeRef>Activity_02zjgtz</bpmn:flowNodeRef>
          <bpmn:flowNodeRef>Activity_1krgllg</bpmn:flowNodeRef>
          <bpmn:flowNodeRef>Event_lup2huq</bpmn:flowNodeRef>
          <bpmn:flowNodeRef>Event_09ht0x2</bpmn:flowNodeRef>
        </bpmn:lane>
        <bpmn:lane id="Lane_0rdaepg" name="Warehouse Worker">
          <bpmn:flowNodeRef>Activity_18rt1ks</bpmn:flowNodeRef>
        </bpmn:lane>
      </bpmn:laneSet>
    </bpmn:process>
  </bpmn:collaboration>
</bpmn:definitions>
```

XML serialization:
Portability
Interoperability

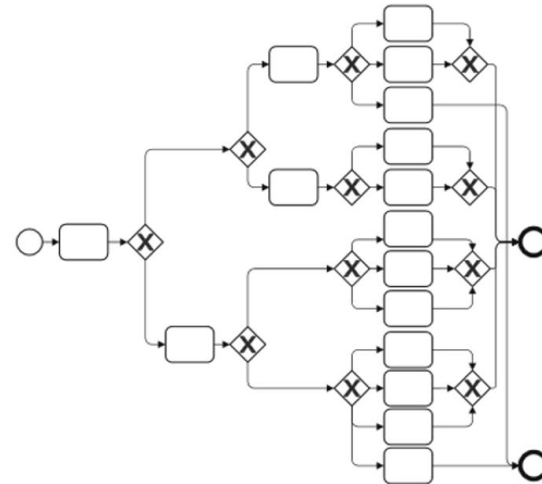
Decision logic in BPMN models

As process execution unfolds, multiple decisions are taken. Due to the **intertwining nature of processes and decisions**, a **convolution of decision and process logic** is frequently encountered.

Even if decision-making is an integral part of BPM, **BPMN notation does not support explicitly the modeling of decision logic in business processes.**

Typically, the **decision logic of BPMN models** is rendered with **control flow constructs**, such as exclusive (XOR) gateways and **script tasks**, that in their background implement the desired decision logic.

1) Decision logic with exclusive gateways...

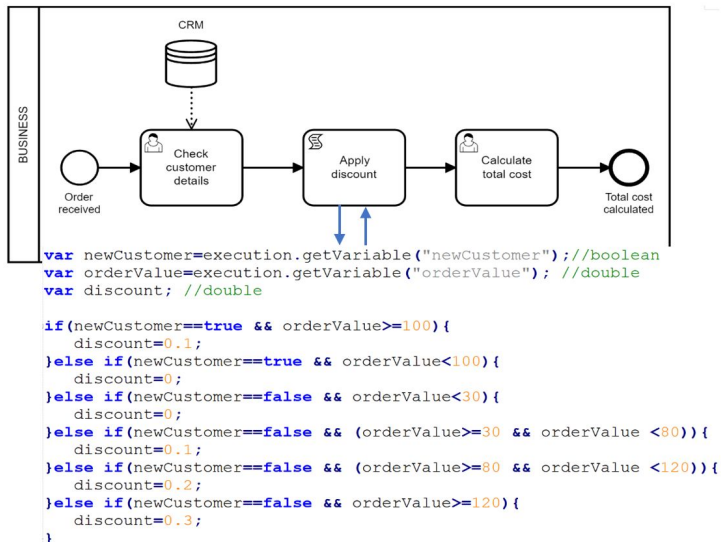


Source: Batoulis et al. (2015), Extracting Decision Logic from Process Models

... leads to **spaghetti-like processes**, **high complexity** and **decreased maintainability, scalability and flexibility** of both processes and decisions.

Decision logic in BPMN models

2) Decision logic with script tasks...



Overall:

BPMN is not tailored to the modeling of the decision logic of business processes.

For this reason, **Decision Model and Notation (DMN)** emerges as the **standard notation** to model repetitive operational decisions, while it is interestingly well integrated with the BPMN notation.

... leads to **low transparency**, **hard-coded decisions**, while it is more about **coding rather than modeling**.

4 Decision Model and Notation (DMN)

1

Recent standard for **modeling and automating decisions**, introduced by OMG in 2015 (currently DMN 1.3).

2

Main focus on **modeling and automating recurrent operational decisions**, that depend on an established decision logic.

3

Developed with the ultimate goal to be **facilitate the business - IT alignment** and **be integrated with the BPMN notation**.

4

Renders **business decisions in two levels**, namely the **decision requirements** and the **decision logic** level.

5

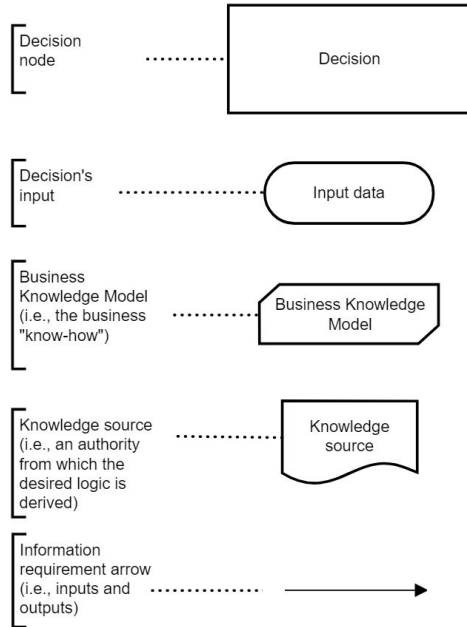
It is both a **graphical and executable notation**, supporting an **XML serialization format**.



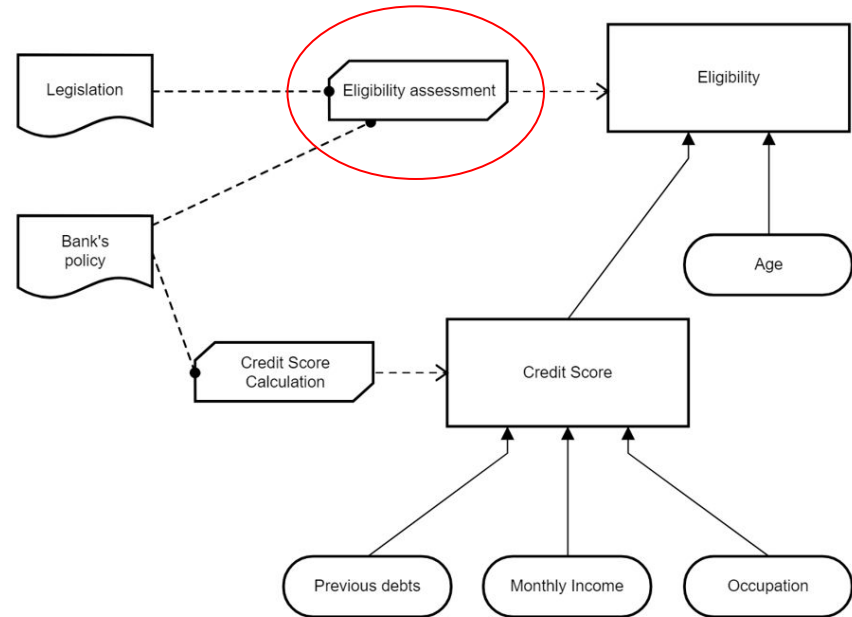
Decision requirements level

Rendered graphically with a Decision Requirements Diagram (DRD).

Basic elements:

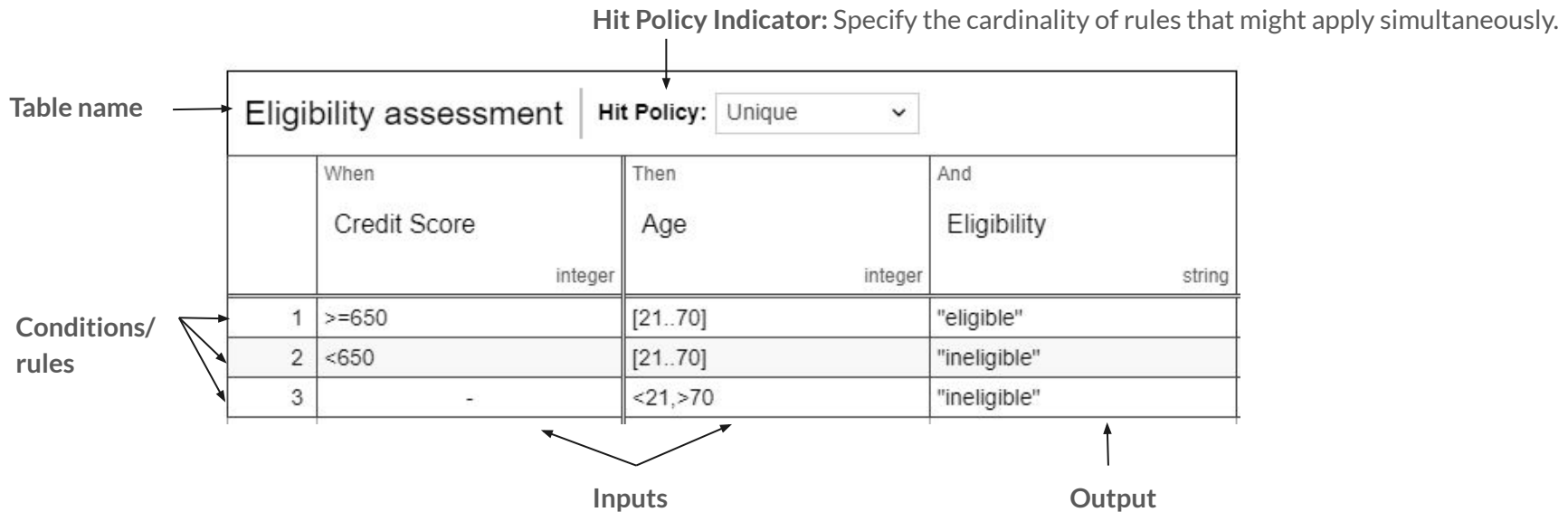


Highlights the **decision requirements** and the **decision interrelationships**.



Decision logic level

Rendered with **Decision Tables**.



Decision-making with DMN

Example

Inputs:

Eligibility assessment

Age: 46

Credit score calculation

Monthly Income: 1400

Previous Debts: 700

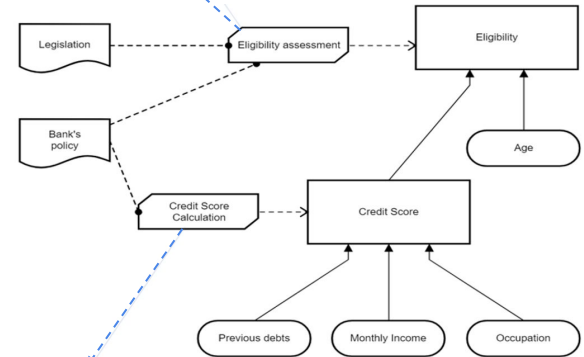
Occupation: employed

Outputs:

Eligibility: eligible

CreditScore: 720

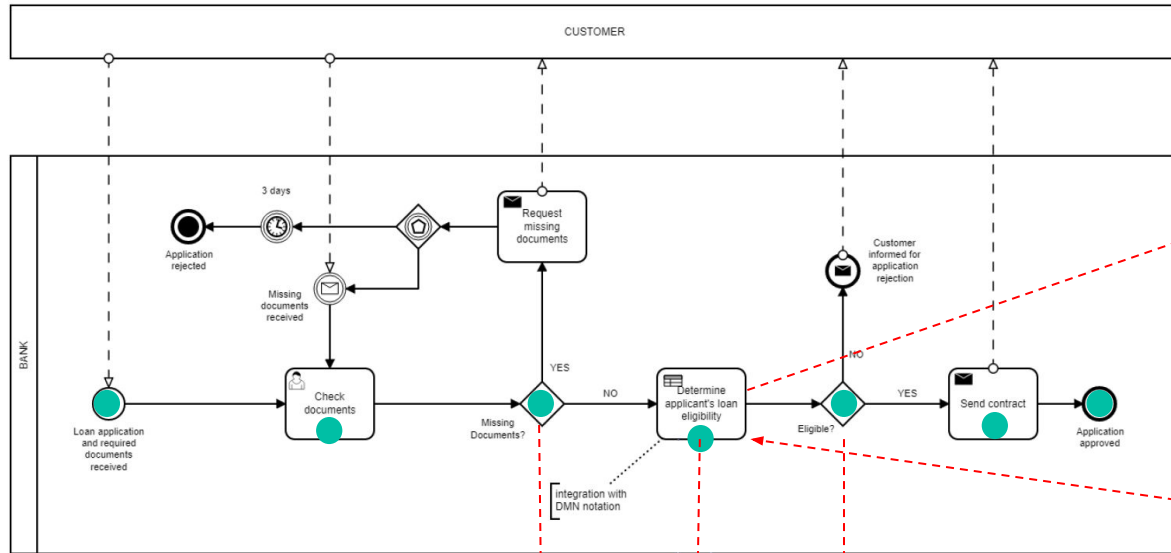
Eligibility assessment				Hit Policy: Unique
	When	And	Then	
	Credit Score	Age	Eligibility	
	integer	integer	string	
1	>= 650	[21..70]	"eligible"	
2	< 650	[21..70]	"ineligible"	
3	-	< 21,>70	"ineligible"	



Credit score calculation					Hit Policy: Collect (Sum)
	When	And	And	Then	
	Monthly Income	Previous Debts	Occupation	CreditScore	
	integer	integer	string	integer	
1	<500	-	-	100	
2	[500..800[-	-	150	
3	[800..1000[-	-	180	
4	[1000..1200[-	-	210	
5	>= 1200	-	-	250	
6	-	< 500	-	350	
7	-	[500..800[-	300	
8	-	[800..1500[-	180	
9	-	[1500..2500[-	140	
10	-	>= 2500	-	100	
11	-	-	"employed"	250	
12	-	-	"self-employed"	220	
13	-	-	"unemployed"	150	

BPMN and DMN integration

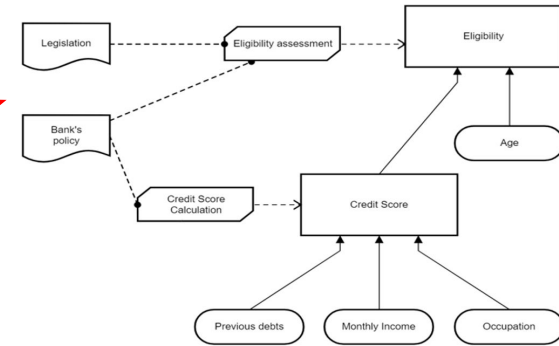
Research challenges arise in the context of integrating BPMN and DMN notations. → Ultimate aim to render business processes **decision-aware** and **decision-intelligent**.



Routing decision

Routing decision

Business decision

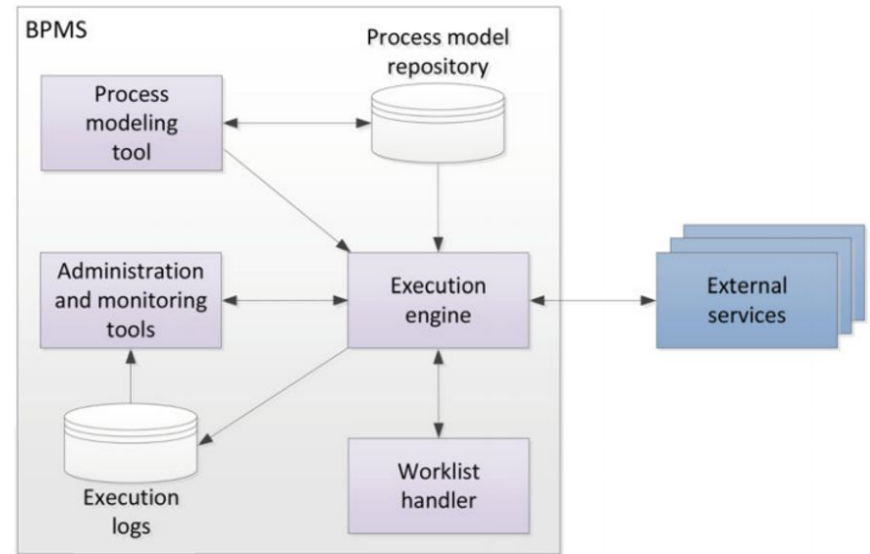


Eligibility: eligible

5 Business Process Management Systems (BPMSs)

Business Process Management Systems (BPMSs) have emerged as more sophisticated variants of Workflow Management Systems (WfMSs), supporting not only the execution of process models, but arising also as the technology response to support the entire BPM lifecycle.

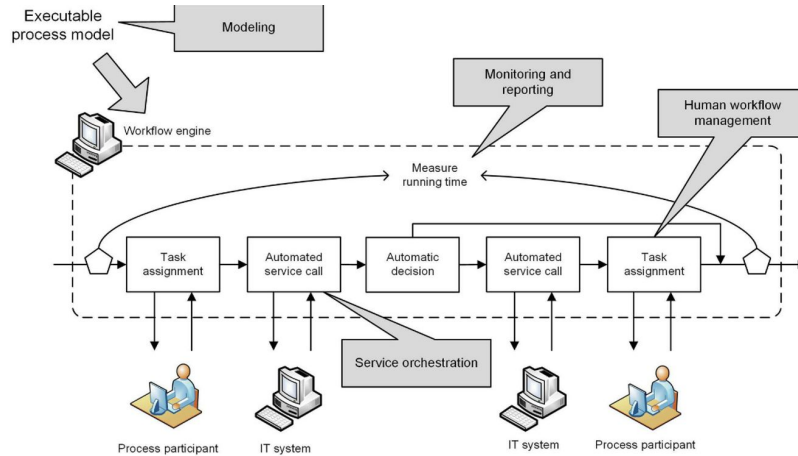
BPMS Architecture



Source: Dumas et al. (2018), Fundamentals of Business Process Management

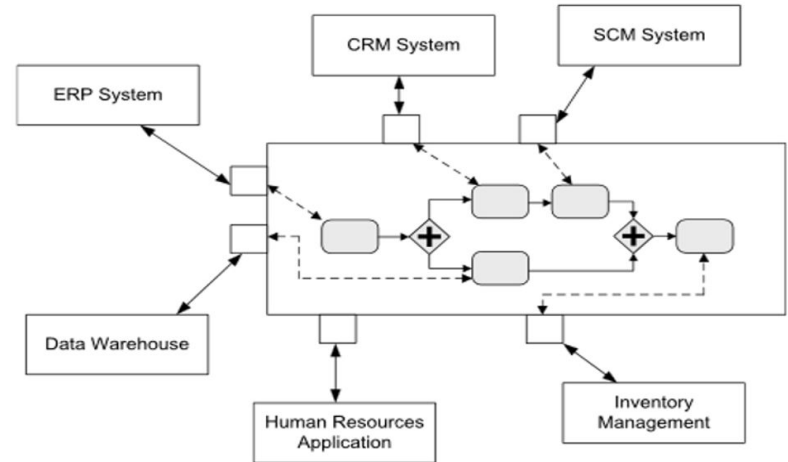
Workflow engine

Serving as the **backbone of a BPMS**, the **workflow engine** is deemed to pull the strings of automatic process and decision execution on the basis of an **executable model**.



SOURCE: J. Freund and B. Rücker. (2019), Real-Life BPMN (4th edition): Includes an introduction to DMN

The workflow engine ensures that the **right information** reaches the **right person or computer application** at the **right time**.



SOURCE: M. Weske. (2007), Business Process Management: Concepts, Languages, Architectures



6 Live Demo

Banking industry - opportunities for automation

Today's highly competitive marketplace and the volatile business environment has put pressure on the banking industry to get digitalized, accelerate its operations and reinvent its bureaucratic processes.

Processes in banking industry are highly influenced by strict regulatory compliance strategies, that delineate specific guidelines as the process lifecycle unfolds.

Application - to - approval process: Defined as a business process where a plethora of activities, events and decisions are performed, before a privilege being granted or denied

Source: Dumas et al. (2018), Fundamentals of Business Process Management

Loan application-to-approval process at the fictitious bank, “UoMBank”.

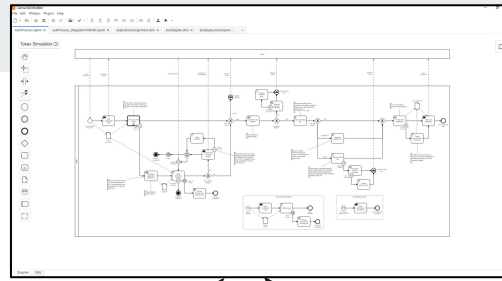
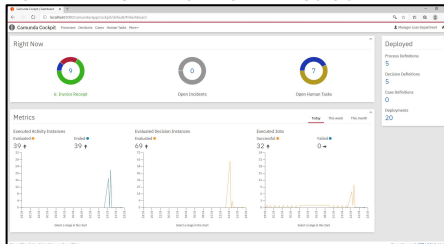


Architecture

Front end - End users - Applicant



Backend - UoMBank administration



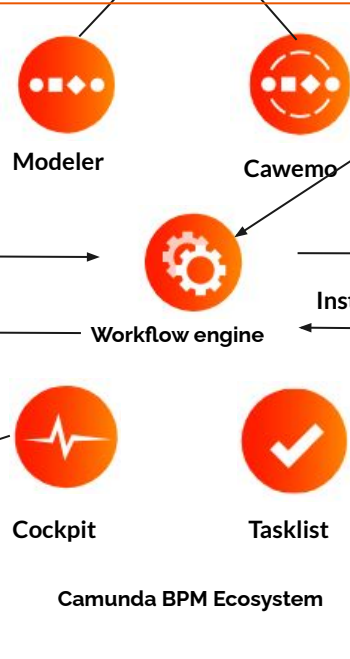
Executable BPMN model



Maven Project with
Camunda's Archetype

Eclipse IDE

.war



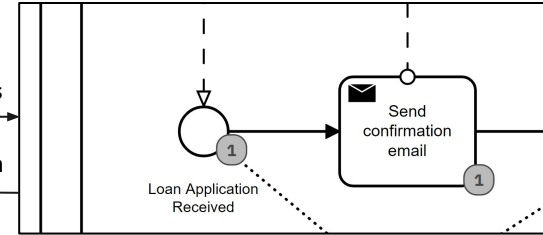
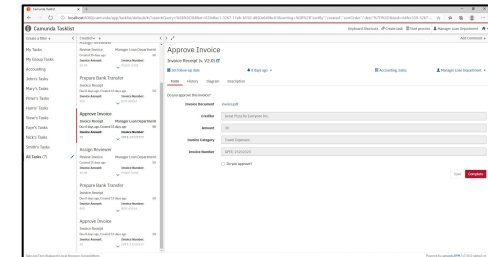
REST API call

Response

Trigger process

Instance completion

Backend - UoMBank employees



7 Discussion & Conclusions

Research Contribution

- 1 Contributes to the already existing academic work around the workflow automation, by providing not only the theoretical concepts behind it, but also by introducing a practical example of a loan application-to-approval process.
- 2 Introduces how workflow automation can be applicable with a BPMN and DMN-based workflow engine.
- 3 Highlights the BPMN and DMN integration in an end-to-end business process.

Research Limitations

Real business process examples are not presented explicitly in literature.

Future work

- 1 BPMN models integration with Machine Learning (ML) algorithms. Invoke and retrieve the knowledge of an algorithm, by the means of BPMN service tasks.
- 2 Utilization of Robotic Process Automation (RPA) within BPMN models.

Conclusions

- 1 Workflow automation is applicable for high repetitive, standardized and rich in information business processes.
- 2 Workflow automation accelerates business processes, decreases error rates and increases customer satisfaction.
- 3 Workflow automation on the basis of executable models, like BPMN and DMN models, refines the transparency of both processes and decisions.



Thank you.

