


TAL TECH

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BUSINESS PROCESS MANAGEMENT (BPM) AND BLOCKCHAIN

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AGENDA

- INTRODUCTION TO BPM
 - Ingredients of a business process
 - Sample business processes
 - Business process management and life-cycle
- PROCESS-AWARE INFORMATION SYSTEMS
 - Types of process aware information systems
 - Architecture of BPMS
 - Advantages of process-aware information systems
- EXECUTING BUSINESS PROCESS ON BLOCKCHAIN
 - Introduction to Caterpilla (Business process execution engine on blockchain)
 - Architecture
 - Compilation of BPMN into Smart-contract (solidity)

INTRODUCTION

Citation [1]

WHAT IS A BUSINESS PROCESS?

A business process as a collection of inter-related events, activities, and decision points that involve a number of actors and objects, which collectively lead to an outcome that is of value to at least one customer.

Ingredients of a business process

- Business process contains **events, activities** and **decision points**
- Business process delivers either **positive** or **negative outcomes**
- Business process involves actors and objects.

An example of a customer, representative in an organization

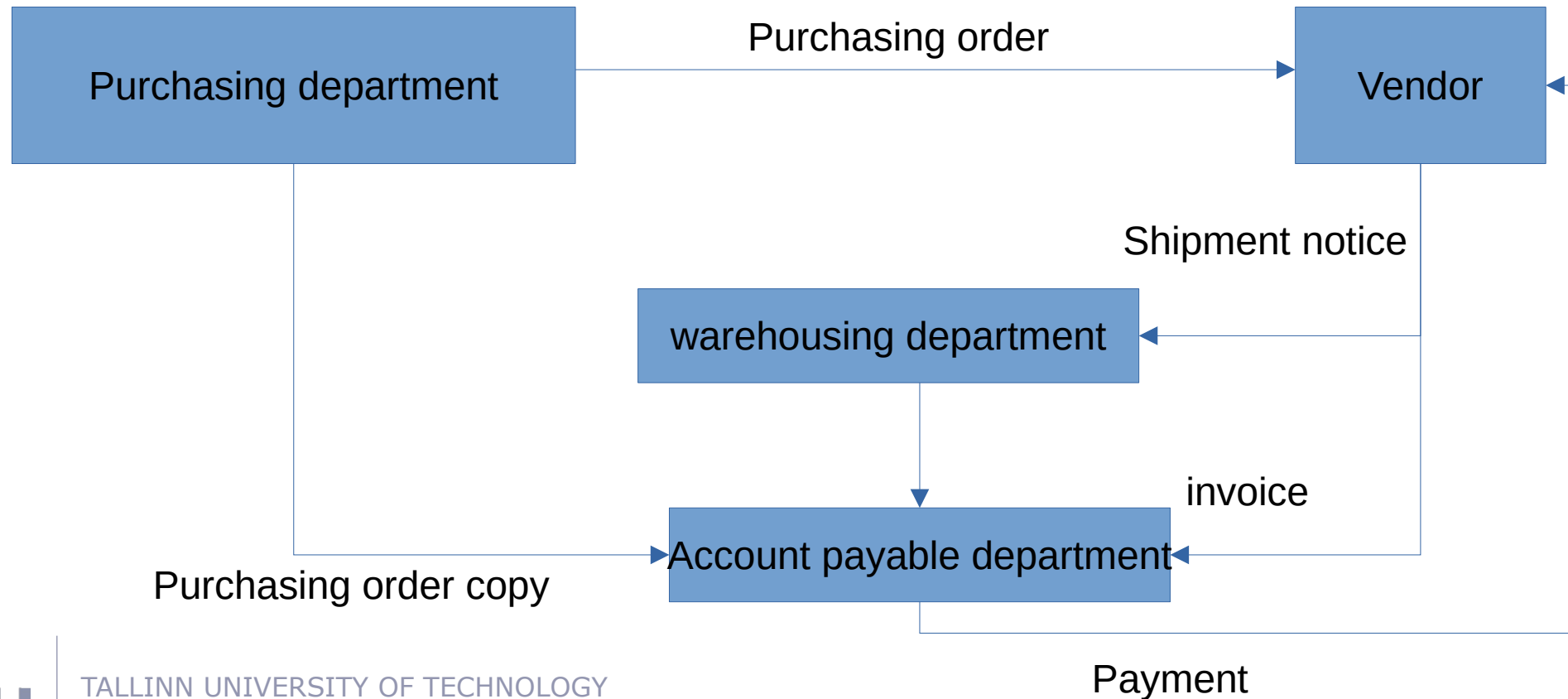
Objects can include different resources used in executing a business process

WHAT IS BUSINESS PROCESS MANAGEMENT:

BPM as a body of methods, techniques, and tools to identify, discover, analyze, redesign, execute, and monitor business processes in order to optimize their performance.

SAMPLE BUSINESS PROCESS

An example of a business process is the initial purchasing process at Ford company



BUSINESS PROCESS MANAGEMENT LIFE-CYCLE

Establishing Process Thinking in Organizations

- Establish BPM Team
- Describe Process Architecture
- Define Process Performance Measures
- Discover and Model Processes
- Analyze, Redesign, Implement and Monitor Processes
- Make Use of Process-Aware Information Systems

Steps for business process lifecycle management involves:

1. Process discovery: As-is process model
2. Process analysis: insight in process weaknesses and impact
3. Process redesign: to-be process model
4. Process implementation: executable process model
5. Process monitoring: conformance and performance insights

PROCESS-AWARE INFORMATION SYSTEMS

Domain-Specific Process-Aware Information Systems

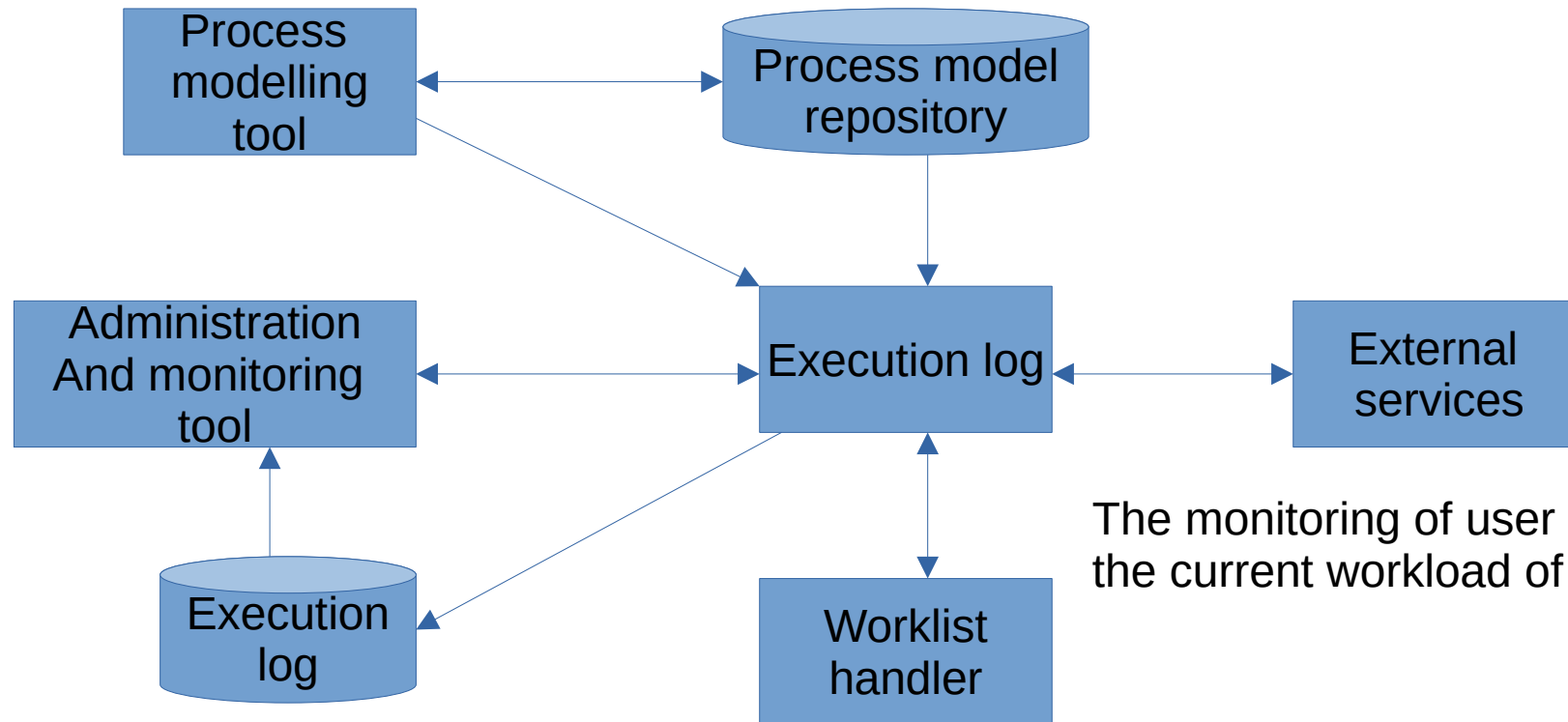
- Enterprise Resource Planning (ERP) systems:
 - Provide generic business functionality, which is required across various industries.
 - Supports accounting, controlling, human resource management, and production.
 - Most important processes covered are procure-to-pay and order-to-cash process.
- Customer Relationship Management (CRM) systems:
 - Support marketing and sales.
 - Helps to document interaction with customers through various channels.
 - Supports sales and marketing activities related to products, pricing, distribution, and campaigning.
 - Most important processes supported are campaign-to-leads and lead-to-order.

PROCESS-AWARE INFORMATION SYSTEMS

Domain-Specific Process-Aware Information Systems

- Supply Chain Management (SCM) systems:
 - Focus on support of logistics operations.
 - Support for freight and transportation, warehousing, storage and inventory.
 - Support electronic data interchange, tracking technologies such as Radio-Frequency Identification (RFID) and barcode scanning.
 - Key supply chain processes are order-to-delivery and return-to-refund.
- Product Lifecycle Management (PLM) systems:
 - Support processes of product lifecycle from engineering perspective.
 - In realisation phase, manufacturing system is planned and actual products are built, assembled, and tested.
 - In service phase, products are sold and delivered, used, maintained, and eventually disposed of.
 - Important processes are idea-to-launch and different types of order processes.

ARCHITECTURE OF PROCESS MANAGEMENT SYSTEMS



The monitoring of user queues provides good transparency of the current workload of the different process participants.

ADVANTAGES OF BUSINESS PROCESS MANAGEMENT SYSTEM

Workload Reduction

- Straight-through processing
- Less coordination
- Less gathering of relevant information

Flexible systems integration

- Generic functionality of process layer
- Easier to change process logic
- Island automation

Execution Transparency

- Transparency of operational information
- Transparency of historic information

Rule Enforcement

- Reducing freedom of executing process
- Enforce separation of duties
- Implement control tasks

CHALLENGES OF BUSINESS PROCESS MANAGEMENT SYSTEM

Technical Challenges

- Applications often not developed from a business process perspective
- Screen scraping might be required to integrate input and output from legacy
- Batch processing systems do not work with a case concept
- Middleware, Enterprise Application Integration, Service-oriented Architecture and Web Service solutions support integration

Organizational Challenges

- Complexity due to exceptions
- Adjust to pace of organizational change
- Potential fears of process participants
- Strong management commitment needed

BUSINESS PROCESS MANAGEMENT SYSTEM ON BLOCKCHAIN

CATERPILLAR is an example of Business Process Execution Engine on the Ethereum Blockchain [2]

About Caterpillar

- Caterpillar executes state of each process instance is maintained on the Ethereum blockchain
- The workflow routing in caterpillar is performed by smart contracts that transforms BPMN process to solidity codes
- Caterpillar's Execution Engine provides the operations to deploy a BPMN model (deploying of the smart contract codes generated by the transformation tool)
- The execution engine is also responsible for executing automated script tasks and for triggering external service calls whenever a service task is enabled.
- The Event Monitor listens to events generated by the blockchain and generates notifications

SYSTEM OVERVIEW OF CATERPILLAR BLOCKCHAIN BPMN

Process Repository and Ethereum Log: stores and provides access to compilation artifacts, including the BPMN process models, the Solidity code generated

On-Chain Runtime Components: consists of runtime registry, worklist handler, workflow handler, contract factories and service bridge. The on-chain components run on the Ethereum blockchain platform, and store and support the execution of smart contracts that fully encode a set of process models

Off-chain Runtime: consists of the BPMN compiler, deployment mediator, execution monitor and event monitor. The off-chain components provides a service-oriented layer to allow external applications to interact with the on-chain components and the repository.

COMPILLATION OF BPMN TO SOLIDITY IN CATERPILLA

Caterpillar supports the following elements in the standard BPMN 2.0:

Tasks: user tasks, service tasks, and script tasks,

Gateways: exclusive gateways, parallel gateways, event-based gateways,

Subprocesses: embedded subprocesses, event subprocesses,

Activities: call activities, parallel and sequential multi-instance activities.

The Caterpillar compiler provides the possibility to automatically transform these BPMN elements into solidity codes for the generation of smart contracts for specific business processes.

References

1. Dumas, Marlon, et al. Fundamentals of business process management. Vol. 1. Heidelberg: Springer, 2013.
2. López-Pintado, Orlenys, et al. "Caterpillar: a business process execution engine on the Ethereum blockchain." Software: Practice and Experience 49.7 (2019): 1162-1193.