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# Business process modelling and analysis as a start point for process change management

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# BUSINESS PROCESS MODELLING AND ANALYSIS AS A START POINT FOR PROCESS CHANGE MANAGEMENT / Modelowanie procesów biznesowych jako punkt początkowy zmiany zarządzania

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**Streszczenie**

Modelowanie procesów biznesowych jest obecnie jednym z najczęściej używanych terminów w teorii zarządzania. Stanowi on pierwszy i najważniejszy krok w realizacji zarządzania zmianami. Celem pracy jest przedstawienie metod modelowania procesów biznesowych oraz opisanie aktualnej sytuacji w przemyśle drzewnym Słowacji. Ponadto artykuł dotyczy porównania przemysłu przetwórstwa drzewnego z branżą odniesienia.

**Słowa kluczowe:** Modelowanie procesów biznesowych; Zarządzanie zmianami; Diagram przepływu danych; OLAP Kostka; Petri Nets.

**Abstract**

Business Process Modelling and Analysis are nowadays the most used words in management theory. They are the most important steps for implementation of the process changes because they enable identification of needed changes in processes. The aim of the paper is to present methods of business process modelling and analysis and describe the current situation in the wood-processing industry of Slovakia. In addition, the paper deals with the comparison of wood processing industry with a benchmark industry.

**Key words:** Business Process Modelling; Change Management; Data Flow Diagram; OLAP Cube; Petri Nets.

JEL Classification: M21, O21, L25

## 1. INTRODUCTION

Business process management (BPM) is the management of all internal processes with emphasis on improving corporate performance by their optimising. This systematic approach makes an organization's workflow more effective, more efficient and more capable of adapting to an ever-changing environment. Process approach helps organization to reach required results by managing all operations, activities and sources understood as one process. Meeting customer requirements is the core of Process Approach. Taking a process approach implies adopting the customer's point of view. Fundamentals of the BPM are process orientation, horizontal management and philosophy oriented to staff knowledge and skills (Truneček, 1999). Process modelling and analysis present two parts at the beginning of BPM. They are the basis for process improvement when the change of process can be started. Ability to manage changes in processes successfully becomes a competitive advantage.

The aim of the paper is to present modern methods for process modelling and analysis and their application in Slovak industrial companies from wood-processing and machinery industry as a benchmark. Using modern methods is considered to be a prerequisite of sustainable process performance and optimisation (Simanová, 2015).

## 2. THEORETICAL BACKGROUND

According to authors (Brockeand Roseman 2014) identification of BPM core elements requires an organization-wide perspective and the identification of the core

capability areas skills. Core elements of BPM are depicted in figure 1.

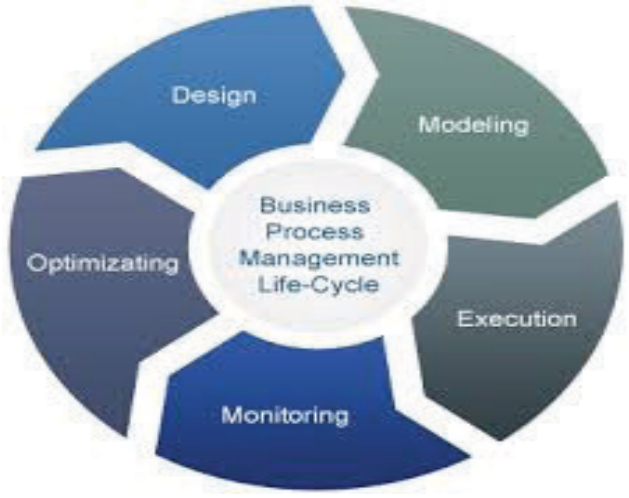
**Figure 1** BPM core elements

| Strategic Alignment | Governance | Methods | Information Technology | People | Culture | Factors |
|---|---|---|---|---|---|---|
| Process Improvement Planning | Process Management Decision Making | Process Design & Modelling | Process Design & Modelling | Process Skills & Expertise | Responsiveness to Process Change | Capability Areas |
| Strategy & Process Capability Linkage | Process Roles and Responsibilities | Process Implementation & Execution | Process Implementation & Execution | Process Management Knowledge | Process Values & Beliefs | |
| Enterprise Process Architecture | Process Metrics & Performance Linkage | Process Monitoring & Control | Process Monitoring & Control | Process Education | Process Attitudes & Behaviors | |
| Process Measures | Process Related Standards | Process Improvement & Innovation | Process Improvement & Innovation | Process Collaboration | Leadership Attention to Process | |
| Process Customers & Stakeholders | Process Management Compliance | Process Program & Project Management | Process Program & Project Management | Process Management Leaders | Process Management Social Networks | |

**Source:** Brocke, Roseman, (2014)

Business Process Management life cycle is created based on the company's strategic visions and goals. It can by stating that all activities in BPM could be grouped into the 5 categories which are depicted in figure 2 (Skjæveland 2013).

**Figure 2** BPM life cycle




**Source:** Skjæveland (2013)

According to Skjæveland (2013), Business Process Design and Modelling are the first steps of this BPM life cycle. When designing the processes, one must see the company as a whole and clearly distinguish the correlations between processes. It is necessary to answer the questions: "What are the main business processes in an organization? How to describe them?" These steps consist of identification and understanding of all internal processes (Sujová, Marcineková, 2016). When the processes are modelled, their theoretical design can be visually displayed. Process design and modelling can be integrated into one part of BPM. There exist many methods of business process modelling, namely (Aldin, de Cesare, 2009):

- Flow Chart – graphical visualisation of process structure and sequence of activities.
- Role Activity Diagram – process visualisation in time, logical description of individual following steps in process and interactions with external events.
- Petri Nets – mathematicaly-graphical modelling tool process dynamics

- Data Flow Diagram – presentation of system functionality with its process and data flows
- Business Process Modelling and Notation – scheme and language for process modelling
- Business Use Cases – description of organization behaviour.
- Business Object Interaction Diagram – communication and sequencial schemes.

Process analysis enables identification of process critical points and to know the process in detail. Models for process analysis could be divided into the 4 groups (Hermandez-Matias et al., 2006). Authors of the paper add Economic models to this categorization:

- Diagnostic Reference Models:

The core essence of these models are questionnaires with question focusing on the current state of the production system. Results are compared with reference tables. These tables analyse product structure, workflow and corporate coordination with other functional areas.

Procedures for measuring the principal system factors such as productivity, costs or flexibility making up second group of methodologies establishing how to match a reference model that is considered optimal. Important steps in models development are creation of web tools allowing utilization of indicators from connected databases. OLAP cubes (see figure 3) presents data structures for quickly data analysis and overcome the relational databases.

- Information Modelling:

Based on these process modelling techniques, a high number of process modelling tools have been developed, e.g., ARIS (IDS Scheer), Matis (NCR), FirstStep (Interfacing Technologies), MM/IEM (IPK), CimTool (RGCP), Grai-Tools (Graisoft), Scitor (Sciforma), Structware (Temas) or All-Fusion Modeller (Computer Associates). Of all these methodologies are part of the IDEF family. They present a set of activities taking inputs and through the mechanism inputs are managed and transformed to outputs.

- Dynamic Simulation:

It is the use of a computer program to model the time varying behaviour of a system. Simulation software provides the user interface allowing reducing of programming time, but the need for well-defined simulation model specifications is necessary. Hybrid Methods have been developed in order to get over boundaries of simulation models (fuzzy logic, experimental designing, genetic algorithm).

- Integrated Modelling Methods

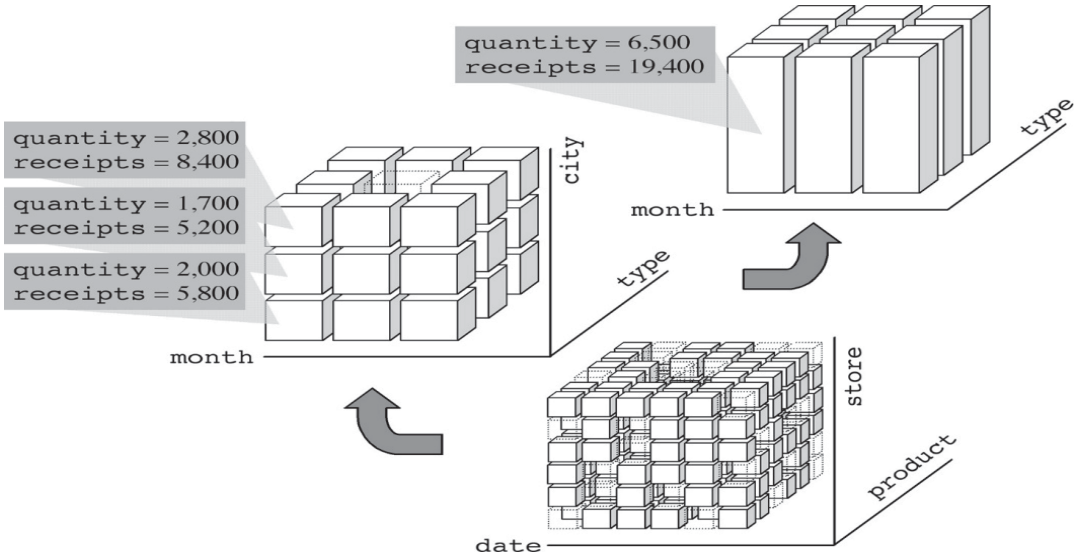
As a result of the limitations of methods and techniques, a limited number of integrated modelling methods have been developed such as:

  - GIM Methodology includes modelling methods: GRAI (decision.making system), MERISE (information system), IDEF0 (physical systems),
  - SIM (modelling methods: Data Flow Diagrams, GRAI Grids) - for static aspects of physical production processes,
  - GI-SIM (modelling methods: GRAI grid, IDEF0, SIMAN) – extends static model SIM by dynamic aspects,
  - IMF-M – united conception of physical and information processes,
  - IDEF3 – description of activities and mathematical relationships between inputs, output and managerial elements.

- Economic Models:

Schloske and Thieme (2010) present methods for production process analysis such as Activity Based Costing, Failure Mode and Effect Analysis, Value Stream Mapping, Six Sigma Methodology, Failure Process Matrix and Process Efficiency and Effectiveness Measurement.

**Figure 3** Online Analytical Processing (OLAP) multidimensional data cube




**Source:** Golfarelli, Matteo, and Stefano Rizzi (2009)

When the results of process analysis are known, the critical factors of processe are input data for suggestion of needed changes in the process. The management of changes follows. Change Management represent the process, tools and techniques to manage the change both from the perspective of an organization and the individual to achieve the required business outcome. Successful Implementation of the Change Management is a difficult process which includes critical activities such as trigger the Request for Change (RFC), perform the RFC Analysis, prioritize the change, categorize resource of change, create the Change Advisory Board, schedule the change, build and test the change and finally implement the change (Doherty-Waterhouse, 2006).

## 3. MATERIAL AND METHODS

In the primary quantitative research, online questionnaire as the main research method have been used.

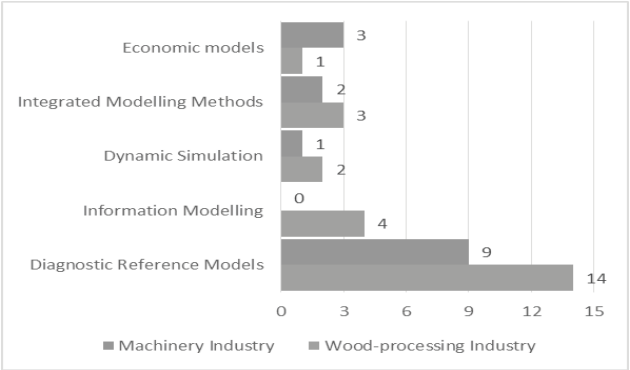
The enterprises from selected industrial branches of the Slovak Republic have been set as the research subjects. The partial aim of the research has been to find out the current status of utilization of BPM methods and tools in the wood-processing industry of the Slovakia. In addition results were compared with machinery industry, which was stated as a benchmark due to the highest values of performance indicators reached in previous years.

Database of the information about the enterprises has been created in the first step. Secondly the online questionnaire has been created. Subsequently the questionnaire has been sent to the enterprises' email addresses. Data collection has been processed from 1 December 2016 to 31 March 2017. 108 questionnaires have been completed by the enterprises from wood-processing (77 enterprises) and machinery industry (31 enterprises). The answers in questionnaires have been processed and evaluated by chosen descriptive methods. Researched enterprises were mostly small and medium sized with legal form Ltd. Their main business activity is manufacturing.

## 4. QUESTIONNAIRE RESULTS

In this part of the paper selected research results are presented. Relative and absolute frequencies of answer on the selected question concerning about models for process analysis are depicted in figures below (figure 4 and table 1). 70.13% (54 in absolute numbers) of wood-processing enterprises in the sample do not analyse their processes as well as 54.84% (17 in absolute numbers) of enterprises from machinery industry. Wood-processing enterprises use less than 1 model in average (0.31 models) as well as enterprises of machinery industry (0.48 models).

**Figure 4** Models for Process Analysis: Absolute Frequencies




**Source:** Own study.

**Table 1** Models for Process Analysis: Relative Frequencies

| Industry: | Wood-processing | Machinery |
|---|---|---|
| Frequencies: | Relative | Relative |
| Diagnostic Reference Models | 18.18% | 29.03% |
| Information Modelling | 5.19% | 0.00% |
| Dynamic Simulation | 2.60% | 3.23% |
| Integrated Modelling Methods | 3.90% | 6.45% |
| Economic models | 1.30% | 9.68% |
| No process analysis | 70.13% | 54.84% |
| Average without no analysing enterprises | 1.04 | 1.07 |
| Average with no analysing enterprises | 0.31 | 0.48 |

**Source:** Own study.

Relative and absolute frequencies of answer the second selected question concerning methods of Business Process Modelling are depicted in figure 6 and table 2. We can see that 81.82% (63 in absolute numbers) of wood-processing enterprises in the sample do not map and model their processes as well as 58.06% (18 in absolute numbers) of enterprises from machinery industry. Wood-processing enterprises use less than 1 method in average (0.22 methods) as well as enterprises of machinery industry (0.48 methods).

**Figure 6** Methods of Business Process Modelling: Absolute Frequencies


**Source: Own study.**

**Table 2** Methods of Business Process Modelling: Realtive Frequencies

| Industry: | Wood-processing | Machinery |
|---|---|---|
| Frequencies: | Relative | Relative |
| Process Map | 14.29% | 35.48% |
| Data Flow Diagram | 2.60% | 6.45% |
| Flow Chart | 2.60% | 3.23% |
| Petri Nets | 1.30% | 3.23% |
| BP Interaction Diagram | 1.30% | 0.00% |
| No process mapping and modelling | 81.82% | 58.06% |
| Average without no modelling enterprises | 1.21 | 1.15 |
| Average with no modelling enterprises | 0.22 | 0.48 |

**Source:** Own study.

It could be stated that the most of the wood-processing enterprises in the sample (70.13%) do not analyse their internal processes. In addition managers of these enterprises do not focus on process modelling and mapping. In the machinery industry (benchmark), the situation is a little bit better (45.16% of enterprises analyse their processes and 41.94 of them use methods of Business Process Modelling).

By process modelling the surveyed enterprises use process maps and flow charts or diagrams. As for methods of process analysis, the most used are diagnostic reference models. Wood-processing companies in 9 % use also information and integrated modelling methods. Machinery companies prefer economic models.

## 5. CONCLUSION

The problem of Slovak wood-processing enterprises is a low performance in comparison with other industrial companies (Potkány, Giertl, 2014). The enterprises in a machinery industry reach the highest performance values, that is why can be considered to be a benchmark. The level of managing internal processes has a direct impact on corporate performance, as it was proved in previous works of paper´s authors. The results of research presented in this paper showed that most of wood-processing enterprises don´t pay attention to process modelling and analysis and only a little number of them use one method to model and analyse internal processes. It can cause a low ability to identify needed changes, to manage changes successfully and to improve process performance. The subject of our next research is to find out reasons why wood-processing enterprises in Slovakia don´t take care about internal processes.

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