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# Analysis of Student Perceptions of the Use of Business Process Modelling in Improving Organisational Operations

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## ABSTRACT

The main objective of the article is to identify and compare students' awareness of the possibilities of using business process modelling to improve organizational operations. The survey was conducted at the beginning of 2023 in the first and final year of studies at the University of Warsaw, which at the same time allowed to compare the impact of the implementation of the study program on increasing awareness of these possibilities. In addition, the results of the survey were compared with an analysis of the core curriculum. The research was conducted using the CAWI method. The questionnaire prepared for this purpose was first reviewed by experts in the field of business process modeling and then made available on the University of Warsaw servers for students to complete. The research showed that the interest in business process modeling among students entering the University of Warsaw is not very high and that emerging innovations in this field are not known. From the point of view of the University of Warsaw, it is important to note that more than 90% of the students received basic information about Business Process Modeling at the University, so they will be able to use BPM systems in their professional work. The most significant and encouraging information is that almost half of the students graduating from the University of Warsaw use business process modeling systems in their professional work. The conducted study had its limitations - it was conducted in 2023 in only two university faculties (the Faculty of Management and the Faculty of Journalism, Information and Bibliology). It is recommended to increase the number of subjects in the area of business process management in university curricula, which will allow a deeper understanding and a modern approach to the interpretation of economic phenomena. On the basis of the research it was proved that despite the average knowledge of students about computer-based modeling of business processes, they consider it essential for the improvement of business operations.

**Keywords:** Business process modelling, Organization value creation, Innovations, Technological changes

## INTRODUCTION

Business Process Modeling Notation (BPMN) is used to represent the overall architecture of a business process. The main goal of BPMN is to provide a notation that is clear to all parties involved in organizational processes, from business analysts who create or define business process models, to technical developers who are responsible for developing the IT infrastructure for these

 

processes, and finally to all users who will monitor and manage the developed processes. To make it easier for developers to identify and distinguish between the various elements, the notation of the language's elements is presented graphically (Rosing et al., 2015).

A business process can often be visualized or modeled as a diagram of a sequence of activities with intertwined decision points, or as a process matrix of a sequence of activities with relevance rules based on the data in the process. Business process modeling (BPM) in business process management and systems engineering is the activity of representing an organization's processes so that the current process can be analyzed, improved, and automated (Waszkowski, 2018).

The study of business processes must be conducted from the point of view of the impact of various factors. An important task of business process management is the need to take into account as much as possible the factors influencing the current state of the company's business processes and to determine the forecast of their development in the future (Kizlargul, 2023).

The modern pace of development of the information and communication society causes a rapid growth of business requirements in all industries and spheres of activity. The development of information technology changes the business models of business organizations, the procedure of adaptation to new business conditions and requirements, which provide a higher degree of automation and digitalization of business processes and production stages (Obikhod et al., 2023).

Process modeling in business improvement projects requires the involvement of many people, such as senior managers, employees from different departments, and specialists from consulting firms. A key element in the collaboration of so many people is that they all use the same nomenclature and understandable modeling techniques (Lindland et. al., 1994).

The primary purpose of this article is to identify and compare students' familiarity with the use of business process modeling to improve organizational operations. (This familiarity is intended to refer not only to the definitional concepts that can be looked up on the Internet, but also to knowledge of how it can be used in personal and professional life). The survey was conducted in the first and last year of studies at the University of Warsaw (at the Faculty of Management and the Faculty of Journalism, Information and Bibliology), which at the same time made it possible to compare the impact of the implementation of the study program on increasing awareness of these opportunities. In addition, the results of the survey were compared with an analysis of the core curriculum.

The problem that was adopted to solve was to study the knowledge of students about the possibility of using business process modeling to improve the operation of the organization. The degree of students' knowledge and familiarity with BPM methods for improving the quality of the organization's operations was studied and a comparison of this knowledge was made.

The process of verifying the set research problem consists of the following stages: literature analysis; analysis of the materials of conferences, seminars and symposiums; development of a questionnaire; conducting the survey;

analysis of the results; development of conclusions, recommendations and limitations of the study.

The study of the area of business process modeling in improving organizational operations is a premise that can lead to an increase in knowledge and awareness among the public about business process modeling. At the same time, the literature review conducted in section two indicates that there is a research gap in this area. The study conducted was aimed at reducing the identified research gap.

The following structure of the paper was adopted: in section two, a literature analysis was conducted in the area of business process modeling. Section three describes the methodology and selection of the research sample. Section four presents the analysis and discussion of the study results. The last section - the fifth section - is a summary containing conclusions, limitations of the research conducted and areas of research for further work.

## ANALYSIS OF THE LITERATURE ON BUSINESS PROCESS MODELLING

The use of business process modeling is gaining increasing recognition in both research and practice (Massa et al., 2017). The literature on business models has proposed numerous requirements for defining and representing business models and their components (Turetken et al., 2019; Gordijn et al., 2001; Osterwalder et al., 2005). In essence, a business model represents the mechanisms by which an organization creates, delivers, and captures value (Teece, 2010).

Business processes are a key component of the operational architecture of the business model (Morris et al., 2005). To implement a business model, the relevant processes must be designed (Valentin et al., 2012). In essence, a business process is a set of logically related tasks, events, and resources required to achieve a desired outcome (Dumas et al., 2018).

The system is modeled using various graphical methods such as Block Diagram, Petrinets, Data Flow Diagram, Role Activity Diagram, Business Use Cases and BPMN. For the representation of business processes, BPMN has worldwide acceptance, which is currently growing steadily. The most commonly used tools in organizations are BPMN (Chinosi et al., 2012). One definition defines process modeling as the process of documenting business processes using a combination of textual and graphical notation. Process modeling in business improvement projects requires the involvement of many employees, such as senior managers, employees from different departments, and specialists from consulting firms. A key element in getting so many people working together is that they all use the same nomenclature and understandable process modeling techniques. When discussing the purpose and scope of modeling, it is critical to choose a notation that allows for the description of the necessary elements that define a process at a given level of detail, but also includes graphical symbols and associated semantic rules that can be understood by all those involved in process modeling. The degree to which a process model is understood and interpreted by users allows one to assess the pragmatic aspect of model quality and testifies to the effectiveness

of the models, i.e., their fit with the needs of the audience and their ability to achieve the intended purpose of modeling (Lindland et al., 1994; Recker et al., 2007; Danesh-Pajou et al., 2009; Kock et al., 2008).

The Business Process Management Initiative has developed and promoted a language known as Business Process Model and Notation (BPMN), first published in 2004. (BPMI). Eventually, the Object Management Group (OMG) adopted BPMN as a standard. The first version of BPMN was developed to standardize the graphical representation of business processes and contained a set of visual symbols for different parts of a process, each with a distinct meaning and able to represent many possible combinations (Mendling et al., 2010).

A business process simulation is an imitation of the operation of an actual process or system at a given time. Simulation is a dynamic view of complex systems that needs to be analyzed before the actual implementation of the system. Any environment can be visualized with a simulation model before taking the risk of actual implementation. Developing a simulation helps to understand the system, and in the case of systems before implementation or change, simulation helps business stakeholders to see whether or not a change or new procedure is helpful to the business. Simulation saves both time and money by identifying gaps in the process (Ingalls, 2011). It is now widely accepted that simulation experiments are a trusted and reliable source of information to support organizational decision making. In fact, managers are better equipped to make decisions when they are able to predict, in a concrete and understandable way, the likely outcomes of a decision before it is made in the real world. Simply put, simulation helps managers make decisions by allowing them to create and evaluate a variety of potentially interesting scenarios. The costs and risks associated with evaluating "what-if" scenarios in the real world are eliminated when "what-if" situations are analyzed using simulation (Choudhary et al., 2023).

Identifying opportunities for: new business ventures; outsourcing; increasing business efficiency; and locating areas within an organization where technology can be used to support business processes, the fields of business process modeling (BPM) and reengineering aim to better understand key business mechanisms in order to improve and, in some cases, radically change business performance. Many authors define business process management as the stages of discovery, analysis, modeling, and then optimization. As with earlier software modeling techniques, BPM methodologies have evolved over the past 20 years from a variety of disciplines, but what these techniques have in common is a lack of standard procedures and notations, with each BPM method using its own notation. A process is a deliberate arrangement of work activities in time and space, with a beginning and an end, and well-defined inputs and outputs (Choudhary et al., 2023).

Process orientation can also be defined as an organizational effort to make business processes the foundation of organizational structures and the subject of strategic planning. However, there can be no process orientation if managers have no real influence on the implementation and management

of processes. Process-oriented management is not possible without effective management of the processes themselves (Kohlbacher et al., 2011).

Processes play a key role in the effective execution of an organization's mission-related activities. Therefore, in order to deliver value to customers, it is necessary to align the business model with the underlying processes. In addition, it is essential to understand how organizations work to create value through their internal processes and manage the exchange of data (Solaimani et al., 2012).

The results of the above research confirm the relevance of the presented research problem and the necessity of introducing BPM into study programs in order to prepare potential employees to use business process modeling in their professional work.

Business process modeling is the most common subject in the curriculum of the second-level management course. Students attend lectures and labs where, among other things, they are introduced to business process modeling software. Students manage selected businesses by characterizing and modeling processes, identifying the necessary resources, information flows, and scope of their operation, and implementing selected control and monitoring tools.

No studies were found in the literature that identified students' familiarity with the use of business process modeling to improve organizational operations, indicating that there is a research gap in this area.

## RESEARCH METHODOLOGY AND SAMPLING

In order to create new advanced business models for IT applications in management, a survey was conducted at the beginning of 2023 among students at the University of Warsaw (Faculty of Management and Faculty of Journalism, Information and Bibliology) to determine the awareness of the use of business process modeling in improving organizational operations. The CAWI (Computer-Assisted Web Interview) methodology was used to conduct the survey.

The survey form contained thirteen factual questions and eight questions characterizing the research sample. The questions were diverse in scope and related to:

- general knowledge of concepts related to business process modeling,
- detailed definitional knowledge of selected categories in the field,
- the feasibility of implementing business models.

The survey was designed in such a way that the respondent could simultaneously learn about aspects of business process modeling - there was a theoretical part that intuitively conveyed knowledge in the field of business models.

The survey was completed by 62 students in the second (final) year of a Master's program at the University of Warsaw, 57 of whom completed the survey in full, which represents a response rate of 91.94%. The survey was also carried out among students starting their studies at the University of Warsaw - 103 people completing their first year of undergraduate studies

took part in the survey, 77 of whom completed it in full, which represents a return rate of 74.76%.

The selection of the research group was made after analyzing the results of a global survey published in April 2020: "2020 Deloitte and WSJ Intelligence global survey," conducted by Deloitte in partnership with WSJ Intelligence, showed that it is now widely recognized that technology and digital transformation determine the success of virtually every business. One hundred CEOs and four hundred CIOs from twenty-two industries and nineteen countries participated in the survey. The survey results show that in many areas, success in business today is closely linked to technological competence. A more integrated strategic approach to technology can benefit the entire organization. In addition, according to CEOs, the technology department cannot operate in isolation, as a siloed model does not allow it to receive adequate support and funding or have a significant impact on the business. According to the survey, companies in the Leaders Group are two and a half times more likely to view technology as the most important factor in achieving business goals (Deloitte, 2020). In addition, D. Batorski's research showed that the highest percentage of use of the latest technologies is among the 16–24 and 25–34 age groups (almost 70%) (Batorski, 2015). Thus, it was considered that students are the group that most actively uses the latest information technologies, the group that knows the most about them not only from a theoretical point of view, but also is curious about them and is able to grasp the relevant things from the flood of Internet information and then use them in both personal and professional life. The laboratory groups were randomly selected from all first and fifth year students at the University of Warsaw (Faculty of Management or Faculty of Journalism, Information and Bibliology), where the subject Management Software or Application of Information Technology in Business is implemented, in the course of which students learn the basics of software for managing organizational projects and software for modeling and managing organizational processes.

At this point it should also be emphasized that the students participated in this study after completing the course Management Software or Application of IT in Business, during which they learn the basic issues in software:

1. for the management of the organization's projects, e.g. ProjectLibre, where topics such as
    a. project planning, management and analysis;
    b. the procedure for creating and launching, controlling and coordinating a project;
    c. the definition of organizational structures found in project management;
    d. human Resource Management in Project Management
    e. managing user requirements and project risks;
2. for modeling and managing the organization's processes, e.g. Adonis, where the following topics, among others, are covered:
    a. process description components;

b. BPMN notation;
c. process branching;
d. event symbols;
e. defining process participants;
f. auxiliary elements of the notation;
g. identifying the processes of the organization.

## ANALYSIS AND DISCUSSION OF RESULTS

The main purpose of this article was to analyze and compare students' familiarity with the use and applicability of business process modeling in improving organizational operations. The research also focused on comparing the results of students who started their studies at the University of Warsaw (at the Faculty of Management and the Faculty of Journalism, Information and Bibliology) and those who finished their studies. The results of the research and analysis made it possible to draw the following conclusions:

- students of the University of Warsaw who start and finish their studies have a very general and unstructured knowledge of business process modeling, their interest in the latest technologies is not very deep, and they are not aware of the emerging novelties, although the students are pursuing the subjects Management Software or Application of Computer Science in Business, which undoubtedly allow them to learn the subject from scratch, deepen their knowledge, and have the opportunity to learn about the tools that enable business process modeling,
- from the point of view of the University of Warsaw, it is important to note that more than 90% of the students received basic information about business process modeling at the university, so that they will be able to use BPM systems in their professional work. About 30% of the respondents searched for knowledge about process modeling on the Internet, which is undoubtedly a positive development considering the cognitive issues. More than 30% of students encountered business process modeling at work - thanks to this information we know that the implementation of current issues does not remain passive only within the university. The most significant and encouraging information is that almost half of the students graduating from the University of Warsaw use business process modeling systems in their work. The most frequently used system for business process modeling is BOC Adonis (both among first-year students (27.27%) and second-year students (33.33%)),
- more than 73% of the respondents (both those who started the survey and those who completed it) agreed that, in their opinion, business process modeling should be used to define the main activities of a company - a correct process model allows to eliminate redundant activities, adapt the organization to the environment and improve the company's ability to adapt to changes. It is worth mentioning that this answer was also the most popular in the 2022 (Oleś-Filiks, 2023) survey, with 80% of respondents agreeing with it,

- an undeniable advantage is that students are aware that business processes should be related to the realization of the organization's goals - more than 75% of freshmen and almost 90% of graduates agree with this statement. It is worth noting that in the 2022 (Oleś-Filiks, 2023) survey, this answer also received the most votes - more than 80% of respondents chose this answer,
- in the 2022 (Oleś-Filiks, 2023) study, 63.26% of respondents appreciated the fact that business processes should be dynamic, changeable and responsive to current market demands and constraints, in 2023 this feature was selected by more than 55% of respondents, while more than 70% pointed out the feature of repeatability, extensiveness, complexity, representing flows of: information, materials, competencies, values, knowledge and business activities,
- the vast majority of respondents (60% of those who began the study and more than 80% of those who completed it) recognize that the concept that supports the process approach most often used in practice is work schedules. More than half also recognized the importance of Gantt charts. At this point, it is worth noting the difference - as much as 40% - that we find between the responses of undergraduate students (45.45%) and graduate students (5.26%) in indicating that it is the concept of lean manufacturing that supports the process approach. A significant difference of more than 17% also appeared in the responses of undergraduate students (20.78%) and graduate students (3.51%) in indicating that it is the SixSigma concept that supports the process approach,
- the main benefits of using business process modeling are (in 2022 (Oleś-Filiks, 2023) according to 71% of respondents and in 2023 according to more than 80% of respondents) a significant acceleration of tasks (e.g. customer service), among others due to their automation, and the ability to map, model and optimize processes (in 2022 (Oleś-Filiks, 2023) according to 68.14% of respondents and in 2023 according to more than 80% of respondents),
- based on their knowledge of business process modeling after completing the Management Software or Application of IT in Business courses, respondents were able to identify new challenges posed by the use of business process modeling, and here more than half of them point out that it is the expansion of human resources with new skills (software, analytics),
- at the end of these analyses, it is impossible not to mention the disadvantages of business process modeling. In 2022 (Oleś-Filiks, 2023), the only disadvantage mentioned by more than half of the respondents was the need to learn the tools (54.65%); in 2023, this answer was high among both first-year students (51.95%) and second-year master's students (45.61%). However, in 2023, the need to overcome organizational resistance was cited as a disadvantage by most people (both first-year students (53.25%) and final-year students (52.63%)),
- on a more optimistic note, 76.51% of respondents in 2022 (Oleś-Filiks, 2023) would use business process modeling to improve the organization's

operations if given the opportunity, while the vast majority in 2023 would do so as well (80.52% of first-year students and 71.93% of second-year master's students).

## CONCLUSION

Interpreting the results of the study, it can be said that the use of processes leads to better consideration of the requirements of internal and external customers in the activities of contractors and allows them to identify their role. The process approach realizes the premise of optimizing activities in terms of processes rather than functions, and therefore the process is a natural determinant of improving the activities of a modern company. Improvement of activities on the basis of process analysis makes it possible to dynamize the entire organizational system. Transforming a company into a process-oriented organization means adjusting the tasks, organizational structures and resources of the company so that the activity of these parts is directed to the best possible implementation of business processes.

Business processes are increasingly used to make informed decisions. Employee awareness and involvement are important elements for the successful use of models. An important feature of this approach is team building and a collaborative attitude to achieve the best possible results. Recognizing the need to gather knowledge about the market becomes critical, but BPM places special emphasis on knowledge about customers and competitors.

The survey had one limitation - it was conducted only in two university faculties (Faculty of Management and Faculty of Journalism, Information and Bibliology), where the subject Management Software or Application of IT in Business is implemented. Despite the implementation of the above mentioned subjects, students' knowledge of business process modeling is low. Therefore, it is recommended to increase the number of subjects in the area of business process modeling in university curricula, which will allow for a deeper understanding and a modern approach to the interpretation of economic phenomena.

It is not excluded that the results would be different if they were extended to polytechnic universities. It is also necessary to conduct research on a completely random sample, first in terms of the degree of returnability of the questionnaire, secondly in terms of the correctness of its understanding and completion, and only on the third position - its final results.

The research carried out does not exhaust the subject. In the future, it will be possible to conduct research among those who are currently in their first year of undergraduate studies, in order to verify the knowledge they have acquired in the area of the use and applicability of business process modeling in improving organizational operations.

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