

Digitalization of Process Mapping as an Integral Part of Business Process Management

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Abstract: An important driver of success, according to several scientists, is Business Process Management (BPM), which represents a structured holistic management discipline focused on improving the performance of enterprises through the management of their business processes. BPM includes various methods, techniques and tools to support the identification, design, mapping, modelling, implementation and optimization of processes in order to support business goals. Business process mapping, as an integral and primary part of BPM, plays a fundamental role in the identification, analysis and design of processes. The digitalization of business process mapping supported by BPM software tools and standards fundamentally changes the means of documenting and managing processes. The scientific article includes: theoretical definition of basic concepts in the field of BPM, analysis and development of business process mapping and management also in the context of digitalization, synthesis of findings from expert sources and surveys, identification of barriers to implementing BPM, overview of BPM software tools and formulation of recommendations for enterprises in the field of BPM, including the digitalization of business process mapping. The main findings indicate that companies have low levels of digitized processes, 70% of companies use at least one BPM tool, only 3% of companies do not model or map processes at all, and up to 82% of companies use paper or manual process mapping. These findings are critical in the context of Industry 4.0, where the current emphasis is on digital innovation and thus on a high level of automation of business processes.

Keywords: process management, digital technologies, business process management, digitalization, BPM

JEL Classification: M11, M15, O31, O33

1 Introduction

The dynamically changing business environment and current economic challenges, including Industry 4.0, force companies to be efficient, competitive, innovative and digitally transformed, which also requires proper management and optimization of business processes. For this reason, business process management itself is becoming a key pillar of success in companies. Szelagowski (2019) also points out the importance of processes in companies and that all organizations hoping to prosper in the 21st century must be process oriented. Business process mapping is a necessity for organizations that focus on sustainable growth (Rosita, 2022).

Albrecht, Lösner & Röglinger (2024) argue that in order to maintain their competitiveness, companies must embrace the dynamics of the ever-changing business environment, radically change the way work is done and thus implement business process management (BPM). The importance of business process management and the implementation of BPM has also been pointed out in recent years by other researchers such as: Helbin & Van Looy (2021); Gabryelczyk, Sipior & Biernikowicz (2022); Tellez-Risco (2022); Özkan et al. (2023); Mößlang et al. (2024); Handriani & Mahendrawathi (2024) and Kozma et al. (2024). According to Mößlang et al. (2024), business process management is essential for companies to adapt to changing requirements and remain relevant in the market. Business process is defined by Sołtysik-Piorunkiewicz & Morawiec (2021) as a series or network of value-added activities, performed by their relevant roles or collaborators, to purposefully achieve the common business goal. Senkus et al. (2021) state that business process is a complex work that brings value to customers. Process management has been around for over 100 years (Koch et al., 2022) and represents the systematised application of relevant concepts, methods and tools of influence at the stages of identification, modelling, controlling, implementation and improvement of processes (Wąchol, 2020).

Business process management (BPM) according to Albrecht, Lösner & Röglinger (2024) is a holistic management discipline that offers mature methods and end-to-end management activities. BPM according to Al-Fedaghi & Mohamad (2019) refers to the execution of processes using tools (for workflow management, tools for enterprise application

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integration and web services, which also includes process automation technologies) and also according to scientists it is an approach to change in an enterprise through the use of various tools, which include business process mapping. Stojanović et al. (2020) provide a definition according to Harmon (2005), and BPM is defined as a management discipline focused on improving corporate performance by managing a company's business processes. According to Reijers (2021) BPM embodies a management philosophy that is supported by a range of methods, techniques and tools. Fahrenkrog-Petersen (2024) state that BPM is widely used for discovering, modelling, analysing and optimizing organizational processes. BPM is defined as the discipline that involves any combination of modelling, automation, execution, control, measurement, and optimization of business activity flows in applicable combination to support enterprise goals within and beyond the enterprise boundaries (Von Rosing, von Scheel, & Scheer, 2014; Saidane, Hassani & Ghannouchi, 2024). According to Putra & Mahendrawathi (2024), BPM is an approach that aims to improve the performance and flexibility of an organization through business process management.

BPM is an important discipline that drives the success of a company (Vom Brocke & Mendling, 2018; Vom Brocke et al., 2021). According to Reijers (2021), the development of the BPM discipline over the years is characterized by: BPM systems, process modelling, process design, coordination and interoperability, model management, process mining and new technologies. According to Karmoker & Golam Rabiul (2025), BPM is part of modern organizations that helps them analyse and redesign business processes. BPM has its roots in business process reengineering (Niehaves & Hense, 2011), enables continuous improvement of business processes (Dunzer et al., 2024) and includes, according to Koch et al. (2022), the design, implementation and optimization of processes. According to Ubaid & Dweiri (2020), BPM also includes process mapping. BPM focuses on business processes using analytical techniques that assume a clearly defined beginning and end (Fahrenkrog-Petersen, 2024).

The BPM process according to Tellez-Risco (2022) includes activities such as:

- Planning and alignment: knowledge of available documentation.
- Process analysis: use of matrices (e.g. SWOT and VAA) to know the efficiency of the process.
- Process design: know the hardware and software requirements to improve the process.
- Process implementation and monitoring: there will be a matrix of KPIs to be able to verify that the implementation is giving the expected results.
- Process refinement: verification of fulfilment of KPIs, and if not, analyse what went wrong and readjust the process.

BPM models include: flowchart, BPMN (Business Process Model and Notation), EPC (Event-Driven Process Chain), UML (Unified Modelling Language), which are modelled in (Nizioł et al., 2021).

An element and integral part of BPM is also process mapping (PM), which according to Templar & Mena (2010) is generally defined as the activity of identifying and recording relevant tasks. Bedel (2003) defines PM as a thorough analysis of organizational processes in order to understand how tasks are performed using tools such as flowcharts and process diagrams. PM is a key link in the enterprise, which significantly improves business processes and economic results (Hunt, 1996). Process mapping is a common practice for documenting existing and newly designed processes, it is a best practice and one of the four most commonly used tools in business process improvement (Kettinger, Teng & Guha, 1997; Dolan, 2003; Siha & Saad, 2008; Bowles & Gardiner, 2018). According to Al-Fedaghi & Mohamad (2019), PM is a schematic representation of processes. PM is found in several BPM activities and can be classified as one of the initial phases of BPM: identification, modelling and design of business processes. The phases characterizing the process of process mapping according to Antonacci et al. (2021) are: preparation, planning and process identification; data and information gathering; map generation; process analysis, and further fulfilment /take it forward. The output of PM are process maps or process maps, which, according to Goodman, Kuniavsky & Moed (2012), are the result of applying the task analysis approach to the entire business or organization.

Since its inception, BPM has traditionally been combined with information technology (IT) to fully exploit the potential of BPM for process redesign, improvement and management (Gabryelczyk, Sipior & Biernikowicz, 2022). BPM is a multidisciplinary process, most business processes are supported by IT (Harmon, 2010; Sidorova & Isik, 2010; Niehaves, Plattfaut & Becker, 2012), and therefore the functioning of BPM should also be supported by software tools and digital technologies of Industry 4.0, as currently pointed out by several researchers such as: Ubaid & Dweiri (2020); Brkić, Tomićić Pupek & Bosilj Vukšić (2020); Zuhaira & Ahmad (2021); Moreira & Dallavalle (2024); Szelągowski & Berniak-Woźny (2024); Vu et al. (2025) and others.

Digitalization of process mapping represents a change from an analogy approach to the use of information technologies for collecting information about business processes, their modelling, visualization and optimization. Initially, business processes were recorded on paper - so-called paper mapping and were not formally managed at all. The turning point came in the 1980s, when textual digitization of processes documented in Microsoft office software tools began. Later, in the 1990s and until the beginning of the 21st century, the first specific software tools designed for process modelling began to emerge, such as: Microsoft Visio, Aris Toolset and IBM WebSphere Business Modeler. The standardization of BPM and the emergence of BPMN 1.0, cloud tools, BPMN 2.0, the advent of Industry 4.0 and the use of digital technologies represented further development phases of BPM and the digitization of process mapping itself, which is its integral part.

BPM provides several advantages in business, as scientists Aidara, Diaw & Cisse (2024) emphasize that BPM increases the efficiency of business processes, reduces costs and increases profits in companies. De Luzi et al. (2025) state that in recent years, scientific and industrial interest in BPM approaches and methods has increased. The interest of companies is also significant due to the increasing rate of digitalization in companies and, consequently, the continuous optimization of business processes.

2 Methods

The main objective of the scientific article is to analyze the digitalization of business process mapping and management in enterprises, to evaluate the current state of the techniques and tools used, and to provide recommendations for effective and digital mapping and management of business processes.

The achievement of the main objective required the fulfillment of the following partial objectives, namely:

- to examine the theoretical foundations in the field of business process management (BPM) and business process mapping in general and subsequently with a focus on digitalization;
- to evaluate the significance of BPM digitalization in the context of Industry 4.0;
- to map the current state of use of BPM tools in business practice based on available statistical reviews and conducted studies;
- to identify software tools for the digitalization of business process mapping;
- to formulate recommendations for business practice aimed at the effective digitalization of business process mapping through BPM tools.

The subject of this scientific article is the digitalization of business process mapping and management in business practice.

The object of the study is business entities involved in statistical and empirical surveys in the field of BPM, which represented enterprises of various sizes and operated in various sectors of the economy.

The collection and selection of literary sources took place in scientific databases with an emphasis on the Web of Science and Google Scholar databases, where sources were searched for in the period from 2020 to 2025 (older sources were included for referencing in relevant scientific publications). The search for literary sources was carried out using keywords. The keywords for the initial search were: "industry 4.0", "process management", "Business process management", "process mapping", "business process mapping", "digitalization of business process mapping" and the abbreviation "BPM", which were used separately and in combination. Given that the databases in some cases contained hundreds of thousands of documents, we focused on peer-reviewed and freely available sources when processing the literature review. The data presented in the analytical part came from secondary statistical surveys and expert analytical reports that were published on expert portals in 2024 and 2025. The results and discussion part contained sources about companies that have implemented and used BPM solutions in practice and use software tools for mapping business processes and BPM in general. The analytical part also identified specific software tools used in process mapping, which were subsequently evaluated according to the frequency of occurrence in expert sources, mainly of technology companies.

Several scientific methods were used in the preparation of the scientific article, namely:

- abstraction - in generalizing findings and making recommendations for business practice;
- analysis - in dividing the researched issue of BPM and its digitalization into individual researchable parts;
- deduction - in verifying general principles in specific BPM applications in business practice and also in formulating general recommendations from individual cases and vice versa;

- induction – when drawing general conclusions from individual case observations;
- comparison – when comparing the development of BPM and the use of tools between different periods;
- synthesis – when integrating knowledge from different studies into a coherent concept of effective process management, and thus also connecting knowledge into coherent conclusions.

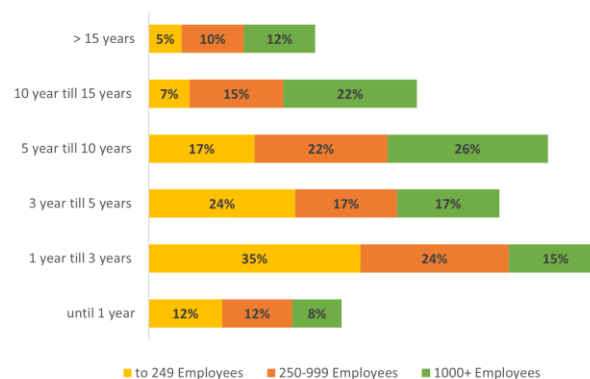
3 Research results

The size of the global BPM market according to Fortune Business Insights (2025) was valued at 17.78 billion USD in 2024. Comidor (2024) estimates the value of the BPM market in 2024 at 15.4 billion USD and states that the need for organizational excellence and reduction of operational costs is the driving force behind the growing BPM market, which is also influenced by the evolving business environment and the need to thrive in the digital sphere. Quixy (2025) states that the global BPM market will be worth 26.18 billion USD in 2028. Fortune Business Insights (2025) also predicts the future growth of the BPM market, namely that it is expected to grow from 21.51 billion USD in 2025 to 70.93 billion USD by 2032 at a CAGR of 18.6%.

3.1 Comparison of statistical studies of BPM and business process mapping in corporate practice

Gerussi (2025) reports the duration of BPM practice in companies (figure 1), which shows that it is significantly influenced by the size of the company. Larger companies have many years of experience with BPM, but smaller companies do not have as much experience and have increasingly started using BPM only recently. The reasons may be that larger companies have more available resources (financial, personnel and technological), technologies are implemented there earlier, and they have a higher pressure on digitalization and business efficiency.

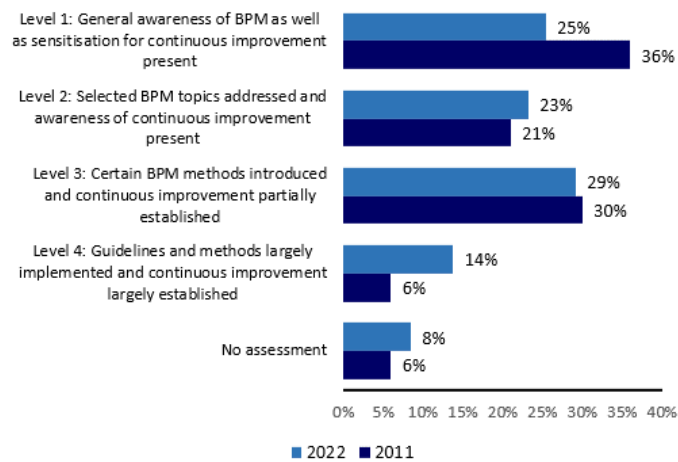
Figure 1 Length of time BPM has been practiced in businesses by size



Source: Gerussi (2025)

The maturity level (figure 2) shows a visible shift towards systematic and embedded BPM from general awareness (level 1) to fully implemented BPM (level 4). The largest increase was recorded at level 4, where companies are continuously engaged in the management and overall improvement of business processes. Despite the fact that BPM is growing, most companies remain at intermediate levels (levels 2 and 3), which indicates room for further improvement, especially in the area of digitalization and process optimization. Level 1 fell by 11 percentage points, indicating that fewer and fewer companies remain in the early stages of BPM without concrete activities.

Figure 2 BPM development stages and maturity levels in 2011 and 2022



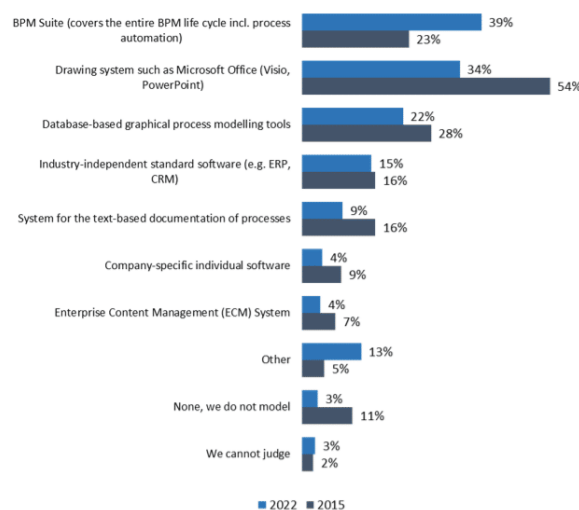
Source: Gerussi (2025)

Figure 3 illustrates the growth in BPM tool usage between 2015 and 2022, showing the transformation from simple/ad hoc tools to integrated, comprehensive BPM solutions. The graph shows:

- a significant decline in companies that do not model processes at all, from 11% to just 3% of companies;
- an increase in the use of BPM Suite tools from 23% to 39%;
- a decline in traditional office and text documentation tools for mapping business processes.

These changes mean that robust solutions are being replaced by traditional tools, companies are increasingly preferring integrated tools that support the entire BPM lifecycle - from identification, mapping, modelling to automation and monitoring, and the importance of automation and workflow orchestration within BPM is increasing.

Figure 3 Tools used in the field of BPM in 2015 and 2022



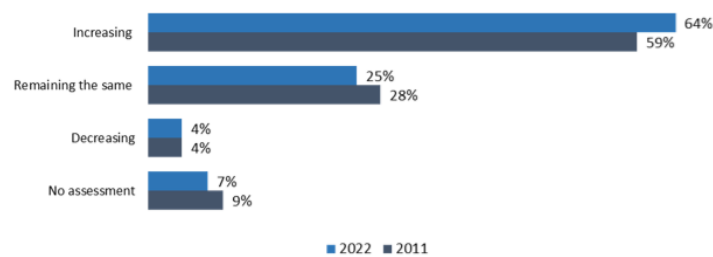
Source: Gerussi (2025)

The digitalization trend in process mapping is evident in Figure 3, as it captures the shift from analog process mapping to the use of intelligent BPM tools.

Despite previous findings that full BPM integration remains a challenge for many companies, the trend in the importance of BPM has been consistent over the years. The research results clearly point to the important importance of BPM in companies, especially in terms of the use of software tools for BPM – the so-called BPM tools (Figure 4). Between 2011 and 2022, there was an increase in companies that expect the growing importance of the tools, from 59% to 64%. At the

same time, only 4% of companies expect the importance of BPM software to decrease, which has remained constant over the years. The number of companies that cannot assess the future development of BPM software tools has slightly decreased. Overall, up to 89% of companies consider BPM tools to be increasingly important and at least as important as in the past. Changes in the use of BPM tools reflect a broader push to increase efficiency, automation, and agility in businesses, resulting from the digital transformation of businesses and the emergence of the Industry 4.0 paradigm.

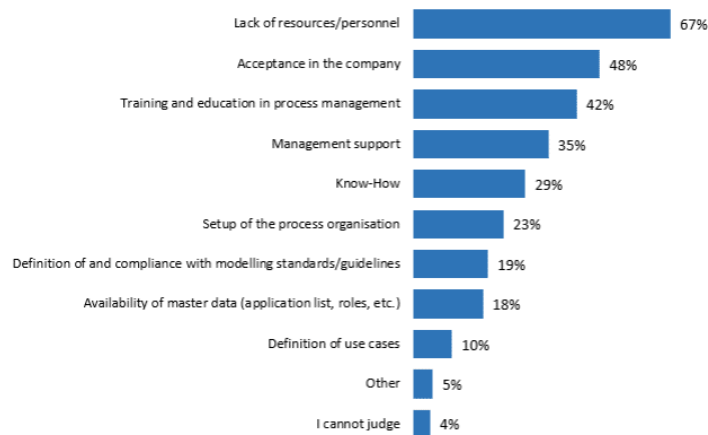
Figure 4 The future importance of BPM tools in enterprises in 2011 and 2022



Source: Gerussi (2025)

BPM implementation in enterprises faces several obstacles related to human capacity, as well as operational and technical factors. The main barriers in the field of BPM (figure 5) are the lack of personnel in 67% of enterprises, which represents a lack of professional capacities and competencies. Other significant obstacles are: poor adoption in 48% of enterprises, insufficient training and education in process management in 42% of enterprises, low management support in 35% of enterprises and lack of know-how in 29% of enterprises. In addition to these main obstacles, companies also face structural and methodological challenges, such as: unclearly defined or insufficiently developed process organizational structure in 23% of companies, absence and non-compliance with modelling standards in 19% of companies, unavailability of relevant master data (e.g. application lists, roles, process owners) in 18% of companies, as well as poor identification and formulation of specific use cases for BPM initiatives in 10% of companies.

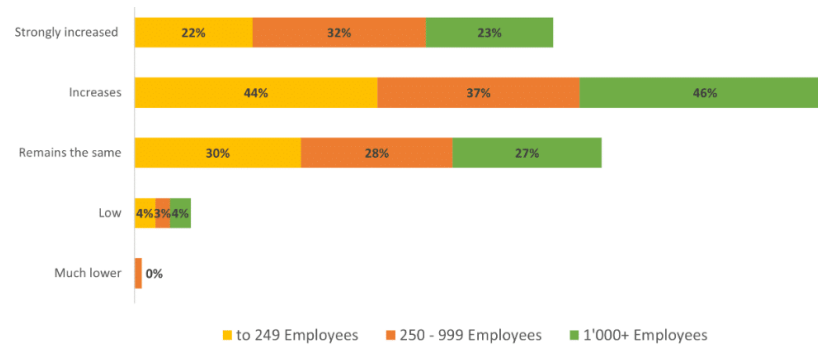
Figure 5 Barriers in BPM



Source: Gerussi (2025)

The future of BPM in terms of enterprise size (figure 6) indicates the growing strategic importance of BPM. The results of the survey according to Genussi (2025) show a high level of consensus in the assumptions of the growing importance of BPM, where up to 68% of enterprises expect that the importance of BPM will grow normally or significantly in the coming years, while the majority of enterprises expect at least to maintain the current level.

Figure 6 Expectations for the future of BPM by company size



Source: Gerussi (2025)

The results confirm that BPM is no longer just a trend in large enterprises, but is also becoming an essential management practice in small and medium-sized enterprises. The main reasons are: the use of digital technologies and the digital transformation of Industry 4.0, a dynamic business environment, various economic challenges and global problems, the increasing complexity of business activities and processes, and especially the greater availability of BPM tools.

Condor (2024) points to the growing use in business practice in 2024, when businesses believe that it will help them manage tasks and increase efficiency. Given this, there has been a sharp increase in interest in BPM and at least 74% of businesses have shown an increased interest in implementing BPM. It is further stated that: 70% of businesses already use at least one BPM application and 63% of businesses use two or more BPM tools; 38% of businesses have formalized BPM programs; businesses with BPM implemented have seen a reduction in workload and 40% of businesses have seen a reduction in errors and the implementation of more accurate decisions.

Lordan (2025) states that 26% of companies are implementing BPM, 28% of companies are mapping processes or modelling processes, and there are also a large number of companies that manage business processes through Excel. One company reports that it uses 10,000 Excel documents for BPM throughout the company. Forrester and Lordan (2025) point out that up to 82% of companies still use paper and manual process mapping.

In addition, Condor (2024) also points out that companies rely on manual processes or processes recorded on paper, which means inefficient systems, which leads to losses and financial impact on the business. According to statistics, companies have lost at least \$ 1.3 million due to inefficient processes (Condor, 2024).

Bennett (2025) states that only 2.76% of companies monitor and manage their processes; 21% of companies use process optimization techniques; BPM software is used by less than 50% of enterprises and the rest do not use it because they think it is too expensive; 29% of enterprises want to deploy business process management software; 48% of enterprises are trying to use business process automation tools to automate the management of manual processes; 54% of enterprises say that mapping complex processes is their biggest obstacle to automating operations.

In terms of segments, according to Condor (2024), the highest BPM implementation rate was in the banking, financial services and retail sectors (35%), followed by the healthcare and retail segments with the next highest adoption.

3.2 Software tools for digitizing business process mapping

Given the findings in the previous theoretical and analytical base, it follows that companies are increasingly aware of the importance of BPM and process mapping, so their implementation is limited by a lack of professional and technological resources. In this context, software tools play an important role.

Specific software tools for digitizing business process mapping and BPM in general are listed in the following table 1.

Table 1 Software tools for digitizing business process mapping

Business process mapping tool	SAP (2025)	IBM (2025)	Dreher (2025)	Microsoft (2025)	Gupta (2025)	Gartner (2025)	Miro (2025)	Covel (2025)	Occurrence
Adonis			X			X			2
Apromore			X						1
Aris			X			X			2
BIC Platform						X			1
Bizagi Modeler								X	1
Cacoo					X				1
Camunda			X						1
Celonis			X						1
Creately					X			X	2
EdrawMax					X				1
GitMind					X				1
IBM Blueworks Live		X				X			2
iGrafx			X			X			2
Lana			X						1
Lucidchart					X			X	2
Microsoft Visio			X	X	X	X		X	5
Miro					X		X	X	3
SAP Signavio Process Manager	X		X			X			3
Trisotech			X						1

Source: own processing

The analysis of tools illustrates that the BPM software tools market is fragmented and provides solutions ranging from traditional to complex BPM Suite solutions. Individual software tools differ in the degree of extensions, integration, functionalities, deployment models, level of support for business process mapping in enterprises and other parameters. A comparative analysis of the mentioned software tools for the digitalization of business process mapping and for BPM in general shows that the most frequently mentioned BPM tools are: Microsoft Visio, SAP Signavio Process Manager and Miro. Microsoft Visio has a dominant position, providing a comprehensive solution and having an intuitive user interface, integration with the MS Office package, high availability and compatibility with the BPMN standard. SAP Signavio Process Manager is a highly robust cloud system for advanced analysis and integration with ERP solutions, supports BPMN 2.0 and is mainly used in large enterprise architectures. Miro represents a modern collaborative tool for visual facilitation of processes, thereby supporting distributed environments and agile teams in enterprises. Other less common software BPM tools represent established BPM solutions or tools with specialized functionalities.

4 Conclusions

Business Process Management (BPM) is a holistic management discipline focused on improving the performance of companies through the management of their business processes. BPM includes various methods, techniques and tools to support the identification, design, mapping, modelling, implementation and optimization of processes in order to support business goals. In the context of a dynamic business environment, economic challenges, Industry 4.0, BPM is profiled as a strategic tool enabling the optimization of business activities, thereby also ensuring the support of decision-making in the company. Business process mapping as an integral and primary part of BPM plays a fundamental role in the identification, analysis and design of processes. The digitalization of business process mapping supported by BPM software tools and standards fundamentally changes the means of documenting and managing processes. The importance of BPM is also confirmed by the growing scientific and industrial interest in this area, while BPM is positioned as a driving force for increasing efficiency in companies and achieving sustainable business growth.

Not only from the theoretical basis, but also from the analysis of the state in business practice, we have found that BPM is gaining increasing strategic importance in companies, across various size categories of companies. Its importance is increasing especially in the context of Industry 4.0 and the emphasis on the digital transformation of companies, where digitalization and the use of digital technologies play an important role. The historical development of business process mapping also points out in the analytical part a fundamental transformation from an analog format to a digital format. The transformation of process mapping occurred from traditional, informal and ad hoc approaches, where business processes were carried out intuitively, were not managed at all and were without a systematic understanding. Subsequently, paper-based mapping began to be used, in which processes were recorded manually in the form of text descriptions and informal diagrams. The development towards digitalization occurred with the emergence of office software, when processes were already recorded digitally in text form. Gradually, not only the classic description of the algorithm of activities was used, but also flowcharts. In the 1990s, a fundamental shift in digitalization occurred, when specialized software tools were created that enabled standardized process modelling, including process mapping, advanced analysis, automation, optimization, and integration with other information systems in enterprises.

Based on the analysed statistical data from various research studies, it can be stated and highlighted that there is significant growth, diversification, and digitalization shift in BPM indicators. The main findings show that: the market value in 2024 is estimated to reach between 15.4 and 17.8 billion USD, with forecasts predicting an increase to 70.93 billion USD by 2032 with an annual CAGR of 18.6%; larger enterprises have longer implementation and use of BPM; BPM maturity is increasing; There is a visible shift from traditional, paper and office methods to digital tools in business process mapping and BPM, with 39% of companies using them; 70% of companies use at least one BPM tool; 82% of companies use paper or manual process mapping (mainly Excel); only less than 3% of companies do not model processes at all and up to 89% of companies perceive that BPM software tools, including tools for process mapping, are important. The main obstacles are: lack of BPM experts, low acceptance in the company, lack of training and education, and low support from company management.

Digital tools in process mapping and in BPM in general represent the main pillar of BPM and we recommend that companies, for better efficiency and digitalization of process mapping:

- ensure full support from the company's management in BPM;
- implement and use BPM in business;
- introduce BPM software tools and thereby replace the original manual and office tools;
- focus on cloud solutions for software tools and the use of digital Industry 4.0 technologies in them;
- provide experts in the field of BPM and process mapping;
- provide employee education in the field of BPM, including training courses;
- assign an owner/responsible person to each process, who will ensure their updates and continuous improvement;
- evaluate process performance through KPIs;
- ensure the integration of BPM tools with other information systems in the company (e.g. ERP, CRM, SCM and others);
- regularly optimize business processes, including updating process maps.

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