The Future Development of ERP: Towards Process ERP Systems?

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Abstract. Organizations operating in Industry 4.0 and 5.0 use both ERP and BPMS systems. As recently as 10–15 years ago, the reasons behind using these two classes of systems were different. ERPs were used to manage the organization's resources, and BPMS – to support the implementation of business processes, often understood as work or document flows. However, as a result of digital transformation, both business needs as well as ERP and BPMS vendors responding thereto made these two classes of systems overlap to an increasing degree. Thus, the aim of this article is to answer the question: Are we heading towards process-based ERP systems or is the future in the flexible, open integration of postmodernERP and iBPMS? The authors conducted a narrative literature review and content analysis of 88 ERP systems offered on the Polish market. As a result, 11 ERP systems containing functionalities specific to BPMS were identified. Further, to define the essence of the transformation of ERP into process-based ERP systems, 5 expert interviews were conducted, which allowed for the formulation of two approaches to this transformation: the integration of ERP systems with iBPMS as an external subsystem taking over the implementation of selected business processes based on metadata and data of the ERP system; or process management within the ERP system by enabling the configuration of selected processes in ERP subsystems or modules based on a repository of process models, e.g. in BPMN.

Keywords: Enterprise Resource Planning (ERP) · postmodernERP · Business Process Management System (BPMS) · intelligent BPMS (iBPMS)

1 Introduction

For almost 30 years, Enterprise Resource Planning (ERP) systems were considered to be the main systems supporting management in organizations [1]. However, the increasingly broad use of process-based methodologies and hyperautomation techniques in management forces organizations to also use Business Process Management Systems

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(BPMS). The vast majority of organizations that already use ERP systems have to decide whether or not and to what extent BPMS should be implemented or whether the ERP system should be changed to a process-based one. ERP vendors are faced with even more significant decisions. Should "process" functionalities be built into an existing ERP system with a view to preparing integration mechanisms enabling the on-demand addition of BPMS elements, including selected hyperautomation techniques such as process mining, robotic process automation (RPA), or artificial intelligence (AI)? Both for systems vendors and the users themselves, these are strategic decisions that are difficult to make, essential from the perspective of the competitive ability of the organization, and involve long-term significant human resources. Thus, the aim of this paper is to answer the research question: "Are we heading toward process-based ERP systems or is the future in the flexible, open integration of postmodernERP and iBPMS?".

The paper begins with the outline of the methodology. Parts 3 and 4 present the results of the literature review relating to the current status and development trends of ERP and BPMS. Part 5 compares the requirements, development drivers, and architectures of both system classes. Then, the results of the ERP systems analysis supplemented with the experts' interviews are presented and discussed. The last part presents the conclusions of the research.

2 Methodology

Studies on the research topic have been performed in three stages. The first step consisted of a narrative literature review held on the basis of the resources available in scientific databases, such as the repositories of SpringerLink, Emerald, ScienceDirect, Proquest, and Google Scholar. The main topics of interest were critical success factors, drivers of the evolution and architectures of ERP and BPMS. The summation of the literature research formed the basis of the next stage of the study. In the second stage, the authors analyzed online resources pertaining to the ERP systems available on the Polish market, with a focus on the possibilities of their use with a view to supporting business process management. The authors have based this stage on Qualitative Content Analysis – a research methodology of systematic analysis and interpretation of contents of texts – in this case, the ERP systems offered on the Polish market [2]. In the last stage of the study, the authors used partly structured expert questionnaires with representatives of 5 selected ERP system vendors. For each of the questionnaires, the same scenario was used, which allowed the authors to easily compare the results [3].

3 Enterprise Resources Planning Systems

Since the mid-1990s, ERP systems, which integrate support for various different areas of operation and business processes [1, 4], have become the standard regardless of the industry. The coherent combination of managing sales, production, human resources, and finances allowed for more efficient planning and monitoring of ongoing operations. However, since the mid-2000s, it has started to become increasingly clear that the monolithic architecture of ERP systems has certain limitations: it is unable to tailor the system's operations to the business processes of the organization, lacks the flexibility of

process performance, lacks standard integration mechanisms with external systems and databases, and suffers from vendor lock-in, which often results in dismissing the needs of the users and high systems maintenance costs. Both the pressures of business and growing technological possibilities from the late 2000s onward have led to significant changes in the architecture of ERP systems and the emergence within the ERP system architecture of a module responsible for the integration of its various other modules, but also enabled the efficient integration of the system with external software and data sources [5]. In acknowledgment of the revolutionary nature of the introduced changes, in 2014 Gartner proposed the creation of a new class of "postmodernERP" systems, characterized by a modular internal architecture and the readiness to be integrated with external functionalities and modules [6]. The resulting composite IT architecture enables the users to quickly adapt or expand in accordance with the changing needs of business without being limited to the offer of a single vendor, a single software standard, or a single group of business processes.

The evolution of ERP systems began with inventory databases, which were later enriched with the planning and registry of operations (transactions) with the management of increasingly complex business processes [7]. In effect, even postmodernERPs remain transactional systems, that is, systems intended to register and monitor transactions instead of designing and executing end-to-end business processes. The support of business processes requires their strict integration with BPMS or the inclusion of process management tools within the architecture of the ERP system itself. In both cases, from the perspective of the user, this requires in the minimum the capability to design end-to-end business processes and to hold transactions configured in specific modules of the postmodernERP system from the level of the executed business processes. Vendors of ERP systems undertake to develop their offer in terms of embedding process management or enabling the strict integration of ERP with selected BPMS or Business Process Analysis (BPA) systems.

4 Business Process Management Systems

Business processes can be considered the arteries of modern organizations [8], as they represent the specific way in which organizational work is structured and executed, with a view to creating value and supporting business strategy implementation. BPMS, which combined information technology and knowledge in the field of management sciences and were applicable to operational business processes [9], support holistic management and increase the flexibility of implemented processes. They are defined as an application infrastructure supporting BPM projects and programs that support the entire process life cycle, from identification, through modeling, design, implementation and analysis, to continuous improvement [10]. BPMS allow organizations to increase the flexibility of business processes in a diverse application landscape [11]. However, due to the growing volume of data and the increasingly complex decision-making process resulting from the growing dynamics of the business ecosystem, BPMS have reached their limits. With the advent of Industry 4.0, traditional structured business processes have been largely replaced by dynamic ones: either partially structured or unstructured [12]. According to Olding and Rozwell [13], traditional, structured BPs encompass only about 30% of processes in organizations operating in Industry 4.0.

The answer to the changes taking place were intelligent BPMS (iBPMS) a type of high-performance (low-code/no-code) application development platforms that enable dynamic changes to operating models and procedures, documented as models, directly driving the execution of business operations [14]. Such platforms serve as a single tool allowing for the easy leverage of the analytics and intelligence of BPM through the use of the cloud, Internet of Things (IoT) integration, message-oriented middleware, business activity monitoring, the use of artificial intelligence (AI), and much more. In turn, business users make frequent (or ad hoc) process changes in their operations, regardless of technical resources managed by IT, such as integration with external systems and security administration. iBPMS also enable "citizen developers" and professional developers to collaborate to improve and transform business processes. They allow new, emergent practices to quickly scale across a function or enterprise. Although they take into account aspects of business transformation and digitization, changes in the requirements related to Industry 5.0 and the need for seamless collaboration between people and machines are driving the further evolution of BPM software [15]. The purpose of the changes is to provide a tool building a sustainable competitive position on the market.

5 Postmodern ERP and iBPMS – Differences and Similarities

5.1 Goals and CSFs for the Implementation of ERP and BPMS

In Industry 4.0 and 5.0, the measure of success of an organization is its ongoing efficiency and the development potential of its products and services, as well as the capability to use and develop its own intellectual capital [16].

In the literature from the last 10 years, there exist multiple publications on the requirements of Critical Success Factors (CSFs) for ERP systems and BPMS. All point to the fact that the success of implementing ERP or BPMS is dependent not on a single factor, but on the synergy of several or even several dozen CSFs [17–19]. They also lead to the observation that the goals and CSFs of the implementation of ERP and BPMS are if not identical, then at least largely overlapping and complementary. In Industry 4.0, it is expected that the implementation of ERP or BPMS will result in an increase in efficiency and effectiveness, as well as the flexibility of business processes [20]. However, from the point of view of Industry 5.0, in order to unleash the potential of both classes of systems and unlock the innovation of employees, the need to change the work culture and the empowerment of employees should also be taken into account.

5.2 Trends in the Development of Postmodern ERP and iBPM Systems

The results of the literature review highlight several concerns that determine the driving forces behind the development of ERP and iBPM systems. The most important among them are the needs of organisations operating in global, ever-changing business ecosystem of Industry 4.0/5.0, as well as technological possibilities available to system vendors. The system users' requirements resulting from nature of their work and social culture cannot be ignored either. The drivers pursued lead to appropriate trends in the development of ERP and iBPMS, which are characterised in more detail in terms of

foreseen requirements having a key impact on the further development of systems [21, 22].

(D1) The Constant Efforts of Enterprises to Improve Productivity and Efficiency
The main driver of the practical use of both ERP and BPM systems is the pursuit of reducing costs and increasing the efficiency/productivity of the business [23]. On the one hand, 72% of organisations indicate that cost reduction is their goal of implementing and using a BPMS [24]. On the other hand, ERP systems vendors declare that organsations use their systems to integrate the management of business processes [25]. Beyond the 2000s, emphasis for both class of systems has shifted from supporting internal management to leveraging value in real time [1, 26]. Nowadays, production, provision of services, and decision-making are federated within and between different organisations and divisions. According to Bailey et al. [27], by 2026, more than 50% of large organisations will compete as collaborative digital ecosystems rather than discrete firms. Therefore, improving productivity and efficiency should be analysed not only in the local context, but also in the context of the global business ecosystem. This means that in order for ERP and BPMS to be useful for cross-functional integration and value creation, they must be implemented in a technological ecosystem that covers and integrates the entire business ecosystem.

The foreseen requirements having a key impact on the further development of systems are as follows: (1) The need to support a business in such a way that it could systematically explore new opportunities, adapt, and fundamentally transform itself; (2) The need to support processes of highest maturity levels and of different natures; (3) The need to enable the management of end-to-end processes covering networks of different types of organisational units; (4) The need to align business processes with a strategic level; (5) The need to ensure systems quality characteristics, such as interoperability, performance, and scalability; (6) The need to create preconditions for cooperation with other systems types to fully automate end-to-end processes.

(D2) Abrupt Changes in Work and Social Culture
The real enterprise environment is highly dynamic and deals with a large number of various exceptions. The COVID-19 pandemic has demonstrated the reality of unforeseen disruption. According to Chong et al. [28], organisations that are able to adapt to such challenges are resilient, and characteristics of resilience include the development of local networks of teams and business units. This driver clearly indicates the importance of tools for the real-time management and improvement of business processes. Such a situation significantly accelerated changes in the work culture and made it possible to implement new business models based on digitisation [29]. This in turn resulted in the necessity to maintain a permanently higher rate of adoption of remote work and digital touchpoints [30]. By necessity, in many organisations technology has become the key to every interaction [28]: The foreseen requirements having a key impact on the further development of systems are as follows: (1) The need to support a digital-first, remote-first business model; (2) The need to support decisions on business innovations, including new business models and agility; (3) The need to support different types of process variability, run-time process variability, and their management in real time;

(4) The need to enable holding business activities anywhere, exploiting the potential of mobile technologies.

(D3) Technological Changes
ERP and BPMS vendors today have at their disposal opportunities provided by rapidly evolving and emerging new information technologies. These technologies originate from different fields, including cyber-physical systems, Internet of Things (IoT), cloud computing, hyperautomation, service-oriented paradigm, industrial information integration [31], to list just some of the more important ones. They are the major force behind a technological shift toward supporting new models of business.

The foreseen requirements having a key impact on the further development of systems are as follows: (1) The need for the orchestrated use of multiple technologies; (2) The need to extend the variety of supported technologies and simplify them to expand the scope of business automation; (3) The opportunity for on-demand access to required services (i.e., required infrastructure, platforms, software) and for building resilient, flexible, and agile application architectures thanks to the availability of cloud technology [32]; (4) The need to develop customer-facing systems by blurring business and technological aspects: (5) The opportunity to create flexible, adjustable, composable systems even faster thanks to the use of principles of service-oriented architecture; (6) The creation of preconditions to extend the digital workforce with smart things and cyber-physical systems.

(D4) Rapidly Growing Data Streams and Data Heterogeneity
Some departments or even entire organisations (for example, insurance companies) have always been data driven. Nowadays, businesses make extensive use of data because of the potential they provide. This requires ensuring that large amounts of structured, semi structured, and unstructured data can be stored and processed, including in their native form. In the context of Industry 4.0/5.0, business data that flow through business processes and are exchanged among the different types of actors are highly heterogeneous. The steps of business processes are carried out not only by traditional workers, but by various internet-connected devices as well. In addition, data should be available as soon as they are created and acquired. According to Guay [33], without appropriate data management, the expected business value of postmodern ERP systems will not materialize. The same can be said for iBPMS. The foreseen requirements having a key impact on the further development of systems are as follows: (1) The need to enable collaboration between machinery and people in running the business activities by enabling data exchange; (2) The need to extend the system's data infrastructure to cover not only traditional data bases and warehouses, but also data lakes, repositories, mobile data bases, etc.; (3) The need to ensure data quality, integrity, and security; (4) The creation of preconditions for the real-time and embedded analytics; (5) The creation of preconditions for end-to-end processes and for overall business visibility; (6) The creation of preconditions for processes mining and optimization.

(D5) Prerequisites for Increasing the Intelligence of ERP and iBPM Systems
AI-enabled solutions are implemented in different fields, changing the work of entire organisations and their employees. The research indicates that the development of AI has

made it possible to automate complex business process that until then could be executed only by humans. Advancements in machine learning, robotics, knowledge representation, automated reasoning and data analysis, planning and scheduling, computer vision, and natural language processing make the prerequisites for extensive hyperautomation, which is among the most important strategic technology trends [30, 32]. Thus, ERP and iBPM systems will be increasingly extensively rely on AI-based solutions combined with the digital workforce to improve business efficiency and workflow. The foreseen requirements having a key impact on the further development of systems are as follows: (1) The need to automate an increasing number of processes and remove the need for human intervention; (2) The need to shift ERP and iBPMS workplaces to a heterogeneous workforce, where people, as well as robots and intelligent things interact with the system; (3) The opportunity to develop an AI-driven user experience providing the users with more useful content; (4) The opportunity to use automated reasoning and inferred data to interpret documents written in a natural language when replacing people in the performance of tasks; (5) The opportunity for advanced and extensive business analytics and for its automatisation.

5.3 Architectures of Postmodern ERP and iBPM Systems

The term ERP is a generalized and an abstract term, because the products of specific providers can differ in many particular aspects. Some ERPs support only some operational and financial processes. They vary in functionality, data representation schemes, operation modes, and in many other details. An iBPMS is a solution for management of structured and unstructured business processes. To highlight their distinctive features, it can be said that BPM systems help enterprises optimize, implement, and automate flows of business activity to achieve business goals. iBPMS go one step further, i.e. "i" refers to the intelligence and advanced capabilities of these systems. The common denominator of both class of systems is not limited to principal architectural solutions. In practice, iBPMS increasingly supplement or even overlap with the typical functionalities of postmodern ERP systems. Typically, postmodern systems are characterized as federated and loosely coupled when the functionality is sourced as cloud services or via business process outsourcers [1, 33]. All these features are quality characteristics (i.e. adaptability, scalability, integration feasibility to name just a few) and can be implemented via design approaches, system IS architecture styles, and design patterns.

(A1) Functional Architecture of PostmodernERP Systems
PostmodernERP has taken shape through several stages of development. The system consists of many functional subsystems or modules that share a database. As a rule, every functional subsystem/module focuses on one business area, such as human resources, sales and distribution, procurement, asset management, manufacturing, finances, and planning. As the system evolved, additional capabilities were integrated. The extension of the system can be considered from two dimensions: (1) horizontal – where functionality is extended by adding domain-specific constituents, i.e. by integration with subsystems or modules of the same category; (2) vertical – where ERP evolves thanks to new technological capabilities, i.e. by adding functionality to enable advanced capabilities such as intelligent automation, advanced analytics, and real time activities.

The horizontal dimension can be adapted to the needs of the business through specialized subsystems, such as supply chain management (SCM), supplier relationship management (SRM), product lifecycle management (PLM), or business warehouse (BW), have been created to expand some ERP functions or to implement new functionality. As a result, the boundaries of ERP were rethought in two ways: (1) these subsystems, namely warehouse management (WM), SRM, and CRM, were in fact included in core ERP [34, 35], (CRM and SRM are the examples in Fig. 1); or (2) they were developed as independent subsystems or modules and could be integrated among themselves and with the core ERP system (PLM, BW and SCM are the examples in Fig. 1).

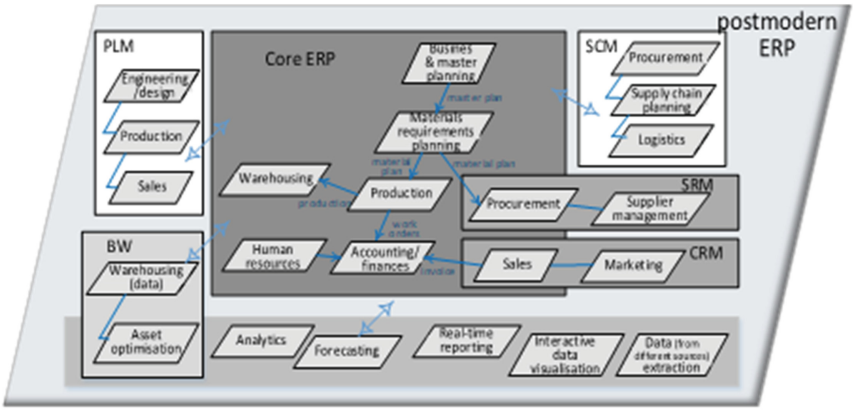

Fig. 1. Functional architecture of ERP.

This second option allows users to purchase and configure systems from modules that meet their needs. However, additional integrations increase the complexity of the system as a whole. As a rule, the core ERP serves as the central point of the integrated constituents. Considering the aspect of vertical extension, functional modules cover and extend the activities traditionally performed by people. Analytics comprises predictive, embedded, and real-time analytics in addition to classic data warehouse-based analysis. Some modules can be named as software agents, which perform tasks ranging from routine repetitive tasks to complex solutions.

The vertical dimensions of the expansion of ERP systems offers an increasing number of new possibilities thanks to the fact that constantly emerging and improved new technologies allow for the automation of an increasing number of activities that were previously performed only by people. To ensure a truly live business, some functional modules, such as planning, procurement, or manufacturing [34, 36] must have their

real-time execution counterparts, or, generally speaking, they should integrate the digital world. In other words, a module to process different types of data (e.g. unstructured, binary) from sensors, social networks, the IoT should appear on a vertical scale.

(A2) Functional Architecture of Postmodern iBPM Systems

The different types of architectures for BPMS have received quite a lot of attention from, among others, Arsanjani et al. [37] and Pourmirza et al. [38]. The functional architecture of iBPMS, analogously to postmodernERP architecture, can be considered as an extension of its predecessor from horizontal and vertical points of view (Fig. 2).

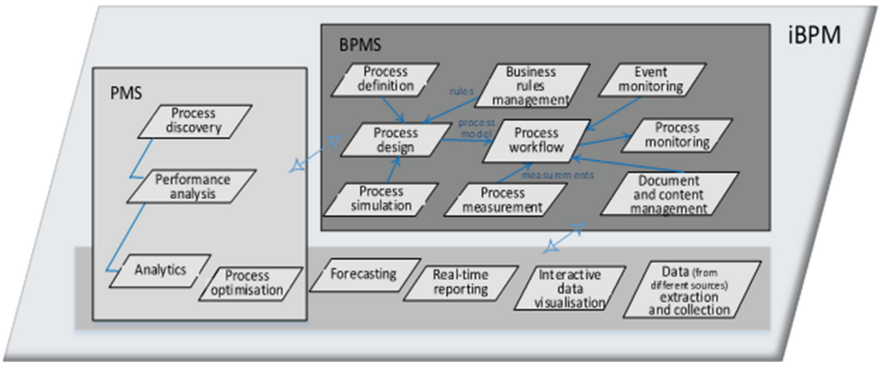

Fig. 2. Functional architecture of iBPMS.

The functional modules of an iBPMS support business process identification, engineering, execution, monitoring, and measurement. Process engineering includes process model development, optimizing, evaluating, and quality assurance. Multiple alternatives should be generated, studied, and analyzed in simulation and replaying on historical data studies in order to engineer the best possible business processes. In general, iBPMS takes manual processes and transforms them into digital processes that operate intra- and inter-enterprise systems. The business rules management module focuses on defining and storing rules which control business processes, while the content management module – on storing and securing documents, images, and other types of information entities. iBPMS extends the functionality of its predecessors by highly complex event monitoring and processing, increasing the ability of a business to identify opportunities or adapt to unexpected situations. In the context of integration with specialized systems, process mining systems (PMS) are worth mentioning. In addition to typical types of process mining [39], a PMS can be used to detect routine work in processes that can be automated [9].

In the vertical dimension, iBPMS implement end-to-end process automation via hyperautomation, including mimicking the behavior of workers. The process analytics functional module adds advanced predictive and real-time analytics, in which big data are used as well. Analytics also includes customer records on social networks, which enable both the definition and execution of more dynamic process discovery [40, 41]. Nowadays, iBPMS link workers, machines, and the IoT to ensure support for intra- and

inter-processes [42]. One consequence of this is the creation of a functional module to process large amounts of different types of data in real time. In addition, the functional architecture of BPMS is extended by a real-time decision making module.

6 ERP Systems Evolution – Vendors Perspective

In order to confront the results of literature research with business practice, the authors have analyzed ERP systems offered by vendors in Poland. In total, 88 such systems were identified. Following the analysis of the content of the offers from the perspective of using the solutions to support business processes, 10 vendors were identified for a total of 11 ERP systems, which are undoubtedly already designed in accordance with the principles of composite architecture and which enable the use of business process models. These are: Infor (Infor LN), Sygnity Business Solutions (Quatra MAX), Oracle (Oracle e-Business Suite and Oracle ERP Cloud (Fusion)), SAP (SAP S/4HANA) Comarch (Comarch ERP Egeria), Soneta (enova365 platinum version), IFS (IFS CLOUD), BPSC (Impuls EVO), SIMPLE (SIMPLE ERP), and Gardens (GardensERP).

In the last stage of the study, the authors applied 2 step expert interviews. First, based on the literature review and content analysis results, the authors developed and administered partly structured expert questionnaires to representatives of 5 ERP systems vendors, who accepted invitations to participate in the study. The results of the questionnaires were presented in Table 1.

Table 1. Process-based functionalities of selected ERP systems.

	System name	Infor LN	Oracle ERP Cloud (Fusion)	SAP S/4HANA	Comarch ERP Egeria	enova365
1	Process modeling	Yes, own DEM notation	Yes, with Oracle BPM Cloud	Yes, with SAP Signavio	Yes, with Camunda	Yes, own workflow description notation
2	Importing process from Business Process Analysis (BPA)	Yes	Yes, with Oracle BPM Cloud	Yes with SAP Signavio	Yes, with Camunda	No
3	Process execution in accordance with predefined models (changes to the model change the means of execution)	Yes	Yes	Yes	Yes	Yes
4	Adding or ommiting tesks or subprocesses in the course of execution	Yes, modifications, versions	-	Yes	Yes	NO
5	Launching tasks in other systems in the process view	Yes	Yes	Yes	Yes	NO
6	Controlling of executed processes	Yes	Yes, but transactional not process-based	Yes	Yes	Yes

The studies show that typically process-based functionalities are already present in postmodernERP systems. These systems allow for the modeling of business processes (e.g. INFOR or enova) or are strictly integrated with iBPMS applications (e.g. Comarch, Oracle, or SAP). All vendors who participated in the study offer the possibility of executing processes in accordance with predefined models (changes to the model lead to

changes in execution) and control over ongoing and finished processes. It should be noted that almost all systems allow for the execution of processes not just in a way which is fully compliant with the predefined sequence of actions, but which also allows for the possibility to adapt the process the needs of the specific execution context. This is a key feature which enables the execution within these systems of fundamental processes, which are decisive with regard to the results and the competitive position of the organisation and the vast majority of which require, in Industry 4.0/5.0, the dynamic adaptation of the process to the needs of the clients or the broader business environment [13, 14]. In most of the analysed cases, there is also the possibility to launch tasks in other systems in the course of process execution. Both these features considerably raise the flexibility and possibilities of the integration of ERP systems.

In the second step, the authors conducted in-depth interviews with experts participating in the study. The interviews were aimed at understanding the essence of the applied ERP system development approaches towards business process management. In the course of expert interviews, the respondents have provided a broader description of the offered ERP systems from the perspective of their present possibilities in the scope of process management.

The INFOR LN 10.7 system from Infor has a composite architecture, which enables the modeling of processes of any nature, as well as data flow, including the integration with external software. It has its own notation, which is similar to BPMN. In the course of work, the processes available to users have the form of active diagrams, which offer the possibility of maintaining the system and executing processes in accordance with a predefined sequence of tasks and decisions or through the direct selection of actions from the process diagram level. The system enables the users to launch tasks in other applications in the course of process execution. Data on the ongoing and finished processes may be presented in the form of diagrams containing the full information on the process executors, the state of completion, the time of completion, and the data processed. The system includes built-in tools from the areas of RPA, process mining, and ML/AI, but also allows for integration with external tools.

Oracle Fusion applications are implemented through Oracle Business Process Management and depending on the executed process may be modified in accordance with client requirements. New business process models may be designed and implemented with the help of the Oracle Process Cloud Service, which also provides the choice of the method of contact with process and task executors. In the course of work within the system, all actions within processes are logged and controlled, which facilitates undertaking actions and reporting problems or identifying delays, but also allows for the analysis of the executed tasks and processes.

The architecture of the Comarch ERP Egeria 8 system was based on microservices. The system allows for the execution of business processes in accordance with patterns implemented therein and updated by the developer on an ongoing basis in response to legal changes. At the same time, the system allows the users to configure their own unique processes and implement them in iBPMS Camunda, strictly integrated with Egeria. Another possibility is the integration with external document management and workflow class software with the use of the functionalities of both systems.

SAP S/4HANA from SAP – S/4HANA consists of domain-specific application written in ABAP code and an additional layer of the SAP Fiori application, which service predefined business roles. SAP offers pre-prepared business process patterns modeled in BPMN along with instructions for configuring the correct parameters in the SAP S/4HANA system and the SAP Signavio subsystem, which enable work with processes throughout their entire lifecycle – from design and modeling, through management and ongoing execution, up to evaluating their business efficiency.

7 Discussion

Industry 4.0 is characterized by the convergence of technologies that improve the efficiency and effectiveness of business processes [21]. ERP systems enable the integration of business processes and ongoing access to integrated data throughout the enterprise [7]. The implementation of the postmodernERP system provides organizations with benefits as a catalyst for business innovation, a platform for business process efficiency, a tool for standardizing processes, and by saving IT costs. One of the most important decision groups in ERP implementation are decisions regarding the configuration of the organization's business processes [43], i.e. decisions directly linking ERP systems with the functional scope of iBPMS. From this perspective, it is not surprising that CSFs and drivers for the development of postmodernERP and iBPMS systems are almost totally overlapping. In Industry 4.0 and the emerging Industry 5.0, both classes of systems require: (1) support in achieving current results, incl. Through the effectiveness of business processes, a system of continuous monitoring and improvement, effective management of organizational change, including the implementation of business process improvements; (2) development support based on employee involvement and participation, organizational culture, awareness, and understanding of process management.

For both classes of systems, compliance with the above CSFs requires: (1) ensuring system-level feasibility, best described by the CSF "System Architecture for Flexibility and Integration to Generally Accepted Standards"; (20 ensuring the actual implementation of BPM at the organizational level, including changes in the organizational culture, best described by the CSFs "Appropriate Implementation Strategy" and"Organizational Culture."

This is clearly indicated not only by the D1 driver "Continuous efforts of enterprises to improve their productivity and efficiency," but by the analysis of all other drivers presented in Sect. 5.2. Only a combination in the development of both classes of systems of "technological" (Industry 4.0) and "cultural" (Industry 5.0) views can ensure a balanced and sustainable competitive position of organizations using these systems.

As shown in the paper, the architectural requirements for both classes of systems are essentially the same. They can be summarized in two main points: (1) composite architecture enabling the integration of modules and even external subsystems and their data, in accordance with the requirements of planning, implementation and analysis of business processes; (2) flexibility to adapt to the organization's business processes, regardless of their nature.

Theoretically, these requirements can be met in three ways: (1) integration of the ERP system with iBPMS, as an external subsystem taking over the implementation

of selected business processes based on the metadata and data of the ERP system; (2) process operation of the ERP system, by enabling the configuration of selected processes in selected modules based on a repository of process models, e.g., in BPMN; (3) building the full functionality of the ERP system using iBPMS.

The authors reject the third option of preparing an application as impractical. A system built in such a way would require the preparation of a database layer and a presentation layer, analogous to ERP systems. In addition, a significant part of the processes supported by ERP systems is static, often defined by law, and it is much more effective to "program" them in the application. In practice, as the analysis of architectural requirements and possibilities has shown, there are only two ways leading to the same goal, which is the process operation of the ERP system.

8 Conclusions

The aim of the article was to answer the research question: "Are we heading toward process-based ERP system or is the future in the flexible, open integration of postmodernERP and iBPMS?". The complementary and overlapping functionalities of postmodernERP and iBPMS mean that both systems are at present dedicated to the same group of users. This fact, along with the similarity of the CSFs and drivers of development of both classes of systems, as well as identical architectures and the use of the same ICT solutions, de facto determines the strict integration of both classes, and, in the future – their combination into a single class of systems. They are merely two points of departure, from which further development leads to the same end point, namely the process-based operations of an ERP system or, broadly looking, an enterprise information system (EIS). To answer the posed research question, we are undoubtedly going in the direction of process-based ERP systems. However, this "process-based" nature can be achieved by the two paths presented in the article.

This new direction of the development of postmodernERP will undoubtedly become a crucial topic of further research on the development of systems, encompassing e.g. tracking the directions of the development of iBPMS and postmodernERP, the identification of the limitations of thereof, as well as the combination of both classes of systems into a single class, not to mention tracking the proliferation and the effects of using techniques from the area of hyperautomation and the analysis of changes to implementation methodologies.

The limitation of this research is its focus on the systems offered on the Polish market and on the vendor perspective. In the course of further work, the authors intend to extend their research to all European Union countries and for research from the perspective of companies using both systems. This will enable them to formulate a final answer to the question about the future of postmodernERP and iBPMS.

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