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Internal Determinants in the Field of RPA Technology Implementation on the Example of Selected Companies in the Context of Industry 4.0 Assumptions

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Abstract: As part of the assumptions of Industry 4.0. many modern technologies are developing. One of them is robotic process automation (RPA). It allows the replacement of human labor with robots, thus increasing the production capacity of enterprises. In practice, the implementation of RPA takes place through two solutions (models): using the services of an external entity offering RPA (service insourcing) or creating your own center of excellence (CoE). The use of both solutions is influenced by numerous conditions (determinants), among which we can mention benefits on the one hand and threats on the other. They are very different and depend on the model used. In this article, attempts were made to identify and determine their impact on the selection of the appropriate model from the point of view of the company (the purpose of the article). The research used two cases of entities implementing RPA on the basis of opposites, i.e., two different models, in which the discussed technology is treated as an important element of their automation. The achieved results indicate that there is no universalism, and their dominant feature is individualism concerning both enterprises and the solutions they implement. This is undoubtedly the effect of the currently too shallow RPA market, as well as the small number of entities using technologies based on intelligent systems. This is a serious research gap, which along with RPA growth will be reduced as a result of more and more intensive research in this field.

Keywords: industry 4.0; robotic process automation (RPA); center of excellence (CoE); intelligent automation; determinants of RPA implementation

1. Introduction

The first decade of the 21th century is recognized as the beginning of the fourth industrial revolution. It is a consequence of three other revolutions. The first of them began in the 18th century in England. It consisted in the mechanization of factories with the use of steam engines on a large scale, which manifested itself in increasing the production capacity of enterprises. The turn of the nineteenth and twentieth centuries is considered the beginning of the second industrial revolution, in which the main role was played by the intensive development of science and breakthrough discoveries in the field of electricity use. In 1869, a production line was built in a meat production plant in Cincinnati, and the production process was divided into stages, assigning specific tasks to employees [1]. The idea was replicated soon after by the Chicago plant, from which Henry Ford took the idea of introducing similar procedures in the automotive industry, which resulted in a significant increase in production capacity. Another technological leap began in the 1870s, when the industry began to use programmable controllers with memory and computers [2]. This made it possible to fully automate the processes and move people to the level of supervising the production process. It was the beginning of the next "era" related to industrialization and the introduction of the assumptions of the next revolution known as "Industry 3.0".

Currently, the term "Industry 4.0" is used to describe the level of advancement of industry development, which, compared to the previous one, is based on new technologies equipped with artificial intelligence.

The term "Industry 4.0" was used for the first time in 2011 to refer to the industrial transformation taking place in German enterprises [2–4]. The global recession has forced the industrial sector to invest in technologies in order to reduce labor costs and increase their competitiveness in the constantly developing market [5]. The future of modern companies has become digitization, in which great hopes were placed for technological development, which was aimed at creating intelligent production processes, procedures, or the products themselves [6–8]. The development of information technologies and the Internet resulted in the emergence and dynamic development of many innovative solutions such as Big Data, the Internet of Things and Services, cloud technologies, and intelligent robots [9,10]. In addition to intelligent robotics, classically understood as physical manipulators, functioning, e.g., in the automotive industry, more and more people started to talk about artificial intelligence and robots in the sense of software [11]. At the end of the 20th century, artificial intelligence was defined as an IT creature that can think by itself and has the ability to learn [12]. Terms such as deep learning, machine learning, or neural networks were popularized [13–15]. The development of these technologies significantly contributed to the creation of a new branch of IT solutions—robotic process automation (RPA) [16].

For some time now, RPA technology has been the subject of close scientific observation. This is due to the fact that it is considered to be the "face" of the aforementioned digital transformation in business [17–19]. A common feature of all industrial transformations and intelligent business automation solutions is the possibility of significantly increasing the production capacity of enterprises, with the difference that industrial revolutions have improved physical processes, and automation with the use of artificial intelligence has enabled the full automation of virtual tasks [20]. The industries very quickly noticed the great potential of the new IT solution, which started to be used in accounting and finance (e.g., OpusCapita) [21], human resources, consulting (Deloitte) [22], banking (Nordea) [23], and telecommunications (Telefonica O2) [24]. Currently, RPA system providers experience a continuous increase in the demand for this type of software. An example of the growing demand for intelligent technologies is their use in public institutions, finances, and human resources, not only manufacturing companies. In the case of business entities, the implementation of RPA solutions is associated with the use of two types of models. The first is the creation of RPA Centers of Excellence (CoE) in order to acquire the appropriate level of competence to internally improve the operation of the company. Building your own team creating the so-called the Center of Excellence (or RPA CoE) is one of the opportunities. The task of the center of excellence (CoE) is the development of specific technologies in order to sell related services or to effectively implement the technology in the structure of the company [25]. In turn, the second model, due to the fact that the market of such solutions is quite young, means outsourcing and obtaining RPA services from external contractors (service insourcing). In summary, no matter what type of model is used, the demand for RPA services is growing all the time. This is evidenced by the forecasted revenues of leading technology providers (UiPath (Romania), Blueprism (UK), Automation Anywhere (USA)) [26].

The growing demand for RPA is the result of a huge number of advantages that directly or indirectly result from the use of this type of solution. The former undoubtedly include the limitation in the field of manual work, which has a positive effect on employees, freeing them from routine, repetitive tasks [27]. The consequence is their better physical and mental health and the possibility of a more creative use of their working time. On the other hand, the second group of advantages includes a number of financial benefits for the company (despite the need for large initial expenditures) resulting from lower employment in a longer period of time, or the benefits of improving the quality of the offered end products (benefits for the consumer) and the improvement of the so-called customer experience. Moreover, it also directly translates into shaping an advantage over

the competition and increasing market importance. The above advantages are an example of internal conditions positively influencing the use of RPA technology on a large scale by some enterprises. Due to the fact that they have a stimulating nature (they are an undoubted motivator for the implementation of this technology), in this article they will be treated as determinants influencing the pro-development position of the surveyed enterprises. However, it should be remembered that companies implementing RPA not only benefit from this, but also experience measurable "losses" (risks) resulting from improper matching of available solutions within the above-mentioned RPA technology implementation models [28]. Both of them are the subject of research in this article.

2. Robotic Process Automation—Theoretical Background

The subject of this article implies the need to present the concepts of Robotic Process Automation and Competence Centers (CoC) (also referred to as Centers of Excellence (CoE)). With reference to the first of these concepts (RPA), it should be stated that, in general, RPA is a technology used to automate business processes, which is characterized by the ability to process large volumes of data, reduce errors caused by the human factor, and increase the precision and speed of the process and the fact that, unlike the human worker, it does not need to rest [29]. This technology can relieve employees of performing repetitive and monotonous business processes, thanks to which the employee's competences can be used to perform tasks requiring greater creativity or more advanced thinking [30–33]. Intelligent programs built using RPA technology are often referred to as software robots. Their typical tasks are the migration of very large amounts of data between different systems along with their comparison and validation, automation of sending e-mails to a large number of users, obtaining data from various sources and updating databases, and handling various orders in tasks based on operations on IT systems. The technology can only be used in business processes with clearly defined rules and business logic. It mainly involves interacting with IT system interfaces by mapping the steps taken by employees to go through the entire business process [34].

When analyzing RPA technology in the context of its structure and functionality, it should be stated that it uses non-invasive mechanisms that detect individual elements of building applications or web pages. Artificial intelligence algorithms retrieve information found in the code, distinguish individual components (called attributes), and remember their settings. Artificial intelligence referring to individual elements may, for example, press buttons, enter and read text, recognize windows, or close or open systems [24,35,36]. As V. Kommer rightly pointed out: 'RPA aims to replace people by automation done in an outside-in manner. This differs from the classical inside-out approach to improve information systems' [37]. Due to the very low level of invasiveness, the Institute of Robotic Process Automation and Artificial Intelligence (IRPA-AI) [38] defined RPA class solutions not as resources that are part of the IT infrastructure of companies, but rather as a solution that is something like an add-on sitting at the top infrastructure [18,38].

This general presentation of RPA technology becomes the starting point for the conceptualization of the concept. Authors writing about this technology define it in different but convergent ways. The most frequently repeated term is a software solution, which describes robotic process automation as a computer program [27,39–41], the effect of which is the automation of work performed so far by a human [21,23,39]. Table 1 presents some sample definitions describing the RPA technology.

Table 1. Chosen RPA definitions.

Author	Definitions	Key Words (Explanation)
Asatiani et al. [21]	The automation of service tasks that were previously performed by humans	Process of automation, replacement of human work with artificial intelligence
Sobczak [40]	A class of IT tools that enable developing	software robots using a graphical wizards, software solution
Balasundaram et al. [41]	Software program that executes steps taken by humans to finish the task	Software solution, mimic human steps
Fernandez et al. [39]	Configurable software solution to do the work previously done by people	Software solution, replacement of human work
Kedziora et al. [23]	Software to offload mundane, manual actions and focus humans' attention on more creative work	Tool to automate humans' work, replacement of human; work
Willcocks et al. [27]	Software solution that can be configured to execute work done by human workers	Software solution, replacement of human work
Martinek-Jaguszewska [42]	Technology that takes over the steps taken by humans to proceed with the business process	mimic human steps, software solution, replacement of human work, help in business process

Definitions presented above indicate two essential elements (in addition to the "computer program" mentioned above). The first is "to imitate humans" and the second is "to replace human labor". However, defining this concept as "a software solution that replaces a human" while performing business processes is a very general definition; therefore, the authors very often use additional explanations aimed at making it more detailed. Replacing a human, or performing work previously performed by a human, is a response to a very high level of generality and leaves a lot of room for guesswork. A more precise term is imitating human behavior [43–45] or mapping steps taken by a person to complete a given task [41]. Expanding the definition to include such terms allows the user to imagine the way in which artificial intelligence is supposed to work in a much easier way.

Much less frequently, when defining RPA, there are terms regarding the nature of automation and the description of the nature of tasks performed within this technology. Among them, RPA technology can be identified as:

- Routine tasks—business processes that are performed with a certain constant frequency [20,46,47]. The more often the business process is performed, the more prone it is to automation, which makes it a very good showcase and an example on the basis of which an RPA solution can be described.
- Principle-based process—the execution of which depends on clearly defined steps (paths) that can be described by a closed procedure [20,44,48].
- Structured data—refers to the standardization of documents used in a given business process [20,48,49]. It is worth noting that processes that do not have a uniform data structure, or those in which the structure can change frequently, are not recommended for automation due to too many exceptions.
- Non-invasive tasks—the term itself does not refer to the performed tasks, but the relation of the RPA technology to the systems with which it cooperates [47,50]. The interaction of an intelligent automation class solution with the client's systems consists only in retrieving visible data and processing it without the need for deep access to services.

Therefore, for the purposes of this article, the definition of RPA is adopted, according to which it is a technology that automates repetitive, manual business processes with the use of artificial intelligence mechanisms. The feature of RPA is "the imitation of human steps", illustrating a closed procedure in the scope of repeatability of these processes thanks to the collection of data and the possibility of their processing, the end result of which is to improve the effectiveness of customer service and thus increase the competitiveness of an enterprise based on this type of solutions.

The problem of RPA technology implementations is directly related to a specific level of investment. Undoubtedly, such solutions are expensive, but they are profitable in the long run. One of the first high-profile investments in RPA technology was Opus Capita's 2014 [21] investment in a UiPath solution to automate its internal finance and HR processes.

Numerous studies conducted on case studies confirm the growing interest in investing in the sector of intelligent automation of business processes [22–24,51]. Enterprises noticed in RPA an opportunity to stay ahead of the competition by using virtual employees in their structures. In order to effectively implement technology into an organization, it has almost become necessary to build Centers of Excellence (CoE), involving the use of the first possible solution model among companies using this type of solution.

Competence centers (CoCs) (or centers of excellence (CoE)) have become a catchy slogan not only in the context of business, but also in the scientific context. Consideration of competence centers has been going on for some time. In 2009, Beerkens [52] wrote about the emerging global model for CoE. In 2014, Forrester raised the topic of RPA CoE with the participation of Blueprism, one of the world's leading RPA software providers [53]. In 2018, S. Anagnoste described a model illustrating the structure of an exemplary CoE with its operational goals, a division into individual roles with a matrix of skills and responsibilities required by them [54], and in 2020, Kędziora and Penttinen described the Nordea case study [23]. According to Hellstrom's research, centers of excellence can be talked about, for example, in the context of nanotechnology, biomedical, IT, and any other sectors where there is a need to develop infrastructure aimed at exploring hard-to-reach knowledge and developing advanced technologies [55].

CoE can be described as organizational environments aimed at developing the highest standards of conduct in a given field and achieving success in the context of applying a given technology or investment in an enterprise or a given unit. CoE's tasks are to conduct research on a specific innovation, perform tests, or adapt a new technology to be successfully implemented and used in a given organization [25]. Therefore, it can be concluded that the main sense of the existence of competence centers is to absorb knowledge from the environment (usually external), process it, and successfully distribute this knowledge in the most suitable form within one's own organization in order to achieve the intended benefits [55] or distribute it outside as a form of a new form of services offered by the company.

Competence centers can take the form of a physical team or unit working within one organization or a virtual (distributed) form and consist of a network of partners with a coordinated center [56,57]. There is no rule when it comes to the size of CoE—a team may consist of a small group of employees assigned to this task in a small organization, a team in the R&D department of such a company, or a large group of hundreds of researchers consisting of a network of smaller teams spread over various organizational units, enterprises, or scientific institutions [58].

3. Research Methodology

3.1. Characteristics of the Research Sample

Two research methods were used in this article: a systematic literature review (SLR) and a case study (SP). The first of these methods, the systematic literature review method, is derived from medical research. Over the last two decades, it has been adapted to the search for information also in the areas of management or information technology, because it systematizes knowledge about various research sectors, ensuring its reliability, appropriate quality, and completeness in the context of obtaining conclusions [59–62]. Referring to the traditional steps required to obtain appropriate results using the SLR method, the following steps should be taken [63,64]:

- search for selected literature on the topic under study
- make a quantitative selection and choose materials directly related to the research topic described
- perform a qualitative analysis and synthesis of approved materials

In the case of this article, the selection of literature was made on the basis of the criteria presented in Table 2.

Table 2. Research details for RPA subject.

SLR Protocol Element	RPA Research Details
Sources	EBSCO, Google Scholar, Research Gate, IEEE Explore
Keywords	Robotic process automation, center of excellence, RPA in business, RPA organizational structure
Search strategy	Publications up to 6 years old with few exceptions, Articles containing PDF files, Priority for articles published in science journals, science publications, case studies from companies using RPA solutions, conference review, reviews
Inclusion criteria	Search string robotic process automation, search string RPA business model, search string RPA center of excellence, search string RPA organizational structure
Exclusion Criteria	Articles without full access, articles without references to other papers, articles without full PDF files, articles with abstract access only

The next step was to search the databases of articles:

- EBSCO—Full library access and search criteria based.
- Google Scholar—Public access to materials.
- Research Gate—Public and easy access to scientific materials containing PDFs.

The EBSCO database was the key base for acquiring RPA and CoE knowledge. This was performed based on the analysis of keywords related to this issue. It is presented in Table 3.

Table 3. Keywords used in EBSCO search.

Search Criteria	Number of Results	Full Text	Scientific Journals
robotic process automation	1868	1743	85
robotic process automation AND center of excellence	15	14	3
robotic process automation AND organizational structure	2	2	1
robotic process automation AND business management	65	46	5

The second method used in this article is the case study, which is a qualitative method. In these methods, it is essential to describe fewer cases in more detail. Qualitative methods provide information on a better understanding of the operation of the analyzed issues and provide new information about the studied phenomenon. The research presented in this article covers the case of two companies: a Finnish forestry manufacturing company, mainly engaged in paper production, and a French IT corporation, dedicated to providing digital services. The choice of these specific companies as models in this article is due to the contrast between the companies and the difference in the original business assumptions behind the creation of the RPA structures. On the one hand, there is a company that rents an RPA center of excellence to automate its business processes, and on the other hand, a corporation that, in order to automate its own business processes, creates an RPA business process team that is to be the local RPA center of excellence. Despite significant differences, both organizations invested in technology knowledge and its development, which contributed to the creation of a valuable service that can earn for itself, bringing financial and non-financial benefits to both itself and the customers.

3.2. Defining Research Questions

A systematic literature review for this article shows great interest in the subject of robotic process automation. Research on this topic is relatively young, and preliminary findings show that the literature still lacks studies on this issue. The considerations mainly concern the benefits and risks of business investments in competence centers. However, there is a lack of analyses related to their functioning and the impact of RPA technologies on the development of enterprises using them. This proves the need for research in this area. Significant research and cognitive gaps in this area are the result of too much "novelty" of this issue and too short implementation time resulting from the application of

these solutions in practice. In addition, it should also be noted that the level of using the assumptions of Industry 4.0, including solutions equipped with artificial intelligence, is not yet very common in Poland. This is due to many reasons, including constant changes due to technological developments, the organization's fear of investing in RPA, and the relatively large financial contribution that is required to start a project. Companies using IT systems very often have little or no knowledge of automation, which translates into uncertainty related to business investments in new technologies, such as RPA. In connection with the above, the following research questions were asked:

1. What internal determinants in the case of these two organizations influenced the implementation of RPA technology by the studied enterprises, causing their digital transformation?
2. What are the potential benefits and risks of intelligent business process automation?
3. What was the impact of internal determinants on the choice of approach (model) for implementing RPA solutions in the surveyed organizations?

4. Results

4.1. Presentation of the Surveyed Enterprises

The first of the presented companies is a Scandinavian corporation from the forestry sector. The company employs 20,000 people worldwide. Most of the company's production plants are located in Europe, but the company also has facilities in Asia (Russia, China), South America (Uruguay), and North America (USA). In addition to the production of paper, the company also operates in the energy and biofuels markets and has its own research and development center.

A very large number of complicated but repetitive business processes in various companies of the presented company created the need to hire more employees or invest in intelligent automation technology. Due to the complexity of the procedures governing the course of business processes and the very large number of potential improvements, it was decided to make a long-term investment in the RPA center of excellence. The lack of competence in the field of robotic process automation within the organization resulted in a decision to contract a center of excellence provided by an external company.

The company decided to provide a robot construction service through outsourcing by a development team from India, but the investment did not bring the expected results. The company decided to invest in a competence center that was to be provided by the European RPA market leader. CoE was to consist of development teams whose task was to conduct business analysis of the enterprise in terms of selecting the most optimal processes for automation, creating solutions, and testing them. In addition, the robotic resource maintenance team was to supervise, repair, and change already implemented solutions.

The second described company is a French corporation operating in the IT, banking, and finance sectors. It employs over 100,000 people in dozens of countries on all inhabited continents of the world. The company provides a wide range of digital services and describes itself as the World Digital Leader. The company provides infrastructure solutions, data management, system integration and implementation, big data, and cybersecurity.

One of the organization's branches is located in Poland and employs approximately 7000 people. A highly developed human resource management department works every day on routine tasks resulting from their daily work. The unit decided to invest in RPA class solutions, but due to the confidentiality of data processed in business processes and very high security standards of the internal network and systems, it was necessary to build a local executive team. At the same time, the team was tasked with analyzing the possibilities of automation, creating solutions, and establishing a growing center of excellence.

The described enterprises were selected for this article due to the similarities regarding the scale of operations and as opposing models of approach to investments in robotic process automation technology.

4.2. Answers to the Research Questions

Answering the first research question (what internal conditions in the case of these two organizations influenced the implementation of RPA technology by the researched companies, causing their digital transformation), it can be concluded that in the case of the first company (first case), the idea of automation resulted mainly from several fundamental determinants. Among them can be mentioned:

- A high level of complexity of business processes—this factor influenced the time-consuming nature of performing specific tasks by employees. Along with the growing difficulty of the business process, a greater number of errors made by operators appeared. Thanks to artificial intelligence, it was possible to eliminate them. This is due to its features, which are the lack of need to take time to make the right decision regarding the course of a specific process and the ability to remember all information related to the performance of a specific task. It is a very important business aspect that is often mentioned by companies as even more important than the financial aspect.

- Increasing the number of transactions—business development characterized by an increase in the number of customers of the enterprise affects the amount of time needed by employees to complete specific tasks. The use of RPA technology is a cheaper and simpler solution than employing additional personnel. The robot does not need additional training or breaks in work.

The analysis carried out in the case of the second enterprise allowed for the specification of the following conditions directly affecting the use of RPA technology. These include:

- Privacy policy—some tasks could only be performed by dedicated employees, due to access to confidential data, which is why the company decided to use RPA technology by creating a dedicated team. The created robots were launched by employees of specific teams on demand and under their strict supervision. Employees performing the necessary tasks could be delegated to work requiring greater creativity and RPA assistance allowed to increase the efficiency of individual departments.

- The need to expand the IT department—a very important element that goes hand in hand with intelligent automation of business processes is equipping the company with the appropriate infrastructure and competences, allowing full advantage of the technology's potential to be taken. The cost of RPA implementation, in addition to aspects such as business analysis, building solutions, or testing them, also includes the costs of building an appropriate infrastructure (virtual machines or workstations on which the robots are to work). In the case of the described company, it allowed the minimization of the costs of applying the technology in the company's structures.

Moreover, the case study of the described companies shows that the main condition for the implementation of RPA technology was the possibility of a real increase in the efficiency of the company's operations by automating internal business processes. The common condition for the successful implementation of intelligent business process automation technology is that the company has monotonous, repetitive tasks with clearly defined business logic. It was met in both described cases and was the direct reason for investing in intelligent solutions.

The above case study of two companies allows for drawing several important conclusions (with regard to the first research question). Firstly, RPA implementations in each of these cases were forced by specific internal conditions. Secondly, these conditions are very different and depend on the specific company. It can be concluded that these conditions are subject to individualization. Hence, it is difficult to speak at present, i.e., in a situation where there are still too few entities implementing RPA on the market, about "common" internal conditions influencing decisions on the implementation of this type of technology. Third, as this research shows, the only exception in this respect seems to be "repetition of tasks with clearly defined business logic". Fourth, considering the answers in the light of the first research question, it is necessary to emphasize that these conditions are perceived by the surveyed companies mainly in the context of the benefits that these organizations

achieve as a result of RPA technology implementations (the ability to handle more complex business processes, a greater number of transactions, or a more effective privacy (data security) policy).

In turn, when answering the second research question (regarding the specific benefits and risks of using RPA by the researched companies), it should be noted that in both cases the potential financial benefits obtained by investing in RPA technology are listed first. In addition to them, there are also business benefits resulting from the use of this technology in IT systems. In the first enterprise, the main observed benefit was the saving of employees' working time along with the increase in their efficiency. In addition, it benefited from the structuring of process documentation and the modernization of IT resources in order to enable the efficient work of robots. The second company, thanks to the elimination of unnecessary links in the workflow of business processes, could fully automate some of the tasks. This allowed for the elimination of external entities, which have so far been performed manually (outsourcing tasks). More specifically, the additional benefits of implementing RPA on the basis of the first case study are:

- Automation of monotonous and repetitive tasks—this allows freeing up some human resources that can be redirected to tasks requiring more creativity or applying less clear rules (activities difficult to replace by artificial intelligence). The industry uses the term FTE (full-time equivalent), which is a measure of a robot's performance. 1 FTE means the employee's commitment to work on a given task for eight hours a day. The solutions proposed by RPA companies are based on the calculation of how many employees could replace the robot (or how much help it would be). Replacing a human worker with a virtual one can be compared to the automation of a production line by replacing a human with a machine.
- Document structuring—one of the requirements set by RPA technologies for the automation of business processes is to follow clear rules, with a finite number of exceptions and standardized forms of documents. The implementation of intelligent automation can very often force a company to restructure its business processes in the form of standardization or digitization of the documents it uses. The creation of new standards not only enables robots to work, but also contributes to improving transparency and modernizing the client's business.

In the case of the second enterprise (as indicated above), the detailed benefits of implementing RPA technologies are as follows:

- Simplification of procedures—Intelligent automation of business processes is primarily designed to generate savings, but is also increasingly described as a mechanism to reduce the number of errors made by human workers. The use of the machine in the form of intelligent scripts not only increases the "digital efficiency" of the company, but also the quality of services and their availability to customers. The same business processes that previously had to be physically undertaken by the designated employee run and perform themselves, which is often accompanied by the creation of alerts and indicators for people supervising the robots and checking the correctness of the work performed.
- Modernization of IT resources—The use of robotic process automation requires appropriate IT resources such as dedicated workstations (most often these are so-called virtual machines), establishing a specific security policy, network access, or the employees' competences in the above scope. It often happens that a company investing in RPA solutions simultaneously modernizes its network resources, physical computers, or introduces other innovative technologies (such as GitHub, Jira, VNC protocol, Puppet, etc.).

Therefore, answering the first part of the second research question, it can be stated that the implementation of RPA class solutions may bring significant benefits to organizations, which are manifested in an increase in the quality of services provided or savings obtained by freeing up employees' working time. Unfortunately, the solution may entail various

types of threats (risks). Their identification will allow obtaining answers to the second part of the research question (concerning risks).

Based on the case studies of both described companies, two main risks have been identified—inappropriate selection of business processes for automation and unforeseen and frequent changes or updates of systems. The first firm's analysis also highlighted the likely negative impact on business resulting from a decline in knowledge of the processes that were entirely dedicated to robots. The risk of inadequate selection of a specific technology and the lack of awareness and knowledge about the use of RPA at a later stage influenced the decision to invest in the center of excellence (the case of the second enterprise). This entity experienced problems related to granting access to networks and machines as well as problems related to the high level of security of the company's internal systems. The creation of such a center of excellence was aimed at eliminating this type of risk. More specifically, the risks associated with the implementation of RPA technology, as observed in the first case, include:

- Incorrect selection of business processes for automation—poor process analysis can lead to wrong conclusions about the benefits of work improvement. If it turns out that the process contains elements that are difficult or impossible to automate, or if possible errors or poor quality of system functioning are not taken into account, the return on investment may be delayed, or sometimes the investment may turn out to be completely unprofitable in the long run. The most appropriate solution is to use the correct PoC (proof of concept).
- Unforeseen and frequent system changes or updates—each change of the existing system or application on which the robot works will involve additional costs of the developer's work to calibrate the solution to the new system realities. This may delay the return on investment or lead to a situation where the investment becomes unprofitable.
- Loss of knowledge about the course of the process—if a given task is completely taken over by a robot and is not performed manually, it may turn out that after some time the organization will suffer from "amnesia" regarding the course of the procedure. If appropriate documentation on the performance of specific procedures is not created, knowledge about specific business processes may be reduced or almost completely forgotten. Introducing employees to the same process will cost the employer additional working hours.

In turn, in relation to the second case (the second enterprise), the following types of risks (in detail) were distinguished:

- Incorrect selection of RPA technology—software implementing automation available on the market undoubtedly have advantages and disadvantages and are characterized by a different degree of development and purpose. The wrong choice of technology can result in serious complications related to the investment. Certain technologies may not be able to perform the intended work effectively, which may result in design locks.
- Lack of RPA awareness or basic knowledge about the use of intelligent automation technologies—employees are a very big threat to the robot's work, unaware that even a small system change (e.g., selection of an ERP system overlay) may cause the robot to stop working, or it will not be able to implement the steps previously designed in its logic. The wrong approach to the solution implies the incorrect operation of the robot, which may cause irreversible or difficult to remove damage to the production data.
- Lack of proper access and security—it should be remembered that the robot uses the system accounts intended for it, just like regular employees. If for any reason gaining access to websites or applications proves to be problematic or impossible, it may have a negative impact on the investment results. It is very common for a project budget to get exhausted due to too many downtimes waiting for certain accesses.

When answering the research question, it should be stated that the benefits of RPA technology implementations can be divided into two main groups: financial and non-

financial (business). Both are extremely important from the point of view of the surveyed entities (they have very measurable effects). However, as mentioned in the answer to the first question, their nature is very individual, tailored to the specific company. Others were specific benefits for the first and the second entity. The situation is also very similar with regard to risks. At the same time, in both analyzed cases, the greatest emphasis is placed on the level of knowledge—in the absence of it, it causes certain negative effects manifested by improper operation of RPA technology. The result is the necessary corrections in the robot's logic, or "cleaning up" of the mess that the robot could leave behind in IT systems due to incorrect operation.

Answering the third question (concerning the most frequently used models among entities implementing RPA technology), it can be stated that, on the basis of the case study of the presented entities, two different models have been observed: RPA technology (on the basis of outsourcing) and the second consisting in investing in the RPA center of excellence (building a local team to create a CoE). In the first case, the first company decided to automate its business processes by an external organization that was to provide a complete set of services related to the implementation of RPA technology. Some of the reasons for such a decision taken by the company first were:

- Susceptibility to automation and the need for appropriate competences—after successful tests of the technology's capabilities (the use of the so-called proof of concept), the company noticed a great potential in the application of the solution—a large number of business processes to be automated. In order to implement large projects, a team of adequate size and competencies at the appropriate level is needed. Choosing to use the services of experts offered by an external company increases the chance of high-quality solutions and eliminates the challenges of employing appropriate personnel along with continuous investment in the development of their competences in a given field.
- The existing solutions required improvement—also, in this case, the best choice was to invest in the services of an external company. To correct defective solutions that have already been implemented, but cannot be implemented from the beginning (due to various factors), greater competence is needed than in the case of starting the project from scratch.

The second described company decided to create a new unit in the organization aimed at automating internal business processes and acquiring knowledge and competences in the field of intelligent technologies. The team was to function as a local RPA center of excellence. This was due to the following conditions:

- Restrictions related to employing a larger number of employees as well as strict rules regarding the corporate data security policy—some of the automated business processes had access to confidential data. The company's security standards indicated the benefits of omitting some of the procedures in the case of technology implementations carried out by the company's employees. In the case of an implementation by an external company, certain processes could not be automated due to the company's privacy policy.
- Technical facilities—process analysis and solution design is by far the most important part of the implementation, but it is also important to provide the appropriate infrastructure, networks and workstations (virtual machines), on which robots are to work. The ability to use the services of local infrastructure teams provides some of the competencies needed to establish a center of excellence and conduct successful technology implementations. This circumstance was conducive to investment in the local RPA team.

However, the question posed in this way did not allow obtaining an answer regarding the effectiveness of RPA implementations. It is difficult to state on the basis of the above analysis which of the cases (models) is better when it comes to implemented RPA. The responses most often emphasized the great usefulness of RPA without focusing on the

assessment of individual models. It seems, however, that, as in the previous questions, also here, the displacement of an appropriate solution was determined by the nature of the expected benefits (or threats) resulting from the use of this technology. It was also difficult to obtain unambiguous answers regarding the costs of implementing these two models. The comparability was made difficult by the different time frames of implementations and their different scope. To sum up, the selection of the appropriate RPA implementation model is an individual matter of each of the analyzed enterprises. Nevertheless, in practice, there are two solutions of this type—one with the use of external resources (exploration of the environment) and the other with the use of employees' own resources, which is manifested in the creation of CoE.

5. Discussion

The above analysis of internal conditions influencing the implementation of RPA technology in the analyzed enterprises has its serious limitations. The first one is undoubtedly the scope of the research carried out. Due to the small number of entities on the market using RPA technology (and thus experience in this field), only two key entities using extreme model solutions (insourcing and CoE) were invited to this study. This limitation had its "consequences", which were the use of qualitative rather than quantitative research (of course, it is difficult to talk about the advantage of one over the other in this context). It also has one more serious consequence—it makes it impossible to apply generalizations regarding companies operating in this industry. The second limitation concerns the time of the investments made. In the case of the first audited entity, due to the "purchase" of ready-made solutions in the environment, the investment time is relatively short (not taking into account the necessary periodic modernizations). In the case of the second company, the situation was slightly different. There, the investment process takes place all the time, due to the development of CoE, which results from the need to improve the solutions created within the structure of this analyzed entity. This makes the process of comparing these cases extremely difficult, especially in terms of the size of the investment and the assessment of the effectiveness of the implementation of the technology in question. The last limitation is that in this article only internal determinants directly or indirectly influencing the propensity to implement this type of solution in the surveyed enterprises are taken into account. In practice, this means deficiencies in taking into account the role of the immediate and further environment in the analyzed process of applying RPA technology. However, it is not possible to include in a short study all the elements that relate to the analyzed issues, as it is physically impossible. It is necessary to focus only on those elements that constitute the main point of the undertaken considerations. In the case of this article, it is undoubtedly a study of the impact of internal conditions on the implementation of RPA, mainly in relation to "positive" features, because the subject of research concerns the propensity to use this technology (and not the lack of its use).

With regard to the first research question, it can be stated that in the literature on the subject, by far the most common reason that motivates enterprises to invest in RPA technology is the possibility of increasing their business efficiency, which at the same time translates into financial results. Intelligent automation of business processes offers companies the employment of a robot that performs tasks that were previously performed by human workers, in less time and with a lower margin of error [21]. This is described, inter alia, by Asatiani and Penttinen, who say that the premise of investing in this technology is the ability to receive more labor for less cost or to carry out daily, routine tasks with less time involvement of employees. In turn, Hallikainen, Bekkhus, and Pan emphasize the fact that these employees may be redirected to perform more complex (or requiring more creativity) tasks [51]. Each improvement of the company's efficiency with a negligible (in relation to the effect) cost increase allows the generation of savings, which companies care about in the first place.

Some authors pay attention to one more important aspect, which is reducing the number of errors. The result of a mistake is a greater amount of time that an employee has

to spend on performing a specific task, as mentioned by Fernandez and Aman [39]. An error may also result in a negative reception of the services provided by the company by the end customer (e.g., if an incorrect document containing incorrect or distorted data was sent to the customer, or the service was not fully performed). The level of complexity of internal processes very often influences the decision to use RPA technology [24]. This is because the robot cannot make a mistake as long as it is designed correctly. Its effectiveness is also not affected by the time of previous work, the number of cases worked in a row, or the level of complexity of the task performed—in the same circumstances, the susceptibility to error among human employees increases.

In some cases, a very large number of transactions during the execution of cases go hand in hand with data confidentiality. This is marked by, among others, Asatiani and Penttinen in their scientific works. This happens most often in the case of financial institutions [21] or very developed enterprises with large HR departments. The privacy and personal data protection policy very often "forces" the company to create its own local team to increase work efficiency. The best example is banks, where care for the welfare of the client and protection of his interests must be of the highest quality [23]. Building a scalable, digital solution to automate work is a simpler and cheaper solution than employing a large number of employees and training them. The use of RPA often forces the company to adopt new safety rules or update the existing ones [40]. This is a positive "side effect" of intelligent automation, in addition to adapting the IT infrastructure.

The need to introduce innovative technology often goes hand in hand with the improvement of local IT resources, because it forces the enterprise to adapt its IT infrastructure to the requirements of the technological solution, and it forces employees to develop new skills. This is often associated with additional costs that affect not only the development of RPA technology in companies, but also the functioning of other departments, thanks to the overall improvement. The prerequisite for the implementation of the innovation is the "track laying" necessary to allow the smooth operation of RPA technology, as emphasized by Kedziora and Penttinen in their work [23]. To sum up, it can be concluded that there are considerable similarities in terms of the types of internal determinants influencing the propensity to use RPA between those that have been characterized in the literature and those that were "identified" in this research.

The answers obtained to the second research question are mostly consistent with the results of the research described in the literature. This is due to the fact that the interest in the RPA technology of companies using IT or ICT solutions has started to grow exponentially in recent years [49,65–68]. Research conducted in business confirmed that the assumptions of the technology bring measurable benefits and lead to transformation and contribute to technological progress [69–72]. Willcocks and Lacity described a case study of a provider and integrator of business processes and technology services [73] and used the term strategic transformative leverage for the global business services market [27]. Companies from various sectors have seen the potential of technology to reduce costs and increase their production capacity [74].

It is the significant reduction of costs that is the factor that arouses enormous (and constantly growing) interest in investing in this sector. The industry has a parameter called FTE (full-time equivalent), which determines the effectiveness of the robot in relation to eight hours of full-time work of an employee. For each investment in robotization, the work efficiency of robots is calculated, reflecting the number of employees needed to perform exactly the same work at the same time that the RPA solution does. In 2017, Capgemini noticed that the cost of licensing one robot ranged between 1/3 and 1/5 of the cost of one full-time employee [75]. Research conducted by Willcocks and Lacity at MIT in 2016 showed that one robot replaces three to five workers on average, which is in line with the research carried out by Capgemini [76]. The companies described in the literature described the need to modernize IT infrastructure in order to adapt it to the needs of RPA technology. The optimization necessary to improve the quality of robots within this company contributed to the increase in the efficiency of other business processes [23,24].

The risk affecting the success of the project is the appropriate selection of technology and selection of optimal processes for automation. The creation of the "proof of concept" influenced one of the companies to obtain more information on investments in RPA, which in turn allowed for a much more accurate prediction of the effects of the implementation of the technology. A. Sobczak [40] emphasizes the importance of appropriate planning and analysis of the company's susceptibility to the possibility of automating business processes. In the example of the company he describes, an analysis was carried out in order to find the appropriate processes for automation, define its goals and their benefits, and examine their own technical resources. The same author, on the basis of the presented research, also identifies the risk in the form of the possibility of losing the level of knowledge about the course of business processes by personnel [28]. This is a theoretical threat that is rare in practice, but not impossible. The risk is minimized through digitization and documentation of procedures. Along with the delivery of the robot, documents describing the business rules of the process flow are created on the basis of which a logical solution and its technical description are created.

Both the selection of the appropriate technology and processes and building RPA awareness among employees is very important. Research on the impact of RPA on global accounting services by D. Fernandez and A. Aman identified employees' competences in the field of intelligent automation as a threat to investment success. The issues related to employees' awareness of the impact of their activities on the proper functioning of technology were emphasized. It happens that the employees' lack of knowledge in the field of automation or the lack of awareness of how they operate may lead to inadvertent damage to the solution or provoking its temporary indisposition [39].

The case of Nordea describes the tendency of systems and applications to undergo change as one of the risks leading to a reduction in the business benefits of investing in RPA technology [23]. The changes generate additional costs related to the developers' work on patches or upgrades to existing solutions. Each update of the system may increase the cost of implementing the technology and, in extreme cases, lead to its unprofitability. Kedziora and Penttinen also specified an appropriate analysis of the company's access and security as one of the elements of the company's susceptibility to automation testing. Lack of adequate access or difficulties in obtaining it can lead to significant design delays [58]. This may lead to a situation where, for example, hired consultants will be unable to work due to lack of access to systems, and their time for which the company has to pay, will be wasted. The above analysis of the literature indicates a much greater number of threats and risks resulting from the implementation of RPA technology than those identified in the research conducted in Poland. Undoubtedly, this is the fact that there is a research gap and the need for further observation of this phenomenon on the basis of Polish enterprises.

When answering the third research question, it should be emphasized that the selection of the appropriate RPA technology implementation model depends on many determinants and is an individual matter for each enterprise. Each company is guided by its own regulations and is characterized by a separate set of circumstances that make up the final decision to choose the direction in which it wants to go in the context of implementing RPA technology. The first step in introducing intelligent automation into an organization is the Automation Potential Analysis (sometimes referred to as RPA maturity assessment). The large number of business processes that could be streamlined very often benefits investment in their own RPA center of excellence [24], but this is not necessarily the case. In the case of the first enterprise, it can be said that it decided to use the services of a third party, which was to provide the enterprise with a full range of intelligent automation services. This model of technology implementation was also chosen for another reason— business processes, originally provided by an Asian company, had a very high level of complexity, which often led to incorrect operation of robots. In the literature on the subject, Geyer-Klingeberg et al. defined the use of the center of excellence model with its division into control (maintenance) and development (development) teams as a condition

for effective utilization of RPA technology, thus pointing to the importance of the analysis of the company's susceptibility to the use of technology [34].

Another factor influencing the selection of the appropriate model is the level of data confidentiality. Companies care more and more about the security of customer data in the era of cybercrime, and privacy policies often prohibit sharing data with third companies. This forces the organization to create an internal RPA team. The phenomenon can be observed, for example, in banks [23] or companies from the financial and accounting sector [21].

As already mentioned in this article, the implementation of RPA very often involves the need to expand or improve the local IT infrastructure, which may also be a disadvantage (affecting the course of the technology implementation project), or an advantage indirectly resulting from the company's need for a suitable environment in which robots will run. Having a very well-developed infrastructure invalidates the above, because the RPA implementation requirements are met, and the infrastructure does not require improvement [24]. This is a factor that contributes both to building your own team, as the implementation costs of the technology are reduced, and to opting for third-party services, as infrastructure costs are eliminated [40]. Another reference to the literature indicates the great role of creating internal IT and the great role of maintenance engineers in ensuring the best possible condition of the created solutions [73]. This may favor the use of third-party services due to the quality assurance of delivered solutions and cooperation to create a professional, local center of excellence built on the principles of industry best practices.

6. Conclusions

The considerations in this article are the basis for drawing some important conclusions. Firstly, the definitions of RPA technology vary widely, both in terms of scope and meaning. They focus on concepts such as automation of tasks previously performed by people, a software solution that imitates a human while working in IT systems, and a configurable solution that automates human work or robotic business assistance.

Secondly, in order to effectively implement RPA technology, companies invest in RPA centers of excellence, which are aimed at acquiring and continuously increasing competences in the field of business process automation. CoE's task is to create intelligent solutions aimed at increasing the business efficiency of the enterprise, which affects its financial results. The reasons why companies decide to invest in this solution may be the possibilities of automating processes (their susceptibility to replacing a human with a software robot), the level of complexity of business processes often leading to mistakes made by an employee, the desire to improve the operation of the enterprise while investing in modern IT solutions using artificial intelligence or limited opportunities to increase the efficiency of the company's work due to the inability to engage more human employees.

Thirdly, the main tenet of technology is to free human resources from routine, repetitive, and often tiring tasks and to direct their attention to tasks that require more creativity. Employees' working time recovered in this way and the increase in the speed of processes performance along with a simultaneous reduction in the number of errors leads to the generation of savings and an increase in the quality of services provided. Additional business benefits are the structuring of procedural documents, improvement of internal company procedures, a positive impact on the development of the team and IT infrastructure, and increased the so-called "customer experience", i.e., the possibility of influencing customer satisfaction by, for example, reducing the waiting time to service a given order.

Fourthly, intelligent automation may, however, involve the business risk of losing the level of knowledge regarding automated business processes and factors such as the wrong choice of processes for automation, the technology itself to be used to implement them, and the lack of RPA awareness among employees and teams cooperating with the RPA unit. Unforeseen updates of the company's systems on which robots are to work and problems with obtaining appropriate access to work may extend the return on investment in technology or in extreme cases even make it unprofitable.

Fifthly, the two basic models (presented in this article) of using the possibilities of RPA are the creation of a local team of experts dealing with this technology within the company's structures, or an investment in the center provided by a third company. Both approaches produce the same effect, and many determinants can influence one's reason for choosing one of them. These include the minimum number of business processes that have the potential to be automated, the level of data confidentiality that the implementation team must have access to, and the level of advancement of the infrastructure and competencies of the IT team. It is impossible to determine which of the models is better, because their applications are related to the current situation of the company and the specificity of their business processes.

The presented literature review and a qualitative case study of serious RPA players in Europe allowed us to present the topic of intelligent business process automation as a valuable research field. The research does not exhaust the topic which, despite the great interest of companies from many industries, can still be described as little known. Enriguez claims that "however, to the best of our knowledge, it appears that RPA is being more used in industrial than scientific contexts. In this sense, opening a discussion about the disparities and coincidences between RPA and similar technologies, and formally classifying what is being investigated relative to this technology, is of vital importance for the community to grow and open new research lines" [18]. Research on robotic process automation is taking new directions and is increasingly carried out not only in terms of finance, but also in social [7] or management [77] terms or in terms of the possibility of using its full potential in the future [17]. Considerations regarding RPA centers of excellence show at the same time a certain trend and standardization of the approach to creating specialized organizations or departments of intelligent automation and, despite very large similarities, some differences.

Further considerations on the issues may concern organizational structures emerging during the implementation of CoE, or the development of companies or units dealing with RPA, as well as the nature and impact of technology on business in terms of reducing costs, improving customer experience or changing the level of openness to technological innovations. In addition to the positive impact of the solution, the risks of using technology related to problems that may occur in the organization in the long term are still an unexplored topic. This article may suggest new directions of reflection on RPA, such as comparing the financial and business benefits of implementing technologies to enterprises, examining the impact of developing a center of excellence on the shaping of the organizational structure of an enterprise, and human resource management. Carrying out more case studies has the potential to provide the scientific world with new conclusions and new directions of reflection on this issue.

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