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Implementation of new technologies in accounting and financial processes: An effectiveness assessment

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ABSTRACT

Objective: The aim of this paper is to explore accountants' views on the usage of Robotic Process Automation technology (RPA) which brings efficiency increase.

Research Design & Methods: An online survey has been addressed to over 500 respondents from international companies, where 160+ complete answers were received from the most important types of organizations in the business services industry. The non-parametric rho Spearman correlation coefficient and the non-parametric Kruskal-Wallis test and business case for the RPA implementation efficiency were used.

Findings: Based on the research results obtained, it should be emphasized that robotization technologies which raise the efficiency of financial and accounting services make an important impact on the efficiency of modern business services sector. Application of RPA assumes replacing work of an existing employee with the use of dedicated software (software robots) to support activities, primarily repeated and uncomplicated, characterized by a low number of exceptions.

Implications & Recommendations: RPA application is commonly used in modern business services, particularly in the areas of Finance, Accounting, IT and Human Resources Management. By utilizing RPA technology, the effectiveness of operations increases while reducing workload, minimizing possible errors in the process. The greatest efficiency resulting from the RPA implementation was observed in the Accounts Payable department, to a lesser extent in the General Ledger department and in the Tax section. The assessment of managers in terms of the effects of RPA implementation is unequal, while for Business, IT Process Outsourcing companies (BPO / ITO), Shared Service Centers (SSC), Consulting / Advisory companies and their customers no significant differences were found.

Contribution & Value Added: The article presents an assessment of the effectiveness of the use of Robotic Process Automation in Process Outsourcing companies (BPO / ITO) and Shared Service Centers (SSC) operating in Poland. It is one of the first studies of this type for enterprises operating in Poland. The article uses a relatively large number of responses (160+) from the respondents. In the previous studies in the literature, the answers obtained came from a much smaller number of respondents and were conducted in the form of direct interviews. In the article, the group of respondents consists not only of managers of outsourcing companies, but also auditing companies and clients of outsourcing companies. The article also presents a financial simulation of the effectiveness of BPO / ITO and SSC using Robotic Process Automation, which additionally validates the responses obtained in the questionnaire.

Article type:	research article
Keywords:	robotic process automation; business process outsourcing BPO; IT outsourcing; company efficiency, Poland, questionnaire
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INTRODUCTION

Employees from financial and accounting departments curry out financial processes during unprecedented technological changes that take place in the profession (Borrego *et al*., 2020). Specialists working in financial departments have long been subjected to the process of accelerated computerization, and more and more advanced information technologies are also used to an increasing extent (Borrego *et al*., 2020). The implementation of high-quality financial services also necessitates the digitization of accounting processes. This phenomenon intensified especially during the pandemic (Kaka, 2020). The use of more and more advanced technologies is, on the one hand, becoming a necessity, on the other hand, it facilitates the work of financial services, increases the quality of accounting information and its credibility (Özdoğan, 2017). The growing need to dematerialize accounting and tax processes, as well as the more and more common use of accounting applications necessitate the development of a greater use of information technology in financial processes (Gulin *et al*., 2019). In economic practice, technologies such as Internet of Everything, blockchain, Big Data may be used, but most of all in the financial services sector – automation of accounting processes and artificial intelligence and (Rîndașu, 2017).

Given the recent technological advancement, an increasing range of services rendered by enterprises and institutions alike is provided in digital format (Andrzejewski & Dunal, 2021; Sieja & Wach, 2019). It is largely possible thanks to the automation of corporate business and operational processes (Osman, 2019; Ribeiro *et al*., 2021). The modern view on automation of business processes is a solution designed to help optimize human activities during the performance of tasks. Using the latest technologies, an increase in effectiveness of the operations takes place while reducing workload and errors. It should also be noted that digitization as a continuous process of convergence between the real and the virtual worlds is becoming a major drive of innovation and change in most sectors of the economy.

Regardless of how the use of modern information technology is assessed, there are also some doubts as to whether it should replace human activities. The use of RPA in the creation of state-of-the-art services may reduce the need for human labor, making it possible to limit the costs of labor in a highly effective way (Kaya *et al*., 2019). This study provides a perspective on this issue.

Robotic automation processes are a technology consisting of software agents, so-called "bots", which imitate human work through a series of applications when performing specific activities in business practice (Syed *et al*., 2020). RPA provides a class of software for automating business processes. It assumes replacing an existing employee with the use of dedicated software (software robots) to support activities, primarily repeated and uncomplicated, characterized by a low number of exceptions. The operation of robots consists in imitation of human activities within a specific process. RPA can act as another employee in the organization, who does not require holidays or breaks. RPA allows an employee to focus on more complex, discretionary processes, which bring greater added value to the organization. RPA is one of the latest technological solutions. RPA is actually becoming a must when it comes to doing business for many enterprises across the world. It creates added value for companies (Madakam *et al*., 2019).

The aim of this paper is to explore accountants' views on usage of Robotic process automation technology which brings efficiency increase. The key advantage of using RPA in handling processes previously carried out by human beings has become fast implementation while reducing errors and no need for large financial investments. By using RPA, a rapid flow of information is introduced throughout the company internal network along with its external and internal customers, which allows for proper analysis of the surrounding economic environment. The application of this class of solutions usually does not require modifications to the already existing IT systems of the company. This is because RPA tools operate at the level of the Graphical User Interface (GUI), i.e. in the same way as human operators do. The business logic is embedded within automated applications, which solves the problem of its restoration which occurs in the traditional systems integration model. In addition, different than in the case of IT transformation using Enterprise Resource Planning (ERP), the use of RPA does not require significant investments made by organizations or substantial interference with existing systems. RPA can be deployed in organizations in a relatively short time, as it requires relatively low cost of investment.

We believe that our study contributes to the body of literature mainly because we investigate a large sample of finance and accountant experts in a relatively unexplored area. We plan to continue our research to assess the impact of automation on the area of risk and security of financial processes as well as the impact on the change of the desired skills of accountants. In addition, most of the research projects addressing the issue in question make use of direct interviews while our study involved a questionnaire-based survey.

LITERATURE REVIEW AND HYPOTHESES DEVELOPMENT

RPA can be applied in a great many branches of the economy (Madakam *et al*., 2019). The application of RPA is particularly widespread in the areas of Finance, Accounting and Human Resources Management. This is largely due to the high repeatability of processes and the relatively low number of exceptions. Due to the fact that robotization is becoming more and more popular and common, organizations are beginning to use increasingly mature knowledge-based automation methods, which, thanks to the constantly expanded database of cases and exceptions from the standard process, allow to use automation also in those processes with much more exceptions. Typical examples of knowledge-based automation are Customer Service processes, where robots analyze and categorize types of queries from individual customers. By identifying key words, they search for the right information in the various IT systems of the company. Then, based on the response templates they provide specific information in the form of e-mail messages (e.g. if and when an invoice with a specified number was paid).

RPA is most useful in situations of an increase in the volume of error-free transactions and when it comes to monitoring such transactions. Operations proven to be particularly ineffective so far can become profitable again, and experts in a particular field can focus on operations which are the most strategic and important for the client (Kaya *et al*., 2019). Companies should continuously monitor their process in order to identify and optimise those that would benefit from RPA. High-volume tasks and low-complexity tasks are the most RPA-adaptable (Ribeiro *et al*., 2021).

Another important feature of RPA technology is the lack of need to implement new advanced and costly IT tools, as automation is most often carried out on platforms already used by business entities.

Gotthardt *et al*. (2020) highlight the potential of time and financial savings to be made thanks to the implementation of RPA. But there are also many limitations and potential problems related to the quality of data fed into and coming from the system. A gradual implementation of RPA in many accounting and auditing firms seems to be a good idea. Companies should adopt RPA as a tool that can support and be useful to their employees. It should not be considered a complete replacement of human resources (Madakam *et al*., 2019).

Extensive research on the automation of tasks was conducted by Engberg and Sordal (2012), who stressed that it has aroused interest for more than a century. RPA is regarded as key, as it allows taking over repetitive, monotonous tasks previously performed by humans. RPA promotes the use of technology reducing costs while increasing the competitiveness of the beneficiary entity. In their study, conducted research involved 11 respondents, where characteristics of their positions were analyzed according to their: skill variety, task identity, task significance, autonomy, and feedback. The result of the study was an indication that employees perceived the impact of the application of RPA on all the features of their job positions except feedback (Engberg & Sordal, 2012).

A similar theme was taken up by Szmajser *et al*. (2019), who also noted that RPA is increasingly being used in financial service entities, performing certain tasks previously assigned to people and thus replacing employees. The activities of robots consist in imitation of activities hitherto assigned to humans during certain processes. According to the authors, RPA robots, thanks to appropriate programming, perform activities of a certain level of complexity in an autonomous manner. These activities are predominantly characterized by repeatability as well as a certain number of exceptions to the rule used in the algorithm. An example of this is, when robots log on to data handling programs from which they retrieve information that is then processed and afterwards they store the results in specific databases or systems. As pointed out by the authors, the use of robots happens where the integration of many systems is too time-consuming and expensive, and all the possible functionality of the systems has already been used.

Thanks to this use of the latest technology, it is possible to significantly increase the profitability of the processes assigned to the robots, as the cost ratio of an robot/worker can be as high as 1/9. Among the benefits, the infallibility of the robot (provided, of course, that it is properly programmed), the lack of stress and the possibility of continuous operation should be noted (Szmajser *et al*., 2019). The positive impact of the application of RPA on profitability was also proven by Seasongood (2016).

Research on the automation of accounting processes was also conducted by Fernandez and Aman (2018). The results were used to understand the impact of RPA on the development of global accounting services. The research was based on a comprehensive analysis of one of the largest global institutions providing accounting services, and the published findings indicate that RPA has a key impact on organizations changes happening in them. At the very outset it causes reductions of tasks performed by humans, thus reducing employment. The authors also noticed a certain way in which people "can't compete" with robots. This was particularly the case with regard to disciplinary problems, staff productivity, human resources shortage, and wage growth expectations (Fernandez & Aman, 2018).

Eikebrokk *et al*. (2020) conducted 24 interviews with individuals engaged professionally with such industries as production, finance, and mining. They noticed that in the case of industries offering standardized products, characterized by little differentiation, the greatest advantages of the use of RPA are effectiveness and reduced labor costs. The phenomenon is typical of industries where cost leadership is a significant success factor.

Van Looy (2020) stresses that companies make use of robotization of business processes to an increasing extent. Based on 48 interviews, the authors of the study notice that most employees, mainly those highly skilled and highly qualified, speak positively of the performance of robot – including robots with advanced cognitive abilities. Employees tend to say that they are ready to accept working with robots if their work is supervised accordingly. Managers tend to accept working with robots to a greater degree if their work involves carrying out simple, repeatable tasks, which are often labor-intensive. The general preference is to leave the more demanding, complex, difficult tasks, which require creativity and interpersonal interaction, to humans.

Apart from the obvious benefits of RPA implementation, some challenges or difficulties in this respect deserve to be distinguished. Accountants believe that the level of their knowledge of the practical application of information technologies is at most average (Rîndașu, 2017). A large part of accountants is also unaware of the time savings resulting from the use of advanced technological solutions, such as, for example, RPA (Zenuni *et al*., 2014).

In economic practice, there are often inappropriate business models in enterprises, which make it difficult to implement RPA technologies. Only in enterprises that focus on innovative investments, are flexible and open to changes, the implementation of modern technological solutions is possible (Soni *et al*., 2019). Employees of accounting firms are aware of technological barriers that are not easy to overcome. Hence, there may be a natural reluctance to implement advanced technologies (Brooks *et al*., 2020). Many accounting firms do not attach much importance to innovation in the accounting profession, despite the fact that advanced technologies allow to a large extent to improve the management efficiency of accounting firms. It may be necessary to develop an appropriate organizational culture based on technologies and innovation (Lee et. al., 2019).

Cooper *et al*. (2019) draw attention to the actual difficulties and coordination of RPA implementation responsibilities between accountants and specialists from the IT department. The question that needs to be answered is whether bots should be programmed by accountants or IT specialists. Each of the solutions has both positive and negative aspects. In the opinion of Kokin and Blanchette (2019), the wider introduction of RPA in accounting departments is rather implemented in a small or medium scope. As a result of RPA implementation, new problems may arise related to the realization of internal control, as well as new types of risk. Enterprises must determine to what extent bots will be responsible for the recording of processes and to what extent accountants. Appropriate segregation of duties can redefine the accounting profession. Often also the complexity of individual accounting processes can be a significant barrier to RPA implementation. In addition, there are objective technical problems in the RPA implementation process, necessitating very high involvement of IT departments, which in

turn is costly and labor-intensive. The authors also point out that numerous processes are not easy to standardize, which can significantly reduce the profitability of RPA

Regardless of how the use of modern information technology is assessed, there are also some doubts as to whether we should replace human activities in the implementation of the automation in business processes. The financial benefits associated with the implementation of RPA may in fact vary significantly. As calculated by Szmajser *et al*. (2019), apparently similar business processes performed in different geographical locations may in fact require the programming of completely different, independent robots. The authors also point out that another often overlooked aspect of mass automation is that the implementation of a robot in the financial process "freezes" the possibility of modifying the process from the point of view of its simplification. This makes further standardization of the automated processes more difficult, as any change in the way the process is performed requires modification of the robot's performance.

The reactions of employees to the implementation of RPA could be described quite often as full of concern and uncertainty, including fear of becoming redundant. But the more recent studies reveal a slightly different sentiment among employees (Asatiani *et al*., 2020). The authors decided to conduct a study to verify the reaction of employees of accounting firms to the adoption of RPA. Their response was surprisingly positive. Some employees appeared to be really enthusiastic about and interested in a new technology. Therefore, the potential escalation of concern among employees was uneven, highly diversified. The authors conclude that the adoption of RPA may even have a positive impact on the atmosphere at work (Asatiani *et al*., 2020). It seems reasonable to stress that robots performing simple, repeatable operations in finance-accounting departments relieve employees from the need to handle these unpleasant and unambitious obligations. This way, they actually improve the atmosphere at work and the quality of life of employees (Madakam *et al*., 2019). Thus, it seems very important to promote the positive image of RPA when it is to be implemented (Madakam *et al*., 2019).

Different opinions about the processes related to RPA are a matter raised also by Cooper *et al*. (2021). The authors conducted 14 interviews with representatives of the Big 4 auditors – with both top managers and lower-rank employees. The survey focused on the impact of RPA on the performed work, on the level of job satisfaction, and on the opportunities of development. It was proven that there is a difference as to how the benefits resulting from the implementation of RPA are perceived by managers and lower-rank employees. Both groups of respondents agree that RPA has a positive impact on the work of an accountant, but lower-rank employees did not report any significant impact of RPA on the level of their job satisfaction – unlike managers. This may stem from the fact that lower-rank employees still work within the same time frames and the same number of hours despite the time savings made thanks to RPA.

Others authors believe that the adoption of RPA in private companies is accompanied by layoffs, or at least suspended recruitment of new employees (Eikebrokk & Olsen, 2020). The implementation of new RPA technologies makes it necessary for accountants to expand their competences in the field of information technology (Stancheva-Todorova, 2018). Therefore, the improvement of the effectiveness of economic processes carried out by companies from BPO / ITO will result in the necessity to expand professional competences among employees of accounting departments. Accountants who will not be able to do this may be more exposed to potential problems in the labor market. The phenomenon concerns also qualified employees, whose work is based on knowledge. The situation is different in the public sector, where a greater emphasis is put not on making savings through staff reductions, but on the quality of the public services provided, of the recorded data, on effective migration of data between systems, etc. To facilitate the above process, employers should conduct advanced training in the use of advanced technologies in the work of BPO / ITO centers (Shaffer *et al*., 2020). Often the accountants themselves are not aware of the benefits of using advanced RPA technologies (Zel & Kongar, 2020). RPA implementation will be easier if it is accepted by the accountants themselves. The role of an accountant is changing, who will not only be responsible for the records of repetitive operations, but will rather create value or manage strategic finances of the company. However extensive cooperation between accountants and specialists from the IT department seems also indispensable here.

Considering the different points of view, the authors put forward the following main hypothesis and two sub-hypotheses:

H: The proper implementation of RPA in the sector of modern business services increases the operational efficiency of organizations.

H1: There is a relationship between the job position and the perception of the impact of RPA on individual benefits of organizations.

H2: There is a relationship between the type of company in the business services industry and the perception of the impact of RPA on individual benefits of organizations.

RESEARCH METHODOLOGY

Survey

An online survey has been addressed to over 500 respondents from international companies, where 160+ complete answers were received from the most important types of organizations in the business services industry, i.e. Business and/or IT Process Outsourcing (BPO/ITO), Shared Service Centers (SSC), Consulting/Advisory and their customers. Survey results were provided by representatives of the positions in their organizations: Members of the Board, Directors, Managers and Experts/Specialists. The non-parametric rho Spearman correlation coefficient and the non-parametric Kruskal-Wallis test and business case for the RPA implementation efficiency were used.

The introduction of automation of financial processes increases the efficiency of Business, IT Process Outsourcing (BPO / ITO), Shared Service Centers (SSC). It is worth noting, however, that it is the highest for relatively simple, repeatable processes carried out in the accounts payable section, lower efficiency was observed for the general ledger, the lowest and the least predictable for tax services. Moreover, there are some differences in opinions on the potential efficiency resulting from the automation of processes among employees holding various positions in the company (Executive Board, Director, Senior Manager, Expert / Specialist). There were no significant differences in the perception of the effectiveness of the implementation of accounting process automation in various entities operating in the financial services sector (Business, IT Process Outsourcing (BPO / ITO), Shared Service Centers (SSC), Consulting / Advisory and their customers).

Due to the fact that the survey was addressed to respondents of international companies located both in Europe and on other continents, the authors decided to conduct the survey using CAWI (Computer Assisted Web Interviews). The survey was conducted using SurveyMonkey, a professional survey tool which has extensive mechanisms for defining questions, the way they are answered, their analysis and visualization of results. The survey was addressed to the international group of LinkedIn participants, mainly from the modern business services industry or being their current or potential customers.

As a result of a personalized online survey addressed individually to over 500 respondents from international companies, 162 complete answers were received from the most important types of organizations in the modern business services industry, i.e. BPO/ITO, SSCs, consulting/advisory and their clients. Answers were provided by representatives of diverse roles in their organizations: board members, directors, managers and experts/specialists. In addition, the survey was further supplemented by an in-depth interview, where respondents were invited to supplement their position with additional comments and observations.

Statistical Tools

The statistical analysis used is the IBM SPSS Statistics software. The non-parametric rho Spearman correlation coefficient and the non-parametric Kruskal-Wallis test were used. The Spearman rho correlation coefficient was used to determine whether for variables measured at the level order (ranks) a statistically significant correlation occurs. Three levels of statistical significance were assumed: $p < 0.001$, which was determined ***, $p < 0.01$, which was determined ** and $p < 0.05$, which was determined *. If the correlation is at least at the level of $p < 0.05$, then the rho correlation coefficient shown in the table should be interpreted as statistically significant. Negative values mean that as the value of one variable increases,

the value of the other variable decreases. Positive values, on the other hand, indicate that the value of one variable increases with the value of the other. The coefficient indicates the existence of a linear correlation but does not indicate which variable is the effect and which one is the cause.

The Kruskal-Wallis test is used to determine whether the values obtained in two or more groups differ statistically significantly. In the tables, the following designations are used: M – the arithmetic mean, Me – the median, SD – the standard deviation, H – the Kruskal-Wallis test statistics, "p" – the significance of the Kruskal-Wallis test. Three levels of statistical significance were assumed: $p < 0.001$, which was determined ***, $p < 0.01$, which was determined ** and $p < 0.05$, which was determined *. In each of these three cases, the discrepancy between at least two groups can be defined as statistically significant. In the case of this test, it is also necessary to establish exactly which groups differ from each other significantly. It occurs when the test shows a significant difference of at least $p < 0.05$.

RESULTS AND DISCUSSION

Empirical Findings

The analysis included the responses of 162 respondents from various types of organizations: BPO/ITO – 31, SSCs – 52, consulting/advisory – 41, client of a company providing BPO/SSC services – 9, others - 29 and those performing various roles in their organizations: management board – 47, director – 36, senior manager – 53, expert/specialist – 26. The respondents were asked to assess the impact of benefits related to the implementation of RPA on particular benefits. Each benefit was evaluated on a 5-point scale, where 1 is low, 2 is moderate, 3 means medium, 4 is high, and 5 is very high. On this basis, the mean (M), the median (Me) and standard deviations (SD) for the different advantages were calculated. The higher the average and the median on a scale of 1-5, the higher the assessment of the impact of the benefits associated with RPA implementation on individual benefits of organizations. Table 1 compares the responses from different organizations and the respondents' respective roles therein in terms of answers to individual questions.

Table 1. Comparison of the opinions of respondents with different roles in the organization in terms of assessing the impact of benefits associated with the implementation of RPA

Rank the impact of the following benefits behind RPA on implementation on:	Position in the organization												Kruskal-Wallis Test	
	Executive Board			Director			Senior Manager			Expert/ Specialist				
	M	Me	SD	M	Me	SD	M	Me	SD	M	Me	SD	H	p
Productivity improvements	3.83	4	1.03	3.92	4	0.97	3.85	4	0.82	3.88	4	0.65	0.430	0.934
Reduction of operating costs	3.21	3	1.04	3.39	4	0.99	3.57	4	0.93	3.23	3	0.99	4.036	0.258
Increased compliance with standards and procedures	3.51	4	1.08	3.33	3.5	1.07	3.79	4	0.97	3.35	3	1.06	6.059	0.109
Increase in customer satisfaction	3.17	3	1.09	3.06	3	1.15	3.30	3	0.89	3.23	3	0.91	0.669	0.880
Revenues growth	2.47	3	1.12	*2.31*	2	1.24	2.91	3	1.06	3.04	3	1.04	10.568	0,014*
Decrease in the number of errors	3.98	4	87	3.69	4	1.04	3.89	4	0.91	4.12	4	0.95	3.779	0.286
Process acceleration	4.02	4	92	4.00	4	0.89	4.08	4	0.94	4.31	4	0.68	1.800	0.615

1 – low, 2 - moderate, 3 – medium, 4 – high, 5 – very high

Source: own study based on the survey questionnaire (n = 162).

The Kruskal-Wallis test showed statistically significant differences between respondents depending on their role in the organization in terms of assessing the significance of RPA implementation for revenue growth. Managers and senior managers assessed it as more important for the growth of revenue than directors did. Among other groups, there were no statistically significant differences. There were also no statistically significant or close differences regarding other benefits. Thus, the hypothesis that there is a correlation between the job position and the perception of the impact of RPA on individual benefits of organizations in relation to revenues growth was confirmed.

In the next question, the respondents were asked to specify the level of benefits they expected from the implementation of RPA for particular financial processes. Each process was evaluated on a 5-point scale, where 1 means no or low (0-10%), 2 is moderate (11-25%), 3 implies medium (26-50%), 4 is high (51-75%), and 5 is very high (76-100%). On this basis, M, Me and SD were calculated for the expected level of benefit in relation to a given financial process, as shown in Table 2. The higher the average and the median on a scale of 1-5, the greater the expected benefit of implementing RPA for financial processes.

Table 2. Comparison of the opinions of respondents with different roles in the organization in terms of the expected level of benefits associated with the implementation of RPA on individual financial processes

The expected level of benefits associated with the implementation of RPA on financial processes	Position in the organization												Kruskal-Wallis Test	
	Executive Board			Headmaster			Senior Manager			Expert/Specialist				
	M	Me	SD	M	Me	SD	M	Me	SD	M	Me	SD	H	P
Accounts payable	3.28	3	1.15	3.86	4	0.91	3.87	4	0.86	3.88	4	0.82	9.025	0.029*
Accounts receivable	3.26	3	1.06	3.54	4	0.95	3.42	4	0.82	3.69	4	0.93	3.792	0.285
Travel and expenses	3.13	3	1.20	3.53	4	0.86	3.35	3	0.99	3.62	4	0.75	3.376	0.337
Intercompany GL	3.11	3	1.11	3.38	3	1.10	3.45	3	1.05	3.35	3	0.80	2.404	0.493
General ledger	2.73	3	0.96	2.88	3	1.15	3.10	3	0.88	3.54	4	0.86	13.042	0.005**
Cash flow management	2.49	3	1.06	2.65	3	1.10	2.78	3	0.90	3.15	3	0.92	6.468	0.091
Management accounting	2.67	3	1.11	2.71	3	0.94	2.86	3	0.87	3.12	3	1.11	2.979	0.395
Taxes	2.31	2	1.04	2.49	2	1.09	2.76	3	0.93	2.77	3	1.03	5.974	0.113

1 – low, 2 – moderate, 3 – medium, 4 – high, 5 – very high

Source: own study based on the survey questionnaire (n = 162).

The Kruskal-Wallis test showed statistically significant differences between respondents depending on their role in the organization in terms of assessing the significance of RPA for accounts payable and the general ledger (table 2). Significantly higher expectations for the benefits of accounts receivable were expressed by managers and senior managers than members of the board. Among other groups, there were no statistically significant differences. In turn, experts and specialists have significantly higher expectations of benefits related to general ledgers than board members and directors. Among other groups, there were no statistically significant differences. In addition, the difference close to statistical significance refers to the expectations related to cash flow management. Clearly higher expectations in this regard were expressed by experts and specialists than board members. No statistically significant or close differences were noted regarding the other expectations.

Table 3. Comparison of the opinions of respondents from different types of organizations in terms of assessing the impact of benefits from RPA implementation

Rank the impact of the following benefits behind RPA on implementation on:	Organization type:															Kruskal-Wallis Test	
	I			II			III			IV			V				
	M	Me	SD	M	Me	SD	M	Me	SD	M	Me	SD	M	Me	SD	H	p
PI	3.93	4	0.80	3.74	4	1.00	3.77	4	0.96	3.98	4	0.82	4.11	4	0.60	1.905	0.753
ROC	3.31	3	1.07	3.16	3	0.97	3.50	4	0.94	3.37	3	1.07	3.56	3	0.73	2.446	0.654
ICSP	3.48	4	0.95	3.26	3	1.18	3.56	4	1.06	3.68	4	1.04	3.89	4	0.78	4.686	0.321
ICS	3.14	3	1.09	3.13	3	1.09	3.27	3	1.07	3.10	3	0.80	3.67	4	1.00	3.128	0.537
RG	2.76	3	1.18	2.58	3	1.09	2.60	3	1.21	2.73	3	1.14	2.78	3	0.97	0.509	0.973
DNE	3.69	4	0.85	3.81	4	1.19	3.98	4	0.90	3.98	4	0.82	4.22	4	0.97	4.586	0.332
PA	3.93	4	1.07	3.94	4	1.03	4.21	4	0.82	4.15	4	0.69	4.00	4	0.87	2.130	0.712

PI- productivity improvements; ROC- reduction of operating costs; ICSP- improving compliance with standards and procedures; ICS- increase in customer satisfaction; RG - revenues growth; DNE- decrease in the number of errors; PA- process acceleration; I-Other, II- BPO/ITO, III- SSC, IV-consulting/advisory, V-BPO/SSC customer; 1 – low, 2 – moderate, 3 – medium, 4 – high, 5 – very high

Source: own study based on the survey questionnaire (n = 162).

The Kruskal-Wallis test showed no differences between respondents' opinions from different organizations in terms of assessing the impact of benefits from RPA implementation (Table 3). Partial hypothesis (H2) that: There is a relationship between the type of company in the business services industry and the perception of the impact of RPA on individual benefits of organizations, was thus not confirmed.

In the next step, a comparison of responses from different types of organizations was performed in terms of the expected level of benefits associated with the implementation of RPA on individual financial processes as shown in Table 4.

The Kruskal-Wallis test showed statistically significant differences between respondents from various organizations regarding the expected level of benefits coming from intercompany settlements. Significantly higher expectations for these settlements were expressed by respondents from other organizations than those from BPOs/ITOs. Among other groups, there were no statistically significant differences. In addition, the difference close to statistical significance refers to the expectations related to the general ledger. Clearly higher expectations in this regard were expressed by respondents from organizations that are customers of companies providing BPO/SSC services than respondents from BPOs/ITOs. No statistically significant or close differences in the expectations of others were noted.

Table 4. Comparison of the opinions of respondents from different types of organizations in terms of the expected level of benefits associated with the implementation of RPA on individual financial processes

The expected level of benefits associated with the implementation of RPA on a financial process	Organization type:															Kruskal-Wallis Test	
	I			II			III			IV			V			p	
	M	Me	SD	M	Me	SD	M	Me	SD	M	Me	SD	M	Me	SD	H	p
AP	3.68	4	0.90	3.71	4	0.97	3.66	4	1.10	3.68	4	0.93	4.00	4	1.00	1.047	0.903
AR	3.46	4	0.84	3.19	3	0.98	3.52	4	1.01	3.56	4	0.90	3.33	3	1.00	3.335	0.503
ABT	3.25	3	0.80	3.45	3	0.96	3.16	3	1.07	3.65	4	1.10	3.33	3	0.71	7.328	0.120
IS	3.61	4	0.92	3.00	3	1.03	3.53	3	1.04	3.05	3	1.12	3.56	4	0.53	10.011	0,040*
GL	3.14	3	0.89	2.68	3	0.75	2.94	3	1.11	3.21	3	1.08	3.44	4	0.73	8.551	0.073
CFM	2.89	3	0.96	2.42	2	1.06	2.73	3	1.09	2.87	3	0.95	2.67	3	0.71	4.538	0.338
MA	3.29	3	1.05	2.65	3	1.14	2.78	3	0.96	2.72	3	0.92	2.56	3	0.53	7.715	0.103
TX	2.86	3	1.04	2.39	2	1.05	2.42	2	1.03	2.69	3	1.03	2.67	3	0.71	4.528	0.339

AP-Accounts payable; AR- Accounts receivable; ABT-Accounting for business trips;IS- Intercompany settlements; GL-General Ledger; CFM- Cash flow management; MA-Management accounting; TX-Taxes; I-Other, II- BPO/ITO, III- SSC, IV-consulting/advisory, V-BPO/SSC customer; 1 – low, 2 – moderate, 3 – medium, 4 – high, 5 – very high
Source: own study based on the survey questionnaire (n = 162).

During the study, respondents identified the expected level of process automation (calculated in %) depending on the type of financial process. To verify that the expected level of automation provided a positive return on investment (ROI) and check the level of savings after 12 months of implementation, financial simulation was carried out. During the simulation, the following assumptions were adopted:

- Three financial processes in the area of accounts payable, general ledger and taxes were selected, where the level of expected percentage of automation is different.
- For the group of processes adopted, an automation compartment indicated by the largest share of respondents was adopted (range underlined in Table 5). The simulation was performed for both the smallest and the largest level of automation in the selected processes in Table 5.

For the purposes of simulation, next assumptions were indicated below:

- The level of complexity of the robot implementation (low, medium and complex) directly affects the programming time of the robot.
- Time-consumption: it was assumed that each of the selected processes is performed by four employees with 2-3 years of experience in the workplace.
- Personnel costs for each job are shown in Table 6 on the basis of the average monthly cost per employee.

Table 5. Automation compartment indicated by the largest share of respondents

Process	None or low (0-10%)		Moderate eng. Moderate (11-25%)		Aver. eng. Moderate (26-50%)		High eng. High (51-75%)		Very high eng. very high (above 75%)		Number of respon.
	%	N	%	N	%	N	%	N	%	N	
AP	0.68	1	13.61	20	19.05	28	45.58	67	21.09	31	147
AR	1.36	2	17.01	25	25.85	38	44.90	66	10.88	16	147
TE	2.76	4	15.86	23	33.10	48	35.86	52	12.41	18	145
I	2.78	4	17.36	25	37.50	54	26.39	38	15.97	23	144
GL	4.90	7	23.08	33	39.86	57	25.17	36	6.99	10	143
Tr	11.81	17	29.17	42	34.03	49	21.53	31	3.47	5	144
MA	9.03	13	29.86	43	34.72	50	22.22	32	4.17	6	144
Tx	14.48	21	35.86	52	29.66	43	16.5	24	3.45%	5	145

AP- Accounts payable; AR- Accounts receivable; TE- Travel and expenses; I- Intercompany; GL- General Leder; Tr- Treasury; MA- Management accounting; Tx- Taxes; % - % of responses; N - number of responses
Source: own study.

Table 6. Personnel costs per job position

Position	Average monthly cost per employee		
	Min	Avg.	Max
Personnel costs per employee handling processes from the Payables; Accountant 2-3 years of experience	1 092	1 310	1 528
Personnel costs of employee supporting processes in the GL group (incl., taxes, ledger); Accountant 2-3 years' experience	1 310	1 474	1 638
Personnel costs: IT specialist	983	1 168	1 354
Personnel costs: IT senior specialist	1 092	1 441	1 790
Personnel costs: IT expert	1 747	2 402	3 057
Personnel costs of developer	1 965	2 838	3 712

Source: own study.

On the basis of data received from the IT and finance departments, it was established that the cost of 1 robot includes the following components:

1. Cost of making the robot (one-time): cost analysis of the process, the cost of robot design, robot programming costs, the costs of collection and transfer of robot for use.
2. Cost of robot maintenance (monthly): software license costs, IT maintenance costs and infrastructure costs.
3. The cost of UiPath license is equal to 2696 EUR per year. One licence can operate 4 boots.

Furthermore, an important element is IT maintenance costs emerging in the values indicated in Table 7. Additionally, the costs of designing and software together with the costs of process analysis, collection and transfer for use are provided in Table 8.

It was assumed that the costs of IT infrastructure are at the level of EUR 75,000 a year and they can handle up to 100 robots. The cost of infrastructure per robot is therefore EUR 750/year/robot (EUR 75,000/year for 100 robots).

The value of savings was determined by:

$$Value\ of\ savings = Personnel\ cost\ reduction - \\ - onetime\ cost\ of\ robot\ implementation - \text{monthly IT support costs} - \\ - \text{monthly license cost} \quad (1)$$

Based on the major assumptions, calculation was made concerning the period of ROI in months and the value of savings after 12 months, as shown in Table 9.

Table 7. IT maintenance costs + RPA license costs

Position	Cost per boot (employee) in EUR	Quantity	Unit of Measurement Definition	Annual cost in EUR	Method of calculating the fee
RPA license cost (robot per virtual machine)	2 695,65	25	License	6 7391,30	Yearly
IT specialist (standard queries)	1 168,12	2	1 employee	2 336,24	Monthly
IT senior specialist (medium complexity queries)	1 441,05	2	1 employee	2 882,10	Monthly
IT expert (complex queries)	2 401,75	2	1 employee	4 803,49	Monthly
IT infrastructure costs	750,00	100	BOT	75 000,00	Monthly
Total				152 413,13	Cost per 100 robots
No. of robots				100	No. of pieces
Monthly cost per 1 robot				127,01	EUR/m

Source: own study.

Table 8. Costs of design and software per robot together with the costs of process analysis, collection and transfer for use

The components of the cost of robot designing and software	The level of complexity of the robot		
	Simple	Medium	Complex
The time needed to create a robot: analysis, development, testing, documentation (workdays)	20,00	30,00	40,00
Average labor cost EUR/day	98,00	142,00	186,00
The cost of building 1 robot	1 965,00	4 258,00	7 424,00

Source: own study.

Table 9. Period of ROI in months and the value of savings after 12 months

Financial process	Accounts Payable		General Ledger		Taxes	
Number of employees involved in the process (currently)	4		4		4	
The expected level of time reduction associated with the implementation of the robot (min/max)	51%	75%	26%	50%	11%	25%
The level of complexity of the robot	**Medium**		**Complex**		**Complex**	
Number of employees involved in the process (target)	1.96	1	2.96	2	3.56	3
The level of reduction in time consumption (number of people)	2.04	3	1.04	2	0.44	1
Monthly personnel costs per employee	1 310	1 310	1 474	1 474	1 474	1 474
Costs of the design and development of single robot	4 258	4 258	7 424	7 424	7 424	7 424
The number of robots to handle	4	4	4	4	4	4
Monthly IT support costs/robot	508	508	508	508	508	508
Monthly license cost/robot in EUR	449	449	449	449	449	449
The payback period per robot (months)	3.00	2.00	13.00	4.0	-	22.00
The value of savings after 12 months	16 324	31 416	-518	16 460	-11 130	-3 191

Source: own study.

As the calculations show, the payback period is diametrically different ranging from two months for the accounts payable process with 75% savings (in this case value of savings after one year at 31,416 EUR) and in the extreme case for the process taxes implementation and maintenance costs exceed the savings resulting from the use of the robot.

DISCUSSION

Similar research results were obtained by Cooper *et al*. (2019). Research participants (large audit companies) confirmed that the implementation of accounting processes based on RPA causes a very significant increase in the efficiency of accounting companies. Bots can work full-time, reduce the time of a given process by about 30-40%, and also provide continuous work for clients. The authors also emphasize that the implementation of RPA for tax services is the most difficult; consulting and assurance services are slightly closer to practical implementation. Employing accountants with basic accounting knowledge may be limited in the future. On the other hand, the robotization of accounting processes may result in a greater balance in professional work and private life. Similar results were obtained by Kokina and Blanchette (2019). However, the authors believe that only some of the processes that are properly prepared for RPA, moreover, are repeatable and rules-based can be implemented by bots. This is in line with the Task-Technology Fit and Technology-to-Performance Chain. RPA will be most effective if the processes are time-consuming, large-scale, digitized, and used by a variety of systems. In this situation, RPA provides cost savings, a more effective flow of documentation, accounting errors are reduced, processes are valued more reliably, and financial reporting is improved.

CONCLUSIONS

In summary, the results of the statistical analyses carried out with regard to revenue growth confirmed the correctness of the hypothesis that there is a correlation between job position and the perception of the impact of RPA implementation on individual benefits of organizations. Its importance for revenue growth was rated in a statistically significantly greater manner by managers and senior managers than directors. The differences between respondents on the other job positions were not so significant. This may be due to the greater practical knowledge of managers who, due to the nature of their work, have closer contact with operational issues than directors and are able to control the impact of RPA implementation on the generation of additional sources of income on an ongoing basis.

Against this, the authors claim that the partial hypothesis (H1) that there is a correlation between the job position and the perception of the impact of RPA on individual benefits of organizations in relation to revenues was confirmed. It was different in the case of the partial hypothesis (H2) that there is a correlation between the type of company in the modern business services sector and the perception of the impact of RPA implementation on individual benefits of organizations. In this case, no statistically significant differences or any close to the statistical significance were noted between respondents from different organizations. Thus, the adopted partial hypothesis (H2) could not be confirmed. Thus, it was not possible to unequivocally confirm the main hypothesis H0 in its wording: Proper implementation of RPA in the sector of modern business services increases the operational efficiency of organizations. This does not, however, complete the research conducted at this stage. Due to the fact that during the response to the survey, the participants were able to add comments on other benefits resulting from the implementation of RPA, the issues raised in this article will be analyzed in further research.

Two further areas that the authors intend to verify during the research will be directed to seek answers to questions about the limitations and barriers associated with the implementation of robotization and the impact of RPA implementation on changing work characteristics and employee competencies. This will enable RPA implementation not only in the area of finance and accounting but will also foster a holistic approach to the functioning of a business entity in all its areas.

The introduction of automation of financial processes increases the effectiveness of Business, IT Process Outsourcing (BPO/ITO), Shared Service Centers (SSC). It is worth noting, however, that it is the highest for relatively uncomplicated, repeatable processes realized in the accounts payable section, lower efficiency was observed for general ledger, the lowest and least predictable for tax services. Moreover, there are some differences in the potential efficiency resulting from automation of accounting processes among employees holding various positions in the company (Executive Board, Director,

Senior Manager, Expert/ Specialist). No significant differences were observed in the perceived effectiveness of implementing accounting process automation among various entities operating in the financial services sector (Business, IT Process Outsourcing (BPO/ITO), Shared Service Centers (SSC), Consulting/Advisory companies and their customers).

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Conflict of Interest

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