

Aspects of implementing RPA in an IT company

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Abstract. The unstable market situation and strong competition in the IT sector make companies providing such services focus on streamlining and automating processes to reduce costs and accelerate project implementation. This is achieved by implementing automatic process robotics (RPA). This article aims to identify problems occurring during the implementation of RPA in a large IT company and to create a model framework for this implementation. The result of the research is the identification of the stages of creating and implementing RPA, the effects of this implementation, and the verification of the adopted model framework. The originality of the article lies in the presentation of experiences and recommendations from the experiences gained during the pilot implementation of RPA. The results of this work may be useful for managers of IT companies implementing RPA and theoreticians examining its impact on the effects of an organization's operations.

Keywords: Robotic Process Automation, RPA, RPA implementation, process management, process improvement, software robots, software agents.

1 Introduction

To cope with the growing competition, companies are increasingly increasing the efficiency and effectiveness of IT applications [16]. The ongoing digital transformation enables various methods of achieving success in the market, from replacing the entire system with a more modern one to partial modifications consisting of replacing or extending the functionality of the business processes of the existing system [5, 7, 11]. This problem is current, especially when implementing artificial intelligence (AI) systems [26]. For this paper, two categories have been distinguished. Artificial intelligence is treated as the ability of information technologies to simulate human skills and the decision-making process to optimally achieve the intended goals [6]. For organizations, it is a strategy for the future - the AI system learns during operation and is flexible, but requires specialized, expensive training, and its quality depends on access to large data sets. Process automation using software robots (RPA) [23] is a set of technologies enabling the automation of routine processes based on business rules that perform repetitive human activities in interaction with IT systems [1]. For organizations, RPA is the day's strategy – it is cost-effective, quick to implement, minimizes errors, and automates high-volume tasks. It covers narrowly specialized tasks and is difficult to scale

[4]. Knowledge about the stages necessary to create and implement RPA is still insufficient, which is why about 50% of initial RPA implementations are not successful [7]. The research gap in this area in the literature is the lack of publications presenting the problems of the methodology of creating and implementing real RPA and the methods of solving them. Therefore, this article aims to identify problems occurring during the implementation of RPA in a large IT company and to create a framework for this implementation. Whenever a new IT appears, it is often glorified and is considered profitable. Reliable research on the economic effects of its use and other success factors is rarely conducted [3, 13]. The above is particularly important in the case of innovative projects for which good management practices have not yet been developed. Against this background, the following research questions emerge:

1. RQ1: What are the conditions for building and implementing RPA in an organization?
2. RQ2: What methodology should be adopted to ensure the success of the organization in implementing RPA?

The answers to the above questions are consistent with the directions of RPA research suggested by van der Aalst et al. [26], especially for supporting the methodological and practical management of RPA projects [15].

2 Literature background

RPA enables the automation of digital but manually operated tasks within business processes using automated robots using the existing user interface [25], for the automation of repetitive tasks (standard, relatively constant, high-volume, and long-lasting) [28]. Therefore, RPA is an economically significant alternative, because the return on investment can be achieved quickly thanks to the so-called "light automation" [6]. The advantage of RPA, often created using ready-made low-code platforms, is the fact that it does not require programming knowledge and does not interfere with the structure of older software [26]. For this reason, RPA projects are cheap and quick to implement [7]. An additional effect of this fact is the management of RPA implementations by "business" departments, in which the processes are automated [10]. The best results are achieved by automating clearly defined tasks consisting of - business rules [6]. In summary, RPA can be defined as a technology for rapidly implemented process automation using software robots that operate on the user interface layer of existing software [19].

3 Research method

Most of the analyzed works [6, 8, 16, 26] do not contain specific recommendations and guidelines for RPA implementation. A full review was provided by detailed analyses from the paper by Herm et al. [9], defining the RPA project life cycle into the following phases: initialization, process selection, supporting software selection, creation of a pilot version of RPA, assessment of business effectiveness and adjustment to the business strategy (adaptation, scaling, process maintenance and orchestration of all

phases). On this basis, as well as our own experience, a framework for the application of RPA technology in the analyzed organization was constructed. The adopted research method began with a literature analysis [27] consisting in a systematic exploration of selected items from the databases: Google Scholar [20], ProQuest [17], and ScienceDirect [22], where the keyword: robotic process automation implementation was introduced. The keywords allowed for locating publications from the last three years by title, in terms of search relevance (significance) in the field of TI, and for a preliminary analysis of their content. In Google Scholar, the abstracts of the first fifty publications were analyzed for relevance - 22 were consistent with the subject of the work. In the ProQuest database, 11 of the first fifty were selected for further analysis from over 13 thousand items. Similarly, in the ScienceDirect database, 31 of the first 50 publications were distinguished from almost 16 thousand publications. Through further elimination, 10 examples were analyzed in detail from the 64 distinguished articles, and individual stages of the RPA project life cycle were identified. This allowed: for establishing a starting point for the case study, conducting an analysis of a selected department of the company to identify processes to be automated first, identifying and selecting a process for pilot implementation and selecting software to support the process, conducting a pilot implementation of RPA, conducting a preliminary analysis of the profitability of implementing RPA compared to processing information in a traditional system. Therefore, the following implementation framework is proposed, consisting of 6 stages: initialization and logical design (process identification, process selection: process map, work intensity assessment, time consumption assessment, FTE indicator analysis); technical design (RPA automation tool selection, implementation, and operation cost estimation); RPA testing; organizational changes necessary for RPA implementation; post-implementation economic analysis; maintenance and monitoring. The following sections of the article show the implementation conditions of this framework and verify its relevance for implementation.

4 Analysis of the framework concept implementation

It was assumed that the RPA implementation would be carried out according to the agile methodology - the SCRUM method [21], in line with the trends according to the Standish Group [13], because in the case of RPA, we are dealing with small, repeatable tasks that can and should be carried out in small teams, in fast cycles with continuous, iterative communication with the user. This ensured the product was adapted to current business needs, minimizing the costs of changes and error corrections [2, 7]. The advantages of this method were taken into account, which include: rapid delivery of business value, flexibility, high quality, risk minimization, and high involvement of the executive team [13]. The processes in the Business Intelligence department of an IT company providing a wide range of services and products were analyzed [23]. The analysis was carried out in a unit that services and provides IT services for the financial sector. The main areas for which the unit is responsible are: software development, software maintenance, system integration, cloud computing services, and business process outsourcing.

The method for assessing the processes in the organization is based on: process metrics; participant observation; and analysis of data available in the application used to

record time spent on tasks. After additional consultations and unstructured interviews with employees, five basic processes of process transformation were distinguished: settling invoices submitted by coworkers; a process used to manage quality, risk, and decisions; handling incident reports; and project management. During the analysis of processes for optimization, the focus was on a thorough assessment of the processes in terms of repeatability, standardization, time consumption, volume of operations, and estimation of the FTE (Full Time Equivalent) indicator. The FTE algorithm measures the total number of hours worked by employees with a full-time work schedule. FTE calculations help employers track workforce size and budget for staffing costs. After the process valuation, we assess the complexity of the processes, the number of exceptions and dependencies on other systems, and the risk analysis. The process map should be used in the analysis. Blue Prism software [28] was selected as the robotization environment. Each of the distinguished processes was assessed in terms of FTE. Due to the highest frequency of occurrence and time-consuming service, the process of settling invoices sent by coworkers was selected for analysis. At the same time, it was considered that in its case the greatest effects can be observed after their automation. First, the scope of automation processes for the process of settling invoices sent by coworkers was identified. The reduction of resources in the invoice settlement process using RPA, calculated based on estimated and observed times of performing activities and the calculated FTA indicator, showed that the time needed to complete this process decreased by over 97%. This provides significant savings in working time. Assuming that we have 1,500 full-time working hours per year, the implementation of robotization allows for savings of around 550 hours per year. Detailed calculations are presented in Table 1.

Table 1. Calculation of labor costs before and after implementing robotics and labor savings after implementing robotics

No.	Process description	Average unit time of the described process		Average number of occurrences per month		Standard working time	Required full-time positions
		Total hours	Units	Pcs	Hours	FTE	
1.	Settlement of invoices sent by coworkers before robotization	20:00:00	0:50:00	70	8:00:00	0.35	
2.	Settlement of invoices sent by coworkers after robotization	0:43:12	0:01:48	70	2:24:00	0.01	
3.	Savings from robotization						0.34

Source: own study

5 Discussion of the design framework implementation

The above studies led to the adoption of the following RPA implementation procedure. The key, initial stage of robotization is documenting processes. To create and implement the selected process, the following steps should be performed:

- Pre-implementation analysis – providing documentation on the current state of processes, in terms of PDD automation and risk analysis, as well as SDD (Solution Design Document) documentation: containing a description of process modifications to automate the user interface [24], then construction of the RPA prototype and integration with the environment according to the pre-implementation analysis.
- Testing – conducting tests of individual robots in dedicated environments analyzing and submitting test results for approval [18] and conducting training for employees whose work is subject to automation.
- Implementations - including the characteristics of the automated process, RPA documentation with tests, process owner consent, and designation of the person responsible for the RPA implementation,
- Post-implementation validation and verification and transfer of results to the user – adaptation process for employees related to the automated process [1] and implementation approvals.

The PDD should include the following information: a description of the process in the form of a flow diagram – the sequence of activities performed in the current process (“as-is”); participants in the process; requirements for automation – its elements and effects; setting business rules, information flow; FTE; lists of exceptions and service scenarios; inter-process dependencies and defining the elements that should be robotized and which should be automated using code.

Then, the creation of SDD should be started - a document containing information on how to automate and implement processes, based on information from PDD. The document contains information on the solution architecture, a list of technologies and tools used for automation; application interfaces and the method, and requirements for compliance with security standards; describing error handling. The remaining stages are sequentially or iteratively consistent with software testing, implementation, system launch, and operation.

After creating the first, ready version of RPA, as part of the implementation, tests of objects are carried out in Xray Jira [14], and reports from the tests performed are available after each scenario execution. After sending the W tests for approval to the process owner, the production implementation takes place [18]. The next steps of the implementation are carried out according to the procedure presented earlier.

6 Conclusions and recommendations

The full answer to the research question RQ1 was provided by the literature analyses included in Section 2 and the practical solutions proposed, implemented, and presented in Section 4. The answer to the second question RQ2 is the proposed (Sections 3 and 5) concept and implementation of the framework. In addition, two criteria were adopted for assessing the implementation and work management stages: RPA success and the effects of robotization implementation (Section 4). From this point of view, additional comments and recommendations [33] were presented relating to the selected stages of the framework (Table 2).

Table 2. Problems and recommendations to overcome them in the proposed final framework structure

Stages and phases of the procedure	Problems and challenges	Recommendations for solutions
Pre-implementation analysis - logical (1)	problems during process identification	detailed analysis and improvement of processes with additional external tools and workshops with process owners [9]
Pre-implementation analysis - logical (2)	psychological barriers fear of losing employment or having to change the specialization of users of automated processes	presentation of a schedule of changes and benefits of robotization
Pre-implementation analysis - logical (3)	selecting processes that are too complex (for RPA)	using tools for process analysis: process map, effort assessment, FTE analysis
Pre-implementation analysis – technical (1)	ensuring data security	entrusting the IT technical department with the aim of compliance with organizational standards and regulations
Pre-implementation analysis - technical (2)	integration with other company systems	integrity tests during the iterative creation of robots
Pre-implementation analysis - technical (3)	optimization of implementation and operating costs conducting	an economic calculation based on suppliers' offers
Pre-implementation analysis - technical (4)	minimizing errors	using agile methodologies [40] in the process of creating robots
Construction of an RPA prototype	lack of precise implementation patterns and the risk of lack of integration with other company systems	use of methods agile – continuous improvement (Jira Scrum Boards)
Process testing (1)	lack of test scenarios and schedules	planning a test set agreed with the process owner,
Process testing (2)	inability to conduct tests in the real environment	creating a test environment to enable testing
Process testing (3)	non-compliance with end-user expectations	thorough pre-implementation analysis in close communication with the user, creating a monitoring procedure and reconciliation after implementation
Implementation – organizational changes (1)	resistance to organizational changes	presentation of the effects for employees and the company resulting from the implemented changes
Implementation – organizational changes (2)	resistance to using new tools and technologies	conducting courses on the use of technologies supporting project management
Implementation - economic effects	difficulties in measuring the economic efficiency of the project implementation of a feedback system	setting performance indicators and comparing results before and after the implementation of automation for subsequent implemented RPAs
Maintenance and monitoring (1)	constant monitoring of RPA operation	implementation of an appropriate tool (e.g. Blue Prism Dashboard [27]) to monitor and report on performance
Maintenance and monitoring (2)	software updates required	Providing technical support and training the IT support team
Maintenance and monitoring (3)	robot performance optimization	procedures for regular reviews of RPA performance, integration with other systems and updating settings

Stages and phases of the procedure	Problems and challenges	Recommendations for solutions
Post-implementation validation and verification	problems with end-user acceptance of RPA	planning an adaptation process for employees related to RPA and assistance in implementation [1], and ensuring employee support in the adaptation process
Implementation approvals	problems with full acceptance of RPA and implementation support by the company's management	providing results of the economic efficiency of implemented solutions and ensuring end-user support

Source: own study

The above implementation recommendations resulting from practice can contribute to further improvement of the adopted framework for creating and implementing RPA. The limitation of this work was undoubtedly conducting research only in one specific IT organization based on selected, repeatable processes. In this situation, generalization of the framework assumptions is impossible. Nevertheless, the experience gained in this example can be useful for automating other processes taking place in the company. Further work should therefore consist in expanding the experimental base and conducting a more detailed, comprehensive economic calculation of all RPAs in the organization. Conducting similar research in other organizations would also allow for an assessment of the usefulness of the proposed solutions. It also seems that workshops with the main stakeholders and interviews/surveys with end users of robotic processes would be helpful in its specification.

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