PRIORITIZATION OF BUSINESS PROCESSES FOR ROBOTIC AUTOMATION IN A LOGISTICS COMPANY USING THE AHP

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Original Scientific Paper

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A clear research gap exists in the field of robotic automation of business processes, particularly within logistics and supply chain management. The goal of this paper is to establish an innovative, structured approach for selecting among multiple proposed processes to support higher-quality and more reliable managerial decision-making regarding business process automation in logistics companies, utilizing the AHP (Analytic Hierarchy Process) method. Specific criteria and sub-criteria are defined based on the company's needs, along with suitable numerical and verbal scales for evaluating alternatives. The alternatives represent processes considered for automation within the QMS (Quality Management System) and IT (Information Technology) sector. For hierarchical structure modelling, the Criterium DecisionPlus software is used. The analysis enables the identification of the priority process for automation. Additionally, the impact of changes in criterion priorities on the process ranking is examined as a simulation of potential changes in managerial decision-making. The results indicate that the proposed model is stable and reliable for process ranking. Therefore, the proposed methodology represents a practical tool that can potentially be applied in related companies when choosing priorities in digital transformation processes. A proposal for further research is the risk assessment of the automation of the analyzed processes.

Keywords: AHP; Process prioritization; RPA; Criterium DecisionPlus; Logistics.

INTRODUCTION

In modern business environments, companies face an increasing need to undergo digital transformation, with the help of which they would adapt to the dynamic market environment and changing consumer demands (Abildtrup, 2024; Christofi et al., 2025). Companies are constantly looking for ways to improve their performance in order to increase productivity, reduce operating costs, and achieve greater business value (Ivančić et al., 2019). The ever-present challenges brought by global competition and significant growth in customer demands and expectations place heightened expectations and pressure on logistics service providers (Lagorio et al., 2022; Winkelhaus & Grosse, 2020).

The logistics industry, which significantly enhances the competitive advantage of the companies it cooperates with (Sezer & Abasiz, 2017), should constantly strive to improve productivity and agility in its operations (Ugrinov et al., 2025; Ye et al., 2025). In this way, more successful management of unstable demand, different assortments, and orders would be enabled, and the time required for realizing deliveries would be reduced (Lagorio et al., 2022). Given that supply chains are still frequently not integrated, despite the fact that logistics is known to track all significant economic

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developments, they now present a barrier to the successful growth of digital logistics in conjunction with digital marketing (Egorov et al., 2020). One of the possible solutions that contributes to the improvement of the efficiency of logistics companies, along with numerous unsolved challenges, is the possibility of automating numerous activities that were previously performed by employees using Robotic Process Automation (RPA) technologies (Krakau et al., 2021; Nalgozhina et al., 2024; Tsang et al., 2024).

The mentioned activities are predominantly structured and monotonous processes, such as generating invoices, recording employee records, managing company payments, and transferring data from several sources, such as email, spreadsheets, and folders, to systems used for recording, including Enterprise Resource Planning systems (ERP) and Customer Relationship Management systems (CRM) (Deloitte Consulting LLP, 2024; Lacity & Willcocks, 2016). Through the implementation of RPA, operational costs, the time required to perform monotonous tasks, and the workload of employees at the workplace are reduced, which directly contributes to increased organizational productivity (Syed et al., 2020).

A particularly important step of any RPA project is the selection of the process to automate. The choice of process depends on how successful the implementation will be, as well as the acceptance of the technology by employees (Costa et al., 2022).

This paper seeks to answer the following research question: How can the decision-making process within the QMS sector of the observed logistics company be improved? The authors propose a structured framework for managerial decision-making in the case of prioritizing process automation using RPA technology. The proposed framework incorporates all relevant criteria and sub-criteria based on which the processes are assessed in order to generate one priority process for automation.

In order to examine this potential systematic way to determine the priority process for automation in a logistics company, the authors of this paper conducted a practical analysis using the AHP (Analytic Hierarchy Process) method, one of the Multi-Criteria Decision Analysis (MCDA) methods, applying the Criterium DecisionPlus software to rank and determine the priority process that indirectly supports logistics operations, and consequently providing a way of optimization, which improves internal business processes and helps management to improve the quality of services provided by the company.

Relevant previous research was introduced as a theoretical framework for the practical analysis following the introduction. In the methodological part, the formed criteria and sub-criteria are presented, as well as the selected alternatives for conducting the analysis, while the results of the application of the method and their discussion are elaborated in detail in a separate chapter. The paper ends with conclusions, which should indicate the necessary course of action.

PREVIOUS RESEARCH

Previous research in the area of prioritization and process selection for RPA automation has been underexplored (Wanner et al., 2019) in different industrial fields, while its importance is widely recognized in the logistics industry (Egorov et al., 2020). For this reason, we are conducting research in a logistics company in Serbia.

RPA is a modern technology that, supported by software programs, enables the automation of routine and standardized tasks that were previously performed manually by people (Moreira et al., 2023). According to Devarajan (2018) and Ferreira et al. (2020), the Institute of Electrical and Electronics Engineers (IEEE) Standards Association (2017), formulated RPA as: "A preconfigured software instance that uses business rules and predefined activity choreography to complete the autonomous execution of a combination of processes, activities, transactions, and tasks in one or more unrelated software systems to deliver a result or service with human exception management".

This innovative solution is implemented as a means of digital transformation in various sectors, among which a significant place, apart from Human Resources (HR), accounting, and finance, is also occupied by the area of supply chain management, enabling the improvement of business processes and services provided by companies (Lievano-Martínez et al., 2022). According to research by Forrester Consulting, 86% of observed organizations saw an increase in efficiency after implementing RPA technology in their business processes (Forrester Consulting, 2019).

According to Lievano-Martínez et al. (2022), processes that are most often automated through RPA include logging users into corporate applications, reading emails and opening attachments, relocating and saving documents to desired locations (such as shared folders or cloud systems), and integration and data exchange with systems such as ERP, CRM, and internal HR systems. A key step in any RPA implementation project is to analyze the suitability of the process for automation.

Several process characteristics have been identified that are common to processes that are successfully automated. Processes that are based on defined rules are suitable for RPA, because decisions in those cases do not require deliberation and are suitable for modeling through if-then logical decision trees. It is convenient to automate routine processes that are often triggered and are activated by a specific action or at a predefined time without the need for human intervention (Costa et al., 2022). Processes in which structured data types are used, such as invoicing, contribute to successful automation because the robot clearly primarily interprets and processes data during the realization of the process, thereby achieving greater accuracy, precision, and reduced activity time (Bhardwaj et al., 2024; Costa et al., 2022). Another desirable feature of the process is maturity, which is reflected in the fact that there have been minimal changes in the process in the past, as well as the expectation that there will be no major changes to that process in the future (Viale & Zouari, 2020). This reduces the likelihood of additional financial expenditure and time spent on subsequent changes to the automated RPA process. The suitability of the process for automation also depends on the number of exceptions, which represent the number of deviations from the defined process flow. In the case of processes that work in multiple systems that are not synchronized, RPA can enable automated integration between systems, thus increasing process efficiency (Costa et al., 2022). Process complexity is another significant factor (Lacity & Willcocks, 2018). Authors Tomar and Grover point out that RPA achieves the greatest benefit for companies by automating processes that are large in volume and less complex, as well as those where there is a tendency for errors to occur during manual work (Tomar & Grover, 2024).

Determining the priority process for automation through RPA can be examined using MCDA due to the need for tools that enable structured, transparent, and consistent decision-making based on the simultaneous consideration of different criteria and often-conflicting goals (Dean, 2022; Costa et al., 2022; Ishizaka & Nemery, 2013).

One of the more well-known MCDA methods is the AHP, officially presented by Thomas Saaty in 1980 (Saaty, 1980; Saaty & Vargas, 2012), which gives the possibility of simplifying the decision-making problem by breaking it down into hierarchical levels, enabling a more transparent and simpler structure consisting of goals, criteria, and alternatives (Chaube et al., 2024).

The principal advantage of the AHP method lies its ability to form a relative scale for any attribute, regardless of whether it is qualitative or quantitative, from verbal assessments in pairwise comparisons (Forman, 1993).

In addition to the standard application of the AHP method through matrix calculation, there are many possibilities of using the AHP method through different software solutions. One of those solutions is Expert Choice, a program that significantly contributed to the popularization of the practical use of the AHP method thanks to its user-friendly interface and applicability in business environments (Ishizaka & Labib, 2009). The following software solutions exist for the computer application of the AHP method: Super Decisions (Mu & Pereyra-Rojas, 2017), Decision Lens (David, & Saaty, 2007), MakeItRational, ExpertChoice, Decision Lens, HIPRE 3+, RightChoiceDSS, Criterium, EasyMind, Questfox, ChoiceResults, 123AHP, and Decerns (Ishizaka & Nemery, 2013; Ishizaka & Labib, 2009). The group of AHP software tools also includes Criterium DecisionPlus (CDP 4.0 student version), which was used in this work (Lakicevic et al., 2019; Murphy, 2014). Criterium DecisionPlus enables the ranking of considered alternatives and thus makes it easier for managers to determine priority solutions (Mustajoki & Marttunen, 2017). Users are enabled to structure the considered problem using a value tree and analyze sensitivity as well as analyze uncertainty (which is limited in this software) (Yatsalo et al., 2015).

The available previous research indicates a wide application of the AHP method in business environments. Mu & Pereyra-Rojas maintain that, although it was originally created in the academic environment and the public sector, the AHP method has progressed to the level that modern managers and leaders actively apply it as an auxiliary tool in decision-making, which is confirmed by the fact that it is used in companies that are on the Fortune 500 list (Mu & Pereyra-Rojas, 2017). Some authors point out that the AHP method deserves more attention because it can significantly improve the quality of the decision-making process. In their work, the authors Canco, Kruja and Iancu present a three-level structure of AHP in which the decision criteria are based on the perceptions of managers and consumers. The results of that work confirm that AHP can help managers, improving decision-making quality and business performance (Canco et al., 2021). AHP has also been used in the field of business that includes project management, with the aim of determining priorities and selecting business projects in portfolios (Vargas, 2010). The AHP method is also actively used to prioritize and rank potential Industry 4.0 technologies (Bhadu et al., 2023). The authors Costa, Mamede & Silva used a combination of the AHP method and the TOPSIS approach to examine the process selection process for RPA automation (Costa et al., 2022). Viehhauser and Doerr state that there are unsuccessful RPA projects due to the wrong selection of processes for automation. The authors develop a general and objective method for identifying, prioritizing, and selecting suitable processes for RPA, which is based on literature, interviews, and AHP surveys with experts. In their work, they point out that the key criteria for process selection are a high degree of standardization and a large volume of transactions (Viehhauser & Doerr, 2021). Noting that the AHP method has already been applied in the sphere of interest of this work, the quality of the criteria as well as the fact that the importance of choosing the optimal choice of candidates for automation through RPA in order to be successful was confirmed, an analysis was carried out according to the methodology described in the next chapter.

METHODOLOGY

As part of the practical part of this work, an analysis of the processes within the QMS sector of the logistics company was carried out using the AHP method, with the aim of determining priorities for automation within the sector, i.e., identifying the most suitable candidate based on the set of characteristics it possesses. It is known that the AHP method enables the ranking of processes according to defined criteria and sub-criteria, which makes it extremely suitable for the needs of this work. For analysis that is more efficient and the possibility of testing supplementary scenarios, the procedure was carried out in the Criterium DecisionPlus (CDP) software.

The Criterium DecisionPlus software was selected as suitable for the needs of this analysis because of its straightforward and intuitive interface, as well as the ability to form specific verbal and numerical scales for each criterion and sub-criterion, which the software then converts into an acceptable format for the background mathematical calculation, that is performed by applying the principles of the AHP method.

Criteria and sub-criteria were formed based on the study of candidates for automation, the specific needs of companies, and the possibility of measuring the effects of their automation. For that purpose, the following criteria and sub-criteria were defined:

1. Time savings based on Full Time Equivalent (FTE) - The indicator of potential time savings can be shown using formula 1:

$$FTE = \frac{\text{Total number of working hours spent on process execution during the year}}{\text{Number of full-time working hours per year}} \tag{1}$$

2. The cost of automation - the criterion was introduced for the purpose of a specific check concerning the justification of the introduction of automation of the process considered from a financial perspective. For a more detailed analysis, it is divided into three sub-criteria:

2.1. The cost of project development (RPA automation) – Observed from the perspective of cost, which is calculated as the product of hours spent (U) and their cost (C) (Stewart, 2006). Within this analysis, the cost of project development (in this case defined as the cost of the company) is defined based on the number of working hours invested in the development of the process, according to formula 2:

$$T_{development} = U_{development} \cdot C_{work} \tag{2}$$

Where the formula elements represent:

$T_{development}$ – Total cost of development-price of project development
$U_{development}$ – Estimated number of working hours invested in development
C_{work} – Average wage of work, expressed in universal monetary unit, MU

2.2. Software Machine Capacity Occupancy Cost - Refers to the utilization assessment of the software license by which the RPA process is executed. It is calculated according to formula 3:

$$C_k = X \cdot Y \quad (3)$$

Where formula elements represent:

C_k – The cost of occupying the capacity of the software engine

Y– Monthly license fee, expressed in universal monetary unit, MU

X – Estimated share of utilization of total capacity for process automation (ranging from 0.01 to 0.99)

2.3. Process maintenance and technical support – This criterion refers to the costs of regular maintenance and technical support during the life cycle of the automated process. It is evaluated on a numeric scale from one to five, where one indicates low costs and five high costs, because at a given moment of the experimental phase it is not possible to make a more precise assessment.

3. Frequency - This criterion examines the frequency of process execution (3.1), as well as possible seasonal variations (3.2). The sub-criterion "Existence of seasonal variations" is assessed with Yes/No values, while for the sub-criterion "Frequency of process initiation," the grade is assigned based on the frequency of process initiation within the business cycle. Possible values are daily, two-three times a week, once a week, once every two weeks, once a month, quarterly, and once a year.

4. Complexity includes the number of exceptions (4.1), data structure (4.2), and source of data (4.3) involved in the process. The number of exceptions in the process is evaluated in the range from 0 to 20, because processes with more than twenty exceptions are not considered for automation based on the previous experience of the employees responsible for their implementation, while processes with more than 10 variations are previously analyzed within the Quality Management System (QMS) and Information Technology (IT) sector of the company in order to examine the validity of considering such a process for automation. Data structure can be structured (edited Excel tables), semi-structured (e-mails, PDF documents), and unstructured (notes, unedited Word documents, and scanned forms). Data sources can be internal or mixed (combining internal data with data from customers or business partners).

5. Risk of errors during manual work - The criterion consists of three sub-criteria: frequency (5.1), consequences (5.2), and probability (5.3) of errors. A universal value scale of 1–2–3–6–10 was formed, with elements modeled after the Kinney method (Kinney & Wiruth, 1976), but much simplified.

6. Coverage of the process (by organizational structures) – This criterion is incorporated into the analysis to evaluate the organizational prevalence of the examined process. Broader coverage indicates a wider influence of automation and potentially greater improvements in company efficiency, while simultaneously implying increased implementation complexity. The assessment is conducted according to the scope of the process: an individual, several employees within a single sector, multiple sectors within the company, or external collaborators across several companies.

7. Impact of automation on quality/ service - Assessment of the extent to which automation contributes to improving compliance with standards (7.1), internal (7.2) and external experience (7.3), as well as process monitoring (7.4). Sub-criteria are assessed as: "Yes / Partially / No" by employees from the QMS sector who have relevant experience for empirical assessment of this type.

Using the example of the first criterion, we can explain how to define a numerical scale in the range from zero to one: value 1 is the most favorable because it represents the potentially greatest time savings in the case of process automation. It is essential to note that for sub-criteria related to automation costs, a lower cost is preferable, and in such cases, the process is evaluated more favorably. An inverse numerical scale was formed, whereby the alternative with the value closest to zero is rated the most favorable. All defined criteria and sub-criteria in this AHP analysis, along with numerical and descriptive scales, are represented in Table 1.

Table 1: Overview of criteria, sub-criteria and their scales for evaluating the priority of the automation process

The name of the criterion	Label	The name of the sub-criterion	Sublabel	Scale
Time savings based on FTE	1	-	-	0-1
The cost of automation	2	The cost of project development	2.1	Number of working hours · Price of work
		The cost of occupying the capacity of the machine	2.2	The cost of occupying the capacity of the software engine · Monthly license fee
		Process maintenance and support	2.3	1 - low costs, 5 - high costs
Frequency	3	Frequency of process initiation	3.1	Daily/2-3 times a week /1 a week /1 in two weeks /monthly/ quarterly/yearly
		Existence of time variations	3.2	Yes/No
Complexity	4	Number of exceptions and variations	4.1	0-20
		Structure of data	4.2	Structured / Semi-structured / Unstructured
		Source of data use	4.3	Internal/Mixed
Risk of errors during manual work	5	Frequency	5.1	1-2-3-6-10
		Consequences	5.2	
		Probability	5.3	
Coverage of the process by organizational structures	6	-	-	Individual/Several employees within one sector/Several sectors within one company/Several companies
Impact of automation on quality/service	7	Achieving compliance with QMS procedures and standards	7.1	Yes/Partially/No
		Improvement of internal experience (employees)	7.2	
		Improvement of external experience	7.3	
		Improvement of process monitoring	7.4	

The observed company did not have a structured and universal approach that could be applied in this situation, so the analysis is conducted based on data collected directly from the company through interviews with employees in the QMS and IT sector and their empirical assessments, and from available data from the QMS documentation. During the criteria weighting process, five respondents participated, whose functions range from lower to senior management, and who were employed in the QMS and IT sectors of the observed logistics company. After collecting the data, a total of 6 potential processes were proposed as candidates for RPA automation:

1. Sending documents (P1) - The extraction of documents from the ERP system and their forwarding to a predetermined address.
2. Data entry (P2) – Invoice data from DMS that is manually entered into the operating system.
3. Branch invoicing (P3) – Receiving and entering documentation to ERP.
4. Post-service invoicing (P4) – Realized data is copied from email into ERP.
5. Collection of documentation (P5) – Searching for documentation in DMS and downloading it to a designated location.
6. Downloading the documentation (P6) – Searching, sorting, and organizing documentation to a designated location.

This analysis includes certain empirical assessments in cases where the evaluated criteria cannot be expressed through strictly measured numerical values. In that case, a numerical or verbal scale is applied, in which values are arranged from the lowest to the highest level (in the cases of sub-criterion "Process maintenance and support", criteria "Impact of automation on quality/service" and "Risk of errors during manual work"). Although these assessments represent a subjective evaluation and may be regarded as a methodological constraint in the analysis, the authors consider them valid and appropriate, as they were provided by company employees who are directly involved in the decision-making processes that are covered in this methodology.

Based on the criteria and sub-criteria from Table 1, all alternative scores had been collected and visually displayed in Table 2. Afterwards, all data was entered into Criterium DecisionPlus.

After defining and clarifying all the characteristics of the criteria and sub-criteria applied in this AHP analysis, all data were entered into the Criterium DecisionPlus software. A hierarchical structure was formed in which four levels are shown (Figure 1):

1. Selection of the most suitable process for automation through RPA
2. Criteria
3. Sub-criteria
4. Alternatives (6 processes)

Table 2: Grouping quantitative data, qualitative data

Label		Alternatives					
		P1	**P2**	**P3**	**P4**	**P5**	**P6**
1	-	0.55	0.38	0.31	0.03	0.05	0.02
2	2.1	30h * 100 MU	8h * 100 MU	20h * 100 MU	18h * 100 MU	10h * 100 MU	15h * 100 MU
	2.2	0.3*Y MU	0.1*Y MU	0.15*Y MU	0.07*Y MU	0.05*Y MU	0.1*Y MU
	2.3	2	5	4	4	2	2
3	3.1	Quarterly	Daily	Daily	Daily	3 times a week	1 a week
	3.2	No	Yes	No	No	No	No
4	4.1	1	9	3	3	6	15
	4.2	Structured	Structured	Structured	Structured	Structured	Structured
	4.3	Mixed	Internal	Internal	Mixed	Mixed	Mixed
5	5.1	3	6	2	1	1	1
	5.2	6	3	2	2	2	3
	5.3	2	3	2	2	2	3
6	-	Several companies	Several companies	Several employees within one sector	Several employees within one sector	Several sectors within one company	Several companies
7	7.1	No	No	No	Partially	Yes	Yes
	7.2	Yes	Yes	Yes	Yes	Yes	Yes
	7.3	No	No	Yes	Yes	Yes	Yes
	7.4	Yes	Partially	Partially	No	Yes	Yes

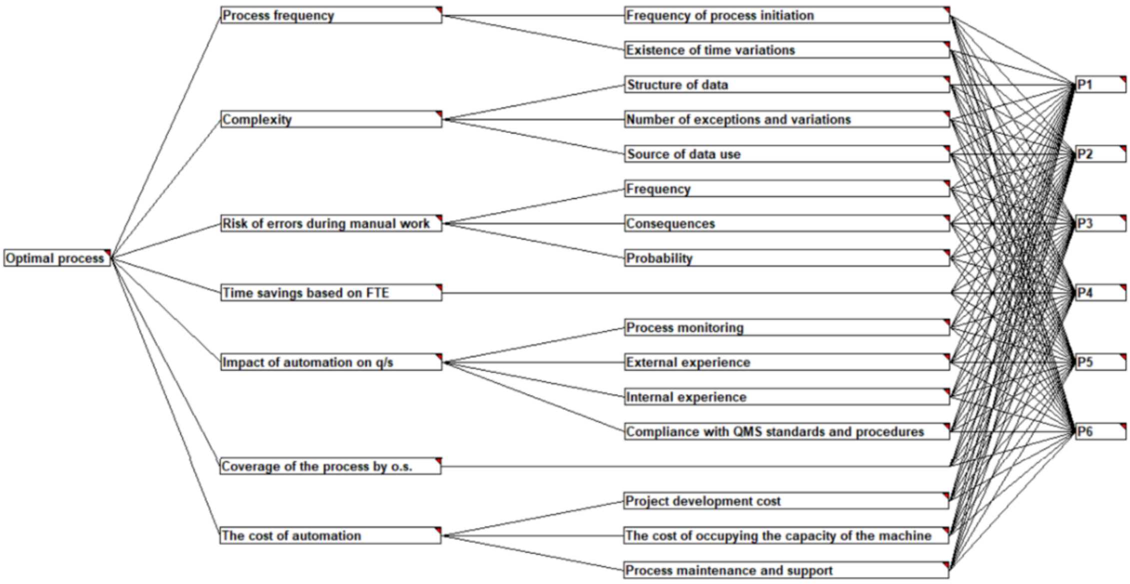

Figure 1: View of the hierarchical structure of the AHP model in Criterium DecisionPlus software

Then the relative weights were determined in the Criterium DecisionPlus software, applying the Saaty scale (1–9) (Saaty, 1990). The selected software program for this analysis performs the background mathematical calculation of the AHP method, which further facilitates the analysis. During the formation of verbal and numerical scales, the software automatically applies a unified scale with which further calculations are made.

The criteria are evaluated as follows:

– The frequency and risk of errors during manual work were rated the highest (9)
– Complexity, time savings (FTE), and cost of automation were rated 8
– Coverage of the process by organizational structures was assessed with a value of 7
– The impact of automation on service was assigned as the lowest value in this method (5)

Table 3: Values of weight criteria

Criterion	Value of the weight coefficient
Time savings based on FTE	0.148
Cost of automation	0.148
Frequency	0.167
Complexity	0.148
Risk of errors during manual work	0.167
The impact of automation on service	0.093
Coverage of the process by organizational structures	0.130

This assessment reflects the assessment of experts from the sector that the frequency of execution and the risk of error during manual work have the greatest importance when choosing a process for automation, while the impact on the service in this context had a lower priority. The software then generated weight coefficients for each criterion, which are shown in Table 3.

RESULTS AND DISCUSSION

The consistency ratio (CR) should be equal to or less than 10%, i.e., the value 0.1, to accept the assessment of weights in the AHP model (Saaty, 1990). Criterium DecisionPlus has the possibility to calculate this coefficient, and it has been confirmed that CR<0.1, which enables quality testing of the system. The following results were obtained: P1 has a Decision Score Value of 0.205, P2 a total value of 0.202, P3 a total value of 0.159, P4 a total value of 0.117, P5 a total value of 0.153, and P6 a total value of 0.164. A large difference was observed between the values of the results of the processes P1 and P4. P4 achieved almost half the overall result compared to P1 and is certainly the least suitable process for automation in this consideration. The differences in the numerous values of results P3, P5, and P6 are not drastic; they differ by a maximum of 0.011. Processes P1 and P2 have very similar numerical values, which indicates a similar outcome when making a decision; in this case, they would be considered suitable for RPA. In this instance, it is important to identify the presented difference in the final evaluation of the processes P1 and P2, even though it can be defined as an insignificant difference. Under certain circumstances, managers need to make a decision that is limited to only one selection, for example: specified project plans, limited budgets or other resource needs for the company.

Figure 2 shows the overall results of each alternative, ranked from the most favorable (at the top) to the least favorable. Based on the numerical and visual representation from Figure 2, it is concluded that P1 is rated as the most suitable for RPA automation.

The contribution diagram (Figure 3) shows the share and importance of each criterion in forming the overall result of the analyzed alternatives. It shows that process P1 achieved the highest overall result thanks to high values in the criterion "Time savings based on FTE" and favorable results in "Risk of manual error". In addition, the previously mentioned criteria have the highest weights in the model, which additionally influenced the placement of process P1. On the other hand, the criteria "Automation cost", "Frequency" and "Impact of automation on service" had a smaller impact on the overall result of the P1 process. Process P1 has the lowest rating within the "Frequency" criterion, which is logical, because of all the considered processes, it is the one that is started the least often.

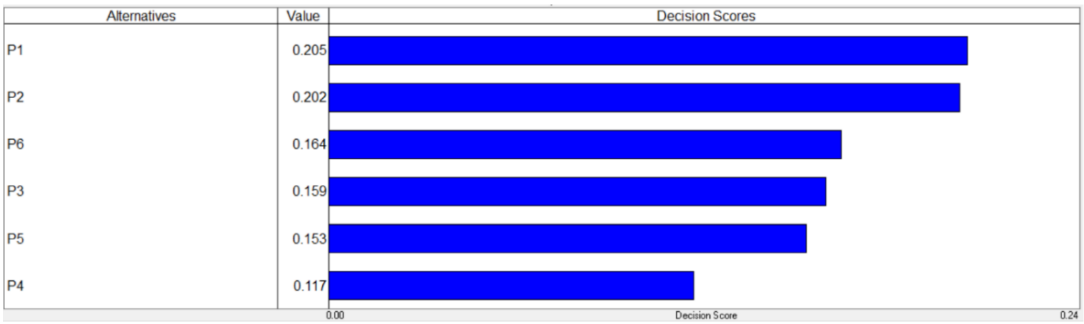

Figure 2: Viewing the results of the AHP method in Criterium DecisionPlus software

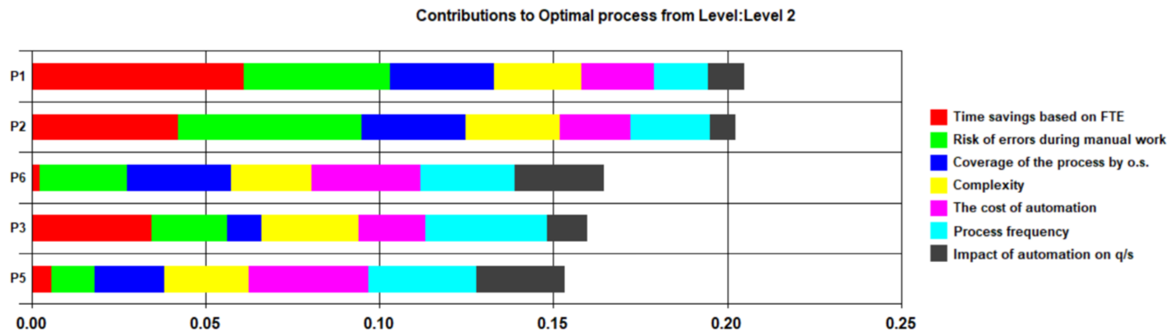

Figure 3: Criterion contribution diagram in Criterium DecisionPlus software

The P1 process has a high level of coverage and a minimal number of exceptions, which makes it technically suitable for RPA. High savings in FTE indicate a significant potential for increased efficiency after implementing an RPA solution. All of the above confirms that the automation of the P1 process will have the greatest effect on efficiency, reliability, and reducing the operational workload of employees.

In addition, a sensitivity analysis was carried out in the Criterium DecisionPlus software in order to examine how changes in the priorities of certain criteria affect the final result of the process selection for automation. The diagrams show the degree of sensitivity of the model to the change of the weight coefficients, that is, to what extent the change in the importance of the criteria can change the ranking of the alternatives. It was observed that the criteria "Cost of automation", "Frequency", "Time savings based on FTE," and "Impact of automation on service" are more sensitive, that is, they have a greater impact on the result. The criteria "Process involvement", "Risk of manual error," and "Complexity" show a lower level of sensitivity. A graphic representation of the most sensitive criteria is shown in Figures 4-6.

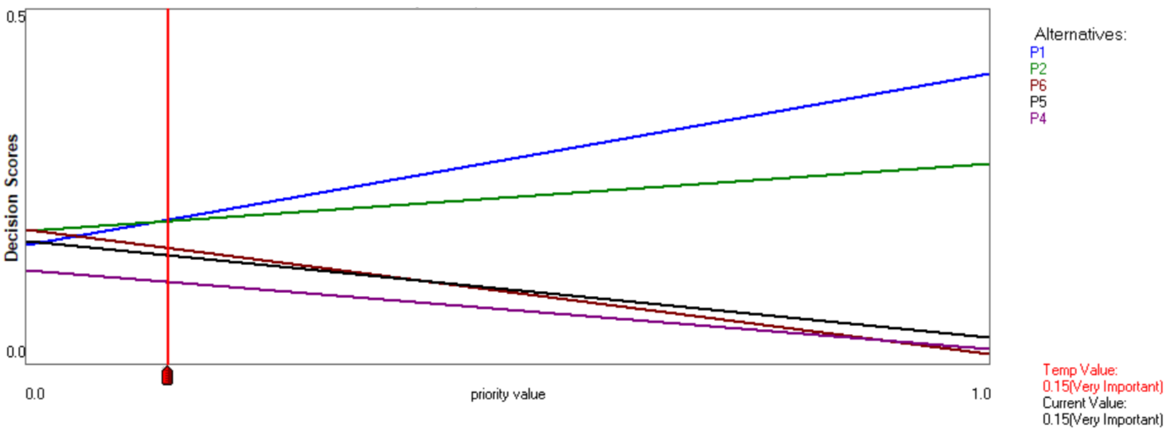

Figure 4: Sensitivity analysis for the "Time savings based on FTE" criterion

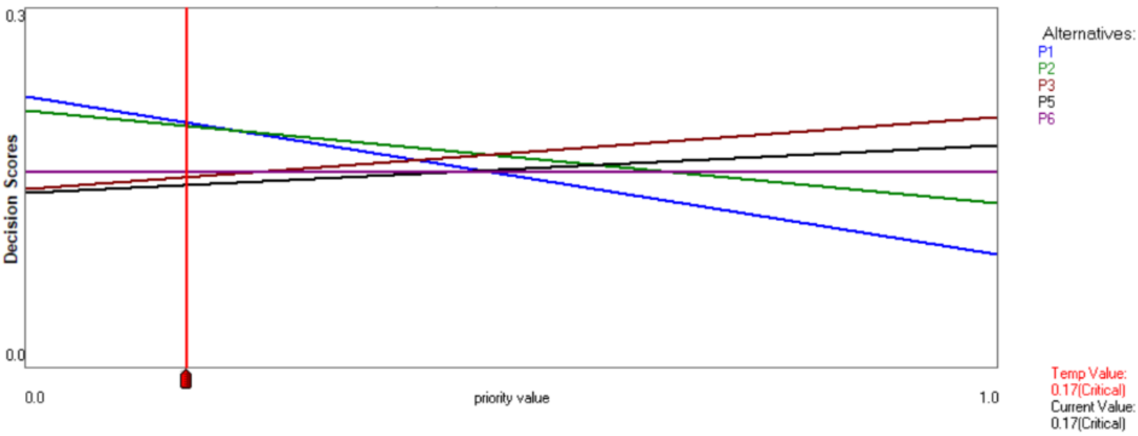

Figure 5: Sensitivity analysis for the "Frequency" criterion

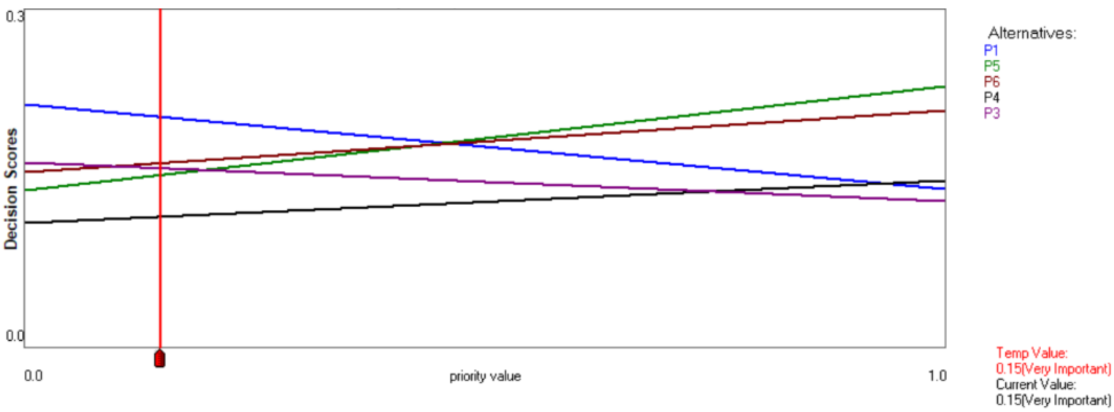

Figure 6: Sensitivity analysis for the "Cost of automation" criterion

For this reason, an additional analysis was conducted in which a scenario was simulated in which the logistics company's management increases the influence of the criteria "Automation cost" and "Time savings based on FTE" to examine whether such a change would change the results of selecting the priority process for automation.

In order to check the stability of the model and assess the sensitivity of the results to changes in the priority of the criteria, a supplementary scenario analysis was conducted. In this segment of the analysis, the impact of increasing the weighting coefficients (increasing the influence of the criteria on the final ranking of alternatives) of the "Cost of automation" and "Time savings based on FTE" criteria, which were identified as more sensitive in the previous analysis (Table 4), is checked.

The goal is to determine whether a change in managerial priorities would lead to a change in the order of priority processes for automation. This kind of simulation is particularly important because in a real business environment, management priorities may vary depending on current goals, economic factors, or management changes. Based on the results shown in Figures 7 and 8 and then combined with the primary analysis in Table 5, it can be seen that the change in priority of the observed criteria does not lead to a significant change in the ranking of alternatives.

Table 4: Presentation of the weighting coefficients (weight) of the criteria after changing the priority of the "Cost of automation" and "Time savings based on FTE" criteria

Criterion	Value of the weight coefficient (Scenario 1)	Value of the weight coefficient (Scenario 2)
Time savings based on FTE	0.143	0.179
Cost of automation	0.179	0.143
Frequency	0.161	0.161
Complexity	0.143	0.143
Risk of errors during manual work	0.161	0.161
The impact of automation on service	0.009	0.089
Coverage of the process by organizational structures	0.125	0.125

Figure 7: Display of the results of the AHP method in the Criterium DecisionPlus software after increasing the impact of the "Automation Cost" criteria

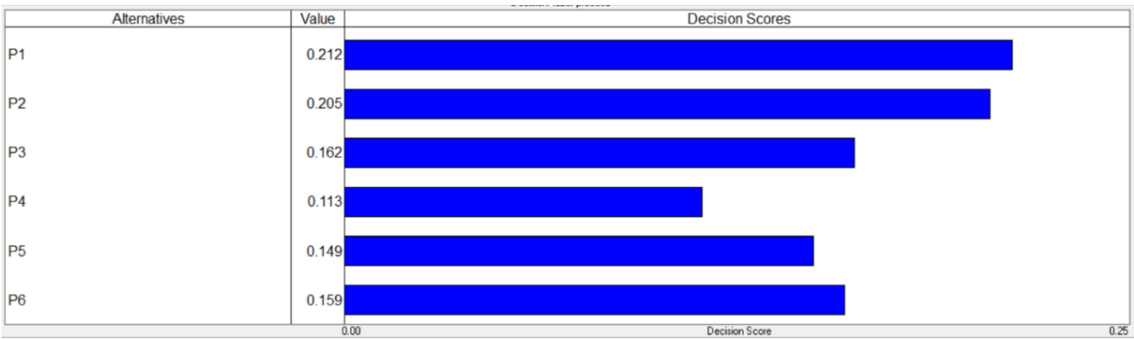

Figure 8: Presentation of the results of the AHP method in the Criterium DecisionPlus software after increasing the influence of the criterion "Time savings based on FTE"

In all scenarios, process P1 maintains the position of the most favorable alternative, with the highest overall result that varied slightly in the supplementary analysis (from 0.202 to 0.212), while P2 remains in second place, with minimal deviations in the result values, which proves that the model responds to weight changes but does not destroy the original order. An increase in the influence of the "Cost of automation" criterion leads to a slight decrease in the results of the alternatives that imply higher investments (P1 and P2) and an increase in the total values of the alternatives P4, P5, and P6. Increasing the importance of the criterion "Time savings based on FTE" resulted in a slight increase in the value of processes P1, P2, and P3, which was expected, considering that these alternatives showed greater efficiency in terms of time savings. It can be concluded that the decision made is stable and resistant to the examined changes in managerial priorities.

Table 5: Comparative view of the primary and supplementary analysis when changing the priority of the criteria

Alternative Ranking Results	Primary analysis	Analysis with Increased Influence of "Automation Cost"	Analysis with Increased Influence of "Time Savings based on FTE"
P1	0.205	0.202	0.212
P2	0.202	0.200	0.205
P3	0.159	0.158	0.162
P4	0.117	0.118	0.113
P5	0.153	0.156	0.149
P6	0.164	0.166	0.159

CONCLUSION

The evident research gap in determining process priorities for automation through Robotic Process Automation (RPA), particularly with the application of AHP-based software solutions, is addressed by this study. Furthermore, the paper responds to the needs of logistics companies by providing a structured, objective, and practically applicable framework for decision-making in identifying priority processes for automation with RPA technology within the Quality Management System (QMS) sector.

The application of the AHP method in the Criterium DecisionPlus software included defining the goal, hierarchical structuring of criteria and alternatives, determination of weight coefficients, process ranking, and sensitivity analysis. For this purpose, the AHP method is implemented using the Criterium DecisionPlus software. The values of the consistency index are within the allowed limits, which confirms the validity of the results obtained.

An additional analysis was conducted to simulate managerial decisions regarding changes in the prioritization of criteria. Both supplementary and sensitivity analyses confirmed the stability of the model, as variations in the weighting of criteria did not significantly alter the ranking of the evaluated processes.

Based on the overall analysis, it is concluded that process P1 - "Sending documents", which involves the extraction of documents from the ERP system and their forwarding to a predetermined address, is the most favorable candidate for RPA automation. By automating this process, significant time savings, increased precision and efficiency, and improved management of financial documentation in the observed logistics company can be achieved.

The proposed framework is primarily intended as a decision-support tool rather than a predictive model. The proposed model is a reliable and practical tool for decision support in process selection for (RPA) automation, and it is the main managerial implication of this manuscript. Although the concept itself is developed on the example of a large logistics company and a certain set of processes, the approach is adaptable and can be applied in smaller companies as well. A more detailed study can examine the possibility of implementing the proposed model in other related companies. The importance of examination of the risk of automation is emphasized in Dogan, Arslan, Cengiz Tirpan, & Cebi (2024), so a proposal for further research is to assess the risk of automation of the considered processes by integrating, for example, FMEA (Failure Mode and Effects Analysis) or FTA (Fault Tree Analysis) methods into the proposed model.

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PRIORITIZACIJA POSLOVNIH PROCESA ZA ROBOTSKU AUTOMATIZACIJU U LOGISTIČKOJ KOMPANIJI PRIMENOM AHP METODE

Primetan je istraživački jaz u oblasti robotske automatizacije poslovnih procesa, posebno u logistici i upravljanju lancem snabdevanja. Cilj rada je uspostavljanje inovativnog, strukturiranog pristupa pri izboru između više predloženih procesa radi donošenja kvalitetnijih i pouzdanijih menadžerskih odluka o automatizaciji poslovnih procesa u preduzećima logističke industrije uz korišćenje analitičkog hijerarhijskog procesa (AHP). Definisani su specifični kriterijumi i podkriterijumi na osnovu potreba logističkog preduzeća, kao i odgovarajuće numeričke i verbalne skale za procenu alternativa. Alternative predstavljaju procese koji se razmatraju u okviru sektora QMS (sistema menadžmenta kvalitetom) i IT (informacionih tehnologija) za automatizaciju. Hijerarhijska struktura modela kreirana je u softveru Criterium DecisionPlus. Predmetna analiza omogućava identifikaciju prioritetnog procesa za automatizaciju. Sprovedena je i dopunska analiza, pomoću koje se ispituje uticaj promena prioriteta kriterijuma na rangiranje procesa, kao vid simulacije potencijalne promene menadžerske odluke u preduzeću. Rezultati analize pokazuju da je predloženi model stabilan i pouzdan za potrebe rangiranja razmatranih procesa. Samim tim, predložena metodologija predstavlja praktičan alat koji se potencijalno može primeniti u različitim preduzećima, pri donošenju odluka o prioritetima u procesima digitalne transformacije. Predlog daljih istraživanja je procena rizika automatizacije razmatranih procesa.

Ključne reči: AHP; Prioritizacija procesa; RPA; Criterium DecisionPlus; Logistika.