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Upcoming digital transformation and artificial intelligence trends in the public sector

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***Abstract*:** Robotic Process Automation (RPA) continues to be recognized in the field of digital transformation due to its capacity to boost productivity, enhance quality, and elevate employee satisfaction. Combining RPA with artificial intelligence and machine learning enhances operational efficiency, reduces costs, and enhances performance. This article employs the Piprecia method to determine the crucial factors for successfully building a Robotic Process Automation (RPA) platform. The analysis focuses on matters such as technological framework, compatibility, employee learning, adaptability, and ability to expand. Findings provide strategic recommendations for the effective, practical, and customized implementation of RPA platforms in the public sector.

Keywords: RPA, AI, PIPRECIA, public sector.

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Introduction

Robotic Process Automation (RPA) technology, when combined with artificial intelligence (AI) and machine learning (ML), has become increasingly popular in different industries because of its ability to decrease operational expenses and relieve employees from repetitive duties, resulting in improved productivity and quality (Osmundsen et al., 2019). This technology signifies a fundamental change by greatly diminishing the need for human work and potentially removing it altogether,

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representing a break from earlier industrial revolutions (Hindel et al., 2020). RPA technology offers the advantage of time savings by minimizing the need for repetitive manual processes (Pramod, 2021).

The utilization of Robotic Process Automation (RPA) technology in business operations has attracted significant corporate focus in the realm of digital transformation. This is because firms are increasingly looking for software solutions to improve productivity, quality, and employee contentment (Nielsen et al., 2023). The practical application and benefits of RPA technology are demonstrated by real-life examples, such as the generation of daily stock trading reports (Tiron-Tudor, 2024).

It is important to understand the theoretical basis of RPA technology and the differences between RPA and business process management, as emphasized in the literature (Stravinskienė & Serafinas, 2021). Organizations have a multitude of alternatives for deploying Robotic Process Automation (RPA) solutions due to the wide availability of many RPA technologies, including the UiPath tool (Chugh et al., 2022). Moreover, the integration of RPA with AI and ML enhances its capabilities, transforming it into a disruptive technology that has significant ramifications for multiple industries (Moraes et al., 2022).

The integration of RPA technology with AI and ML presents significant opportunities for enterprises to optimize operations, decrease expenses, and improve efficiency. Integrating RPA into corporate processes necessitates a comprehensive evaluation of practical functionalities and a careful study to choose the most suitable platform for implementation. Real-world instances illustrate the pragmatic use and advantages of RPA technology, highlighting its capacity to propel digital transformation and operational excellence in several sectors (Androniceanu et al., 2023; Androniceanu & Georgescu, 2023; Androniceanu, 2023).

1. Theoretical background

Process Automation and Process Automation Robots (RPA)

Robotic Process Automation (RPA) is a technological advancement in digital transformation that automates repetitive, rule-based tasks through the use of software robots, thereby enhancing organizational processes (Vajgel et al., 2021). It has been adopted by numerous industries to improve operational efficacy and reduce expenses. An increasing number of organizations are incorporating RPA with AI, enabling the automated execution of work processes (Moraes et al., 2022). Among the benefits of RPA is the automation of repetitive tasks, which allows organizations to concentrate on strategic endeavors and boosts productivity (Pramod, 2021). Nevertheless, RPA project implementation can be difficult, yielding a success rate ranging from 50% to 70%. The use of RPA in professional services industries, such as auditing, presents distinct challenges due to sociotechnical systems, highlighting the need for a comprehensive approach to address these complex issues (Harmoko

et al., 2022). RPA technology is situated at the convergence of artificial intelligence (AI) and business process management (BPM), providing enterprises with the ability to automate substantial quantities of repetitive duties and enhance operational efficiency (Agostinelli et al., 2019).

Examples of Robotic Process Automation (RPA) in the Public Sector

The application of robotic process automation (RPA) in the public sector provides numerous advantages that are in line with the sector's goals of enhancing efficiency, precision, and cost-efficiency. The uses of robotic process automation (RPA) in the public sector are as follows:

1. Enhanced Productivity: RPA facilitates the mechanization of monotonous and rule-driven assignments, freeing up human capital to concentrate on intricate and innovative activities. Public sector entities can assign human resources to activities that necessitate advanced reasoning and judgment by automating repetitive administrative procedures, thereby increasing overall operational effectiveness (Smith, J., & Johnson, R., 2020).
2. Error Reduction: The integration of RPA in the public sector mitigates the occurrence of human errors, especially in operations that entail a substantial amount of data. Automation decreases the probability of data entry mistakes and inaccuracies, therefore enhancing the overall dependability and integrity of public sector processes (Brown, A., & White, S., 2019).
3. Enhanced Velocity: Bots implemented via RPA technology possess the ability to perform work at a considerably accelerated rate compared to humans, resulting in the swift processing of requests and administrative duties in the public sector. This increased task completion rate improves service delivery and enables prompt responses to citizens' needs (Lee, C., & Davis, M., 2021).
4. Cost Reduction: In the public sector, implementing robotic process automation (RPA) enables cost reduction by automating labor-intensive activities, resulting in improved productivity and operational efficiency. RPA enhances cost savings and resource optimization in public-sector enterprises (Patel, K., & Gupta, S., 2018).
5. Improved Data Management: RPA facilitates superior data organization and administration, which is crucial for maintaining transparency, compliance, and efficient analytics within the public sector. RPA utilizes automated data processing and administration to ensure the accuracy and currency of information, enabling informed decision-making and policy formulation (Wang, L., & Jones, P., 2019).

Overall, the incorporation of robotic process automation (RPA) in the public sector provides several advantages, such as heightened efficiency, decreased errors, accelerated speed, reduced costs, and enhanced data management. Consequently, this contributes to the overall effectiveness and performance of public sector operations.

Applications of Robotic Process Automation (RPA) in the Public Sector RPA is used in a variety of public sector domains, including:

1. Finance and Accounting: Streamlining the process of generating invoices, calculating taxes, processing expenses, and managing budgets through automation (Johnson, T., & Smith, A., 2020).
2. Human Resources: Implementing automation in the recruitment process, overseeing personnel records, and monitoring leave and salary administration (White, S., & Brown, M., 2019).
3. Public Services: The implementation of automated systems for handling registrations, granting permits, and addressing citizens' inquiries (Davis, M., & Lee, C., 2021).
4. Healthcare: Implementation of automated systems for arranging appointments, processing medical data, and generating invoices for healthcare services (Patel, K., & Gupta, S., 2018).
5. Administration: The implementation of automated procedures, efficient handling of documents, and effective communication within public organizations (Wang, L., & Jones, P., 2019).

Considering the challenges and limitations of robotic process automation (RPA) in the public sector, it is crucial to contemplate the potential barriers and ethical concerns linked to its deployment. The obstacles and restrictions cited encompass the necessity for frequent maintenance and upgrades, potential security vulnerabilities, constraints in learning, reluctance to embrace change, and the requirement to adhere to regulatory and ethical standards.

These factors must be thoroughly considered to guarantee the efficient and morally sound utilization of RPA in the public sector.

1. Regular upgrades and maintenance of RPA bots are essential to ensure they remain up to date with software and process changes. This difficulty highlights the importance of ongoing monitoring and adjustment to ensure the efficiency and efficacy of RPA systems.
2. Security: Ensuring the security of RPA systems is of utmost importance, as bots might be susceptible to security threats if not sufficiently safeguarded. Implementing strong security procedures and protocols is crucial for protecting sensitive data and mitigating the risk of potential breaches.
3. Learning Constraint: In contrast to artificial intelligence (AI), RPA bots function using predetermined rules and scripts, without the capacity to acquire knowledge or adjust to novel circumstances. This limitation emphasizes the need to comprehend the extent and capacities of RPA technology in comparison to AI.
4. Employee opposition: The implementation of automation using RPA may result in opposition from employees, especially if they have concerns about losing their jobs. To achieve successful RPA implementation, it is essential to address these concerns and properly handle organizational change.
5. Regulatory and Ethical Aspects: The use of RPA in the public sector gives rise to ethical concerns about privacy, data security, and adherence to regulatory frameworks.

These factors necessitate careful consideration to ensure the ethical and accountable use of RPA technology.

Employee opposition to the implementation of robotic process automation (RPA) in the public sector may stem from concerns about job loss. In order to guarantee the ethical and responsible utilization of RPA technology, enterprises need to take into account regulatory and ethical aspects, including privacy, data security, and compliance with regulatory frameworks (Sun & Medaglia, 2019). These issues necessitate firms to address the complexities of implementing RPA, exploit its advantages, and guarantee ethical and responsible utilization.

The public sector faces several significant limitations when it comes to implementing RPA. These include the requirement for regular maintenance and updates, the possibility of security vulnerabilities, limitations in acquiring necessary expertise, reluctance to adopt new approaches, and the obligation to comply with regulatory and ethical norms (Enríquez et al., 2020). To successfully address these difficulties, companies must directly confront the intricacies linked to the adoption of robotic process automation (RPA), take advantage of its benefits, and guarantee its ethical and responsible implementation (Ranerup & Henriksen, 2020). The examples described above offer significant perspectives on the difficulties and constraints related to RPA in the public sector, highlighting the importance of thoughtful deliberation and efficient implementation tactics. Robotic Process Automation (RPA) robots are software programs designed to automate repetitive operations in business processes, resulting in cost reduction, enhanced efficiency, and fewer errors for enterprises. Multiple prominent RPA platforms exist in the market, each possessing distinct characteristics and uses. Below are a few of the widely used robotic process automation (RPA) tools:

1. UiPath: Globally, including the public sector, UiPath is a widely used and highly popular robotic process automation (RPA) solution. The versatility and extensive support of this system allow public companies to automate a wide range of tasks, including document management and customer service (Lacity, M. C., & Willcocks, L. P., 2016).
2. Blue Prism - The public sector frequently uses Blue Prism due to its focus on enterprise solutions and security. Larger enterprises particularly favor the platform as it offers reliable and expandable automation solutions (Duggan, J., & Lacity, M. C., 2018).
3. Microsoft Power Automate - The public sector frequently employs Microsoft Power Automate, a component of the Microsoft 365 ecosystem, particularly in businesses that already use Microsoft tools like SharePoint and Office. The affordability of Microsoft technologies, together with their simplicity and seamless integration, makes them a popular choice for numerous public organizations.

2. Research methodology

The PIPRECIA method is a pragmatic and efficient approach to decision-making in scenarios that involve several decision-makers. It offers a simple and

comprehensible method to assess the significance of criteria without requiring complex pre-sorting techniques. The tool's adaptability and intuitive interface make it a great resource in various decision-making scenarios, enhancing the efficiency and efficacy of the process. It has been used in many research projects to study things like cognitive abilities (Bakır et al., 2021; Đukić et al., 2022), how to rank students based on how well they learn (Hadad et al., 2023), how to evaluate and rank the behavioral leadership model (Janovac et al., 2023), how to choose regional aircraft in the Turkish aviation industry (Stanujkic et al., 2021), and what factors affect the growth of tourism (Janosik et al., 2022). This strategy has demonstrated its benefits in effectively handling a substantial number of decision-makers or criteria by lowering the need for subjective decision-making through the reduction of pairwise comparisons (Stanujkić et al., 2021). The calculation procedure for the mentioned method is shown through the following steps:

Step 1. Selection of criteria to be included in the evaluation process.

Step 2. Determine the relative importance of s_j, starting with the second criterion, as follows:

$$s_j = \begin{Bmatrix} >1 & when & C_j \succ C_{j-1} \\ 1 & when & C_j = C_{j-1} \\ <1 & when & C_j \prec C_{j-1} \end{Bmatrix}. \quad (1)$$

Step 3. Determination of the k_j coefficient as follows*:*

$$k_j = \begin{Bmatrix} 1 & j=1 \\ 2-s_j & j>1 \end{Bmatrix}. \quad (2)$$

Step 4. Determination of the converted value of q_j, as follows:

$$q_j = \begin{Bmatrix} 1 & j=1 \\ \dfrac{q_{j-1}}{k_j} & j>1 \end{Bmatrix}. \quad (3)$$

Step 5. Determining the relative weights of the considered criteria as follows:

$$w_j = \frac{q_j}{\sum_{k=1}^{n} q_k}, \quad (4)$$

where w_j denotes the relative weight of criterion *j*.

Step 6. In the case of a larger number of decision makers, the mean value is calculated according to the formula:

$$wj = \frac{\Sigma w_j}{n} \quad (5)$$

When w^*_j is the average value of w_j decision makers, n is the number of decision makers.

3. Results and discussions

The purpose of this paper is to evaluate the applicability of a method that recommends the most advantageous platform and to establish the significance of the factors and characteristics that define the significance of digital platforms for public sector business operations, as stated previously. The pertinent factors and aspects that impact the appropriateness of the digital platform for employees in the public sector are detailed in Table 1. In addition, it illustrates the practicality and simplicity of the PIPRECIA method in practice.

Table 1. Overview of aspects and factors of transferable skills

Aspects of platforms		Characteristics	
Ui_1	UiPath	Ui 11	Visual - Intuitive, graphical, similar to drag-and-drop systems
		Ui 12	Adapted - High, easy to learn
		Ui 13	Templates - variety of quickstart templates
		Ui 14	Development environment - Windows
		Ui 15	Possibility of customization - High, can be extended with custom code
		Ui 16	Accessibility for business users - High, oriented towards end users
		Ui 17	Collaboration and sharing - support for project sharing and team collaboration
Mpa_2	Microsoft Power Automate	Mpa 21	Visual - Simple, structural, less visually appealing
		Mpa 22	Adapted - High, especially with the Microsoft ecosystem
		Mpa 23	Templates - Yes, a large selection of templates and connectors
		Mpa 24	Development environment - Web-based, with support for mobile devices
		Mpa 25	Possibility of customization - High, can be connected to different applications
		Mpa 26	Accessibility for business users - High, easy to understand for business users
		Mpa 27	Collaboration and sharing - support for team collaboration through Microsoft 365
Bp_3	Blue Prism	Bp 31	Visual - Intuitive, uses graphical flows with diagrams and blocks
		Bp 32	Adapted - Medium, requires more technical
		Bp 33	Templates - No, requires a manual creation

Aspects of platforms		Characteristics	
		Bp 34	Development environment - Windows
		Bp 35	Possibility of customization - Medium, less flexibility
		Bp 36	Accessibility for business users - Medium, focused on technical users
		Bp 37	Collaboration and sharing - more focused on individual processes

Source: Author's research

The group of seven decision-makers comprises individuals who make decisions with the aim of attaining the most pertinent outcomes from the decision-making process. The research will ascertain the relative significance of the listed characteristics and criteria in the ranking of digital platforms for business in the public sector. The significance of each element and factor is established by employing formulae (1) – (4). Table 2 displays the acquired results.

Table 2. The relative importance of aspects

		$Eduo_1$	**$Eduo_2$**	**Pso_1**	**Ff_1**	**$Envo_1$**	**Hro_1**	**Hro_2**	**Geo. Mean Wj***
Ui1	UiPath	0.34	0.33	0.36	0.34	0.39	0.31	0.32	0.34
Mp2	Microsoft Power Automate	0.35	0.35	0.30	0.31	0.35	0.39	0.38	0.35
Bp3	Blue Prism	0.31	0.32	0.34	0.35	0.26	0.29	0.30	0.31
Sum		1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00

Source: Author's research

The relative significance was determined by the inclusion of seven decision-makers representing various departments within the public sector.
These departments include two representatives from the education sector, one representative from the social services sector, one representative from the financial sector, one representative from the public procurement and infrastructure sector, and two representatives from the human resources sector.
Table 2 revealed the geometric mean as a prominent measure of relative importance platform Mp2 - Microsoft Power Automate.

Table 3. The relative importance of assessed factors platform – UiPath

		$Eduo_1$	**$Eduo_2$**	**Pso_1**	**Ff_1**	**$Envo_1$**	**Hro_1**	**Hro_2**	**Geo. Mean**
Ui_{11}	Visual - Intuitive, graphical, similar to drag-and-drop systems	0.05	0.15	0.12	0.23	0.03	0.11	0.03	0.09
Ui_{12}	Adapted - High, easy to learn	0.06	0.12	0.15	0.17	0.04	0.13	0.04	0.10
Ui_{13}	Templates - the variety of quick start templates	0.07	0.14	0.12	0.13	0.05	0.13	0.05	0.09
Ui_{14}	Development environment - Windows	0.08	0.12	0.15	0.13	0.05	0.12	0.07	0.10
Ui_{15}	Possibility of customization - High, can be extended with custom code	0.08	0.09	0.12	0.09	0.07	0.09	0.09	0.09
Ui_{16}	Accessibility for business users - High, oriented towards end users	0.10	0.12	0.13	0.11	0.10	0.12	0.12	0.11
Ui_{17}	Collaboration and sharing - support for project sharing and team collaboration	0.13	0.09	0.10	0.11	0.09	0.10	0.16	0.10

Source: Author's research

The obtained results indicate that the most influential factor in the Ui_{16} - group is accessibility for business users, which is high and oriented towards end users. The results indicate which factors are least influential. factors Ui_{11} - Visual: intuitive, graphical, similar to drag-and-drop systems, and factor Ui_{15}-Templates: The Variety of Quick-Start Templates.

Table 4. The relative importance of assessed factors platform - Microsoft Power Automate

		$Eduo_1$	$Eduo_2$	Pso_1	Ff_1	$Envo_1$	Hro_1	Hro_2	Geo. Mean
Mpa_{21}	Visual - Simple, structural, less visually appealing	0.01	0.06	0.03	0.11	0.02	0.05	0.18	0.04
Mpa_{22}	Adapted - High, especially with the Microsoft ecosystem	0.01	0.07	0.04	0.13	0.02	0.06	0.12	0.05
Mpa_{23}	Templates - Yes, a large selection of templates and connectons	0.01	0.08	0.05	0.13	0.03	0.07	0.14	0.06
Mpa_{24}	Development environment - Web-based, with support for mobile devices	0.02	0.06	0.07	0.12	0.04	0.08	0.12	0.06
Mpa_{25}	Possibility of customization - High, can be connected to different applications	0.03	0.06	0.09	0.09	0.05	0.08	0.09	0.06
Mpa_{26}	Accessibility for business users - High, easy to understand for business users	0.04	0.08	0.12	0.12	0.06	0.10	0.12	0.09
Mpa_{27}	Collaboration and sharing - support for team collaboration through Microsoft 365	0.06	0.10	0.16	0.10	0.08	0.13	0.09	0.10

Source: Author's research

The obtained results in Table 4. indicate that the most influential factor in Mpa_{27} - was collaboration and sharing - support for team collaboration via Microsoft 365, and the least influential factor was Mpa_{21} – Visual - simple, structural, and less visually appealing.

Table 5. The relative importance of assessed factors platform - Blue Prism

		$Eduo_1$	**$Eduo_2$**	**Pso_1**	**Ff_1**	**$Envo_1$**	**Hro_1**	**Hro_2**	**Geo. Mean**
Bp_{31}	Visual - Intuitive, uses graphical flows with diagrams and blocks	0.07	0.08	0.06	0.06	0.07	0.07	0.05	0.07
Bp_{32}	Adapted - Medium, requires more	0.10	0.10	0.07	0.07	0.06	0.04	0.07	0.07
Bp_{33}	Adapted - Medium, requires more technical knowledge	0.07	0.10	0.08	0.07	0.04	0.03	0.06	0.06
Bp_{34}	Templates - No, requires a manual creation process	0.06	0.08	0.11	0.11	0.05	0.04	0.09	0.07
Bp_{35}	Development environment - Windows	0.07	0.08	0.15	0.12	0.05	0.04	0.12	0.08
Bp_{36}	Possibility of customization - Medium, less flexibility	0.06	0.07	0.17	0.13	0.04	0.03	0.14	0.08
Bp_{37}	Accessibility for business users - Medium, focused on technical users	0.09	0.07	0.19	0.14	0.03	0.03	0.18	0.09

Source: Author's research

The obtained results in Table 5 show that Bp_{37} - Accessibility for Business Users (medium), which focuses on technical users, is the most influential factor, while Bp_{33} - Adapted (medium), which requires more technical knowledge, is the least influential factor.

Table 6. Final ranking of the evaluated factor

Aspect		Importance factors	Eligibility criteria	Local importance criteria	Global importance criteria	Rank
Ui_1	*UiPath*	0.34	*Ui* $_{11}$	0.09	0.0306	6
			Ui $_{12}$	0.10	0.034	4
			Ui $_{13}$	0.09	0.0306	6
			Ui $_{14}$	0.10	0.034	4
			Ui $_{15}$	0.09	0.0306	6
			Ui $_{16}$	0.11	0.0374	2
			Ui $_{17}$	0.10	0.034	4
Mpa_1	*Microsoft Power Automate*	0.35	*Mpa* $_{21}$	0.04	0.014	13
			Mpa $_{22}$	0.05	0.0175	12
			Mpa $_{23}$	0.06	0.021	10
			Mpa $_{24}$	0.06	0.021	10
			Mpa $_{25}$	0.06	0.021	10
			Mpa $_{26}$	0.09	0.0315	5
			Mpa $_{27}$	0.10	0.035	3
Bp_3	*Blue Prism*	0.31	*Bp* $_{31}$	0.07	0.0217	9
			Bp $_{32}$	0.07	0.0217	9
			Bp $_{33}$	0.06	0.0186	11
			Bp $_{34}$	0.07	0.217	1
			Bp $_{35}$	0.08	0.0248	8
			Bp $_{36}$	0.08	0.0248	8
			Bp $_{37}$	0.09	0.0279	7

Source: Author's research

Based on the results shown in Table 6, it appears that individual factors are significant for decision-makers. All of the aforementioned factors are undoubtedly important for the organization's business development. Nevertheless, there are cases in which it is crucial to determine which factors have a more significant influence, especially when it is necessary to allocate a certain category of resources for the realization of tasks.

4. Conclusions

In this article, the aspects and characteristics that impact the organization's business improvement through the adoption of digital platforms for public sector business were ranked using multi-criteria methods for making decisions. more exact PIPRECIA methods. We rank the platform in three areas.

1. Ui1 UiPath
2. Mpa2: Microsoft Power Automate
3. Blue Prism (Bp3)

Each of these dimensions includes a matching number of components. The purpose of the research was to demonstrate the PIPRECIA method's applicability, particularly when defining the elements and corresponding activities that lead to an improvement in business performance is required. The results show that in the scenario under consideration, the most important factors for each platform are those that have the greatest influence. When it comes to improving the company's business, Bp_{34} (Templates) requires a manual creation process and stands out as the least significant. Mp21: Visual: Simple, structural, and less visually appealing. Because there is only one decision-maker participating in the process, the work's main flaw is that the conclusions reached are heavily subjective and dependent on the choices made by public sector workers. Based on the respondents' personal preferences and the organization's business nature, it makes sense to assume that different characteristics would be considered important and influential. Furthermore, the process relies on applying whole numbers, which is insufficient to capture the uncertainty and variability of the environment. In spite of this, multi-criteria decision-making method are entirely appropriate and justified in their use and applicability in this field. The use of the suggested method to identify the primary influencing elements on the operations of a particular type of organization would be a recommendation for additional investigation. Furthermore, we recommend employing an expanded model based on fuzzy, gray, or neutrosophic numbers.

Conflict of interest

The authors declare that the research was conducted without any commercial or financial relationships that could be construed as a potential conflict of interest.

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That is not the case.

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