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TOWARDS THE IMPLEMENTATION OF ROBOTIC PROCESS AUTOMATION IN THE PUBLIC SECTOR OF EUROPEAN COUNTRIES: BENEFITS, CHALLENGES, AND BEST PRACTICES

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Abstract
Robotic Process Automation (RPA) is a rising technology with immense potential in bringing significant benefits to the public sector, worldwide. Although RPA implementations in the public sector are still in early stages, several European countries have already made significant progress in this domain. The manuscript aims to explore the benefits and challenges associated with RPA implementations, such as improving efficiency and reducing costs while ensuring that job loss avoidance. Further, the manuscript outlines future paths regarding the implementation of RPA in the public sector, with an emphasise on the European countries.
Keywords *Robotic Process Automation; Public Process Automatization; IT for public sector; RPA case studies.*
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1. INTRODUCTION

In the last years, the technology rapid advancements have brought transformative changes worldwide and in various industries, including the public sector. Besides Artificial intelligence, Internet of Things and Blockchain, RPA is among the latest technological innovation that have gained significant attention worldwide. RPA involves the use of software robots for the purpose of automate the repetitive tasks, enhancing the processes efficiency and accuracy in different organizations (Anagnoste, 2017; Anagnoste, 2018; Bakarich and O'Brien, 2021). RPA has the potential to revolutionize certain operations, to minimize costs, and to optimize the allocation of resources. Due to these, the RPA captured the interest of researchers and practitioners. According with the literature (Juell-Skielse, Güner and Han, 2022) the European countries have recognized the potential of RPA and have been implementing it in various government agencies and for encompassing certain tasks in administration, decision-making (Bernhard and Wihlborg, 2022), and citizen services (Juell-Skielse, Güner and Han, 2022). This article investigates the implementing projects that include RPA in the European public sector and aims to emphasize on its benefits and challenges.

Despite the fact that the implementation of RPA in the European countries' public sector is still in early stages, some non-EU countries have already made significant progress towards the adoption of this technology. The United Kingdom is considered one of the pioneers in RPA implementation in the public sector, as several government agencies are using RPA to automating repetitive administrative tasks such as data entry, paperwork management and process, and emails coordination. The Swedish Tax Agency has also implemented RPA for automating the tax processing (Cooper *et al.,* 2019), which has resulted in significant cost reduction and efficiency improvements.

In the light of the above (Juell-Skielse, Güner and Han, 2022) bridge that gap by presenting findings from a comprehensive survey on RPA adoption across Sweden's public sector. The results display a heightened awareness of RPA's potential in the Swedish public sector, although its actual implementation remains relatively moderate. Moreover, the authors highlight that variations in adoption rates emerge when comparing central and local government entities. The perspectives collected through the above-mentioned studies stand to be a valuable benchmark for other nations and public administration models seeking to navigate similar terrains.

Overall, the literature review shows that he benefits of implementing RPA in the public sector are significant. As mentioned above, one of the most important benefits is the ability to automate routine administrative tasks, which offers more time to public sector employees' and allow them to focus on more complex tasks. Further, RPA implementation can help minimize errors and improve processes accuracy, and these two benefits can lead to an improvement of public services quality. Moreover, RPA can help Eu public sector from different countries to comply with the enforced regulations and to reduce the risk of non-compliance (Anagnoste, 2018).

2. RESEARCH METHODOLOGY

To address the research questions and investigate the implementation of RPA in the public sector of European countries, a literature review approach was used. The current study provide answers to the following three research questions (RQ):

RQ1 - What benefits are obtained by the European public sector countries when implementing RPA technology?

RQ2 - What challenges face the adoption of RPA in automatizing the public services?

RQ3 - What relevant European case studies can be identified in the specialized literature regarding successful RPA implementation?

An initial search among paper published was conducted on the Web of Science (WOS) database, resulting in the identification of 39 relevant articles published between 2017 and present (2023). The keywords used are displayed in Figure 1.

Figure 1. Keywords search and WOS results

Source: Web of Science (2023)

Further, inclusion and exclusion criteria were employed, based on the relevance and content alignment, 27 papers were retained for in depth analysis. 12 papers were removed from the analysis as the topic was not in line with the objectives of the current analysis. The final selection of articles encompasses a wide range of perspectives on RPA adoption in European countries but also include some non-European endeavours for the purpose of performing comparisons. The final list of 27 papers were critically analysed. The manuscripts were read, and pertinent information related to the challenges, opportunities, and implications of RPA implementation in the EU public sector were extracted. The results were organized into three sections, facilitating the identification of patterns, insights, and future paths across the reviewed literature.

This review methodology was conducive to a comprehensive exploration of RPA's implementation projects within the public sector in Europe and offers important insights into the actual state of RPA adoption. Further, there are signalized the challenges faced, the benefits obtained, and the potential implications on public services and the dynamics of workforce. The various perspectives extracted from the pool of 27 articles, contributes to a comprehensive understanding of the aspects regarding the RPA implementation in the European public industry.

3. RESULTS AND DISSCUSSIONS

In order to answer the research questions presented in the methodology section, the following sub-sections extract the findings from the reviewed literature.

3.1. Benefits of implementing RPA in the Public Sector (RQ1)

Accordingly, RPA offers important promise for improving the operational efficiency and effectiveness within the public sector of European countries. The publications of analysed authors highlight the benefits that RPA offers in the context of governmental processes . Hyun *et al.* (2021) prove that RPA can streamline the labour-intensive tasks and eliminate the likelihood of errors. Such benefit is crucial for the public sector, where administrative processes often involve repetitive (Sasak, 2020b) and rule-based activities. The results also

suggests that through the automatization of these routine tasks (Juell-Skielse, Güner and Han, 2022), government employees can be liberated and they can focus on complex, strategic and value-added activities.

The potential for cost reduction (Lindgren *et al.,* 2022) is a highly important advantage of RPA adoption. Several authors affirm that the implementation of RPA can lead to substantial cost savings (Likhacheva, Setchenkova, and Slepneva, 2020) as it reduces the need for extensive manual labor. Consequently, this action can lead to optimized resource allocation within public administration, freeing up time and financial resources that can be directed to other critical actions.

In the financial area related to the public administration, (Likhacheva, Setchenkova, and Slepneva, 2020) highlight the importance of RPA, along with other digital technologies, in the transformation of financial operations. Due to the integration of Artificial Intelligence, Big data, and Machine learning techniques, financial services can access relevant information resources. By this integration, it is facilitated the planning and analysis infrastructure consolidation, contributing to improving the decision making process (Bernhard and Wihlborg, 2022) and organizational efficiency (Prokofyeva and Zaytsev, 2020).

Furthermore, RPA projects can improve transparency (Ranerup and Henriksen, 2019; Johansson, Thomsen, and Akesson, 2023) and accuracy in public services. Stojakovic-Celustka (2020) emphasizes that RPA can be particularly beneficial in areas such as insurance and banking services, trading and capital markets, and risk management. Throughout the automatization of complex processes, RPA lead to reducing the chances of manual entry errors and provides a consistent compliance to regulations and policies (Ranerup and Henriksen, 2022) and this is crucial for the public sector, where maintaining data consistency, accuracy and compliance is a paramount.

RPA's potential to expedite administrative processes is also evident in the case study by Zhang, Thomas, and Vasarhelyi (2022). Their work introduces the concept of Attended Process Automation (APA), which signals that RPA enables auditors to work alongside and interact with automation routines. By such collaborative approach the audit workflows accelerates and also leverages the capabilities of RPA to improve auditors' professional judgment in tasks that cannot be fully automated. This study demonstrates a combination between human expertise and automation which enhances the effectiveness of public auditing.

The collective research stresses the transformative potential of RPA in the public sector of European countries. Among the benefits brought by RPA, we found the ability to streamline operations, costs minimization, accuracy improvements, and enhance the role of human professionals presents a compelling case for its adoption. It is known that European governments are in the quest to

optimize public services, and thus RPA emerges as a key technology that unlocks the operational efficiency and leads to better service delivery.

3.2. The challenges of RPA implementation (RQ2)

The literature analysis revealed several challenges that public institutions have to face when implementing RPA projects.

Technical complexity and integration challenges

RPA implementation within the public sector bears multiple technical challenges. Zhang and Vasarhelyi (2022) highlight the need for organizations to have robust IT infrastructure (Flechsig, Anslinger and Lasch, 2022) and integration capabilities to ensure seamless interactions between RPA systems and existing software. Mihai, Aleca and Gheorghe (2023) mention the complexity of integrating emerging technologies like Artificial intelligence and the Internet of Things with RPA, which requires additional and substantial technical expertise.

Employee resistance to change and workforce concerns

Some authors (Lindgren *et al.,* 2022) identify numerous challenges that arise from people's resistance to change and the workforce concerns (Parchande *et al.,* 2019). Employees might fear that RPA implementation could lead to job displacement (Sarilo-Kankaanranta and Frank, 2021), resulting in reluctance to accept the new automation of public processes. Moreover, (Lindgren *et al.,* 2022) emphasis on the the importance of involving employees in the RPA implementation process and properly address their concerns to ensure successful adoption.

The complexity of public processes

The administrative processes are known for their variability and high complexity. Because of these, the public processes are a real challenge for RPA implementation. (Prokofyeva and Zaytsev, 2020) discuss these issues in the context of the public healthcare industry. As a measure to overcome these challenges, there can be employed different scenarios and exceptions which, in turn, requiring extensive analysis and customization of RPA workflows.

Data privacy and security

The sensitive nature of public sector data, which handles citizen private information, is perceived as a high challenge. Thus ensuring data privacy and security becomes paramount for RPA implementations (Bernhard and Wihlborg, 2022). Further, Staegemann *et al.* (2021) emphasize the need to maintain a high level of trust and security if implementing artificial intelligence based chatbots and RPA for managing crisis communication. The authors (Staegemann *et al.,* 2021) also highlight the importance of monitoring user behaviour and data analytics to gain insights while safeguarding privacy (Stojakovic-Celustka, 2020).

Resource allocation and constraints

The resource constraints perceived as a challenge in the RPA implementation for public sector are discussed by Sobczak and Ziora (2021). The authors mention

that the limited funds and resources might hinder the RPA adoption, which requires high initial investment in technology, employee training, and even process redesign.

Regulatory and compliance challenges

The public industry is constrained by strict regulations and compliance requirements (Anagnoste, 2018). Regulatory and compliance issues *(William et al.,* 2019) can block RPA projects, as highlighted by Parchande *et al*. (2019), who emphasize the importance of ensuring that public process automation are complying with the legal and regulatory frameworks.

Organizational change management

When RPA projects are implemented in an organization, it can lead to significant changes in workflows and roles. Zhang, Thomas and Vasarhelyi (2022) highlight that auditors' roles in an RPA-enabled audit workflow need to be redefined, requiring important organizational change management strategies to ensure a facile transitions and effective utilization of RPA (Hyun *et al.,* 2021).

As presented above, the challenges of RPA project implementations within the public sector include technical complexity, integration challenges, resistance to change, data privacy and security concerns, financial and resource constraints, regulatory and compliance issues, and the need for effective organizational change management. These challenges underscore the importance of careful planning, stakeholder engagement, and strategic alignment when adopting RPA in the public sector.

3.3. Case Studies of regarding RPA implementation in the public sector (RQ3)

In the endeavour to answer the third RQ, this section presents a compilation of case studies found in various countries within the European region, Poland, Sweden, Germany, Finland, etc.) and not only (United Kingdom, Russia, India). These case studies offer a comprehensive understanding of the multifaceted applications and implications of RPA projects across diverse public sectors, such as healthcare, public administration, public accounting, and more. These real-world examples together with the presented benefits and challenges, highlight the real potential of RPA for the public sector of and offers valuable insights for future implementations of RPA projects.

Sobczak and Ziora (2021) present a case study regarding the implementation of RPA in Bydgoszcz City Hall, Poland, for electricity billing document management. The authors describe how RPA facilitates the automation of processes in a smart city context. This implementation resulted in fast and measurable improvement in document management processes, showcasing the potential of RPA in enhancing administrative efficiency.

Likhacheva, Setchenkova, and Slepneva (2020) illustrate a case study on the general use of cutting-edge technologies, which includes RPA, for the financial

departments of public Russian organizations. The authors prove that the implementation of RPA in financial departments led to improved efficiency, reduced costs, and improved the operational effectiveness. Moreover, it is proven that the integration of RPA with other digital technologies enabled these companies (financial departments) to build a unified infrastructure that better serves their interests.

Zhang, Thomas and Vasarhelyi (2022) introduce an Attended Process Automation (APA) framework for incorporating the RPA technology into the audit workflow. The authors apply in their study the APA framework for the planning process of a single audits for the particular situation of Swedish municipalities. The case study demonstrates that auditors can work together and interact with RPA routines to enhance the audit process. Moreover, the APA framework accelerates the important role of auditor in leveraging RPA for an improved decision-making process.

Other authors (Prokofyeva and Zaytsev, 2020) examine the RPA application in the public healthcare industry for the analysis of patient clinical pathways. Authors display in their case study the patient's routes related to sepsis diagnosis. By using different techniques, such as hierarchical agglomerative clustering and additive regularization of topic models, the study identifies patterns in patient trajectories. The case study proves the potential of RPA technology, in combination with others, to the optimization of patient flow and resource allocation in for public healthcare institutions.

Stojakovic-Celustka (2020) presents an overview of FinTech implementation, that includes RPA application for payment fraud prevention and detection using artificial intelligence techniques and data analytics. Additionally, this case study on Dubai Government's Blockchain Strategy showcases the implementation of blockchain technology and artificial intelligences, which are related to RPA technology in terms of technological advancements.

RPA is considered a solution for automating intricate business and operational processes (William *et al.,* 2019) characterized by high labour involvement and errors occurrence. The authors (William *et al.,* 2019) present a case study that reveals how RPA can enhance productivity in corporate services. Their study focuses on the RPA system that supports Corporate Service Providers in Singapore with annual compliance processes. The results show that the implementation improves significantly the CSP's productivity as it automatizes the compliance processes and ad-hoc client requests.

Zhang and Vasarhelyi (2022) present a very interesting case study on public education, which provides a detailed course design and materials for a 14-week RPA course tailored for the needs of accounting students. Although is not a traditional case study, its contribution provides valuable insights into how RPA public education can be structured and integrated into various university curricula.

Sasak (2020b) debates on the challenges of continued adoption of RPA in the Polish public sector and investigates two service centres that offers financial and HR consulting services. The case study underlines the importance of iterative decision-making while emphasizing on the need for sustained commitment to fully implement the potential benefits of RPA technology. Further, Sasak (2020a) discusses the concept of an intelligent generator of functionalities for IT&C system in public sector based on reference processes. This example establishes the potential RPA technology to optimize administrative services through process modeling and automation.

The case studies presented in this section highlight a wide range of RPA implementations in the public sector and not only, including financial departments, smart cities, healthcare, audit workflow, public services, corporate services, higher education, and public administration. These examples constitute best practices as they collectively point out the diverse applications of RPA in addressing various challenges and optimizing processes across different sectors within the public domain. Table 1 presents a synthesis of case studies in public (and private) sector of European countries while Table 2 presents the worldwide case studies identified in the analysed literature.

Table 1. RPA implementation case studies Europe

Sector	Country	Domain Analyzed	Case Study Topic	Reference
Public	Sweden	Municipalities, Audit Workflow	Challenges in RPA Implementation in Swedish Municipalities	Lindgren *et al.* (2022)
Public	European Union	Organizations, Digital Transformation	Influence of AI Technologies in EU Organizations	Mihai, Aleca and Gheorghe (2023)
Public	Poland	Smart City Implementation	RPA in Smart City Implementation: Electricity Billing Management	Sobczak and Ziora (2021)
Public	Germany	Crisis Communication, Public Information Provision	Use of Chatbots for Providing Information in Crisis Situations	Staegemann *et al.* (2021)
Public	Sweden	Audit Education	Teaching a 14-Week RPA Course for Accounting Students	Zhang and Vasarhelyi (2022)
Public	Poland	Healthcare	Clinical Pathways Analysis Based on Clustering Methods	Prokofyeva and Zaytsev (2020)

Sector	Country	Domain Analyzed	Case Study Topic	Reference
Public	Poland	IT System Generation	Generator of Functionalities Based on Reference Processes	Sasak (2020a)
Public	Poland	Public Services	Applying RPA in Administrative Processes of Public Administration	Raissa *et al.* (2019)
Public	Sweden	Social Services	Automated Decision-Making and Value Positions in Social Services	Ranerup and Henriksen (2019); Ranerup and Svensson; 2023)
Private	Poland	Business Processes	Software Robots in Business Process Automation	Sasak (2020b)

Source: projected by author

Table 2. RPA implementation case studies worldwide

Sector	Country	Domain Analyzed	Case Study Topic	Reference
Public	India	Contractual Employee Management	Contractual Employee Management System using Machine Learning and RPA	Parchande *et al.* (2019)
Public	Russia	Financial Services	Digital Technologies in Financial Departments of Companies	Likhacheva, Setchenkova and Slepneva (2020)
Public	Dubai, SAR	Various (Insurance, Banking, Trading, Risk Mgmt)	FinTech Implementation	Stojakovic-Celustka (2020)
Public/Private	Singapore	Corporate Services	Improving Corporate Secretary Productivity	William *et al.* (2019)

Source: projected by author

4. CONCLUSIONS

According with the reviewed literature, the list of additional public processes that can be automated with RPA technology, is presented below:

1. Document management and automation of data entry. By automating the manual process of data entry and document management the public sector can minimize errors and maximize employee's efficiency.

2. Employee on-boarding. The automation by RPA of employee on-boarding process, which includes email sending and receiving, creating user accounts, updating systems, can lead to time save and reduce the manual input.
3. Budget and financial reporting. When automating the process of budget and financial reporting can be obtained benefits such as accuracy, reduce the time required to complete reports, and allow public administrators to focus on more strategic tasks.
4. Procurement and purchasing. Automation within procurement and purchasing processes can modernize these processes, eliminate the manual input effort, and increase the accuracy of data.
5. Licensing and permit processing. RPA can automatize the licensing and permit processing process. Besides eliminating the input errors and efforts, RPA can improve the accuracy and speed of the process.

Regardless of the challenges of RPA implementations, its future use in the public sector of European countries sounds promising. Further, as more governments recognize the benefits of RPA, we will notice an advent in RPA adoption in government agencies and public sector. Additionally, as RPA technology will continue to progress, we can expect to discover even more advanced use cases. Thus, future investigations have to be pursued.

The implementation of RPA in the public sector in European countries has the potential to bring significant benefits, including improving efficiency, reducing costs, and enhancing citizen services. While there are challenges to implementing RPA in the public sector, careful planning and investment can help overcome these challenges.

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