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INTEGRATION OF RPA INTO PROCESS MANAGEMENT IN A LARGE RETAIL NETWORK ORGANIZATION

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Purpose: The paper aims to present implementation of RPA (Robotic Process Automation) into the BPM (Business Process Management) Lifecycle to systematize the application of robotic solutions in process management.
Design/methodology/approach: By exploring BPM lifecycle principles and components, RPA methods, and the APQC® framework, an integrated BPM-RPA model was developed. The components of the BPM-RPA model were defined along with the necessary documentation.
Findings: The proposed model presents a systematic approach to RPA implementation by integrating it into the business process management model. A case study was conducted in a large network organization, and the results are presented.
Research limitations/implications: The model was designed for large network organizations and their branches and functional directorates.
Practical implications: The BPM-RPA model can be adapted to various supportive/back-office processes and applied across multiple industries.
Originality/value: This paper emphasizes the importance of linking RPA with the foundational process management model within an organization.
Keywords: process management, BPM lifecycle, Robotic Process Automation (RPA), process automation.
Category of the paper: case study, research paper.

1. Introduction

Robotic Process Automation (RPA) stands out as a tool for business process automation, with an impressive adoption rate. According to a survey by Deloitte in 2022, RPA solutions have been implemented in 80% of enterprises, often chosen as the primary subject for profitability case studies. The rapid growth of the RPA market is evident from recent research, revealing a global market value surge from USD 849 million in 2018 to USD 1.3 billion in 2019 and a substantial leap to USD 2.9 billion in 2021 (Deloitte, 2022). In 2020, a remarkable

73% of companies expressed their readiness to embrace intelligent automation processes (Deloitte, 2022).

At its core, RPA relies on specific software to map out processes. In the realm of RPA, the term "robot" refers to a license (Willcocks, 2015). Gartner offers a concise definition: “Robotic Process Automation is a tool enabling users to configure one or more scripts, often referred to as 'bots,' to automatically execute specific keystrokes, mimicking human actions. This allows bots to replicate selected tasks (transaction steps) across entire business or IT processes”. RPA utilizes a combination of user interface interactions and descriptor technology, enabling scripts to span multiple applications (Gartner, 2022).

On the other side, it's noteworthy to recognize that RPA, often characterized as a programmatic tool, is a subject discussed in numerous articles (Table 1). These discussions typically shed light on the details of RPA method, emphasizing the necessity for specific phases in its implementation (like: technical documentation, programming, testing and maintenance).

Table 1.
RPA models available in the literature

Publication	RPA model description
Syed, 2020, p. 115	RPA is relatively easier and cheaper to implement, configure and maintain, compared to large enterprise systems and other forms of automation, and typically provides a simple and intuitive interface to users. Also, RPA can be implemented in a short timeframe.
Hofmann, 2020, pp. 99-106	It is key to focus not only on the short-term benefits of applying software robots, but also to concentrate on software robots’ long-term influences on the complexity of IS ecosystems and on the organization as a whole. Thus, decision-making in the context of RPA must have a strategical focus.
Cooper, 2019, pp. 15-35	RPA was described a method to improve efficiency in taxation, assurance, and advisory professional services processes.
Leshob, 2018, pp. 46-53	Four step model of RPA was proposed in the article: validate the process eligibility for RPA, evaluate the RPA potential of the process, Evaluate the RPA relevance for the process, classify the process for RPA.
Enriquez, 2020, pp. 39113-39129	Proposal od RPA model: analysis, design, construction, deployment, control and monitoring and evaluation and performance phases.
Siderska, 2020, pp. 21-31	RPA was described as a technology for digitalization.

Source: own’s elaboration.

The systematic combination of BPM lifecycle and RPA is not applicable in available literature. In author’s article (Uklańska, 2023b) review of accessible literature was made. And the provided cluster analysis state that while numerous publications delve into the definition and conduct cost-benefit analyses of Robotic Process Automation (RPA), there's a notable gap when it comes to practical implementation guidelines. Despite the abundance of RPA vendors and products in the market, a clear lack of well-defined implementation models persists. Additionally, many available rules may be misleading, and the number of presented case studies tends to be limited, further highlighting the need for a more detailed implementation framework.

This article aims to introduce RPA into BPM Lifecycle in the systematic way – by creating the BPM-RPA model. Creating this model is a worthy initiative, especially if there is a recognized gap in the existing literature.

The article consists of methodology chapter, were review of BPM lifecycle and available RPA implementation models were presented. As well as new approach to the BPM-RPA model. In results components of the model were presented with documentation required and outcomes, basing on the large network organization. Discussion part shows pros and cons of BPM lifecycle and RPA orientation. In conclusion, further steps are shown and approach to transformation procedure.

2. Material and methods

The BPM lifecycle is associated with the work of Marlon Dumas, Marcello La Rosa, Jan Mendling, and Hajo A. Reijers. The BPM lifecycle proposed by these authors is a widely recognized framework in the field of Business Process Management. It typically consists of six phases (Dumas et al., 2017, Weske, 2007, Mendling et al., 2017, Mohapatra, 2009, van der Aalst et al., 2010):

1. Process identification: identify and recognize processes within the organization. Capture and document existing processes, understand their purpose, and define their boundaries.
2. Discovery and analysis: describe the identified processes in detail. Use various techniques such as interviews, observations, and analysis tools to discover and comprehend the current state of processes.
3. Redesign: design improved or reengineered processes based on analysis. Develop new process models, incorporate best practices, and redesign processes to achieve organizational goals more effectively.
4. Implementation: put the redesigned processes into action. Deploy the redesigned processes, train employees, and implement any necessary technological changes.
5. Execution: objective: execute and manage the day-to-day operations of the implemented processes. Monitor, control, and execute the optimized processes, ensuring they align with organizational objectives.
6. Monitoring and evaluation: continuously monitor and evaluate the performance of the executed processes. Collect data on process performance, measure key performance indicators (KPIs), and use feedback mechanisms to assess the effectiveness of the implemented processes.

Process management execution is widely described in the literature. Mainly by phases of identification, modelling, implementation, control (review available in Olkiewicz, 2018).

This BPM lifecycle provides a structured and iterative approach to managing and improving business processes over time. Each phase contributes to the overall goal of achieving organizational efficiency, effectiveness, and adaptability. The iterative nature of the lifecycle allows for continuous improvement, ensuring that processes remain aligned with organizational objectives in a dynamic business environment (Figure 1).

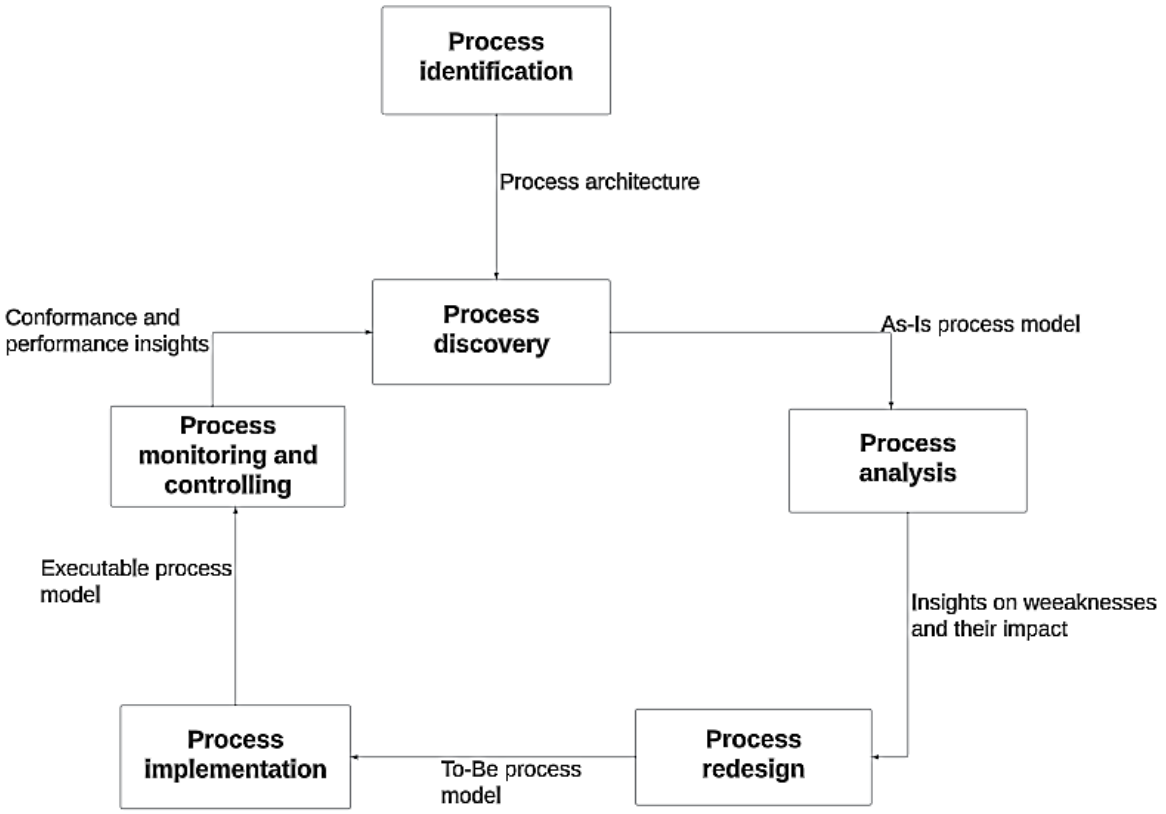

Figure 1. BPM Lifecycle model.

Source: Dumas et al., 2018, p. 23.

The components considered in the model should be comprehensively integrated across the entire organization. A good tool for this purpose is the APQC® PCF® (Process Classification Framework). It defines five level of processes. For the retail the level 1 is as follows (APQC®, 2024):

1. Operating processes:
   a. Develop Vision and Strategy.
   b. Develop and Manage Customer Experience.
   c. Market Products and Services.
   d. Merchandise Products and Services.
   e. Deliver Products.
   f. Deliver Services.

2. Management and support services:
    a. Develop and Manage Human Capital.
    b. Manage Information Technology (IT).
    c. Manage Financial Resources.
    d. Acquire, Construct, and Manage Assets.
    e. Manage Enterprise Risk, Compliance, Remediation, and Resiliency.
    f. Manage External Relationships.
    g. Develop and Manage Business Capabilities.

3. Results

3.1. Description of the BPM-RPA model

As mentioned before the main research question is how can Robotic Process Automation (RPA) and Business Process Management (BPM) be effectively integrated into a unified model to optimize organizational processes and enhance efficiency and productivity? In the research conducted by (Uklańska, 2023a), a model (Figure 2) for process classification within the realm of Robotic Process Automation (RPA) was introduced. The model comprises several distinct phases. The initial phase involves process classification, where an examination and categorization of existing processes take place. This serves as the foundational step in identifying potential areas for automation, laying the groundwork for subsequent stages. Following the process classification stage, the model progresses to the automation candidates review phase. Here, potential processes that exhibit compatibility with RPA are carefully scrutinized, ensuring a targeted and strategic approach to automation implementation. Subsequently, the model incorporates a high-level analysis phase, providing a comprehensive overview of the selected automation candidates. This stage delves into the broader implications and potential impacts of automating identified processes, offering a strategic perspective to guide decision-making. Moving forward, the model includes a detailed process analysis phase, wherein an examination of the chosen processes is conducted, encompassing details. This in-depth analysis is essential for crafting a precise and effective RPA implementation strategy tailored to the unique requirements of each process. The final stage of the model is the RPA implementation, where insights gathered from the preceding phases are translated into actionable steps. This phase involves the actual deployment of RPA solutions, leveraging the analysed data to optimize and streamline automated processes.

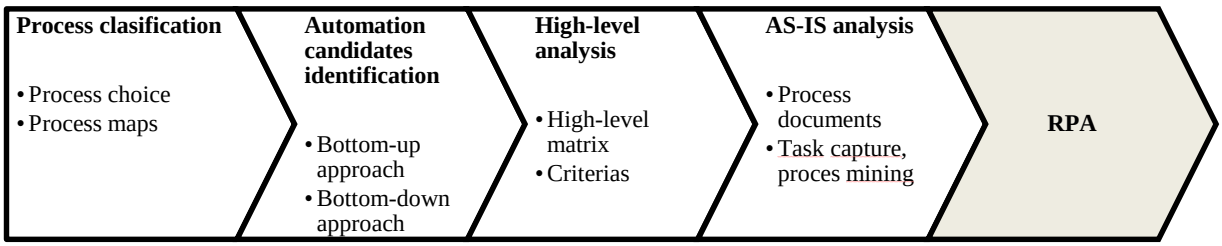

Figure 2. Business Process Classification Model for RPA Purposes.

Source: own's elaboration.

The Business Process Management (BPM) lifecycle and Robotic Process Automation (RPA) are complementary concepts, and organizations often influence both to enhance their operational efficiency. Basing on the review presented previously they can be interconnected in the phases of BPM Lifecycle as presented in Table 2.

Table 2.
Interconnections between BPM Lifecycle components and RPA

BPM Lifecycle Phase	BPM role	RPA role
Process identification	Identify and design business processes to optimize workflow.	During the design phase, identify routine and rule-based tasks suitable for RPA automation.
Process discovery	Create visual representations of processes for better understanding.	Use process models to identify specific tasks that RPA bots can perform, improving clarity on automation opportunities
Process analysis	Analyse process performance and optimize for efficiency.	Analyse RPA performance data to identify bottlenecks or areas for improvement. Optimize automated tasks for better efficiency.
Process redesign	Align RPA implementation with BPM strategies to automate repetitive and rule-based tasks identified during the BPM lifecycle.	Implement automation for specific tasks within a process.
Process implementation	Deploy processes within the organization.	Implement RPA bots to automate specific tasks within the larger process, reducing manual effort.
Process monitoring and controlling	Monitor ongoing performance, track key performance indicators (KPIs).	Monitor RPA bots' performance, ensuring they execute tasks accurately and efficiently. Capture data for analysis.

Source: own's elaboration

By integrating RPA into the BPM lifecycle, organizations can achieve a more comprehensive approach to process improvement. While BPM provides the overall strategy and framework for managing and optimizing processes, RPA serves as a tactical tool to automate specific tasks within those processes, contributing to increased efficiency and reduced manual workload.

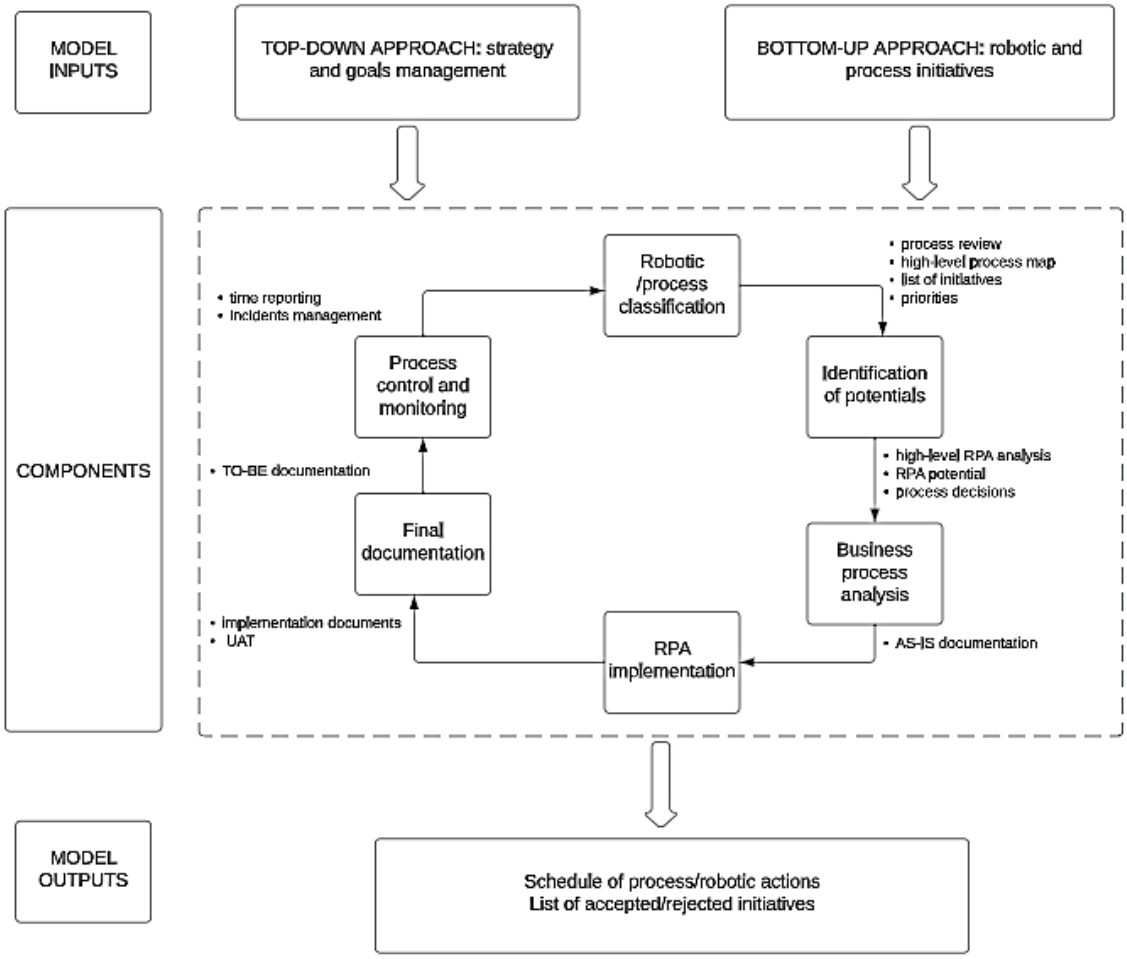

Figure 3. BPM-RPA model.

Source: own's elaboration basing on Dumas et al., 2018, p. 23.

The components of this model are as following:

1. Model inputs:
   - Top-Down Approach: focuses on strategic assumptions and goal management.
   - Bottom-Up Approach: involves initiatives from business users, particularly in the realm of robotics and process enhancements.
2. Robotic/process classification:
   - Compilation of a comprehensive list of initiatives.
   - Development of a primary process map.
   - Process review detailing all organizational processes.
   - Initiative categorization into process-related and robotic aspects, with priorities aligning strategically.
3. Identification of potentials:
   - Determine a list of processes with associated decisions and priorities.
   - Conduct a high-level analysis for processes.
   - Assess and determine the potential for Robotic Process Automation (RPA).

4. Business process analysis:
   - Analyse processes comprehensively.
   - Prepare process documentation.
   - Develop AS-IS process documentation, encompassing mandatory process cards and optional process maps.
   - For RPA solutions, a Process Definition Document (PDD) becomes imperative.
5. Implementation of RPA:
   - Take actionable steps based on prior decisions.
   - Document the implementation process, summarizing the executed improvements.
   - For RPA solutions, a Solution Design Document (SDD) is a requisite.
   - If necessary, document the User Acceptance Testing (UAT) phase.
6. Final Documentation:
   - Prepare documentation for the TO-BE state.
   - Develop TO-BE process documentation, including mandatory process cards and optional process maps.
7. Process control and monitoring:
   - Verify the sustainability of implemented solutions over time.
   - Generate reports.
   - Document and address any incidents that may arise.
8. Model outputs:
   - Develop a comprehensive schedule for both process and robotic work, considering organizational resources.
   - Compile a detailed list of accepted and rejected initiatives, providing valuable insights into the success and feasibility of each proposed change.

Drawing from the analysis outlined in the previous chapters, Figure 3 illustrates the RPA-oriented BPM Lifecycle model. This model is predicated on the assumption that the company isn't required to have an existing process management system in place. The described model is designed to guide each stage of implementation by visually representing the requisite documents and processes.

3.2. Case study in a large network organization

The case study was made in a large network organization. This organization is a retail company with a network of stores spread across Poland and a central office.

The case study was done in a:

1. Assignment of documents to the BPM-RPA model components.
2. Analysis of the model components and documentation available.
3. Preparation of results.

The analysis results are summarized in Table 3, offering insights into strengths, weaknesses, and areas for improvement. This concise presentation serves as a valuable tool for strategic decision-making and guiding interventions to optimize the existing model towards the target model.

Table 3.
As-is BPM-RPA model diagnosis in the large network company

Model component	**Documents required according to the model**	**Results**
Model inputs	Strategy	Document is available and properly defined
	Goals management	Goals are defined per each area of the organization, then up-bottom approach is used
Robotic/process classification	Robotic and process initiatives	Not available
	Process review	Not available
	High-level process map	Not available
	List of initiatives with priorities	Project Management Office is introduced in the organization, so the list of IT projects is available. No connection to process management is made
Identification of potentials	High-level RPA analysis	Not available
	RPA potential	Not available
	Process decisions	Not available
Business process analysis	AS-IS documentation	Available in specific areas, when required
Implementation of RPA	Implementation documentation	Available in specific areas, when required
Final Documentation	TO-BE documentation	Available in specific areas, when required
Process control and monitoring	Time reports	Data can be extracted, no report prepared
	Incidents management	Available, the organization is using tool for incidents management, needs adapting to RPA
Model outputs	Schedule of process/robotic actins	Not available
	List of accepted/rejected initiatives	Not available

Source: own's elaboration.

3.3. Case study results

In summary of the analysis of Table 3, while certain aspects such as strategy and goals management are well-established, there are notable gaps in information related to robotic and process initiatives, RPA potential, process decisions, and certain documentation. Addressing these gaps could enhance the effectiveness and integration of the model within the organization's processes. The three most important of them are: high-level process map, initiatives process and high-level RPA analysis matrix. In the context of the proposed implementation of the discussed model, the subsequent section outlines proposals for the best approach to these areas.

If we take into account process map for large network organizations, the APQC® PCF® (Process Classification Framework) could be used. For each of the group of processes the decision-making process should take place to establish list of initiatives and priorities.

BPM-RPA model in the large network organization needs to be supported by initiatives management process. This process empowers stakeholders at all levels to navigate the changes with confidence. From conceptualization to execution, each step is designed, fostering a sense of clarity and purpose throughout the transformative journey. Initiation begins with the submission of an initiatives form, providing a platform for users to articulate their ideas. Following this, a comprehensive review of the ideas takes place, culminating in a decision-making phase to determine whether the proposed concept should proceed to Robotic Process Automation (RPA) or undergo a thorough process analysis. Furthermore, the evaluation considers whether systemic changes are necessary for successful implementation (Figure 4).

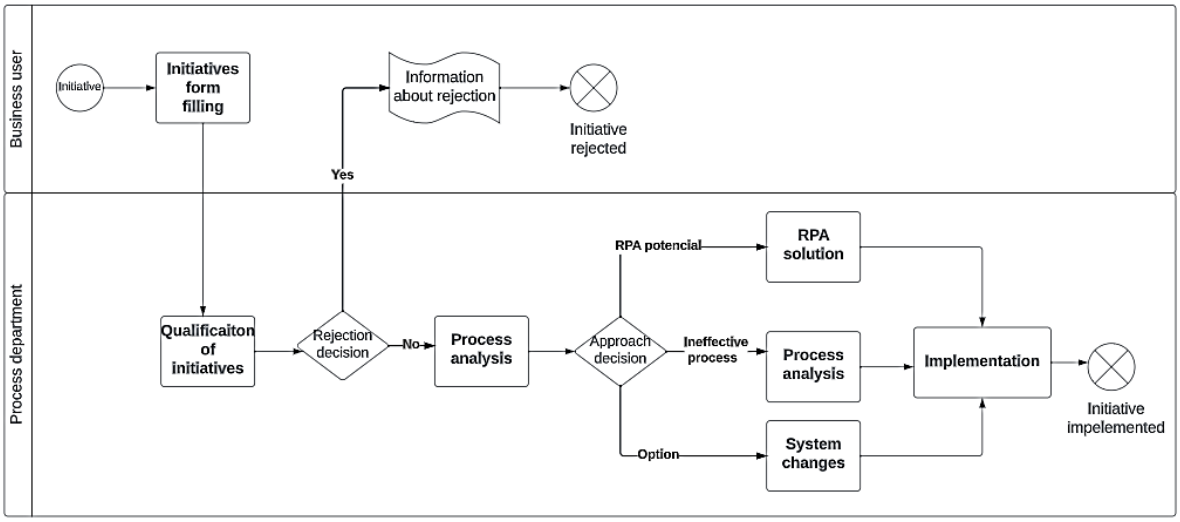

Figure 4. Initiatives management process.

Source: own's elaboration.

Furthermore, as part of the comprehensive strategy to implement the BPM-RPA model processes should be assessed by Robotic Process Automation (RPA) potential in a high-level matrix. Thid matrix served as a tool for evaluating each process, where those exhibiting substantial RPA potential were expected to demonstrate a positive alignment with all specified activators. This methodical approach aimed to not only identify processes ripe for RPA implementation but also to ensure a thorough understanding of the various activators contributing to their automation suitability.

4. Discussion

The synergy between Business Process Management (BPM) Lifecycle and Robotic Process Automation (RPA) represents a new approach to organizational processes. However, it's crucial to recognize that the inherent characteristics of each tool may leave certain aspects unaddressed when considered in isolation. BPM, with its focus on the human element, prioritizes process

optimization, collaboration, and agility. On the other hand, RPA is inherently automation-centric, concentrating on the streamlined execution of specific tasks through software robots.

One notable disparity arises in the adaptability of these methodologies to changing business needs. BPM inherently emphasizes the flexibility to evolve processes over time, catering to the dynamic nature of business requirements. Conversely, RPA is conventionally designed for stable and repetitive processes, showcasing its strength in ensuring efficiency but potentially falling short in scenarios demanding frequent adaptation.

The potential misalignment becomes more evident when considering the integration points between BPM and RPA. Seamless transitions between human-driven and automated tasks may pose challenges, especially in processes requiring dynamic decision-making or intricate judgment calls. The need for a harmonious blend that seamlessly combines the strengths of both BPM and RPA becomes apparent to bridge these transitional gaps effectively.

The insights from Cebuc's (Cebuc, 2023) research underscore the need to address these nuanced gaps in the BPM-RPA integration. It becomes imperative to explore solutions that enhance dynamic adaptability, visibility, governance, scalability, and overall process agility. Achieving a comprehensive and efficient approach to process management and automation might involve a strategic fusion of BPM and RPA with additional technologies or methodologies. This strategic combination would serve as a blueprint for organizations aiming to navigate the intricate landscape of process optimization and automation with maximum efficacy.

5. Conclusion

The primary objective of this paper is to show how the integration of Robotic Process Automation (RPA) into the Business Process Management (BPM) Lifecycle is aiming to systematize the utilization of robotic solutions in process management. This integration is crucial for enhancing operational efficiency and streamlining organizational processes.

To achieve this objective, a comprehensive exploration of BPM lifecycle principles, components, and RPA methodologies was undertaken, supplemented by insights from the APQC® framework. Through this rigorous examination, an integrated BPM-RPA model was meticulously developed, encompassing all essential components and accompanied by the requisite documentation.

The resulting BPM-RPA model offers a systematic approach to RPA implementation, effectively embedding it within the overarching business process management framework. To validate its worth, a case study was conducted within a large network organization, providing tangible evidence of the model's practical applicability and benefits.

It is worth noting that while the model was tailored for large network organizations and their various branches and functional directorates, its adaptability extends across diverse industries and organizational contexts. This versatility underscores its potential to revolutionize not only supportive and back-office processes but also core operational functions across multiple sectors.

Moreover, research conducted by (Brajer-Marczak, 2023) state that organizations need specific resources to enact dynamic process changes. Additionally, they require particular capabilities to ensure these resources yield the intended results.

However, it's essential to acknowledge certain considerations in the adoption of this model. The limitations of RPA, such as challenges in adapting to dynamic changes and the need for robust governance and compliance measures, should be carefully addressed. Successful implementation requires a holistic strategy that encompasses not only RPA tools but also a comprehensive understanding of the end-to-end business processes. Analysed case study in the large network organization can give an overall perspective, but is not sufficient. For further applications is needed to verify the model of broader scope of organizations and processes (to follow the Table 3). This table provides practical guidance on how to apply the model. It makes the integration process clearer and ensures that organizations get the most out of the model for their specific back-office needs.

The aforementioned case study underscores the importance of recognizing that mere analysis and recommendations may fall short in achieving comprehensive results. It highlights the necessity for a transformation procedure that navigates through distinct phases, meticulous steps, obligatory actions, and well-defined documentation frameworks. It is evident that supplementing the analysis with a structured model encompassing a comprehensive approach to BPM-RPA is essential for attaining optimal outcomes. While implementing RPA-oriented BPM Lifecycle model the organizations would need a dedicated roadmap presenting phases, responsibilities, steps and specific documentation. Without this kind of transformation procedure the model itself is not sufficient.

References

1. APQC® (2024). *Retail process classification framework.* Available at: https://www.apqc.org/system/files/resource-file/2023-04/K09368_Retail%20Process_v721_011519_April%202023.pdf
2. Brajer-Marczak, R., Marciszewska, A. (2023). Dynamic process improvement – theoretical and empirical perspectives. *Scientific Papers of Silesian University of Technology Organization and Management Series*, *172*. 10.29119/1641-3466.2023.172.3.

3. Cebuc, C.N., Rus, R.V. (2023). The Use of Robotic Process Automation for Business Process Improvement. In: A.L. Negruşa, M.M. Coroş (eds.), *Remodelling Businesses for Sustainable Development.* ICMTBHT 2022. Springer Proceedings in Business and Economics. Springer.
4. Cooper, L.A., Holderness, D.K., Sorensen, T.L., Wood, D.A. (2019*).* Robotic process automation in public accounting. *Accounting Horizons, 33(4),* pp. 15-35.
5. Deloitte (2022). *Robots are coming*. Available at: https://www2.deloitte.com/uk/en/pages/finance/articles/robots-coming-global-business-services.html, 5 December 2022.
6. Dumas, M., La Rosa, M., Mendling, J., Reijers, H.A. (2017). *Fundamentals of Business Pro-ess Management.* Springer.
7. Enriquez, J.G., Jimenez-Ramirez, A., Dominguez-Mayo, F.J., Garcia-Garcia, J.A. (2020). *Robotic Process Automation: A Scientific and Industrial Systematic Mapping Study*. IEEE Access, pp. 39113-39129.
8. Gartner (2022). *Magic Quadrant for Robotic Process Automation*. https://www.gartner.com/doc/reprints?id=1-26YSZ6WZ&ct=210729&st=sb, 11.01.2022.
9. Hofmann, P., Samp, C., Urbach, N. (2020). Robotic process automation. *Electronic Markets, 30(1),* pp. 99-106.
10. Lazareva, N., Karasevskis, K., Girjatovcs, A., Kuznecova, O. (2022). *Business Process Automation in Retail*. 63rd International Scientific Conference On Information Technology And Management Science Of Riga Technical University (ITMS).
11. Leshob, A., Bourgouin, A., Renard, L. (2018). *Towards a Process Analysis Approach to Adopt Robotic Process Automation.* IEEE 15th International Conference on e-Business Engineering, ICEBE 2018, 8592629, pp. 46-53.
12. Mendling, J., vom Brocke, J. (2017). *Business Process Management Cases: Digital Innovation and Business Transformation in Practice*. Springer International Publishing.
13. Mohapatra, S. (2009). *Business process automation*. PHI Learning.
14. Olkiewicz, M. (2018). Zarządzanie procesowe w ramach funkcjonowania podmiotów sieciowych. *Scientific Papers of Silesian University of Technology, Organization and Management Series, 117,* 369-388. 10.29119/1641-3466.2018.117.24.
15. Siderska, J. (2020). Robotic Process Automation-a driver of digital transformation? *Engineering Management in Production and Services, 12(2),* pp. 21-31.
16. Syed, R., Suriadi, S., Reijers, HA. (2020). *Robotic Process Automation: Contemporary themes and challenges.* Computers in industry.
17. Uklańska, A. (2023). *Robotic Process* Automation jako nowoczesna technologia automatyzacji procesów biznesowych. In: A. Bitkowska (ed.), *Przyszłość zarządzania procesowego* (pp. 314-317). Strategie – Ludzie – Technologie. Towarzystwo Naukowe Organizacji i Kierownictwa. Dom Organizatora.
18. Uklańska, A. (2023). Robotic Process Automation (RPA) – Bibliometric Analysis and Literature Review. *Foundations of Management, 15,* pp. 129-140.

19. van der Aalst, W.M.P., Hofstede, A., Adams, A., Russell, N. (2010). *Modern Business Process Automation: YAWL and Its Support Environment*. New York.
20. Weske, M. (2007). *Business Process Management: Concepts, Languages, Architectures*. Berlin/Heidelberg: Springer.
21. Willcocks, L.P., Lacity, M.C., Craig, A. (2015). *The IT Function and Robotic Process Automation.* The Outsourcing Unit.
22. Willcocks, L., Lacity, M. (2016). Robotic process automation at telefónica O2. *MIS Q. Executive, 15,* 21-35.
23. Willcocks, L., Lacity, M. (2016). *Service Automation: Robots and the Future of Work*. Warwickshire: Steeve Brokes Publishing.
24. Willcocks, L.P., Lacity, M. (2016). A new approach for automating services. *MIT Sloan Manag. Rev., 58*, 40-49.