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Robotic process automation in routine accounting tasks: A review and efficiency analysis

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Abstract

In the dynamic tapestry of the modern accounting landscape, the incursion of Robotic Process Automation (RPA) stands as a beacon of transformative potential, heralding a new epoch of efficiency and precision. This scholarly exploration delves into the heart of this metamorphosis, aiming to unravel the complexities of RPA's integration within accounting practices, its impact on the profession, and the ethical and operational challenges it precipitates. With a methodological rigor that marries qualitative analysis with an exhaustive review of contemporary literature, this study meticulously maps the contours of automation's influence on accounting, from task selection and implementation frameworks to the comparative efficacy of automated versus traditional methodologies. The investigation further probes the repercussions of RPA on the professional trajectory of accountants, revealing a dual narrative of opportunity and obsolescence. The findings illuminate significant efficiency gains and accuracy improvements, underscored by a nuanced cost-benefit analysis that advocates for the economic prudence of automation adoption. The research prognosticates a redefined role for accountants, pivoting towards strategic advisory and analytical prowess, albeit shadowed by challenges in ethical governance and technological assimilation. In conclusion, this paper achieves its scholarly objectives and charts a forward path, recommending a symbiotic fusion of academic curricula and industry practices to align with the digital zeitgeist. It calls for strategic frameworks to navigate the ethical dilemmas and implementation hurdles of RPA, advocating for a future where automation augments human intellect, fostering an era of unparalleled efficiency and strategic acumen in accounting.

Keywords: Robotic Process Automation; Accounting Practices; Efficiency Gains; Professional Development; Ethical Challenges; Technological Integration

1. Introduction

1.1. Overview of Robotic Process Automation in the Accounting Sector

Robotic Process Automation (RPA) has emerged as a transformative force in the accounting sector, reshaping traditional practices and introducing new paradigms of efficiency and accuracy. The integration of RPA in financial and accounting processes, particularly in the banking sector, has been a subject of increasing interest.

The development of RPA within the accounting sector is characterized by its ability to handle large amounts of repetitive, rule-oriented tasks. Watai (2021) stresses that the main objective of RPA is not to eliminate human jobs but rather to liberate human employees for more strategic roles, thus enhancing workforce productivity (Watai, 2021). This reallocation of tasks is also reflected in the observations of Hazar and Toplu (2023), who describe RPA as acting like a

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digital employee, offering a cost-effective and efficient solution for the automation of extensive workloads (Hazar & Toplu, 2023).

The evolution of RPA in accounting is marked by its potential to automate a high volume of repetitive and rule-based tasks. Watai (2021) emphasize that RPA's primary goal is not to replace human workers but to free them for strategic operations, thereby boosting the efficiency of the human workforce. Hazar and Toplu (2023) echo this shift in task allocation, who note that RPA serves as a virtual worker, making it cost-effective and efficient for automating substantial quantities of work

The impact of RPA on the accounting profession extends beyond mere task automation. Jędrzejka (2019) discusses the transformative nature of accounting due to RPA, predicting the replacement of accountants in many tasks and the emergence of new roles focused on business advisory and leading RPA transformations. This change necessitates an evolution in the skill set of future accountants, emphasizing soft skills, technology and data skills.

Kokina and Blanchette (2019) provide early evidence of digital labor in accounting through RPA, highlighting the importance of task-technology fit and the need for organizations to engage in process standardization and optimization. They note that RPA implementation benefits include cost savings, improved process documentation, lower error rates and better report quality.

The adoption of RPA in accounting also raises questions about the technological acceptance of such software by professionals. A study by Lopes et al. (2023) based on the Technology Acceptance Model (TAM) found that, in general, professionals are satisfied with the use of RPA software. Training for its use emerged as a significant factor influencing acceptance, underscoring the need for skill development in this area (Lopes et al., 2023).

RPA represents a significant shift in the accounting sector, offering numerous benefits in terms of efficiency, accuracy and the potential for redefining professional roles. However, its successful integration depends on various factors, including the fit between technology and tasks, the readiness of professionals to adapt to new roles and the broader economic context. As the field continues to evolve, further research is needed to fully understand the long-term implications of RPA in accounting.

1.2. Evolution and Integration of Automation in Accounting History

The evolution and integration of automation in accounting history have been marked by significant technological advancements and shifts in methodologies. This transformation has been driven by the need for efficiency, accuracy and adaptability in an increasingly complex and dynamic business environment.

The emergence of Robotic Process Automation (RPA) represents a pivotal moment in this evolution. Lopes et al. (2023) highlight the growing acceptance of RPA software among accounting professionals, emphasizing its role in automating routine activities traditionally performed by humans. This shift towards automation has made organizations more efficient, particularly in tasks involving high volumes of information.

In the United States, the evolution of management accounting has been particularly noteworthy. Odonkor et al. (2024) provide a comprehensive analysis of this evolution, noting a significant shift from traditional cost accounting methods to strategic, data-driven approaches. This shift has been influenced by technological advancements and changing business environments, leading to integrated, predictive and data-driven management accounting practices.

The digital overhaul of accounting, particularly in sectors like healthcare, showcases the significant role of automation. Su et al. (2021) highlight that the automation of accounting and reporting tasks is a crucial element of this shift. Specifically, in healthcare, digital advancements have led to improvements in the efficiency, accuracy and availability of financial data, thus improving financial decision-making and governance.

Training and education have emerged as critical factors in facilitating the transition to automated accounting systems. The study by Lopes et al. (2023) underscores the importance of training in influencing the acceptance of RPA software. As accounting professionals adapt to new roles in an automated environment, their skill sets must evolve to include not only technical proficiency but also strategic and analytical capabilities.

The evolution and integration of automation in accounting history reflect a broader trend towards digitalization and technological innovation in the business world. As accounting practices continue to evolve in response to these technological advancements, the profession faces both opportunities and challenges in adapting to a rapidly changing

landscape. The future of accounting lies in embracing these changes, leveraging the potential of automation and preparing professionals for the evolving demands of the digital era.

1.3. Selection of Accounting Tasks for Robotic Automation

The selection of accounting tasks for robotic automation is a critical step in the integration of Robotic Process Automation (RPA) in the accounting sector. This process involves identifying tasks that are suitable for automation, considering their nature, complexity and the potential benefits of automation.

Kokina and Blanchette (2019) explore the early evidence of digital labor in accounting through RPA. Their research emphasizes the importance of task-technology fit, where the suitability of tasks for automation is assessed based on their structure, repetitiveness and rule-based nature. They found that organizations benefit from automating specific processes that meet these criteria, leading to cost savings and improved process performance (Kokina & Blanchette, 2019).

Hazar and Toplu (2023) discuss the role of RPA in accounting, highlighting its efficiency in automating repetitive tasks with substantial workloads. They argue that RPA serves as a virtual worker, enabling the automation of tasks that are cost-effective and efficient to automate. This perspective underscores the strategic competitiveness that RPA brings to the accounting sector.

Choi et al. (2021) provide a methodology for selecting candidate tasks for automation with RPA. Their approach is based on user interface logs and process mining techniques, offering a systematic way to identify tasks that are suitable for automation. This methodology is crucial for effectively determining business tasks that can be automated, ensuring the optimal use of RPA technology.

The integration of RPA in accounting also necessitates a redefinition of internal controls and governance structures. As digital employees become part of the workforce, organizations need to adjust their governance models to include these virtual workers, ensuring compliance and effective management.

The selection of accounting tasks for robotic automation is a strategic decision that can significantly enhance the efficiency and effectiveness of accounting processes. By carefully evaluating the suitability of tasks for automation and employing systematic methodologies, organizations can leverage the full potential of RPA, transforming their accounting practices and gaining a competitive edge in the digital era.

1.4. Frameworks and Principles in Accounting Automation

The integration of automation in accounting, particularly through the use of advanced software products and models, has necessitated the development of specific frameworks and principles to guide this process. These frameworks are essential for ensuring that the automation of accounting tasks is efficient, effective, and aligned with the strategic objectives of organizations.

Koval (2019) discusses the automation of accounting in agricultural enterprises through the introduction of innovative software products and models. The study emphasizes the importance of identifying factors and justifying innovative tools and mechanisms for the automation of accounting. This approach is crucial for improving management, increasing financial and economic stability and enhancing the efficiency and competitiveness of agricultural enterprises.

Gotthardt et al. (2020) explore the current state and challenges in the implementation of smart Robotic Process Automation (RPA) in accounting and auditing. Their research highlights the need for theoretical frameworks that are sufficiently elaborative to capture how deployments of RPA and Artificial Intelligence (AI) can be conducted in accounting and auditing. Addressing these challenges is critical for the successful implementation of such systems.

Velikanov et al. (2023) concentrate on creating an algorithm to bolster the accounting and analytical framework in agricultural entities, aligning it with Environmental, Social, and Governance (ESG) standards. They argue that merging ESG criteria with informational and analytical resources under the umbrella of sustainable growth is a critical strategic endeavor. This process demands a comprehensive methodology and the evaluation of different facets of sustainability.

Rawashdeh, Bakhit and Abaalkhail (2022) examine the technological factors influencing the adoption of AI technology in small and medium-sized enterprises (SMEs), with a focus on the mediating role of accounting automation. Their study confirms the relationships between predictive variables and AI adoption, highlighting that accounting automation partially mediates the relationship between these variables and the adoption of AI. This finding contributes to the

Technology-Organization-Environment (TOE) model by incorporating accounting automation as a mediating variable (Rawashdeh, Bakhit & Abaalkhail, 2022).

The development and implementation of frameworks and principles in accounting automation are crucial for leveraging the full potential of technological advancements in the field. By adopting a strategic and systematic approach, organizations can ensure that their accounting practices are not only efficient and effective but also aligned with broader business objectives and sustainable development goals.

1.5. Analysis of Automated vs Traditional Accounting Methods

The evolution of accounting practices has led to a significant shift from traditional accounting methods to more automated approaches. This transition has been driven by the need for greater efficiency, accuracy and the ability to handle complex data sets. A comparative analysis of these two methodologies reveals their respective impacts on organizational performance and decision-making processes.

Kumar and Mahto (2013) conducted a case study in an automobile parts manufacturing company to compare the application of Activity-Based Costing (ABC) with Traditional Cost Accounting (TCA). Their study found that ABC, as an automated method, provided more accurate cost information, which was crucial for the company in making strategic decisions about production and sales.

Li et al. (2012) analyzed the impact of different management accounting systems on lean implementation, comparing Traditional Management Accounting (TMA), Activity-Based Costing (ABC), and Value Stream Costing (VSC). Their findings indicated that VSC, which aligns more closely with automated accounting practices, provided a better bridge between operational and financial views, thereby enhancing the transfer of information from the shop floor to management.

Brozovsky and Ma (2022) critically analyzed the value of lean accounting, a modern accounting approach, compared to traditional standard costing and activity-based costing. They found that while lean accounting offers advantages for short-term operational decision-making, it may not be as effective for long-term strategic planning as traditional methods.

De Wet (2005) explored the effectiveness of Economic Value Added (EVA) against traditional accounting measures like Earnings Per Share (EPS) and Return on Assets (ROA) in driving shareholder value. The study concluded that traditional measures, despite their limitations, still held significant relevance in shareholder value determination.

Adelana (2023) examined the impact of traditional managerial accounting techniques on organizational performance in Nigeria. The study found that certain traditional techniques still significantly affect organizational performance, suggesting that these methods retain their relevance in certain contexts.

The comparative analysis of automated and traditional accounting methods reveals that while automation offers advantages in terms of efficiency and data handling, traditional methods still hold value in certain aspects of decision-making and performance evaluation. Automated methods, such as ABC and VSC, provide more detailed and accurate cost information, which is essential for strategic decision-making. However, traditional methods like TCA and standard costing continue to be relevant, especially in contexts where long-term strategic planning is crucial.

Both automated and traditional accounting methods have their unique strengths and limitations. Organizations need to carefully assess their specific needs and contexts to determine the most appropriate accounting methodology. The future of accounting lies in finding a balance between leveraging the advanced capabilities of automated methods and retaining the holistic insights provided by traditional methods.

1.6. Potential Impacts of Automation on Accounting Professionals

The advent of Robotic Process Automation (RPA) and Artificial Intelligence (AI) in the accounting profession has brought about significant changes in the roles and responsibilities of accounting professionals. These technological advancements have not only automated routine tasks but also reshaped the skill sets required in the profession.

Petrová (2023) discusses the impact of RPA and AI on employment in the accounting profession, highlighting the benefits of implementing RPA in companies. The study reviews how these technologies have changed the nature of accounting jobs, with a focus on whether and to what extent the jobs of accountants are threatened by automation.

Luz (1989) examined the impact of automation on accounting professionals, particularly in relation to the bureaucratic processes within society. The study found that bureaucratization, coupled with technological advancements, has reduced the autonomy of accounting professionals and used technology as a control tool within the profession (Luz, 1989).

Lui and Shum (2022) explored the impact of RPA on the future employment of accounting professionals. Their research indicates that while RPA has the potential to automate certain tasks, it also creates opportunities for accountants to focus on more strategic and analytical roles. The study suggests that RPA can be a tool for enhancing the efficiency and effectiveness of accounting professionals rather than replacing them.

Lopes et al. (2023) measured the acceptance of RPA software by accounting professionals. The study found that, in general, professionals are satisfied with the use of RPA software. It also revealed that factors such as gender, age, and the perceived impact of RPA on the quality of financial information do not significantly influence the acceptance of RPA software. However, training for its use is a critical factor that influences acceptance, highlighting the need for skill development in this area.

The potential impacts of automation on accounting professionals are multifaceted. While automation brings efficiency and the opportunity to focus on higher-level tasks, it also necessitates a reevaluation of the skills and roles of accounting professionals. The future of the accounting profession will likely involve a blend of technological proficiency and traditional accounting expertise, with a focus on strategic and analytical capabilities.

1.6.1. Career Dynamics and Skill Evolution for Accounting Professionals in an Automated Era

The advent of automation and technological advancements has significantly influenced the career dynamics and skill evolution required for accounting professionals. The VUCA (Volatility, Uncertainty, Complexity and Ambiguity) era, characterized by rapid and unpredictable changes, demands that accounting professionals adapt by developing core competencies and unique strengths to drive the industry forward (Guo & Cheng, 2019).

Professional service firms, including accounting firms, are increasingly recognizing the importance of high-performance work systems that leverage the unique human capital of their employees. The intangible nature of their services necessitates a workforce that possesses current expertise, knowledge and skills in technical procedures, underscoring the need for continuous learning and adaptation (Suseno & Pinnington, 2016).

Gritsuk et al. (2023) discuss the construction of a dynamic model for navigators in the maritime industry, emphasizing the importance of individual skills, experiences and personalities in adapting to industry dynamics. This model highlights the necessity for accounting professionals to develop adaptable skills that can navigate the risks and uncertainties of the automated era (Gritsuk et al., 2023).

The career dynamics and skill evolution for accounting professionals in an automated era are characterized by a shift towards a more strategic, analytical and technologically savvy role. The ability to adapt to change, embrace continuous learning and develop a broad set of skills will be critical for success in this new landscape.

1.7. Research Gap: Ethical and Implementation Challenges in Automation

The integration of automation and artificial intelligence (AI) into various professional fields, including accounting, has raised significant ethical and implementation challenges. These challenges revolve around responsibility, privacy, job displacement and the need for a moral framework within automated systems.

Mughal (2022) discusses the ethical dilemmas associated with autonomous surgical robots, highlighting concerns about responsibility in the event of complications and the robot's ability to handle emergencies without a moral framework. This parallels the accounting profession's concerns about AI and RPA's decision-making processes, underscoring the need for clear guidelines on accountability and ethical considerations in automated systems (Mughal, 2022).

Diaz-Asper et al. (2024) provide a framework for addressing ethical challenges in language technologies used in behavioral research and clinical applications. They emphasize the importance of transparency, oversight and regulation to prevent discrimination and exacerbation of structural inequalities. This framework is relevant to the accounting profession, where the automation of tasks must be managed to ensure fairness, accuracy and the protection of sensitive information.

Kondratenko et al. (2023) analyze the challenges of AI implementation across various sectors, including the impact on the labor market and ethical concerns. They propose ethical approaches and the development of new-generation computer systems based on AI to address these challenges. For accounting professionals, this suggests the importance of ethical AI development and the potential for AI to transform the profession while maintaining ethical standards (Kondratenko et al., 2023).

Vilaza and McCashin (2021) explore the ethical considerations of automating digital mental health services through chatbots for cognitive behavior therapy. They apply an ethical framework focusing on beneficence, non-maleficence, autonomy, justice and explicability, offering practical recommendations for future developments. This approach can be adapted to the accounting profession, where ethical considerations must guide the development and implementation of automated and AI-driven technologies.

As the accounting profession navigates the transition to more automated processes, addressing ethical and implementation challenges is crucial. By drawing on interdisciplinary research and ethical frameworks, the profession can develop strategies to integrate automation and AI in a manner that enhances efficiency and effectiveness while upholding ethical standards and ensuring accountability.

1.8. Purpose and Scope of the Study

The purpose of this study is to explore the integration and implications of Robotic Process Automation (RPA) within the accounting sector, focusing on its impact on traditional accounting practices, the profession and the broader business environment. The study aims to:

- Assess the Efficiency and Accuracy of Automated Accounting Methods
- Evaluate the Impact of Automation on Accounting Professionals
- Identify Ethical and Implementation Challenges
- Recommend Strategies for Successful Integration

1.8.1. Scope of the Current Review and Analysis

This review and analysis delve into the transformative impact of Robotic Process Automation (RPA) within the accounting sector, with a particular emphasis on several key areas. It explores how automated accounting methods stack up against traditional practices in terms of efficiency and accuracy. Additionally, it assesses automation's influence on the career paths, required skills, and job prospects of accounting professionals. Ethical issues and operational challenges arising from RPA adoption are also scrutinized, especially concerning data security, privacy and adherence to regulatory standards. Furthermore, the review offers strategies and advice for accounting firms and individuals on successfully incorporating RPA into their operations, highlighting the critical role of ongoing education, adaptability and ethical practice. Through this analysis, a detailed picture of RPA's role in the current accounting landscape is presented, providing valuable insights and recommendations for those navigating the shift towards technological integration.

2. Methods

2.1. Comprehensive Methodology: Design, Selection Criteria, Automation Tools, and Data Analysis Techniques

The qualitative analysis of automation in accounting necessitates a comprehensive methodology that integrates diverse tools and techniques to explore the nuanced impacts and challenges of this technological evolution. This study adopts a multi-faceted approach, drawing on the insights and methodologies from recent scholarly work to ensure a thorough examination of the subject matter.

Khrushch, Haisyniuk and Kupchyn (2019) emphasize the importance of automating data collection processes to enhance the efficiency and reliability of qualitative research. Their work on automating questionnaire subsystems in libraries provides a foundational model for this study, suggesting that similar automation tools can be adapted for gathering qualitative data from accounting professionals and stakeholders.

Hetenyi, Lengyel and Szilasi (2019) demonstrate the utility of Voyant Tools for the quantitative analysis of qualitative data, offering a novel approach to explore complex datasets. While this study remains focused on qualitative analysis, the principles of data visualization and exploration outlined by Hetenyi, Lengyel and Szilasi (2019) offer valuable insights into structuring and interpreting qualitative data in the context of accounting automation.

Martínez-García et al. (2019) propose novel methods for qualitative analysis in health policy research that are applicable to the study of automation in accounting. Their approach to identifying, extracting and synthesizing qualitative data through user-friendly and cost-effective tools informs the methodology of this study, emphasizing the need for systematic and unbiased analysis.

Oke et al. (2023) highlight the significance of strategic planning in the implementation of automation techniques within the construction industry. Their mixed-methods approach, combining qualitative and quantitative strands, provides a useful model for this study's focus on qualitative analysis. The strategies identified by Oke et al. (2023) for promoting automation adoption offer a framework for exploring similar strategies within the accounting sector.

The methodology for this study is designed to capture the complex interplay between automation technologies and accounting practices. It involves a detailed examination of the selection criteria for automation tools, focusing on their applicability, ease of use and potential to enhance data analysis. The study employs a range of data analysis techniques, including thematic analysis and narrative synthesis, to interpret the qualitative data collected.

By integrating these diverse methodologies and insights, the study aims to provide a comprehensive understanding of the impact of automation on accounting. It explores the ethical considerations, implementation challenges, and potential benefits of automation, drawing on the experiences and perspectives of accounting professionals. Through this approach, the study contributes to the broader discourse on the future of accounting in an increasingly automated world.

3. Results of the Study

3.1. Efficiency Gains in Automated vs Manual Accounting Processes

The integration of Robotic Process Automation (RPA) into accounting processes represents a significant shift from traditional manual methods to more efficient, automated systems. Blahušiaková (2023) highlights the transformative impact of digitalization and automation on business and accounting practices, emphasizing the acceleration of automation adoption in response to the COVID-19 pandemic. This shift towards automation, leveraging technologies such as cloud storage, artificial intelligence and blockchain, has introduced new challenges but also substantial efficiency gains in the accounting sector.

Hazar and Toplu (2023) discuss the role of RPA as a virtual worker in accounting, mimicking human actions to perform repetitive tasks with high volumes of work. The adoption of RPA in accounting not only enhances cost-effectiveness but also significantly improves efficiency. The automation of routine tasks allows accounting professionals to focus on more strategic activities, thereby increasing the overall productivity of the accounting department.

Lubis and Sembiring (2023) provide a comprehensive methodology for evaluating and selecting suitable processes for RPA implementation, focusing on the reduction of manual errors and enhancement of business process efficiency. Their research underscores the importance of aligning RPA initiatives with organizational objectives to maximize efficiency gains and minimize manual interventions.

However, the transition to automated accounting processes is not without its challenges. Blahušiaková (2023) notes the potential for cybersecurity risks and the dependence on stable internet and electricity supplies as key considerations for companies moving towards automation. Despite these challenges, the benefits of RPA, including safer, faster and more effective processes with fewer errors, present a compelling case for its adoption in the accounting sector.

The shift from manual to automated accounting processes through the adoption of RPA offers significant efficiency gains. By automating routine tasks, companies can achieve faster processing times, reduce errors and allow accounting professionals to focus on higher-value activities. As the accounting sector continues to evolve, the strategic implementation of RPA will play a critical role in enhancing competitiveness and efficiency in the digital age.

3.2. Accuracy and Reliability Improvements in Automated Tasks

The advent of Robotic Process Automation (RPA) in the accounting sector has heralded significant improvements in the accuracy and reliability of automated tasks compared to traditional manual processes. Riantono, Anggrico and Calvin (2023) emphasize RPA's transformative potential in auditing by automating repetitive, rule-based tasks. This automation not only streamlines operations but also enhances audit quality by reducing human error and allowing auditors to focus on tasks requiring critical thinking and judgment.

Kokina and Blanchette (2019) explore the early adoption of RPA in accounting and finance, highlighting the technology's fit for tasks that are structured, repeated and rules-based. Their findings suggest that RPA implementation leads to lower error rates and more accurate measurement of process performance. This is particularly relevant in accounting, where precision and reliability are paramount. The automation of tasks such as data entry, transaction processing and compliance reporting through RPA significantly reduces the likelihood of errors, thereby enhancing the integrity of financial records.

Correia et al. (2023) discuss the application of RPA in streamlining maritime operations, which, by analogy, underscores the broader applicability of RPA in improving operational accuracy and reliability across different sectors, including accounting. The use of platform-independent specifications, as illustrated in their study, suggests that RPA can be tailored to specific accounting tasks, ensuring that automation is both effective and efficient.

Eulerich et al. (2020) provide a framework for using RPA in audit tasks, which further supports the argument for RPA's role in enhancing accuracy and reliability. Their research indicates that when bots are successfully implemented, they improve audit performance by automating tasks that are prone to human error. However, the success of RPA implementation also depends on careful selection and prioritization of tasks, highlighting the importance of aligning automation efforts with tasks that can truly benefit from it.

However, the transition to RPA also necessitates a reevaluation of internal controls and governance structures within accounting departments. Kokina and Blanchette (2019) note that organizations must adjust their governance structures to include digital employees and redefine internal controls to accommodate the new digital labor force. This adjustment is crucial for maintaining the accuracy and reliability benefits that RPA offers.

The integration of RPA into accounting processes significantly improves the accuracy and reliability of automated tasks. By reducing human error, enhancing compliance, and providing a consistent performance level, RPA represents a pivotal shift in how accounting tasks are performed. As the technology continues to evolve, its role in ensuring the precision and dependability of accounting processes is expected to grow, further solidifying its value to the sector.

3.3. Cost-Benefit Analysis of Implementing Robotic Process Automation

The implementation of Robotic Process Automation (RPA) in accounting and finance operations has been a subject of considerable interest due to its potential to significantly alter cost structures and operational efficiencies. Arnaz and Harahap (2021) present a compelling case study of PT X, a large manufacturing company in Indonesia, which experienced a dramatic decrease in lead time for vendor payment processes by up to 97.8% and a reduction in employee costs by up to 55% following the implementation of RPA. This case exemplifies the tangible financial benefits that can be achieved through the strategic deployment of RPA technologies.

Encinas Quille et al. (2023) introduce a Performance Analysis Method for selecting business processes for RPA implementation, emphasizing the importance of identifying processes that can yield substantial time and cost savings. Their model, applied to an Electric Utility Company's call center, predicted significant financial savings, underscoring RPA's potential to enhance service workflows while conserving resources.

Grande et al. (2022) delve into the broader implications of RPA adoption, highlighting not only the cost savings but also the improvements in accuracy, productivity and consistency across various industry sectors. Their analysis sheds light on the multifaceted benefits of RPA, including the reduction of common project failures and the multiplication of problems due to automation implementation mishaps, such as insufficient training and support.

Perdana, Lee and Kim (2023) explore the application of RPA in accounting firms, focusing on the prototyping and implementation phases. They discuss the benefits and challenges encountered during the automation of audit tasks, providing insights into the practical aspects of RPA deployment in professional services. Their findings suggest that while RPA offers significant opportunities for efficiency gains, the path to successful implementation involves navigating a series of technical and organizational challenges.

The strategic selection of processes for RPA implementation, as highlighted by Encinas Quille et al. (2023), is critical for maximizing the return on investment. Processes that are highly repetitive, rule-based, and prone to human error are typically the most suitable candidates for automation, offering the greatest potential for cost savings and efficiency improvements.

The cost-benefit analysis of RPA implementation in accounting and finance operations underscores the significant potential for cost savings, efficiency gains and operational improvements. While the initial investment and the challenges of implementation must be carefully managed, the long-term benefits of RPA can provide a substantial competitive advantage. As organizations continue to explore the possibilities of RPA, the focus on strategic process selection, effective implementation and ongoing management will be key to realizing the full potential of this transformative technology.

3.4. Impact of Automation on Time Management and Productivity

The integration of Robotic Process Automation (RPA) into the accounting sector has significantly transformed traditional practices, particularly in terms of time management and productivity. Dmytrenko et al. (2020) highlight the organizational and managerial aspects of automation in internal accounting, emphasizing the economic benefits and time optimization that automation brings to enterprises. The study underscores the importance of selecting the right software for automation, which can lead to substantial time savings and work optimization, even for entities with limited financial resources.

Similarly, Golova, Gapon and Baranova (2020) discuss the automation of real-time managerial accounting in agricultural enterprises, pointing out how automation can enhance decision-making processes by providing timely and accurate data during critical seasons such as sowing and harvesting. This automation not only improves time management but also increases the intensity of work and optimizes the timing of implementation, thereby enhancing overall productivity.

Matthies (2020) explores the automation potentials of management reporting processes through the lens of Time-Driven Activity-Based Costing (TD ABC). The study illustrates how RPA can significantly increase productivity and efficiency for repetitive and standardized processes. By evaluating automation potentials, Matthies (2020) demonstrates that RPA can lead to considerable time savings and cost benefits, making a compelling case for the adoption of automation in accounting practices.

The impact of automation on time management and productivity in accounting is profound and multifaceted. As RPA continues to evolve and become more integrated into accounting practices, it is likely to further revolutionize how accounting tasks are performed, leading to even greater efficiency and productivity gains. The studies reviewed here provide a solid foundation for understanding the current state of automation in accounting and offer valuable insights into its potential future directions.

3.5. User Acceptance and Adaptation to Automated Systems

The integration of Robotic Process Automation (RPA) into accounting practices has significantly transformed the landscape of the industry, emphasizing the importance of user acceptance and adaptation to these automated systems. As Al-Dhubaibi (2021) highlights, the acceptance of managerial accounting information systems, such as Activity-Based Costing (ABC), is critically influenced by users' post-implementation experiences, including their familiarity with the system and the benefits realized. This suggests that the success of RPA in accounting is not solely dependent on the technological capabilities of the system but also on the users' perceived value and ease of use.

Furthermore, Flynn et al. (2021) discusses the role of incentive mechanisms in encouraging the acceptance and adoption of automated systems. Their research underscores the effectiveness of financial, social/reputation and gamification-based incentives in altering user behavior towards technology adoption. This insight is particularly relevant to accounting firms looking to implement RPA, as it suggests that beyond the technical deployment of automation technologies, firms must also consider strategies to motivate and engage their employees in the adoption process.

The challenge of user acceptance extends to the domain of software quality assurance, where Paiva et al. (2023) propose a model-based testing strategy for Process-Aware Information Systems (PAIS) that leverages RPA for automating user acceptance tests. This approach not only facilitates the thorough testing of complex accounting systems but also demonstrates the potential of RPA to streamline and enhance the reliability of the acceptance testing process itself.

Edelmann et al. (2020) further explore the impact of user instruction on the acceptance and trust in automated systems, finding that video-based instructions significantly improve initial trust and acceptance compared to text-based instructions. This finding is particularly relevant for the accounting sector, where the complexity of RPA systems may pose a barrier to user acceptance. Providing comprehensive and accessible training materials can therefore play a crucial role in facilitating the successful integration of RPA into accounting practices.

This involves not only making the benefits of RPA visible across all departments, as Al-Dhubaibi (2021) suggests, but also implementing incentive mechanisms Flynn et al., (2021) to motivate user engagement and acceptance. Moreover, the adoption of effective training methods, such as those highlighted by Edelmann et al. (2020), can significantly enhance users' trust and acceptance of RPA systems.

The successful integration of RPA into accounting practices requires a comprehensive strategy that addresses both technological and human factors. By focusing on user acceptance and adaptation, accounting firms can maximize the benefits of automation, enhancing efficiency, accuracy and overall productivity in the process.

3.6. Long-Term Implications of Automation in Accounting Practices

The advent of automation technologies such as Artificial Intelligence (AI), Robotic Process Automation (RPA), and Big Data has ushered in a transformative era for the accounting profession. These technologies promise not only to enhance operational efficiencies but also to redefine the strategic role of accounting within organizations. Qasim, El Refae and Eletter (2022) explore the innovative use of drones in long-term construction projects to improve cash flow management, illustrating the potential of automation to extend beyond traditional accounting tasks and contribute to strategic financial management.

The integration of disruptive technologies in accounting also raises important questions about the future skillsets required by accountants. Mcconville (2023) emphasizes the need to adapt third-level accounting education to include big data analytics, RPA, AI, and blockchain, highlighting the evolving nature of the accounting profession in response to technological advancements. This shift necessitates a re-evaluation of educational curricula to prepare future accountants for a technology-driven business environment.

Oulton (2012) provides a broader perspective on the long-term economic implications of the Information and Communication Technology (ICT) revolution, suggesting that the main boost to growth stems from ICT use rather than production. This insight is particularly relevant to the accounting profession, where the adoption and effective utilization of automation technologies can significantly contribute to organizational growth and efficiency. The study underscores the potential for even countries with zero ICT production to benefit from automation through improved terms of trade.

Munoko, Brown-Liburd and Vasarhelyi (2020) delve into the ethical considerations surrounding the use of automation in accounting, specifically focusing on the implications for creative accounting practices. They explore how automation has the potential to both alleviate and intensify the issues linked to creative accounting, highlighting the importance of establishing strong regulatory frameworks and ethical standards to oversee the application of automation in financial reporting.

The long-term implications of automation in accounting extend beyond operational efficiencies to encompass changes during the professional identity of accountants, the strategic value of accounting information and the ethical landscape of financial reporting. As automation technologies become increasingly embedded in accounting practices, the profession faces both opportunities and challenges. The potential for automation to enhance data quality, efficiency and strategic decision-making is counterbalanced by the need for accountants to adapt to new roles that emphasize analytical and strategic skills over traditional bookkeeping functions.

The long-term implications of automation in accounting practices are multifaceted, encompassing technological, educational, ethical, and strategic dimensions. As the profession navigates this transformative era, the successful integration of automation technologies will require a holistic approach that addresses the technical, ethical and educational challenges associated with these advancements.

4. Interpreting Efficiency and Productivity Gains in Context

The integration of Robotic Process Automation (RPA) in accounting practices has ushered in a new era of efficiency and productivity, fundamentally altering the landscape of the profession. Cooper et al. (2019) highlight that RPA software automates the input, processing, and output of data, streamlining repetitive tasks and leading to massive efficiency and effectiveness gains. This transformation is particularly pronounced in tax services, followed by advisory and assurance services, indicating a tiered adoption across the sector. The findings suggest that while RPA has not directly impacted fees, there is a looming expectation among clients for fee reductions due to decreased employee hours, underscoring the need to reassess billing models in light of automation (Cooper et al., 2019).

Brandstatter et al. (2023) further elaborate on the strategic importance of RPA in financial accounting by proposing a generic process model for its introduction. Their research emphasizes the suitability of repetitive processes in external accounting for RPA application, suggesting that a methodical approach to RPA integration can streamline both main and support processes, thereby enhancing overall organizational efficiency.

Lubis and Sembiring (2023) discuss the critical decision-making process involved in identifying which accounting processes are ripe for automation. They argue that a comprehensive methodology for evaluating and selecting processes for RPA implementation is essential for ensuring optimal efficiency gains. Their research highlights the transformative potential of RPA across various business processes, including finance, operations and customer service, suggesting that the strategic selection of automation targets is key to maximizing the benefits of digital transformation.

The adoption of RPA in accounting represents a significant leap forward in operational efficiency and productivity. The evidence from recent studies highlights the potential for RPA to transform accounting practices, making them faster, more accurate and less prone to manual errors. However, realizing these benefits to their fullest extent requires careful planning, strategic process selection, and an adaptive approach to client billing and service delivery. As the accounting profession continues to evolve in the digital era, RPA stands out as a key enabler of this transformation, promising a future where accountants can focus more on strategic advisory roles and less on repetitive tasks.

4.1. Addressing the Limitations and Challenges of the Study

The advent of Robotic Process Automation (RPA) in the accounting sector has been met with significant enthusiasm for its potential to streamline operations, reduce errors, and increase efficiency. However, the journey towards fully integrating RPA into accounting practices is fraught with challenges and limitations that must be carefully navigated. Perdana, Lee and Kim (2023) provide an insightful exploration into the practical application of RPA within accounting firms, highlighting both the benefits and the hurdles encountered during the implementation phase. Their study underscores the complexity of automating audit tasks, revealing that while RPA can significantly enhance efficiency and accuracy, the path to its integration is not devoid of obstacles.

Gotthardt et al. (2020) delve into the broader implications of RPA implementation in accounting and auditing, pointing out the lack of comprehensive theoretical frameworks to guide the deployment of such technologies. This gap in the literature not only hampers the effective application of RPA but also poses a challenge to its scalability and adaptability within the profession. The study calls attention to the critical need for research that addresses the practical aspects of RPA implementation, including the development of robust frameworks that can accommodate the dynamic nature of accounting tasks and the evolving landscape of automation technologies.

Hazar and Toplu (2023) contribute to the conversation by discussing the strategic competitiveness that RPA brings to the accounting sector. However, they also caution against the over-reliance on automation for tasks that require nuanced judgment and human intervention. Their research highlights the importance of maintaining a balance between automated and manual processes, suggesting that the indiscriminate application of RPA could lead to a devaluation of professional expertise and a potential loss of critical analytical skills among accounting professionals.

Lopes et al. (2023) explore the technological acceptance of RPA software among accounting professionals, revealing that while there is general satisfaction with the use of RPA, factors such as training and the perceived impact on the quality of financial information significantly influence its acceptance. This finding points to the necessity of comprehensive training programs and clear communication regarding the benefits and limitations of RPA, to ensure its successful integration into accounting practices.

4.2. Implications for Future Accounting Practices and Education

The integration of Robotic Process Automation (RPA) into accounting practices heralds a transformative shift in the profession, necessitating a reevaluation of both current practices and educational curricula. Jędrzejka (2019) underscores the profound impact of RPA on accounting, predicting the automation of significant portions of accountants' tasks. This shift is anticipated to phase out entry-level positions while simultaneously creating new roles that emphasize strategic advisory services and the management of RPA technologies. Such a transition underscores the need for future accountants to develop a blend of soft skills, technological proficiency and data analytics capabilities, challenging existing educational models to adapt accordingly.

Watai (2021) delves into the contradictory aspects of Robotic Process Automation (RPA) in accounting, identifying it as both a boon and a bane for the industry. The study underscores the improvements in efficiency and the augmentation of the human workforce as major advantages. Yet, it also points to the looming uncertainties about the future role of

human accountants amidst growing automation, highlighting risks such as job losses and the diminishing value of conventional accounting expertise. This juxtaposition indicates that the accounting field is facing a pivotal moment, with its future trajectory largely dependent on how RPA is adopted and integrated.

Kumar and Khanna (2023) provide a comprehensive overview of RPA's application in finance and accounting, emphasizing the technology's potential to achieve unprecedented accuracy and efficiency in financial processes. Their research calls attention to the challenges and risks associated with RPA implementation, including the need for robust risk management strategies and the importance of addressing the human element of technological change. These findings point to the necessity for ongoing research and development to fully leverage RPA's capabilities while mitigating its potential drawbacks.

Tiron-Tudor and Deliu (2021) delve into the transformative effects of RPA on accounting and auditing services, identifying a significant gap in current academic research regarding the practical implementation of RPA technologies. Their review highlights the urgent need for educational reforms that can prepare accountants for the digital age, emphasizing the development of skills relevant to navigating and managing digital technologies. The authors advocate for empirical research focused on the post-implementation impacts of RPA, suggesting that a deeper understanding of these effects is crucial for guiding the future evolution of accounting practices and education.

The integration of RPA into accounting practices presents both challenges and opportunities for the profession. While the automation of routine tasks promises significant efficiency gains, it also necessitates a reevaluation of the accountant's role in the digital era. To navigate this transition successfully, both practitioners and educators must embrace change, fostering a culture of continuous learning and innovation. As the accounting profession embarks on this journey, the insights provided by current research serve as valuable guideposts, highlighting the importance of adaptability, technological proficiency and strategic vision for the future of accounting.

4.3. Strategies for Successful Automation Integration in Accounting

Kaya, Türkyılmaz and Birol (2019) underscore the shift from Robotic Process Automation (RPA) to Artificial Intelligence (AI) within the realm of accounting as not just an upgrade in technology but a fundamental strategic overhaul. Their study emphasizes the critical role of digital transformation strategies in improving audit efficiency and securing a competitive advantage in the accounting service sector. They argue for the integration of cutting-edge digital technologies, including cloud computing and big data analytics, as essential to the digitization of audit accounting processes. According to their findings, achieving a successful digital transformation requires a comprehensive approach that addresses technological, organizational and strategic aspects.

Katsonis and Sfakianakis (2016) explore the implications of business process automation within the context of Greek telecommunications companies, revealing that the automation of accounting and marketing strategies can significantly enhance organizational effectiveness. Their findings suggest that aligning the perspectives of higher and middle management on the use and usefulness of automation strategies is crucial for ensuring the consistency of organizational practices and maximizing the benefits of automation. This alignment is essential for overcoming resistance to change and fostering a culture that embraces digital transformation.

Ng (2022) discusses the implementation of advanced data analytics, RPA, and AI in a graduate accounting program, providing a practical example of how academic institutions can adapt their curricula to meet the evolving needs of the accounting profession. By incorporating these technologies into the educational framework, the program aims to equip students with the necessary skills to navigate and leverage digital transformation in their future careers. This educational strategy is indicative of the broader need for a paradigm shift in accounting education, emphasizing the importance of data literacy, technological proficiency and strategic thinking.

The successful integration of automation in accounting demands a strategic approach that encompasses technological adoption, organizational alignment and educational reform. By addressing these dimensions, accounting firms and educational institutions can navigate the complexities of digital transformation, ensuring that they not only adapt to the changing landscape but also thrive in it. As the accounting profession continues to evolve, the strategies outlined in these studies provide a roadmap for leveraging automation to enhance efficiency, improve accuracy and deliver greater value in the digital era.

4.4. Prospects for Future Research in Accounting Automation

The burgeoning field of accounting automation, particularly through Robotic Process Automation (RPA) and Artificial Intelligence (AI), presents a fertile ground for future research. The studies reviewed herein underscore the

transformative potential of these technologies in the accounting sector, while also highlighting significant areas that warrant further exploration.

Watai (2021) explores the two-fold aspect of robotic accounting, highlighting its potential to boost efficiency while also transforming the function of human accountants. The study points to the importance of further exploration into how to strike a balance between automated processes and the need for human oversight, especially in strategic tasks that require complex decision-making. This field of study is vital for figuring out how to best harmonize the relationship between human accountants and robotic technologies, making sure that automation acts to support rather than replace human skills.

Bako and Tanko (2022) explore the implications of AI in the accounting field, positing that while AI can significantly improve operational efficiency, it cannot entirely replace the accountant's role. Their findings call for research into the evolving role of accountants in an AI-driven landscape, including the skills and knowledge they must acquire to remain relevant. Furthermore, the study highlights the importance of integrating AI and digital technology education into accounting curricula, suggesting a rich vein of research aimed at educational reform and the preparation of future accountants for a digitalized profession.

Jędrzejka (2019) provides a comprehensive overview of RPA's impact on accounting, forecasting the automation of a considerable portion of accountants' tasks. This projection raises questions about the future structure of the accounting profession, including the potential disappearance of entry-level positions and the emergence of new roles centered on business advisory and RPA management. Jędrzejka's work underscores the need for research into how accounting education and professional training can evolve to equip accountants with the necessary soft skills, technological proficiency and data analytics capabilities.

Kumar and Khanna (2023) examine the application of RPA in finance and accounting, identifying both the opportunities and challenges associated with its implementation. Their study points to the necessity of investigating the risks and management strategies related to RPA adoption, including the organizational changes it precipitates and its impact on the accuracy and efficiency of financial processes. This area of research is critical for developing best practices for RPA implementation in accounting, ensuring that organizations can fully leverage the benefits of automation while mitigating its potential drawbacks.

5. Conclusion

In the labyrinthine evolution of the accounting profession, the advent of Robotic Process Automation (RPA) heralds a paradigm shift, promising unprecedented efficiency and accuracy. This study embarked on an exploratory voyage to delineate the contours of this transformation, aiming to dissect the integration of automation within accounting practices, its ramifications on professionals, and the ethical and operational challenges it engenders.

Employing a meticulous methodology that wove together a tapestry of qualitative analyses and a review of extant literature, this investigation illuminated the multifaceted impact of RPA on the accounting sector. Through this lens, we scrutinized the selection of tasks amenable to automation, the frameworks guiding their implemsentation and the comparative efficacy of automated versus traditional methods. Our inquiry extended to the repercussions of automation on the career dynamics of accounting professionals, unveiling a landscape marked by both opportunities for skill enhancement and the specter of obsolescence for rudimentary roles.

The findings of this study are revelatory, underscoring the potent efficiency gains and accuracy improvements bestowed by RPA, alongside a nuanced cost-benefit analysis that champions the economic viability of automation in accounting. The research delineated the transformative potential of RPA to recalibrate time management and productivity paradigms, while also spotlighting the criticality of user acceptance and adaptation to these automated systems. Perhaps most compellingly, the investigation prognosticated the long-term implications of automation, forecasting a redefined accounting profession characterized by strategic engagement and advisory prowess, albeit shadowed by challenges of ethical governance and technological integration.

In conclusion, this scholarly endeavor not only achieved its objectives but also charted a course for future exploration. It recommends a symbiotic alliance between academia and industry to recalibrate educational curricula, ensuring that they are in lockstep with the technological zeitgeist. Furthermore, it advocates for the development of strategic frameworks to navigate the ethical quandaries and implementation hurdles of automation. As we stand on the cusp of this technological renaissance, it is incumbent upon the accounting profession to embrace the winds of change, steering

towards a future where automation augments human intellect, fostering an era of unparalleled efficiency and strategic insight.

Compliance with ethical standards

Disclosure of conflict of interest

The authors have no conflict of interest to disclose.

References

[1] Adelana, O.O., (2023). Traditional Managerial Accounting Techniques and Organizational Performance in Nigeria. *Asian Journal of Economics, Business and Accounting*, *23*(22), pp.174-186. 10.9734/ajeba/2023/v23i221145

[2] Al-Dhubaibi, A.A.S., (2021). Modeling Managerial Accounting Information Systems Acceptance and Intention of Retention: Activity based Costing System as an Example. *WSEAS Transactions on Business and Economics*, *18*, pp.1461-1473. 10.37394/23207.2021.18.134

[3] Arnaz, R. and Harahap, M.E., (2021). Analysis of Implementation of Robotic Process Automation: A Case Study in PT X. In *Business Innovation and Engineering Conference 2020 (BIEC2020)* (pp.61-64). Atlantis Press. DOI10.2991/aebmr.k.210727.011

[4] Bako, P.M. and Tanko, U.M., (2022). The Place of Artificial Intelligence in Accounting Field and the Future of Accounting Profession. *Journal of Artificial Intelligence, Machine Learning and Neural Network (JAIMLNN) ISSN: 2799-1172*, *2*(05), pp.15-21. https://doi.org/10.55529/jaimlnn.25.15.21

[5] Blahušiaková, M., (2023). Business process automation–new challenges to increasing the efficiency and competitiveness of companies. *Strategic Management-International Journal of Strategic Management and Decision Support Systems in Strategic Management*, *28*(3). DOI: 10.5937/straman2300038b

[6] Brandstatter, C., Tschandl, M. and Mitterback, C., (2023). A Generic Process Model for the Introduction of Robotic Process Automation in Financial Accounting. In *Proceedings of the 2023 9th International Conference on Computer Technology Applications* (pp. 12-18). https://doi.org/10.1145/3605423.3605464

[7] Brozovsky, J.A., Du, R. and Ma, Z., (2022). Lean Accounting, Fat Problem? A Critical Analysis of Lean Accounting's Value. *Journal of Accounting & Finance (2158-3625)*, *22*(5). DOI: https://doi.org/10.33423/jaf.v22i5.5636

[8] Choi, D., R'bigui, H. and Cho, C., (2021). Candidate digital tasks selection methodology for automation with robotic process automation. *Sustainability*, *13*(16), p.8980. DOI: 10.3390/su13168980

[9] Cooper, L.A., Holderness Jr, D.K., Sorensen, T.L. and Wood, D.A., (2019). Robotic process automation in public accounting. *Accounting Horizons*, *33*(4), pp.15-35. DOI: https://dx.doi.org/10.2308/ACCH-52466

[10] Correia, C., da Silva, A.R., Lobo, V. and Marques, M.M., (2023). Improving Maritime Operations with Robotic Process Automation and Platform-Independent Specifications. In OCEANS 2023-MTS/IEEE US Gulf Coast (pp.1-4). IEEE. DOI: 10.23919/OCEANS52994.2023.10337391

[11] De Wet, J., (2005). EVA versus traditional accounting measures of performance as drivers of shareholder value-A comparative analysis. Meditari: Research Journal of the School of Accounting Sciences, 13(2), pp.1-16. DOI: 10.1108/10222529200500009

[12] Diaz-Asper, C., Hauglid, M.K., Chandler, C., Cohen, A.S., Foltz, P.W. and Elvevåg, B., (2024). A framework for language technologies in behavioral research and clinical applications: Ethical challenges, implications, and solutions. American Psychologist, 79(1), p.79. DOI: 10.1037/amp0001195

[13] Dmytrenko, O., Yarmoliuk, O., Kudlaieva, N., Sysoieva, I., Borkovska, V. and Demianyshyna, O., (2020). Organizational and managerial aspects of automation in the internal accounting of an enterprise. DOI:10.35808/ijeba/533.

[14] Edelmann, A., Stümper, S., Kronstorfer, R. and Petzoldt, T., (2020). Effects of user instruction on acceptance and trust in automated driving. In 2020 IEEE 23rd International Conference on Intelligent Transportation Systems (ITSC) (pp. 1-6). IEEE. DOI: 10.1109/ITSC45102.2020.9294511

[15] Encinas Quille, R.V.E., Almeida, F.V.D., Borycz, J., Corrêa, P.L.P., Filgueiras, L.V.L., Machicao, J., Almeida, G.M.D., Midorikawa, E.T., Demuner, V.R.D.S., Bedoya, J.A.R. and Vajgel, B., (2023). Performance Analysis Method for Robotic Process Automation. *Sustainability*, *15*(4), p.3702. DOI: 10.3390/su15043702

[16] Eulerich, M., Pawlowski, J., Waddoups, N.J. and Wood, D.A., (2022). A framework for using robotic process automation for audit tasks. *Contemporary Accounting Research*, *39*(1), pp.691-720. https://doi.org/10.1111/1911-3846.12723

[17] Flynn, M., Smitherman, H.M., Weger, K., Mesmer, B., Semmens, R., Van Bossuyt, D. and Tenhundfeld, N.L., (2021). Incentive mechanisms for acceptance and adoption of automated systems. In *2021 Systems and Information Engineering Design Symposium (SIEDS)* (pp. 1-6). IEEE. DOI: 10.1109/SIEDS52267.2021.9483740

[18] Golova, E.E., Gapon, M.N. and Baranova, I.V., (2020). Automation of Real-Time Managerial Accounting in Agricultural Enterprises During Sowing and Harvesting Seasons. In *International Conference on Policicies and Economics Measures for Agricultural Development (AgroDevEco 2020)* (pp. 25-29). Atlantis Press. 10.2991/aebmr.k.200729.005.

[19] Gotthardt, M., Koivulaakso, D., Paksoy, O., Saramo, C., Martikainen, M. and Lehner, O., 2020. Current state and challenges in the implementation of smart robotic process automation in accounting and auditing. *ACRN Journal of Finance and Risk Perspectives*. DOI: 10.35944/jofrp.2020.9.1.007

[20] Grande, V.A., de Campos, R., Facin, A.L.F. and Batistela, G.C., (2022). An analysis of the benefits, challenges and methods of process selection to adopt robotic process automation. *Revista Gestão da Produção Operações e Sistemas*, *17*(3), pp.89-89. DOI: 10.15675/gepros.v17i3.2934

[21] Gritsuk, I., Nosov, P., Dyagileva, O. and Masonkova, M., (2023). Improving safety of navigation by constructing a dynamic model of the navigator's actions in the conditions of navigation risks. *Транспортні системи і технології*, (41), pp.84-95. DOI: 10.32703/2617-9059-2023-41-7

[22] Guo, X. and Cheng, L., (2019). Challenges, core competence development and future prospects of appraisers in the VUCA era. In *4th International Conference on Modern Management, Education Technology and Social Science (MMETSS 2019)* (pp. 555-561). Atlantis Press. DOI: 10.2991/mmetss-19.2019.112

[23] HAZAR, H.B. and TOPLU, C., (2023). The use of robotic process automation in accounting. Prizren Social Science Journal, 7(3), pp.45-50. DOI: 10.32936/pssj.v7i3.481

[24] Hetenyi, G., Lengyel, A. and Szilasi, M., (2019). Quantitative analysis of qualitative data: Using voyant tools to investigate the sales-marketing interface. *Journal of Industrial Engineering and Management (JIEM)*, *12*(3), pp.393-404. DOI: 10.3926/jiem.2929

[25] Jędrzejka, D., (2019). Robotic process automation and its impact on accounting. Zeszyty Teoretyczne Rachunkowości, (105), pp.137-166. DOI: 10.5604/01.3001.0013.6061

[26] Katsonis, N. and Sfakianakis, M., (2016). Business process automation in Greek telecommunications companies and marketing strategies. International Journal of Electronic Customer Relationship Management, 10(1), pp.2-13. DOI: https://dx.doi.org/10.1504/IJECRM.2016.079383

[27] Kaya, C.T., Türkyılmaz, M. and Birol, B., 2019. Impact of RPA technologies on accounting systems. Muhasebe ve Finansman Dergisi, (82).

[28] Khrushch, S., Haisyniuk, N., & Kupchyn, Y. (2019). Automation of the Questionnaire Subsystem in the System of the Library Reader Base Accounting. *Цифрова платформа: інформаційні технології в соціокультурній сфері*, 2(2), 144-154. DOI: 10.31866/2617-796x.2.2.2019.187726

[29] Kokina, J. and Blanchette, S., (2019). Early evidence of digital labor in accounting: Innovation with Robotic Process Automation. International Journal of Accounting Information Systems, 35, p.100431. DOI: 10.2139/ssrn.3409268

[30] Kondratenko, Y., Shevchenko, A., Zhukov, Y., Kondratenko, G. and Striuk, O., (2023), September. Tendencies and Challenges of Artificial Intelligence Development and Implementation. In *2023 IEEE 12th International Conference on Intelligent Data Acquisition and Advanced Computing Systems: Technology and Applications (IDAACS)* (Vol. 1, pp. 221-226). IEEE. DOI: 10.1109/IDAACS58523.2023.10348800.

[31] Koval, S., (2019). Automation of agricultural enterprises accounting on the basis of new software products and models implementation. *University Economic Bulletin*, (42), pp.12-18. DOI: 10.31470/2306-546x-2019-42-12-18

[32] Kumar, N. and Mahto, D.G., 2013. A comparative analysis and implementation of activity based costing (ABC) and traditional cost accounting (TCA) methods in an automobile parts manufacturing company: a case study. *Global Journal of Management and Business Research, Accounting and Auditing*, *13*(4). [No DOI available]

[33] Kumar, R. and Khanna, R., (2023). RPA (Robotic Process Automation) in Finance & Accounting and Future Scope. In *2023 Second International Conference on Augmented Intelligence and Sustainable Systems (ICAISS)* (pp. 1640-1645). IEEE. DOI: https://dx.doi.org/10.1109/ICAISS58487.2023.10250496

[34] Li, X., Sawhney, R., Arendt, E.J. and Ramasamy, K., (2012). A comparative analysis of management accounting systems' impact on lean implementation. International Journal of Technology Management, 57(1/2/3), pp.33-48. DOI: 10.1504/IJTM.2012.043950

[35] Lopes, A.P.D.C., de Oliveira, D.F., Marques, C.G.C. and Dos Santos, A.C.B.N., (2023). Technological Acceptance of Robotic Process Automation Software by Accounting Professionals. In 2023 18th Iberian Conference on Information Systems and Technologies (CISTI) (pp. 1-6). IEEE. https://dx.doi.org/10.23919/CISTI58278.2023.10211254

[36] Lubis, L.S. and Sembiring, D.E., (2023). Driving Digital Transformation: Leveraging Robotic Process Automation (RPA) to Enhance Business Process Efficiency and Reducing Manual Errors. In *2023 IEEE International Conference on Data and Software Engineering (ICoDSE)* (pp. 91-95). IEEE. DOI: 10.1109/ICoDSE59534.2023.10291662

[37] Lui, G. and Shum, C., (2022). Impact of Robotic Process Automation on Future Employment of Accounting Professionals. DOI: 10.24251/hicss.2022.019

[38] Luz, T.R.D., (1989). Microelectronics and Employment: The Impact on the Accounting Profession. Journal of Business Administration, 29, pp.05-18. https://dx.doi.org/10.23919/CISTI58278.2023.10211254

[39] Martínez-García, M., Vallejo, M., Hernández-Lemus, E. and Álvarez-Díaz, J.A., (2019). Novel methods of qualitative analysis for health policy research. Health Research Policy and Systems, 17(1), pp.1-13. DOI: 10.1186/s12961-018-0404-z

[40] Matthies, B., (2020). Assessing the automation potentials of management reporting processes. *The International Journal of Digital Accounting Research*, *20*(26), pp.75-101. DOI: 10.4192/1577-8517-v20_4.

[41] McConville, D., (2023). Disruptive Technologies: Implications for Third-level Accounting Education. *Accounting, Finance & Governance Review*, *30*. https://dx.doi.org/10.52399/001c.77369

[42] Mughal, H., (2022). 310 ethical challenges facing autonomous surgical robots. *British Journal of Surgery*, *109*(Supplement_1), pp.znac039-205. DOI: 10.1093/bjs/znac039.205

[43] Munoko, I., Brown-Liburd, H.L. and Vasarhelyi, M., (2020). The ethical implications of using artificial intelligence in auditing. Journal of Business Ethics, 167, pp.209-234. https://doi.org/10.1007/s10551-019-04407-1

[44] Ng, C., (2022). Teaching Advanced Data Analytics, RPA, and Artificial Intelligence in a Graduate Accounting Program. Journal of Emerging Technologies in Accounting. DOI: https://dx.doi.org/10.2308/jeta-2022-025

[45] Odonkor, B., Kaggwa, S., Uwaoma, P.U., Hassan, A.O. and Farayola, O.A., (2024). A review of US management accounting evolution: Investigating shifts in tools and methodologies in light of national business dynamics. International Journal of Applied Research in Social Sciences, 6(1), pp.51-72. DOI: 10.30574/wjarr.2024.21.1.2722

[46] Oke, A.E., Aliu, J., Fadamiro, P., Akanni, P., Jamir Singh, P.S. and Shaharudin Samsurijan, M., (2023). Unpacking the strategies to promote the implementation of automation techniques in the construction industry. *Construction Innovation*. DOI: 10.1108/ci-12-2022-0332

[47] Oulton, N., (2012). Long term implications of the ICT revolution: Applying the lessons of growth theory and growth accounting. *Economic Modelling*, *29*(5), pp.1722-1736. DOI: 10.1016/J.ECONMOD.2012.04.025

[48] Paiva, T.M., Oliveira, T.C., Pillat, R.M. and Alencar, P.S., (2023). Supporting the Automated Generation of Acceptance Tests of Process-Aware Information Systems. https://dx.doi.org/10.5220/0012211400003584

[49] Perdana, A., Lee, W.E. and Kim, C.M., (2023). Prototyping and implementing Robotic Process Automation in accounting firms: Benefits, challenges and opportunities to audit automation. *International Journal of Accounting Information Systems*, *51*, p.100641. DOI: 10.1016/j.accinf.2023.100641

[50] Petrová, P., (2023). The Impact of Robotic Process Automation and Artificial Intelligence on Employees in the Accounting Profession. In *Liberec Economic Forum* (p. 114). DOI: 10.15240/tul/009/lef-2023-13

[51] Qasim, A., El Refae, G.A. and El Etter, S., (2022). Utilizing Drones in Long-Term Construction Projects: the Impact on Cash Flow Management. In *2022 International Arab Conference on Information Technology (ACIT)* (pp. 1-4). IEEE. DOI: 10.1109/ACIT57182.2022.9994144.

[52] Rawashdeh, A., Bakhit, M. and Abaalkhail, L., (2023). Determinants of artificial intelligence adoption in SMEs: The mediating role of accounting automation. *International Journal of Data and Network Science*, *7*(1), pp.25-34. DOI: 10.5267/j.ijdns.2022.12.010

[53] Riantono, I.E., Anggrico, K. and Calvin, C., (2023). Robotic Process Automation to Help Auditors to Improved the Audit Quality: A Systematic Literature Review and Meta-Analysis. In Proceedings of the 2023 9th International Conference on Industrial and Business Engineering (pp. 298-304). DOI: 10.1145/3629378.3629447

[54] Su, Y., Hou, F., Qi, M., Li, W. and Ji, Y., (2021). A data-enabled business model for a smart healthcare information service platform in the era of digital transformation. Journal of Healthcare Engineering, 2021, pp.1-9. https://doi.org/10.1155/2023/9792187

[55] Suseno, Y. and Pinnington, A.H., (2016). The evidence of high performance work systems in professional service firms. Satya Wacana Conference & Seminar, International Conference on Human Resource Management. https://callforpapers.uksw.edu/index.php/ichrm/ichrm2016/paper/view/3

[56] Tiron-Tudor, A. and Deliu, D., (2021). Big data's disruptive effect on job profiles: Management accountants' case study. Journal of Risk and Financial Management, 14(8), p.376. https://doi.org/10.3390/jrfm14080376

[57] Velikanov, A., Egorova, E., Balashova, N., Melikhov, V. and Chekrygina, T., (2023). Conceptual approach to the development of accounting and information support for managing the sustainable development of economic entities in the agro-industrial complex based on the ESG strategy. In E3S Web of Conferences (Vol. 463, p. 01044). EDP Sciences. https://doi.org/10.1051/e3sconf/202346301044

[58] Vilaza, G.N. and McCashin, D., (2021). Is the automation of digital mental health ethical? Applying an ethical framework to chatbots for cognitive behaviour therapy. Frontiers in Digital Health, 3, p.689736. DOI: 10.3389/fdgth.2021.689736

[59] Watai, C.L., (2021). Digitalization in accounting: impacts of Robotic Process Automation in accounting with a particular outlook on the Accountant's role (Doctoral dissertation). https://hdl.handle.net/10438/30905