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Viorel-Costin Banța[1]
Bucharest University of Economic Studies, Bucharest, Romania

Alin Banta[2]
University of Craiova, Craiova, Romania

Sabin Alexandru Băbeanu[3]
Bucharest University of Economic Studies, Bucharest, Romania

The Implications of Robotic Process Automation in the Automation of Economic Processes: A Case Study of Fruit Processing Factory

Abstract. *For several years, big companies in Romania and beyond have faced various challenges, including digitization. This involves transitioning to new versions of integrated ERP systems, incorporating cutting-edge database trends like in-memory technology and SAP HANA, and adopting Robotic Process Automation (RPA) for modelling the economic processes used, like order to cash or procure to pay. While the deadline for SAP solutions is set for 2027, the preparations for this shift are extensive and require a mixed team of engineers and economists. Consequently, many SAP clients are exploring using auxiliary interfaces and RPA to streamline economic processes. To provide insights into potential solutions, this article presents a study on the strategies adopted by one large company active in fruit processing, from production to sales and distribution. This study aims to show how intelligent technologies can help company departments automate economic processes. The study draws on questionnaires sent to the users from the mentioned company and the authors' own experience in creating interfaces used for economic processes. The research results confirm that it is time when certain stages of the economic process to be performed by a software bot, which will allow company employees to have the necessary time to study and improve work with economic processes. Companies should prioritize the intelligent processing, storage, and distribution of data to beneficiaries, especially regarding repetitive tasks. Every company should prioritize attracting European funds for automation and digitization, as incorporating intelligent technologies into daily work is essential.*

Keywords: *RPA – Robotic Process Automation, ERP – Enterprise Resource Planning, SAP, economic processes, ERP solutions, RPA lifecycle, project implementation.*

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[1] **Viorel-Costin Banța**, Bucharest University of Economic Studies, Bucharest, Romania.
ORCID 0000-0003-1337-9374
E-mail: viorel.banta@cig.ase.ro (*Corresponding author*)

[2] **Alin Banta**, University of Craiova, Craiova, Romania.
ORCID 0009-0004-4117-2092

[3] **Sabin Alexandru Băbeanu**, Bucharest University of Economic Studies, Bucharest, Romania.
ORCID 0009-0007-6047-3343

Віорел-Костін Банца
Університет економічних наук Бухаресту, м. Бухарест, Румунія

Алін Банта
Крайовський університет, м. Крайова, Румунія

Сабін Александру Бабену
Університет економічних наук Бухаресту, м. Бухарест, Румунія

Вплив автоматизації процесів за допомогою роботизації на автоматизацію економічних процесів (на прикладі фабрики з переробки фруктів)

Анотація. *Протягом кількох років великі компанії в Румунії та за її межами стикалися з низкою проблем, включаючи важливе питання цифровізації. Це включає в себе перехід на нові версії інтегрованих систем планування ресурсів підприємства (ERP), використання передових баз даних, таких як технологія in-memory та SAP HANA, і впровадження автоматизації процесів за допомогою роботизації (RPA) для моделювання економічних процесів, як-от замовлення на готівку або закупівля для оплати. Незважаючи на те, що кінцевим терміном реалізації рішень SAP є 2027 рік, підготовка до цього переходу є досить великою і потребує змішаної команди інженерів та економістів. Отже, багато клієнтів SAP досліджують використання допоміжних інтерфейсів і RPA для оптимізації економічних процесів. Щоб оцінити потенційні рішення, у цій статті представлено дослідження стратегій, прийнятих однією великою компанією, яка активно займається переробкою фруктів – від виробництва до продажу та розподілу. Це дослідження має на меті показати, як інтелектуальні технології можуть допомогти відділам компанії автоматизувати економічні процеси. Дослідження спирається на дані анкет, надісланих користувачам зазначеною компанією, а також власний досвід авторів у створенні інтерфейсів, що використовуються для економічних процесів. Результати дослідження підтверджують, що настав час, коли певні етапи економічного процесу виконуватиме програмний бот, що дозволить працівникам компанії мати необхідний час для вивчення та вдосконалення управління економічними процесами. Компанії повинні надавати пріоритет інтелектуальній обробці, зберіганню та розповсюдженню даних бенефіціарам, особливо в аспекті повторюваних завдань. Кожна компанія ЄС повинна залучати кошти європейських фондів для автоматизації та цифровізації, оскільки впровадження інтелектуальних технологій у повсякденну роботу має важливе значення.*

Ключові слова: *автоматизація процесів за допомогою роботизації, планування ресурсів підприємства, SAP, економічні процеси, ERP-рішення, життєвий цикл автоматизації, реалізація проекту.*

INTRODUCTION

The motivation for this article was to model an observed economic process (order to cash) in one of Romania's largest factories, which deals with processing fruits from fruit orchards in Romania. While the factory is based in Romania, it is a subsidiary of a major global producer. Specifically, the article examines the possibility of automating the production planning process for a range of products including sugar-free jam and marmalade, dried fruit, juices and chocolate bars and fruit, which are all manufactured in Romania and delivered to Romania, Germany, and England on a per-order basis. This article centers on the latest trends in the ERP market (Moon, 2007), specifically focusing on the forecasted changes in corporate integrated software solutions from 2020 onwards.

Given the ever-increasing pace of globalization, it's no surprise that many Romanian companies, including those with local capital, multinationals' subsidiaries, and even established multinationals, have already adopted an ERP system as a means of maintaining their competitive edge (Albu et al., 2015). On the other hand, it must be considered that any such change brings with it a series of additional costs, which some companies may have, others may not (Bhasin, 2017). Thus, intelligent technologies are increasingly in demand among computer system users (Carden et al., 2019).

Over the past two years, as the COVID-19 pandemic has impacted our lives, factories in Romania have increasingly sought to renovate and incorporate new technologies to optimize their operations. These efforts have been motivated by a series of interruptions in activity caused by widespread illnesses in our country.

The adoption of new technologies like AI and RPA has been facilitated by the numerous errors and inefficient practices that have plagued computer systems, particularly SAP, over the years (Addo-Tenkorang & Helo, 2011). The primary objective of integrating these new technologies was to automate existing economic processes and, wherever feasible, to adapt them to the new capabilities that these technologies offer (Bakarich & O'Brien, 2021).

The primary objective of this case study was to develop a project that automates the process of generating packages for delivery, delivery lists and production plans for specific products included in a sales order within a given working range (Ågnes, 2022). As part of this effort to transform the SAP system and incorporate AI and RPA (Antonio da Silva Costa et al., 2022), several aspects were discussed with various departments within the company, including sales and distribution, logistics, industrial engineering, financial accounting, and production staff (Arias et al., 2020).

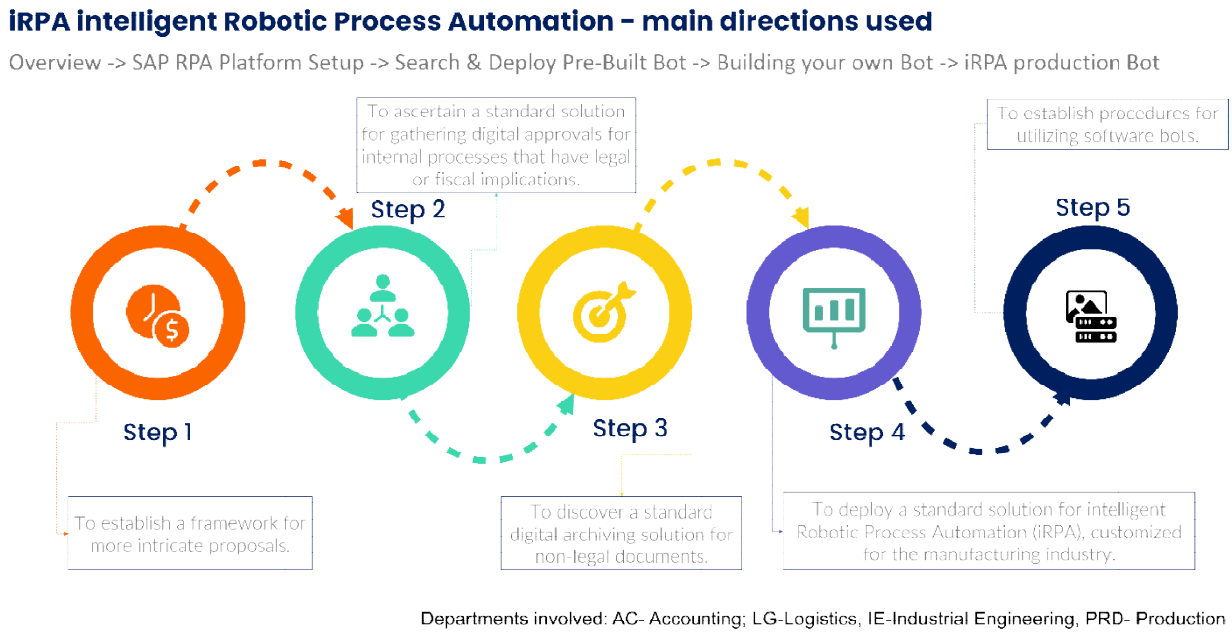

Figure 1. **Steps for defining the software bot project – main direction for implementation**

Figure 1 provides a comprehensive diagram of the digital transformation process, outlining the initial requirements and the considerations that should inform the implementation of this new system. This transformation will require a shift in mindset to accommodate the changes that will arise.

As can be seen in Figure 1, a series of steps were followed when it was decided to implement a robot to automate the delivery process within the fruit processing factory.

LITERATURE REVIEW

The specialized literature in this field covers diverse aspects, including variations across countries, methods for qualitative or quantitative analysis, conceptual design approaches, as well as field studies such as projects, implementations, and discussions (Carden et al., 2019). This literature encompasses contributions from individuals involved in these projects, as well as experts and professionals in the field (Choi et al., 2021). The authors acknowledge that data collected during implementation projects may serve as a source of work opportunities in the future. They note that aspects that are currently deemed non-essential may become essential on future implementation projects (Elragal & Haddara, 2012).

However, analyzing the project data can be challenging without a comprehensive understanding of the underlying processes (Fernandez et al., 2017). Generating ideas to improve calculation methods requires input from those who implement, discuss, analyze, and ultimately achieve satisfactory results (Gotthardt et al., 2019). Aligned with the findings of Hong & Li (2013) regarding the significance of conducting a production audit, this study emphasizes the analysis of product manufacturing, environmental impact, and possibilities for environmental protection (Greenman, 2017).

In a similar view, De Martinis & Houghton (2019) underscore the advantages of an efficiency production audit, which aids in streamlining document management in both public and private sectors. The significance and efficiency of conducting an audit, along with its impact and benefits on the business, cannot be ignored (Chen & Lin, 2008). In this article, the authors aim to provide a dataset for fruit processing – their transformation into various assortments from jams to bars and candied fruits that can be useful in the future. As suggested by Knechel, Rouse & Schelleman (2009), audits tend to be more effective in large firms with automated activities and are less effective when internal controls are already in place, especially with multiple branches (Nazemi et al., 2012). The solutions of creating software bots with RPA solutions plays a crucial role in driving digital transformation efforts in the manufacturing sector. By automating critical processes such as accounts payable, invoice processing, and supply chain management, RPA has the potential to enhance core operations, boosting agility, speed, and overall quality.

RESEARCH METHODOLOGY

Regarding the way of working on this implementation project, as well as a series of results that the authors used in this research, I highlight the use of quantitative research, something found in what follows. This study was based on the collection of existing data series in the process of implementing the automation of the order-to-cash economic process, for this factory that processes fruit from a number of producers.

In Figure 2 can be see the collaborative efforts of the logistics, engineering, and production departments, under the supervision of the financial accounting division, prior to the implementation of automation and self-learning solutions.

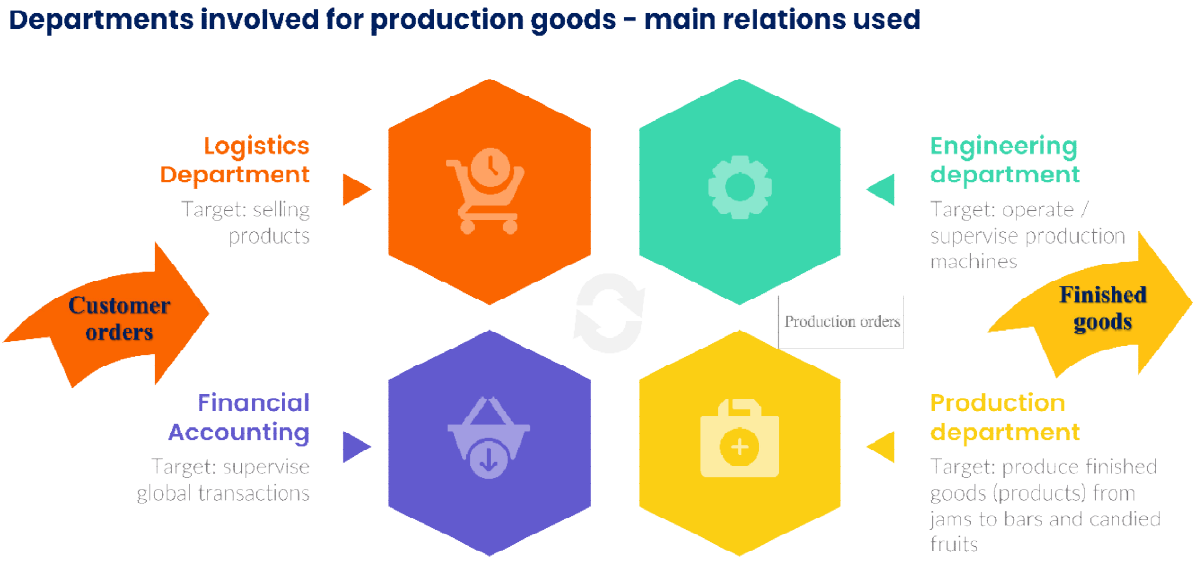

Figure 2. **Main relation between departments – target scope for production goods**

This case study analysis for the scientific article was based on the ERP SAP IT system, which serves as the primary source for production data. The system receives orders from external customers, which translate into requirements for the factory to fulfill. The engineering department then creates a plan for execution, and the production team is responsible for carrying out the plan as communicated by the logistics department. Finally, the sales and distribution department ensure that the products reach the customers.

The working hypotheses regarding the current research want to highlight how intelligent technologies can help departments within a company, in the present case the fruit processing factory – we will further emphasize how certain departments are helped by introduction – as an example of automatic invoicing, or taking orders from customers automatically, highlighting consumption, planning production automatically, etc. In Figure 3 we can see that the development of digital technology has led to the creation of new business models. By implementing the latest business architectures and making significant changes to their management processes, capabilities, and schedules, firms are able to achieve value and enhance their strategic performance. This enables them to enter new markets and move away from existing ones.

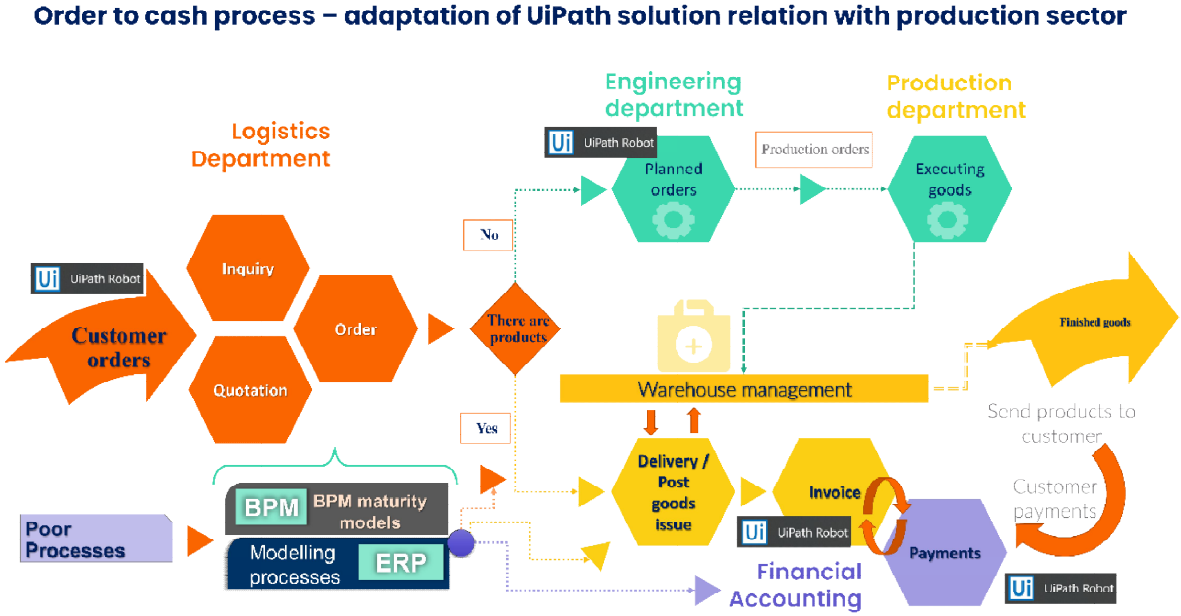

Figure 3. **New model used in the O2C process – digital technology adopted**

In this case we have three hypotheses:

H1 – In the present case study, there is a positive relationship between strategic performance and digital technology.

Various researchers have highlighted the fact that the adaptation and adoption of intelligent technologies has led to an increase in the way those who use them do their daily work. Even in the present case, in the results chapter, we will see an increase in the level of confidence of the employees, that what they use, helps them enormously. In the current study, from everything we collected from the site – the questionnaires sent to the members of the RPA implementation project, the authors being part of it, a number of 41 answers were positive regarding the proposed automation – it will make the work easier and production costs will decrease.

H2 – Digital technology can be used as a mediator between the company's work performance and the way of thinking of its management.

Throughout the implementation project – during it, as well as after, the company's management supported the importance of automating the economic processes used as much as possible. Also, at each work session it became clear that during the COVID-19 pandemic, due to the fact that employees could not be present at work, the execution of processes was cumbersome, very often even stopped – which led to decrease in company revenues.

H3 – The introduction of digital technologies has led to a better way of working for those who work with them – their performance has increased.

The difficult period, through which we all went, highlighted the fact that the automation of economic processes, of repetitive steps, can be the key to success. That is why more and more companies are adopting and adapting smart technologies, their desire being to survive a market that is increasingly difficult to use. The number of employees has continuously decreased, so the implementation of automation in certain steps of the process, if it cannot be fully automated, can be considered an important step. To the 41 questionnaires sent, in the area of employee satisfaction, of the help they receive from intelligent technology, the answers were 100% positive.

RESULTS AND DISCUSSION

This project to implement RPA solutions for the modeling of economic processes was, without doubt, a major challenge for the functional and technical consultants, present on the project, on site within the company. A series of work sessions were held, through which it was explained how the transformation of the existing and functional economic processes will be achieved, showing where the software robots will intervene and change the way of work somewhat.

Thus, the first part of the project highlighted a minus that the company emphasized from the very beginning, namely the fact that taking orders from customers should be done automatically, so that the production stage as well as the supply of the products would not there are still delays.

A second stage was to create the necessary and estimate the production, and here wanting an automation, so that depending on how much is sold, by calendar years, a stock of raw materials can be made, knowing that here comes the problem that we work with perishable raw material, so the storage conditions must be very well managed.

A third problem reported was that of scheduling the distribution of finished products, so that the best possible grouping of the means of transport – or the connection with the courier company – is made so that the transport vehicles leave loaded with more than 80% from the capacity – so that the transport is profitable, and the costs as low as possible.

A fourth problem encountered was that of automatic invoicing, and here automation was desired, when invoicing, even wanting to create an invoice/client twice a month – which included all the deliveries the company made to him, the created invoice had to go automatically the next day in the morning – on e-mail, and if it was on the weekend, it should be sent on Monday morning by e-mail.

A fifth problem signed was that of automating the clearing of documents in the SAP system, in accordance with the receipt and verification of payments made by customers. A total of 41 questioners were collected, for each done automatization (satisfaction level: **1** – Over 80% – Satisfied; **2** – Between 30% and 80% Satisfied; **3** – Unsatisfied), the component teams for each automation were not the same, the result is shown below (Table 1).

Table 1. **Descriptive statistics of the variables used**

Variable	Answers	Women	Man	Technical consultant	Functional consultant	Management
Aut 1	41	22	19	5	4	6
Aut 2	41	20	21	5	4	6
Aut 3	41	18	23	5	3	4
Aut 4	41	22	19	5	3	4
Aut 5	41	30	11	5	3	4

The degree of participation of women in this project was higher than that of men, which highlights a much greater involvement of the female gender, which is a big plus in terms of equal opportunity. The degree of satisfaction regarding all 5 performed automations can be deduced from Table 2 and Figure 4, where the authors averaged the answers from all 41 respondents. That is, the gender of the one who answered was not considered. In future research, the implications that the types of response, depending on the gender, influence or not the application of automation will be detailed – the relevance with which such adoption of an intelligent solution is approached.

Table 2. **The degree of satisfaction – average answers**

Description / Automatization	Over 80% – Satisfied	Between 30% and 80% Satisfied	Unsatisfied
Aut 1	28	10	3
Aut 2	33	4	4
Aut 3	35	4	2
Aut 4	31	7	3
Aut 5	38	2	1

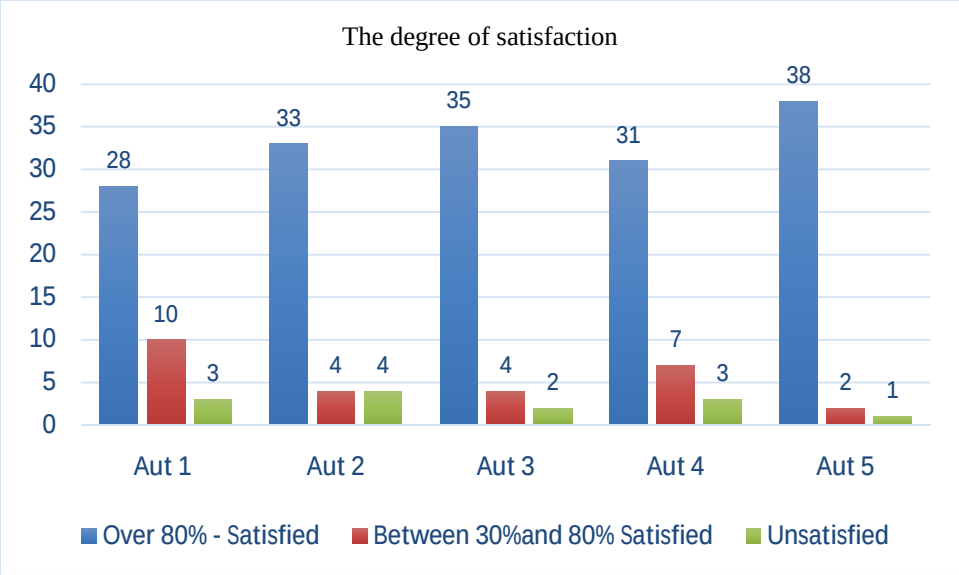

Figure 4. **Graphical satisfaction of overall implementation done**

CONCLUSIONS

This case study wants to show the importance of automation using RPA or iRPA-type solutions for economical processes in the context of the digitalization of many elements needed in the models approached by each company. We had to deal with an unprecedented situation after a very tumultuous period: from the COVID-19 pandemic to what is happening now. It is a time when certain stages in the economic process are carried out by a software bot, allowing company employees to have the necessary time to study and improve their work with economic processes.

Managing companies in our country and beyond should prioritize the intelligent processing, storage, and distribution of data to beneficiaries, especially regarding repetitive tasks. Every company should prioritize attracting European funds for automation and digitization, as incorporating intelligent technologies into our daily work is essential. The authors of this research can also talk about the limitation of this research, it is carried out in a company with approximately 500 employees from Romania, which is a small number, but for the Romanian market, it is still a good one. The sample included in the research is adapted for those who know IT and accounting well, so no questionnaires were sent to other employees. However, they also benefited from automation.

One thing that emerged at the end of these implementations is that a series of knowledge regarding the automation of economic processes are not yet fully known, which led to dialogues, sometimes incomprehensible, between the functional and technical consultants and the company's employees.

4 References

Addo-Tenkorang, R., Helo, P., (2011). Proceedings of the World Congress on Engineering and Computer Science. *WCECS, II*, 19-21.

Ågnes, J. S. (2022). Gaining and training a digital colleague: employee responses to robotization. *The Journal of Applied Behavioral Science, 58(1),* 29-64.

Albu, C., Albu, N., Dumitru, M., Dumitru, V. (2015). The Impact of the Interaction between Context Variables and ERP Systems on Organizational Performance. A Case Study from a Transition Economy. *Information Systems Management, 32*(3), 252-264. DOI: 10.1080/10580530.2015.1044347

Antonio da Silva Costa, D., Sao Mamede, H, Mira da Silva, M. (2022). Process Automation (RPA) Adoption: A Systematic Literature Review. *Engineering Management in Production and Services, 14*(2), 1-12. DOI: 10.2478/emj-2022-0012

Arias, J. A. E., Beltrán, J. A. B., & Bedoya, S. (2020). RPA implementation for automation of management process of personal in Compañía nacional deempaques SA. In *Iberian Conference on Information Systems and Technologies (CISTI)*, 1-5.

Bakarich, K. M., & O'Brien, P. E. (2021). The robots are coming... but aren't here yet: The use of artificial intelligence technologies in the public accounting profession. *Journal of Emerging Technologies in Accounting, 18*(1), 27-43.

Bhasin, M. L., (2017). Integrated Reporting: The Future of Corporate Reporting. *International Journal of Management and Social Sciences Research (IJMSSR), 6*(2), 17-31.

Carden, L., Maldonado, T., Brace, C., & Myers, M. (2019). Robotics process automation at TECHSERV: An implementation case study. *Journal of Information Technology Teaching Cases, 9*(2), 72-79.

Chen, S. G. G., and Lin, Y. K. K. (2008). Performance analysis for Enterprise Resource Planning systems (pp. 63-67). In *Industrial Engineering and Engineering Management Conference.*

Choi, D., R'bigui, H., & Cho, C. (2021). Candidate Digital Tasks Selection Methodology for Automation with Robotic Process Automation. *Sustainability, 13*(16), 8980.

Elragal, A., Haddara, M., (2012). The Future of ERP Systems: look backward before moving forward. *Procedia Technology, 5*, 21-30.

Fernandez, D., Zainol, Z., Ahmad, H., (2017). The impacts of ERP systems on public sector organizations. *Procedia Computer Science, 111*, 31-36.

Gotthardt, M., Koivulaakso, D., Paksoy, O., Saramo, C. (2019). Current State and Challenges in the Implementation of Robotic Process Automation and Artificial Intelligence in Accounting and Auditing. *Journal of Finance & Risk Perspectives*, *8*, Special Issue: Digital Accounting Hanken School of Economics.

Greenman, C. (2017). Exploring the Impact of Artificial Intelligence on the Accounting Profession. *Journal of Research in Business, Economics and Management, 8*(3), 1451-1454.

Moon, Y. B. (2007). Enterprise Resource Planning (ERP): a review of the literature. *Int. J. Management and Enterprise Development, 4*(3), 235-264.

Nazemi, E., Jafar-Tarokh, M., Djavanshir, R, G. (2012). ERP: a literature survey. *International Journal of Advanced Manufacturing Technology, 61*, 999-1018.