
Robotic Process Automation in Logistics – A Case Study of a Production Company

Submitted 14/05/22, 1st revision 10/06/22, 2nd revision 12/07/22, accepted 30/07/22

Łukasz Brzeziński¹

Abstract:

Purpose: The purpose of this paper is an analysis of the implementation of robotic process automation in the logistics processes of a selected production company (case study).

Design/Methodology/Approach: The following research methods were used: desk research and case study. The results of the research can be used in terms of recommendations for entrepreneurs in the approach to implementing the RPA concept, and thus improving the functioning of the organization.

Findings: The results of the research can be used in terms of recommendations for entrepreneurs in the approach to implementing the RPA concept, and thus improving the functioning of the organization. The term Robotic Process Automation (RPA) appeared relatively recently, but the phenomenon itself has been around for a long time.

Practical Implications: Logistics processes, and in particular the costs related to their implementation, are an important element of the economic process. Automation of logistics processes related to logistics processes, and even entire production lines, is becoming a global trend. At the same time, the implementation of this type of improvements and innovations can be carried out in virtually any organization, regardless of the industry and scale of activity. Based on the case study, it was shown that the robotic automation of processes in the logistics of the tested production company contributed to the reduction of the total costs of the entity by about 10%.

Originality/Value: The added value of the article is related to tracing the effects of RPA application in the field of logistics processes of a production company - thanks to which it is possible to indicate benefits in the case of a relatively small scale of activity (entity from the SME sector).

Keywords: Robotic process automation, digitization of logistics management, RPA in logistics, implementation of RPA in logistics.

JEL codes: O32.

Paper Type: Research article.

Acknowledgement: This article is co-financed by the European Union under the Operational Programme Knowledge, Education, Development 2014-2020 within the realization of "The Integrated Programme of Poznan School of Logistics" (no. POWR.03.05.00-00-Z089/17).

¹ Poznan School of Logistics, Poznan, Poland, lukasz.brzezinski@wsl.com.pl;

1. Introduction

Logistics processes, and in particular the costs related to their implementation, are an important element of the economic process. Automation of logistics processes related to the transport of items, manipulation, palletization and depalletization as well as the introduction of robotic workstations, and even entire production lines, is becoming a global trend. Manual performance of simple and repetitive activities is no longer profitable for the company, which is why the work of robots and automatic machines begins to displace manual labor. But even in the era of such intense industrial development, robots are not able to completely replace humans. New applications are systematically created that enable the integration and cooperation of the machine with humans.

The development of technology and the implementation of modern solutions in the field of robotization of production and logistics processes generate a number of benefits. Robotization of production and logistics processes in the world and in Poland is characterized by an upward trend. Unfortunately, it does not develop as dynamically in Poland as it does in the world. Poland is one of the least robotized countries in the world in the group of industrialized countries. Although the interest in robots in Poland is growing, the awareness of entrepreneurs about their possibilities and benefits resulting from their use is still low.

The aim of the article is to analyze the implementation of robotic automation in the logistics processes of a selected production company (case study).

2. Robotic Automation of Processes in Logistics

There are many technological solutions on which modern and innovative logistics processes in the organization are based. Currently, we can talk about a significant dynamization of broadly understood digitization. There are many reasons for this - you can talk about trends and concepts such as Industry 4.0, the globalization of the economy, as well as the effects of the COVID-19 pandemic.

Therefore, it can be indicated that in the near future there will be a focus on the wider use of artificial intelligence, robotization, automation, which will partially or completely replace human work (Boyes, 2015; Sherman and Chauhan, 2016; Bock, Iansiti, and Lakhani, 2017; Ocicka, 2017; Adamczewski, 2018; Nahavanki, 2019; Salimova, Guskova, Krakovskaya, and Sirota, 2019; Aslam, Aimin, and Rehman, 2020; Longo, Padovano, and Umbrello, 2020; Frederico, 2021; Vogt, 2021).

Automation is increasingly used in logistics. In recent years, the ratio of the total cost of owning robots to the benefits they bring has changed radically. In this context, the Robotic Process Automation (RPA) technology has a special implementation potential in organizations. It is based on the automation of repetitive business processes with the use of computer programs (robots).

A business process is a set of activities that are measurable, based on clear rules, followed by a specific sequence and designed to deliver a specific result. A robot, on the other hand, is software that automates specific activities performed by a human (faithfully reproducing them at the user interface level or in the background) during the implementation of a given business process. The effectiveness and benefits of implementing the robot can be considered in various aspects. Assessment criteria should be developed separately for each project (Aguirre, Santiago, Rodriguez, and Alejandro, 2017; Anagnoste and Sorin 2018; Kedziora and Kiviranta, 2018; Rajesh, Ramesh, and Rao 2018).

At the same time, it is worth mentioning that in many companies RPA also contributes to the standardization and optimization of business processes. This solution is quickly available, as the robot implementation time is about a month on average. When choosing RPA, there is usually no need to significantly interfere with the existing IT infrastructure, which in turn reduces costs. Above all, however, RPA in the aspect of enterprise logistics is an important element of building a competitive advantage, offering customers value-added services, building competences and a culture of automation in the enterprise (Willcocks, Lacity, and Craig, 2015; Vilminko-Heikkinen and Pekkola, 2017; Willcocks, Lacity, and Craig, 2017; van der Aalst, Wil, Bichler, and Heinzl, 2018; Sibalija, Jovanović, and Đurić, 2019).

Benefits resulting from the automation of logistics processes (Szatkowski, 2016; Jankowska and Łukasiak, 2017; Martinek-Januszewska, 2018; Kaczmarek, 2020):

- Efficiency: saving time and / or money, reducing operating costs, reducing employment.
- Quality: improvement of the quality of implemented processes, data correctness control, elimination of errors.
- Organization of work: work would not be possible without these solutions (the ability to achieve the goals of the organization), standardization and systematization of work, shortening and facilitating processes, as well as better control of their course, reducing risk at high volume, company development, devoting time to important things.
- Competitiveness: quick reaction to the actions of the competition, making the offer and products more attractive; potentially increased competitiveness, better customer service.
- Employees: one stony load reduction for the team, requires less - present knowledge of the workers serving automation, on the other hand, better knowledge of experts and the possibility of better talent management, the ability to use automation to develop their career (through active participation in improvements).

In addition, robotic process automation technology relies on continuous improvement techniques to identify new processes that are eligible for robotization

and improve performance by learning from mistakes. Thanks to this, it is systematically possible to increase its use in the logistics of the organization.

2. Research Methodology

Detailed description of the cyclic delivery synchronization problem was presented in the previous works of the authors (Gdowska and Książek, 2013; Gdowska and Książek, 2015).

The aim of the research in this article is to analyze the implementation of robotic automation in logistics processes of a selected production company (case study). On this basis the following research problems were formulated:

- What are the possibilities of using RPA in the logistics of manufacturing company from the SME sector?
- What are the benefits of RPA implementation in the logistics of the selected company?

The following research methods were used, desk research and case study. The desk research method consists in compiling, analyzing and processing data and information from existing sources, and then formulating conclusions on the problem under investigation (Makowska, 2013; Bednarowska, 2015).

Case study, analysis of a single case, i.e., a detailed description of a usually real case, allowing to draw conclusions as to the causes and results of its course and the broader business model, market characteristics, technical, cultural, social conditions, etc. on a case-by case basis. The case method offers the possibility of an in-depth problem analysis (as opposed to quantitative methods). It has stringent requirements but allows for considerable flexibility, especially when it comes to an unusual research problem. There are specific rules for study design, data acquisition and analysis, and results presentation (Langley, 1999, pp. 691-710).

The selected Enterprise X², which produces and trades corrugated board and cardboard packaging, was analyzed in this article. The results of own research are included in the next section.

3. Research Methodology

3.1 Enterprise Description

The analysis in this article will cover Enterprise X, which deals with the production and trade of corrugated board and cardboard packaging. It produces packaging made

² *The owner of the enterprise did not consent for the company name to be used.*

of 2, 3 and 5-layer cardboard with various combinations of C, B, E waves, as well as flap packaging, otherwise known as FEFCO201, and shaped packaging.

According to the Polish Classification of Activities (PKD), it is Section C, Division 17.21.Z - Production of corrugated paper and corrugated cardboard as well as paper and cardboard packaging, SIC CODE: 51119902 - Paper for printing, 51130304 - Crinkled and uniform box packaging (PKD, 2020).

As a result of the COVID-19 pandemic, the company started with a wider range of IT solutions than before. In the period of "lockdown" of the economy in relations with employees and co-workers, the organization switched completely to remote work. In turn, in relations with customers and suppliers, elements of remote work in the field of current correspondence (e-mail), invoicing and transfers have already been implemented. Therefore, the crisis did not significantly affect the specificity and organization of work.

3.2 Implementation of RPA in Logistics

The implemented project concerned the digitization of logistics processes. Its assumption is the simultaneous automation of the functions of warehousing, transport preparation, demand forecasting and administration with the use of bots (RPA technology).

The implementation of the new solution was preceded by detailed analyzes of the functioning of the logistics system in the company. The process was carried out in five stages presented in Figure 1. As part of the process measurement, a broad and reliable database of information on the costs of individual operations was obtained. Process mapping contributed to selecting areas that could potentially be robotized.

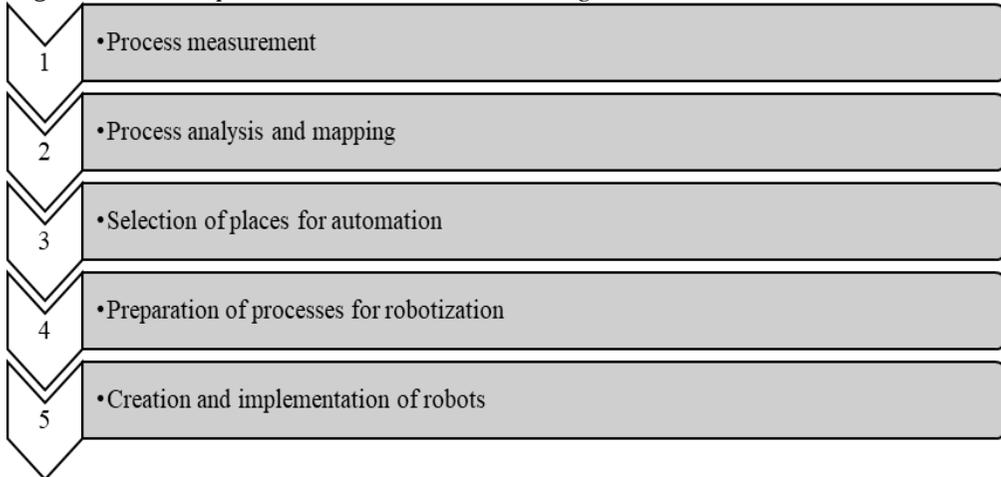
The key element taken into account in the selection of places for automation are the results of process measurement - i.e. the hard facts about the cost of elementary activities. A list of priority processes for robotization has been established. In the penultimate step, a specification of the robot's operation is created, with an emphasis on the auto-diagnosis elements, allowing the robot to verify whether its operation is correct, and the input data meets the automation criteria. The final stage is creating the specifics and implementing robots.

The approach referred to as outsourcing the creation of a bot was used as the base method for implementing RPA solutions. The first robot was implemented in 2 months - from the start of measurements of logistics processes to the initiation of its operation.

In this way, simple activities previously performed manually by production and warehouse. The owner of the enterprise did not consent for the company name to be used workers have been replaced by the automatic work of bots. In addition,

automatic machines leading employees through processes (e.g. outboarding) with the use of MS Power Automate, a new OCR for electronic document exchange, a ticket system for IT service and VPN (Virtual Private Network) were introduced to ensure better quality of cybersecurity.

Figure 1. RPA implementation in the selected organization



Source: Own creation.

Bots were used in the implementation of such logistic functions as:

- Tracking and updating shipment statuses - controlling the shipment status and receiving notifications about the time of receipt, delays, generating an electronic delivery confirmation, inventory control - carrying out activities related to inventory control.
- Purchase management - automatic issuing of purchase orders based on the set criteria of price, quantity and frequency.
- Demand forecasting - analyzing historical sales data, market indicators, by bots based on established rules, adjusting inventory levels, safety stock.
- Documentation - effective and immediate circulation of documents in the organization, data exchange, invoice processing, information exchange between employees.

The team used the services of an external consulting company in the field of RPA (Robotic Process Automation), which helped them not only to learn automation, but also to organize the processes, which turned out to be crucial before starting robotization. Lean Management was selected as the work organization system, which helped to organize the processes necessary before starting automation work. It should be noted that there was a resistance of the crew to the changes. Therefore, the owner held a series of meetings with employees, during which it was explained what RPA implementation would be, what benefits it could generate for the

organization and it was ensured that no employees would be dismissed. The assumption was to facilitate the implementation of tasks and the performance of duties.

3.3 Results of Implementation of RPA in Logistics Processes in Enterprise

The project was created primarily from the desire to use new technologies to increase work efficiency and this effect has been achieved. Without changing the scale of operations (while maintaining similar revenues), it was possible to reduce the costs completely per year by about 10%. The work is automated and very orderly, and the same employees, in the same teams, are able to handle more orders than before. There is also a noticeable improvement in the quality of work, because, for example, one of the implemented bots is a documentation audit bot that constantly checks all inventory levels, orders, invoices and sends reports to employees. Thanks to this solution, there are no errors and everything is corrected from month to month and not, for example, accumulated at the end of the year.

The changes started with the use of 2 robots, but one year after the initiation of the changes, there are 19 already functioning in the organization. It was just such a "selfpropelling avalanche". Especially when employees saw how it works, how it helps them, how flawless it is, how it deprives them of these tedious duties, they themselves started to come up with ideas what else can be done.

4. Conclusions

Economic development and growing competitiveness contribute to the fact that enterprises are constantly looking for solutions that will increase productivity and improve the quality of manufactured products. Meeting both of these conditions is possible for robotic process automation.

Automated processes, before robotization, usually involve significant human resources and a lot of time. Thanks to robotization, human potential can be released to perform more creative tasks, the time of performing routine activities is shortened, and the quality of data is improved thanks to the elimination of human errors, and thus the quality of decisions made on their basis.

Manufacturing companies are currently operating in the conditions of increasing complexity of logistic process management. The flow of information supporting logistics must be more and more precise and take place in real time. Automation in combination with robot software has a positive effect on the work of the company by shortening the processing time, reducing human errors, reducing operating costs, increasing the mutual compatibility of data and greater their accuracy.

The practical part of the article contains the results of a case study on the implementation of the RPA concept in logistics processes. In this entity, as a result

of the COVID-19 pandemic, a wider range of IT solutions was started than before. The assumption of the improvement was the simultaneous automation of the storage functions, transport preparation, demand forecasting and administration with the use of bots.

In this way, simple activities previously performed manually by production and warehouse workers have been replaced by the automatic work of bots. The main benefit was the reduction of costs by about 10% per annum (while maintaining a similar level of revenues). It is also important that the activities and tasks of employees have become orderly through automation, and thus the efficiency of the company's operations has increased. There was also an improvement in the quality of work.

References:

- Adamczewski, P. 2018. The Process of Digital Maturing on Intelligent Organizations. Scientific Challenges. Economic and Legal Challenges, 1.
- Aguirre, S., Rodriguez, A. 2017. Automation of a Business Process Using Robotic Process Automation (RPA): A Case Study. In: Figueroa-García, J., López-Santana, E., Villa Ramírez, J., Ferro-Escobar, R. (eds) Applied Computer Sciences in Engineering. WEA 2017. Communications in Computer and Information Science, vol 742. Springer, Cham.
- Anagnoste, S. 2018. Setting Up a Robotic Process Automation Center of Excellence. Management Dynamics in the Knowledge Economy, 6, 2, 307-322.
- Aslam, F., Aimin, W., Li, M., Rehman, K.U. 2020. Innovation in the era of IoT and industry 5.0: Absolute innovation management (AIM) framework. Information, 11, 12.
- Bednarowska, Z. 2015. Desk research — wykorzystanie potencjału danych zastanych w prowadzeniu badań marketingowych i społecznych. Uniwersytet Jagielloński w Krakowie, Marketing i rynek, 7.
- Bock, R., Iansiti, M., Lakhani, K.R. 2017. What the Companies on the Right Side of the Digital Business Divide Have in Common. Harvard Business Review, January 31st.
- Boyes, H. 2016. Cybersecurity and Cyber-Resilient Supply Chains. Technology Innovation Management Review, April.
- Frederico, G.F. 2021. From Supply Chain 4.0 to Supply Chain 5.0: Findings from a Systematic Literature Review and Research Directions. Logistics, 5, 49.
- Jankowska, A., Łukasiak, M. 2017. Robotyzacja procesów magazynowych w wybranych przedsiębiorstwach. Ekonomika i Organizacja Logistyki, 2, 1, 73-80.
- Kaczmarek, M. 2020. Robotic Process Automation, czyli automatyzacja modeli decyzyjnych z wykorzystaniem botów. Perspektywy i obawy na przykładzie zastosowań w branży farmaceutycznej. Studia I Prace Kolegium Zarządzania I Finansów, 179, 43-56.
- Kedziora, D., Kiviranta, H.M. 2018. Digital business Value Creation with Robotic Process Automation (RPA) in Northern and Central Europe. Management, 13, 2, 161-174.
- Langley, A. 1999. Strategies for theorizing from process data. Academy of Management Review, 4.

- Longo, F., Padovano, A., Umbrello, S. 2020. Value-oriented and ethical technology engineering in industry 5.0: A human-centric perspective for the design of the factory of the future. *Applies Sciences*, 10, 4182.
- Makowska, M. 2013. *Analiza danych zastanych. Przewodnik dla studentów*. Warszawa: Wydawnictwo Naukowe Scholar.
- Martinek-Januszewska, K. 2018. Znaczenie i rola automatyzacji procesów biznesowych – wyniki badań pilotażowych. *Organizacja i Kierowanie*, 4.
- Nahavandi, S. 2019. Industry 5.0-a human-centric solution. *Sustainability* 11, 4371.
- Ocicka, B. 2017. Cyfrowa (r)ewolucja w zarządzaniu łańcuchem dostaw, *Studia Ekonomiczne. Zeszyty Naukowe Uniwersytetu Ekonomicznego w Katowicach*, 337.
- Radke, A.M., Dang, M.T., Tan, A. 2020. Using robotic process automation (RPA) to enhance Item master data maintenance process. *LogForum* 16, 1, 129-140.
- Rajesh, K.V.N., Ramesh, K.V.N. Rao, H.N. 2018. Robotic Process Automation: A Death knell to dead-end jobs? *CSI Communications*, 42, 3, 10-14.
- Salimova, T., Guskova, N., Krakovskaya, I., Sirota, E. 2019. From industry 4.0 to society 5.0: Challenges for sustainable competitiveness of Russian industry. In: *IOP Conference Series: Materials Science and Engineering*. IOP Publishing: Bristol, UK, 497, 1, 1-7.
- Sherman, R., Chauhan, V. 2016. Just My (Re-)Imagination. *Supply Chain Management Review*, March/April.
- Sibalija, T., Jovanović, St. Đurić, S.J. 2019. Robotic process automation: overview and opportunities. *International Journal –Advance Quality*, 46, 3-4.
- Szatkowski, K. 2016. *Zarządzanie innowacjami i transferem technologii*. Warszawa: Wydawnictwo Naukowe PWN.
- van der Aalst, Wil, M.P., Bichler, M., Heinzl, A. 2018. Robotic Process Automation. *Business & Information Systems Engineering*, 60, 4, 269-272.
- Vilminko-Heikkinen, R., Pekkola, S. 2017. Master data management and its organizational implementation: An ethnographical study within the public sector. *Journal of Enterprise Information Management*, 30, 3, 54-475.
- Vogt, J. 2021. Where is the human got to go? Artificial intelligence, machine learning, big data, digitalisation, and human-robot interaction in Industry 4.0 and 5.0. *AI and Society*, 1-5.
- Willcocks, L., Lacity, M., Craig, A. 2015. Robotic Process Automation at Xchanging. *The Outsourcing Unit Working Research Paper Series*, 15, 3, 1-26.
- Willcocks, L., Lacity, M., Craig, A. 2017. Robotic Process Automation: Strategic Transformation Lever for Global Business Services? *Journal of Information Technology Teaching Cases*, 7, 1, 17-28.