Social sciences http://doi.org/10.38104/vadyba.2020.2.16

Vadyba
Journal of Management
2020, № 2 (36)
ISSN 1648-7974

ROBOTIC PROCESS AUTOMATION FOR DOCUMENT PROCESSING: A CASE STUDY OF A LOGISTICS SERVICE PROVIDER

Valentas Gružauskas, Diwakaran Ragavan
Lithuania, School of Economics and Business, Kaunas University of Technology

Abstract
Today we discover ourselves in different transformational periods of human history. Significant as the farming and industrial revolutions before it, this digital reconstruction is redefining various characters of contemporary life throughout the world. Artificial intelligence (AI) represents a frequently fundamental role in this transformation. In modern years, AI has become booming over analysis labs to become omnipresent and ambient in people's personal lives to such a great extent that many purchasers do not recognize people use commodities and applications that contain AI daily. All business areas profit immensely from computer vision and robotic process automation, achieving strides in its adoption from customer segments to companies and manufacturing companies. Logistics is beginning its mission to grow an AI-driven business, though this expectation is still rife with difficulties to succeed and possibilities to exploit. In this respect, the integration of robotic process automation and computer vision is a very lately introduced solution to the real world. This research work is an attempt to examine the benefits and improvement in the supply chain service brought up by automated extraction from documents to the database. It also analyses what computer vision (CV) is, and what it means for the organization to convert robotic process automation (RPA). The best practical examples from other industries can be applied to transportation logistics service by implementing CV. The research work also analyses how RPA and CV can be used in transportation logistics to reinvent back office, operational, and customer and employee facing activities. Also, implementation measures and efficiency have been proposed through the RPA enabled process flow diagram, and cost planning. Lastly, an approximate amount of money that the company can save through the implementation of this project is provided, which can give a competitive advantage to the company.

KEY WORDS: Robotic Process Automation, Logistics, Competitiveness.
JEL: O33, L91, M15

Introduction

The transportation and global logistics service is an essential part of business. Even though today's transportation industries have adopted several technologies, their business process is plagued with documents. Documentation is a great component for the transport service operations to achieve greater supply chain management; however, improper business operations can increase costs and waste time in several stages. This research is provided with major pillars based on the information data or document misplacement, the efficiency of robotic process automation, computer vision classification, and capturing the required data from the document. According to the research, the approximate error caused by a manual task of data extraction from document to the company's database can be up to 50% (Mathes, et al., 2017) and the error rate can vary according to the companies' performance. The information data in the system can be mismatched, wrong, or even not found due to manual extraction and integration of documents to the company's file management, etc. In recent years, the adoption of robotic process automation with the transportation logistics companies has achieved more than ever as the technology has been so convenient and affordable. The traditional practice of document workflow throughout the business process operation is no longer going to help in this competitive market and it tends to put the business process in low quality of service, unordered streamline. In order to emphasize and show a better quality of services, the organization may have to implement computer vision (CV), which stimulates the workflow in real-time and reduces the time spent on manual tasks done by an employee. It simplifies processes with robotic process automation (RPA) and the help of optical character recognition (OCR) (Memon, et al. 2020). This equipment has been used with advanced technology software to capture the required data information from the specific document. Then the captured information data can extracted directly to the required field, for example, when a broker sends a rate confirmation document, it can be directly saved to file management together with the accounts payable document to ERP system (Blackman and Vayalapadu, 2020). The methodology used in this publication includes scientific literature analysis and visualization of business process operation through the descriptive observation, which will help to build-up the qualitative study data by the semi-structured interview. The resources used in the research work are from scientific articles and research journals. The aim of the publication is to propose robotic process automation for automatic document processing and to conduct a case study to validate the preposition. To accomplish this aim the following objectives will be completed:

1. To conduct a literature review related to robotic process automation approaches for automatic document processing and propose a framework.
2. To conduct a case study of a logistics service provider.

Theoretical background

RPA is the new perspective of the transportation and logistics industries. Robots are smart engines used in various industries, especially in the automated manufacturing plants. They are not only freeing human activities and setting a standard of advanced skills and techniques to a business process, but they are also a great solution for transportation sectors (Lin, et al., 2018). The intricate business market sets the transportation industry of the supply chain under pressure by delivering a global standard service at a low cost. The combination of RPA and artificial intelligence (AI) replaces the manual process using software robots. AI can be used to learn and make the classification faster by penetrating unorganized data where RPA can function in a structured manner (Boston Consulting Group, 2017). RPA can automate manageable tasks and make AI available to a large data source (Curran, 2017). RPA is not only used in warehouses and production, but also computing together in the logistics administrative office tasks by adding more value to the shipment process. "RPA is the futuristic technology that can be implemented to process automatically in the aspects of high volume or repeatable tasks" (Deutsche Post, 2019). RPA can be related to AI where it is proficient in doing a set of tasks and work segments in an accurate and rapid manner and robotic processes help to solve the problem in the transportation and logistics application area. To remain top in the market, every company needs to invest in new technologies and applications that can increase efficiency and agility in their business process (IEEE Group Concepts in Intelligent Process Automation, 2017). RPA is not just a technology, it allows to understand the business process and break obstacles in global standard business operations (Issac, Muni and Desai, 2018). The transportation company is running a global supply chain in an increasingly evolving and dynamic business environment under immense pressure to serve the highest quality of service at low costs (Evans, 2017), but the operation process in the organization such as accounts, human resources, dispatch, etc. are corrupted with a large number of document-oriented tasks.

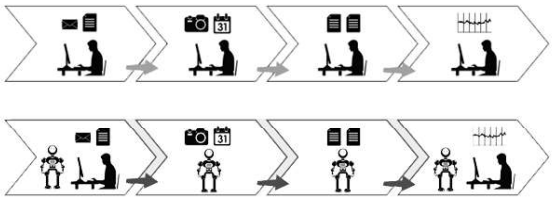

Fig. 1. Comparison of current process and future process with robotic process automation. Source: Ernst & Young 2016.

Figure 1 shows how RPA can support the back-office process in an efficient way, which includes document data sent by email, scanned or copied images. Data checking or collecting process from the respective sources makes the task much simpler, reduces costs and saves time. This sense seems to be adding value to the organization experience effect (Ernst & Young, 2016). In the transportation sector, shipping is considered as the major part of on-time delivery to customers, therefore, it is the focus in supply chain management to make the service more accurate, saving time, reducing cost, compatible with eco-friendly operations. Automatic data extraction was developed and implemented to make the task easier and stressless for the organization. Extraction of data from respective sources of invoices helps the organization to create a better value in the process:

- The computer vision area aims to extract semantic information from the invoice by addressing challenges such as classification of documents, identification of data and processing of the image (Huszár, 2020).
- Current document management can use this technology to boost the detection of time and scan the document and improve the cycle.
- Waiting for the documents to be scanned or slipping out of a defined process can cause loss of receipts or invoices which results in wrong data to be entered. This process of data extraction is precious and prevents an inaccurate operational process of the company.
- By automated data extraction technology, when the correction is needed, the computer does the task and avoids mistakes, reducing costs and increasing quality (Chan and Qi, 2003).

CV makes the systems understand repetitive task outcomes such as document extraction from different sources. Lately, the technology has been used in several industries, including medical sector, and the application has been carried out successfully, the implementation of computer vision to some application has some tremendous outcomes that we can see in the real-world market. OCR is the tool employed to extract data from documents that recognizes characters through an optical mechanism (Marosi, 2007). Optical character recognition (OCR) allows us to detect even handwritten text from the image. CV is a ground-breaking artificial intelligence area that helps computers to recognize and distinguish artifacts and individuals through image detection and deep machine learning. CV is implemented in the global industries such as aircraft, medical transport, and logistics to increase the efficiency of quality checks and to enhance the repetitive tasks. This equipment consists of a new neural network which allows boosting up the analysis and classification of an image object. CV practices the concept of machine learning which is all about reading continuously; the system intends to learn from the present environment and improve this learning design because this brings in further learning and creates unique perspicacity. CV can classify all kind of content in the respective object, where the content parts are interconnected, and usually considers incredibly broad and rapidly growing datasets. Machine learning also allows fraud detection, image classification, customer retention and also helps in business by reducing the manual work, where it gives the big amount of data utilization easily accessible to the stored documents. It helps to solve the mistakes of OCR especially when it fails to function by creating a context around the document. This tool can also scrutinize hand-written and scanned documents, it is designed with the perspective to scan images consisting of various numbers, characters, and letters, and it is compatible with mobile phones. The characters in the document are interpreted through the

uploaded input by a scanner or normal mobile phone camera containing the software (Jasim, et al., 2020). This process is explained below in a simple manner: This helps to capture the item code, description, unit prices, pieces, Bol number and even unstructured data of the documents. An integrated streamline of business process operation is mainly described as how the technology brings value and reduces existing process time for data insertion and how the enterprise can experience the real benefit of this software technology development.

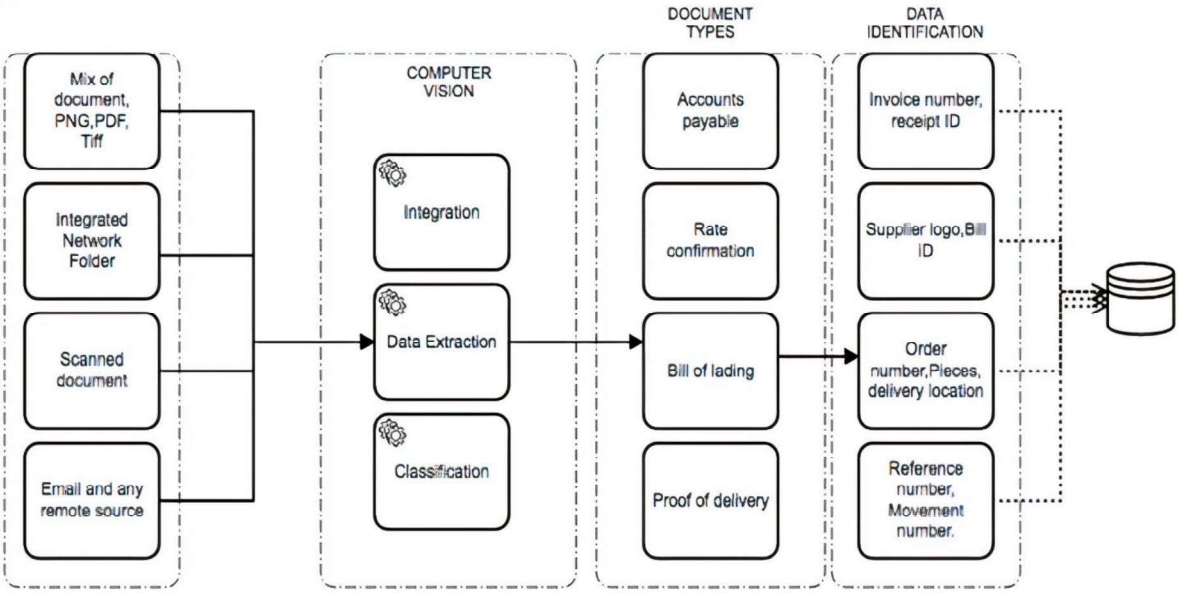

Fig. 2. Computer vision enabled data extraction and integrating to company's file management (designed by author according to Docsumo, 2020)

This streamline development process helps to understand how the data have been retrieved throughout the business process operation from the load confirmation application to the submission of proof of delivery to the customers. In this case, CV can increase the competitive advantages of transportation service. The true value of business process operation is only accomplished when the organization methods become the most desirable and real-time accessible, which can induce dramatic outcomes in the service and decrease employee process time and materials in the company. Automated document workflow is to perform the essence of recognition and retrieve or import data from structured and unstructured document workflow platform or to verification engine. To implement the proposed approach of robotic process automation for document processing, we need to flow a 3-step pattern. Firstly, the organization needs to visualize the business processes by using currently available materials of the company. Secondly, the organization needs to interview to improve the process visualization and better understand the problematic areas, and where it can improve. Lastly, we need to define more precisely the implementation steps, the quantity of work, costs, and potential benefits. Only after completing these steps, the organization can plan the implementation of the project in practice. To validate the preposition, the authors have conducted a case study of UAB Unlimited carrier. The steps are examined according to the existing procedures for their transportation service and workflow.

Research and discussion

Description of the selected logistics service provider

UAB Unlimited Carrier is running a global supply chain in an increasingly evolving and dynamic business environment. The company is under immense pressure to serve the highest quality of service at low costs but the operation process in the organization such as accounts, human resources, dispatch, etc. are corrupted with a large number of monotonous document-oriented tasks. In the current document management process, there are various problems that the employees face in the back-office administration, along with the hectic schedules. The employees face issues in collecting information from the drivers by continuously tracking their movement and simultaneously keeping in touch with the brokers through an email or phone. The monotonous job of scanning documents and uploading them is not only time-consuming but also takes away the productive value that an employee can contribute. Therefore, employees are not able to devote their full time to customers in searching content of these documents, which also stops productivity of the organization and sometimes it can lead to failure of business-critical information, delayed decisions, lack of customer service or maybe risks of penalties. UAB Unlimited carrier is in global transportation and logistics industries where it still relies majorly on paper documents. The main subject turns around computer vision in order to boost up their existing business process operation.

Interview about the transportation process

The respondents of the interview are from UAB Unlimited carrier dispatch, human resources, general accounts, business analytics and accounts departments. These respondents were selected to understand and analyze each framework of document manipulation in the process of transportation service. The study area of the research includes four employees at UAB Unlimited carrier, who have a significant background throughout the business process operation. These 4 employees are the heads of the department and sub-departments, which deal most with the selected processes. Questions asked during the interview were related to the working process operations from the broker to the last step of the loading order, and the company's data updates and document extraction and integration to the database. The workflow has been described into greater detail in the framework of UAB Unlimited carrier major three documentation process and extraction to the database in the below figures with the help of business process modelling notation (BPMN) software. The questions asked in the visualization process table have been integrated with the BPMN workflow process in the results section. BPMN is designed to visualize micro level processes together with data sources, alternative methods such as value chain management focus more on macro level process, thus, BPMN was chosen for this purpose.

Table 1. Summary of interview results

Main challenges	Field of action	Summary of finding
Manual process	Traditional process	The traditional manual process for all types of business document such as-BOL, load confirmation, POD, accounts payable.
	Lack of technology	There is no utilization of technology in identifying fast usable information data.
	Loss of expenditure	The company's expenses are reduced by hiring employees for data extraction and integration
Waiting for data information	Delay in document management	Classification of all document types according to customer subcategory and integration to file management consumes the greatest amount of time in extracting data information from a document
	Less productivity	A less productive process which reduces, time, costs, energy
Human-errors	Mismatching documents	Entering false data information to the company's data base
	Wastage of employee time	Employees are not able to devote their full time to customers due to the excess of processes

Business process modelling for document identification

Shipment documentation is the first documentation process of the company after they receive the load application. As soon as the company gets the load application from the broker, the company must find the time and shipment methods as per request from customers. If they cannot find this information, they send the refusal quotes to the customers, if it is all correct, the load planner will check the requirements for the load. During this process, the load planer decides whether the company can meet the requirements such as temperature control, capacity, etc. If all requirements can be met, the load planner will go to the next step of cost calculation based on the the distances, delivery, and pick up time. Then the load planner confirms the load and assigns a driver and price for the respective load order. At the end of the process, the customer or broker will receive the commercial invoice (load confirmation). The work process consists of several stages. The first stage is the workflow of shipping documentation (load). After load confirmation documentation is created, the following details must be integrated and added to the database along with the scanned copy of the commercial invoice. Afterwards, there is the process of customer documentation (technical vehicle insurance/ bill of lading), followed by a shipment document. The next step is customer documentation process where it plays a vital role. When the load is confirmed, the load planner will check the mode of delivery. If the loaded product is a dairy product or if the product needs to be stored in a certain temperature, the load goes to the refrigerator trailer and the company will have to look if the load needs any kind of specific documents related to insurance or technical documentation for the trailer. If the load is not temperature sensitive, it can be loaded to a dry van. Then the planner goes ahead with the route planning for the delivery and assigns a trailer for the transportation of the load. After all the loads are planned, the dispatch team calls the broker and fixes the appointment time for the pick-up and delivery. Then all the paperwork is given to the driver, and he moves to the truck to pick up the load. We can notice that the driver gets the bill of lading from the pickup location and he tells the information by call or sends it via email. Afterwards, the relevant data must be extracted from the document to the dispatch database. Lastly, process of accounts payable and proof of delivery must be received as well. An example of this process is presented in Figure 3.

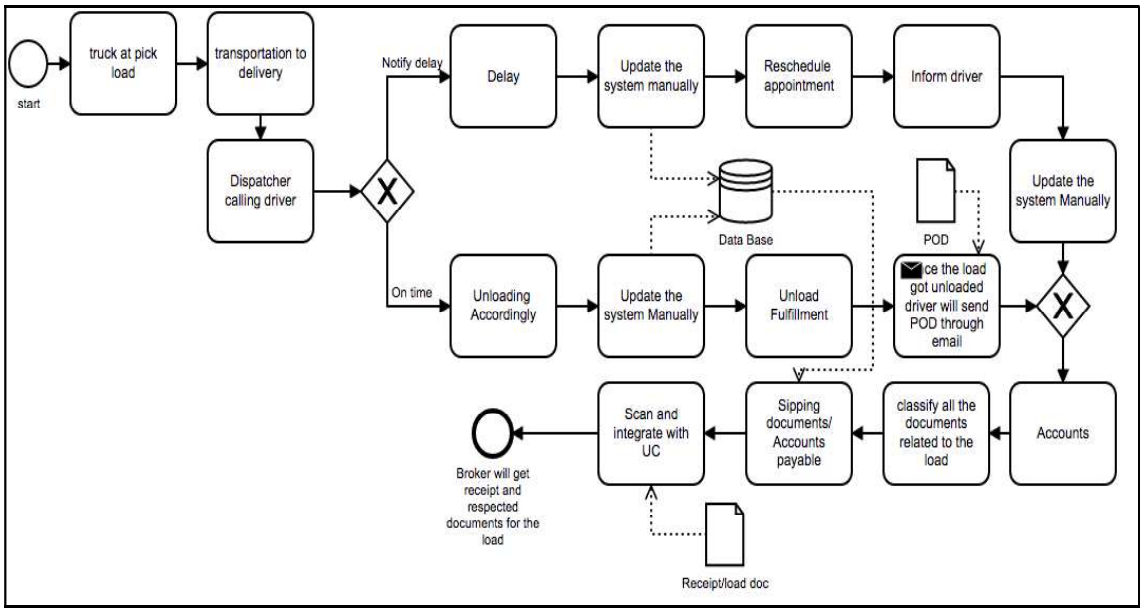

Fig. 3. Process visualization of accounts payable and proof of delivery
Business process model and notation diagram (made by the author)

Figure 3 provides the process of how the company manages documents in the process of transportation from the pick-up point to delivery. After the goods are delivered to the customer, the driver sends a proof of delivery (POD), all documents aligned in the unordered format in the data base are retrieved and classified by the accounts department and finally the company prepares an accounts payable receipt and a proof of delivery that the load has reached the respective destination along with the check-in and check-out time. The major problem here is the whole process of POD submission to the customer since it might be stopped or delayed due to no contact with the driver and at same time the image that the driver sends might be blurred or illegible so that the company will require to wait for the driver to be back to the company's yard. Once after the proof of delivery is submitted by the driver, the following details must be integrated and added to the database alongside with the scanned copy of a POD document.

Calculations of robotic process automation costs and benefits

Based on the proposed theoretical model, process analysis, and interview results, project implementation costs and benefits are evaluated. The following methodology for calculations is used:

$$TQDV = GTO * DPO \quad (1)$$

$$TQDR = GTO * DPO \quad (2)$$

$$GTQD = TQDV + TQDR \quad (3)$$

$$TW = GTQR * PT \quad (4)$$

$$TW = TT * W \quad (5)$$

$$E = EP - NP \quad (6)$$

TQDV - Total quantity of documents for dry van trailer, Units
GTO - Number of grand total orders, Units
DPO - Number of documents per order, Units
TQDR - Total quantity of documents for refrigerator trailer, Units
GTQD - Grand total quantity of documents, Units
TW - Total time spend on documentation, Minutes
PT - Average processing time, Minutes
W - Average wage of the employee, EUR
E - Efficiency, money that the company can save
EP - Existing process expenses
NP - New process expenses

Statistics of monthly orders are retrieved from the company data and the calculations are done according to the methodology. Based on the results of the interview, there are three main documents which must be scanned and integrated to the system, i.e. rate confirmation, bill of lading and proof of delivery. To calculate the total quantity of documents used for a dry van in 3 months:

$$TQDV = GTO * DPO = 10{,}123 * 3 = 30{,}369$$

The total number of documents for a dry van trailer that the company needs to scan and integrate to their file Based on the results of the interview, in terms of the refrigerator trailer, there are 4 main documents which must be scanned and integrated to the system, i.e. rate confirmation, bill of lading, proof of delivery and insurance/technical document for the refrigerator trailer. To calculate the total quantity of documents used for a refrigerator trailer in 3 months:

$$TQDR = GTO * DPO = 2{,}054 * 4 = 8{,}216$$

The total number of documents for a refrigerator trailer that the company needs to scan and integrate to

their file management is 8,216 just for 3 months of their service. To calculate the precise number of documents for 3 months of UAB Unlimited Carrier transportation service, the grand total quantity of documents is

$$GTQD = TQDV + TQDR = 30{,}369 + 8{,}216 = 38{,}585$$

The grand total quantity of documents that the company needs to scan and integrate to their file management is 38,585 documents in just 3 months of their transportation service. A lot of time is wasted during extraction of this huge amount of documents to the company's database. According to the outcomes of the interview, the average time that an employee spends on the particular document is 15 minutes for extraction of a document to the database. The grand total quantity of documents for 3 months is 38,585.

$$TT = GTQR * PT = 38{,}585 * 15 = 578{,}775$$

To change to hours divided by 60 = 578,775/ 60 = 9,646.25 hours

According to the results, the company's employees are spending about 9 646 hours, and this calculation shows only an approximate time spend on insertion of documents. This can vary according to the workload of the company and sometimes the employee can spend up to 3–4 hours in order to receive a clear image of the documents, and here only the preliminary results are given according to the average time of the employee process time based on the interview results. According to the results, the company's employees are spending about 9 646 hours on insertion of documents into the company's database. Let assume the approximate average wage of an employee doing data extraction and insertion is 6 euros per hour at UAB Unlimited carrier. The total wage for 3 months can be calculated according the methodology research formula:

$$TW = TT * W = 9{,}646.25 * 6 = 57{,}876$$

The company spends about 57 876 euros within 3 months, and in order to calculate annual expenses, the amount should be multiplied by 4, which can be about 231 504 euros within a 1 year period. The company loses tremendous amount of money, time and energy, which decreases the efficiency of transportation service.

Preliminary cost calculation for computer vision implementation according to the online review about pricing for the software. This part is essentially made to calculate the efficiency of an approximate amount of money that the company can save. The company maintains 4 000 orders on average throughout the month. Thus, the calculation is done based on 4 000 customized document layout setups. The expenses of the license differ due to different factors. More notably, it depends on the number of documents and required field of data information but approximate price can be up to 38 000 euros per year, the calculation is done based on basic approach. The calculations are preliminary based on the authors' own understanding (According to amazon Rekognition – Pricing - AWS) and the company should contact the providers for detailed cost quote. Preliminary cost calculations for CV implementation at UAB Unlimited carrier are presented in the table below.

Table 2. Preliminary cost calculation according to the authors' understanding

Software and technology	Description	Required amount (Units)	Price per unit (Euros)	Total cost (cost)
The implementation of the software to the company's system setup	Recognition, validation and rule check	1	15,000 €	15,000 €
Customization of document layout to the system	Data classification and extraction Ready to use business data	4000	6.25 €	25,000 €
Licensing for software including service maintenance (Per annum)	Service charge for the enterprise Implementing the process throughout the business process operation	1	38,000 €	38,000 €
Grand total for the investment				78,000 €

Efficiency calculation with CV proposed business process operation. The company spends about 231 504 euros of its existing process operation as per the calculation part. Where the grand total investment for implementing robotic process, operation is only about 78 000 euros per annum. The company can save a tremendous amount of money, time and energy, which tends to increase the efficiency of transportation service and also boost up the company in this competitive global market with the support of advanced technology.

$$E = EP - NP = 231{,}504 - 78{,}000 = 153{,}504$$

Based on the calculations, we can determine that the new proposal process is much more efficient and cheaper in terms of business process operation of the company. By implementing robotic process operation in the document management extraction of information to database, the company can save approximately up to 153 504 euros after the initial investments, while for the following years 38 00 EUR annual costs for software maintenance are required. However, during the implementation period of the project, the costs would increase. After the implementation, the solution not only tends to reduce the costs but also reduces the employee time needed for the tasks or even removes the need of employee for the particular repetitive tasks. Thus, the efficiency of document flow and ready to use business data can add better quality of transportation service in real time. The successful implementation of proposed advanced technology adds up efficiency of document extraction workflow with less manual tasks and errors.

The organization can save a great amount of money with no time waste in the existing business process operation which eventually results in increasing the global logistics transportation service.

Conclusions

Document management in logistics companies is inadequate in technical aspects, which will not be suitable in the new industrial market if the organization strives to stay competitive. It is hard for the employee to manage all the work processes at once. They need to change the document management system to automated data and document classification. The main proposal is for implementation of CV technology in the existing business process operation and a recommended suggestion to avoid the mismatch in a document, delay in decisions, manual data extraction, and integration to the database. RPA can be the potential and recommendation. As described above, manual process problems are seen in the customer information requests about the load order. To solve this issue, RPA can be a potential solution in a progressively dynamic and challenging market environment, businesses running transport logistics are under immense pressure to offer better quality of business process operation at stable or even reduced costs to the customers. RPA can automatically retrieve and integrate PDF files and scanned images from different sources such as email and remotely scanned documents or images sent by drivers, the technology also allows to bind to the cloud platform, utilizing the database server, email client documents as backups, or easily import it to the protected server. An incorporated OCR system enables the retrieval of content from scanned papers or images sent through emails. Enhanced possession-based OCR technologies allow the robotic process automation to explicitly retrieve structured data from the respective document. The integration and uploading paper to the system can be done instantly as the file will be automatically fetched to the file management system; this process might take less than a minute to import data and documents to the company's database. Another advantage is that this retrieved data can be sent to another application such as ERP and Excel, it can be used to make accounts payable and other receipts regarding the load order, and it also reduces the process of creating invoice content since the data are already aligned where they belong. RPA equipment reduces the reputation manual task and also makes the work simple. In other words, RPA equipment is helpful and budget-effective throughout this business process operation, because it is completely operated under the guidance of employees. To successfully implement RPA for document processing, the authors provide a methodology, which focuses on business process analysis, interview and project costs and saving calculations. To validate the methodology, a case study of a selected logistic company is provided. The major disadvantage of UAB Unlimited carrier document inventory is inadequate planning in technology aspects which consumes most of the employee's time and also the work becomes more mechanical because of a lot of information kept as paper, scanned and faxed documents, so employees are not able to devote their full time to customers due to searching content of these documents. This problem also stops productivity of the organization and sometimes it can lead to failure of business-critical information, to delayed decisions and lack of customer service or maybe risks of penalties. The company also needs to utilize every single minute of the employee which helps to build a stronger customer service unit. Document inventory management seems to be the major drawback of the company as it still relies majorly on manual work. CV enabled data extraction and integrating to company's file management is described with the required customization layout setup from document to the computer setup. The efficient way to identify the data information from the document without any mismatching or false integration information to the system. The approximate cost calculations for implementing and required customization setup to the company's system have been presented. Finally, in addition, efficiency calculation with CV proposed business process operation was presented. Based on the interview and result calculations, we can determine that the new proposal to process is much more efficient and cheaper in terms of business process operation of UAB Unlimited carrier. By implementing robotic process operation in the document management extraction of information to database, the company can approximately save up to 151,504 euros. It does only tends to reduce the current existing process costs, but reduces the employee time needed for the tasks or even removes the need of an employee for the repetitive tasks. Thus, the efficiency of document flow and ready to use business data can add better quality to transportation service in real time.

References

Amazon Recognition – Pricing - AWS. Retrieved from: https://aws.amazon.com/rekognition/pricing/?nc=sn&loc=4 (Accessed: 19 May 2020).

Automated invoice scanning & invoice capture software, Docsumo. Retrieved from: https://www.docsumo.com/blog/invoice-scanning/ (Accessed: 19 May 2020).

Blackman, D. H., & Vayalapadu, D. (2020). *U.S. Patent No. 10,776,434*. Washington, DC: U.S. Patent and Trademark Office.

Boston Consulting Group (2017). A comparison of robotic process automation and artificial intelligence. Retrieved from: https://www.bcg.com/publications/2017/technology-digitaloperations-powering-the-service-economy-with-rpa-ai.aspx

Chan, FTS and Qi, HJ. 2003. An innovative performance measurement method for supply chain management. Supply Chain Management: An International Journal, 8(3): 209–223.

Curran, C. (2017). Putting AI to Work in the Enterprise. http://usblogs.pwc.com/emerging-technology/wp-content/uploads/2017/10/Chris-Curran_PwC_AI-Summit-2017-Keynote-3.pd

Deutsche Post, 2019. RPA to office work retrieved from: https://www.dhl.com/global-en/home/insights-and-innovation/thought-leadership/trend-reports/robotics-in-logistics.html

Ernst & Young (2016). A comparison of current back-office processes and future processes assisted with RPA. Retrieved from http://www.ey.com/Publication/vwLUAssets/EY-robotic-

processautomation-for-hr-and-payroll/$FILE/EY-robotic-process-automationfor-hr-and-payroll.pdf.

Evans, J. R., Lindsay, W. M. (2005). The management and control of quality. 6th ed.

Huszár, V. (2020). Application Possibilities of Decentralization and Blockchain Technology Using Computer Vision and Artificial Intelligence in Defense Management, Military and Police Organizations. Honvédségi Szemle–Hungarian Defence Review, 148(1), 4-14.

IEEE Guide for Terms and Concepts in Intelligent Process Automation," in IEEE Std 2755-2017, vol., no., pp.1-16, 28 Sept. 2017 doi: 10.1109/IEEESTD.2017.8070671.

Jasim, Sara, Muneer Al-Mubarak, and Allam Hamdan. "Green Supply Chain Management and Firm's Performance: A Review." In *Joint European-US Workshop on Applications of Invariance in Computer Vision*, pp. 103-111. Springer, Cham, 2020.

Marosi, "Industrial OCR approaches: architecture, algorithms and adaptation techniques", Document Recognition and Retrieval XIV, SPIE Jan 2007, 6500-01.

Mathes, T., Klaßen, P. and Pieper, D. (2017) 'Frequency of data extraction errors and methods to increase data extraction quality: A methodological review', BMC Medical Research Methodology. BioMed Central Ltd., p. 152. doi: 10.1186/s12874-017-0431-4.

Memon, J., Sami, M., Khan, R. A., & Uddin, M. (2020). Handwritten optical character recognition (OCR): a comprehensive systematic literature review (SLR). *IEEE Access*, *8*, 142642-142668.

R. Issac, R. Muni and K. Desai, "Delineated Analysis of Robotic Process Automation Tools," 2018 Second International Conference on Advances in Electronics, Computers and Communications (ICAECC), Bangalore, 2018, pp. 1-5.doi: 10.1109/ICAECC.2018.8479511.

S. C. Lin, L. H. Shih, D. Yang, J. Lin and J. F. Kung, "Apply RPA (Robotic Process Automation) in Semiconductor Smart Manufacturing," 2018 eManufacturing & Design Collaboration Symposium (eMDC), Hsinchu, Taiwan, 2018, pp. 1-3

RECEIVED: 19 October 2020 **ACCEPTED: 1 December 2020**

Dr. Valentas Gružauskas - Assoc. Prof., Kaunas University of Technology, School of Economics and Business, Sustainable Management Scientific Group. Field of scientific research: artificial intelligence, agent-based modelling, business analysis, valuation. Address: Gedimino str. 50-524, LT- 44239 Kaunas, Lithuania, Phone: +370 685 76870, E-mail: valentas.gruzauskas@ktu.lt.

Diwakaran Veeraraghavan - B.sc, Kaunas University of technology, School of Economics and Business, field of scientific research: robotic process automation, logistics, business analysis. Address: Gedimino str. 50-524, LT- 44239 Kaunas, Lithuania, Phone: +370 (621) 19 528, E-mail: diwakardanny25@gmail.com