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Study on the Impact of the Use of No-code Application on Internal Logistics Processes in a Company from the E-Commerce Industry - Process Analysis

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Abstract:

Purpose: *The article aims to deliver the possible methodology of implementing no-code applications, and its possible impact on internal processes with an example from a company in the e-commerce industry, these processes.*
Design/Methodology/Approach: *The study was conducted in a logistics company responsible for comprehensive shipment service. The basic research method was a process study aimed at diagnosing problems occurring at various stages of shipment handling, with a particular focus on the process of parcels acceptance in the warehouse. The results of the study were used for a deeper analysis of individual phases of this process and helped to identify areas for improvement. The last stage of the study was to develop a mobile application solution, with the usage of the no-code platform, which could improve the effectiveness of the analyzed process.*
Findings: *The conducted analysis showed that implementing a simple mobile application and designing a new process which uses it, may contribute not only to reduction of the time spent in the process of parcels acceptance in the warehouse but it also helps to totally reduce the number of paper documents generated in this process.*
Originality/Value: *The carried out research shows that, creating mobile applications using no-code platforms seems to be justified for processes improvement. The implementation of such solutions allows for a relatively quick increase in efficiency or the elimination of current limitations in processes that are crucial for the company. Furthermore, the study shows that the implementation of improvements using no-code application is relatively effective in relation to the time and costs necessary to carry it out.*

Keywords: *AppSheet, business process optimization, BPMN, no-code application, mobile technology, fulfillment.*

JEL codes: *O32, P33, L23.*

Paper Type: *Research study.*

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1. Introduction

E-commerce trade is a common phenomenon almost all over the world. The number of online traders is still growing and more and more traditional stores are turning into online stores. Due to a number of different factors, the practice of outsourcing activities related to logistics has become very popular among online stores, which, next to marketing, plays one of the key roles in the management of an online store (Kawa, 2011). It allows not only to attract new customers (through the availability of goods, various delivery options, and low shipping costs), but also to maintain those who have already placed the order (through timeliness, compliance with the order, no damage) (Kawa, 2014).

The fulfillment operators, which are handling not only warehousing processes, but also the packaging of orders, shipment, and handling of possible returns, strive to guarantee the appropriate quality of logistics, in the era of constantly increasing demand for their services, they face major organizational challenges (Leung, Choy, Siu, Ho Lam, and Lee, 2018). The constantly increasing volume of parcels needed to be handled, with the simultaneous limitations of resource availability (difficult labor market, problems related to the Covid-19 pandemic) causes the need to optimize operational processes taking place in such an enterprise (Nakayama and Yan, 2019).

Therefore, these companies are looking for solutions that can improve their efficiency. The current pace of work additionally makes it difficult to correctly and quickly detect areas with optimization potential and timely implementation of improvements, without excessively involving the operating staff and the IT department.

Recent years have also shown the possibility of quick access to IT tools that do not require writing complex programming code. These tools are low-code or no-code solutions (Dushnitsky and Stroube, 2021).

The implementation of mobile applications based on the aforementioned no-code platforms may be a way to increase efficiency in selected processes or fragments of processes carried out by the enterprise. No-code platforms allow users to build mobile applications without writing complex programming codes. Their assumption is to create an application based on the "drag and drop" of individual elements, and then giving them the appropriate logic of operation (Woo, 2020).

In this article, the authors present the method and effects of implementing a mobile application. The process analysis used in the study was carried out according to the methodology of increasing the efficiency of business processes used in the Łukasiewicz Research Network - Institute of Logistics and Warehousing. The mobile application was created on the Appsheet platform - one of the leading no-code application development platforms (Zavery, 2020).

The article aims to deliver the possible methodology of implementing no-code applications, and its possible impact on internal processes with an example from a company in the e-commerce industry, these processes.

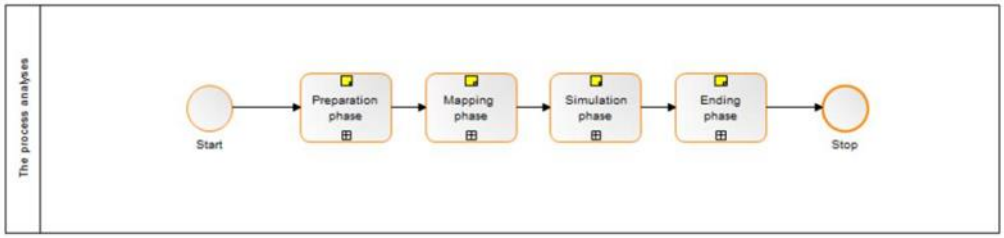
2. Research Methodology

In the research part, the method of process analysis based on a top-down approach was adopted. BPMN 2.0 was chosen as the mapping standard due to its widespread use. This standard is described in ISO/IEC 19510:2013 Information technology - Business Process Model and Notation. The advantages of this notation include:

- user-friendly way of describing the process,
- the ability to model virtually all business processes, regardless of the industry
- specificity,
- common knowledge of the standard symbols in business,
- the possibility of diagnosing unnecessary operations.

The described research was conducted in accordance with the method of increasing the efficiency of business processes (Figure 1).

Figure 1. *Method of increasing the efficiency of business processes.*



Source: *Ragin-Skorecka and Nowak 2017.*

The preparatory phase includes collecting basic information and preparing assumptions on the basis of conducted research. A scenario is built according to the currently running process which will be tested. AS IS scenario includes, among others, information about the number of people working within the examined process, hours of resource availability (working time), determination of process transactions, their quantity and the time when processes will be generated.

The process mapping phase is divided into two parts: AS IS mapping and TO BE mapping. The purpose of AS IS mapping is, on the one hand, to reflect the course of processes in accordance with the practice of their application and on the other hand to prepare conclusions showing the identified discrepancies in relation to the references contained in the arrangements with the process owner. The purpose of TO BE mapping is to illustrate the planned changes and then check their correctness and logic using a process analysis.

The simulation phase is divided into two parts: preparation and simulation of AS IS model and preparation and simulation of TO BE model. The purpose of simulating AS IS model is to verify whether AS IS prepared map reflects the actual state of current process. Completion of the work on AS IS model is verification the maps with the client enables the commencement of the second stage of work. That is the simulation of the target state based on the adopted scenarios of process changes.

The completion phase allows to merge all studies, analyzes and simulations into one report. Only after approval of this stage the results are presented to the client. Searching for potential changes that will increase the efficiency of the process takes place in the mapping and simulation phase. After preparing the current state map of the process (AS IS), it should be parameterized and calibrated on the basis of historical data. KPIs are defined and their values are measured in the current process. At this stage, there are sub-processes that might be improved.

During creating a map of the desired state of a given process (TO BE), it is worth considering how many changes might be made. While stimulating TO BE process, changes should be introduced one by one and tested the effectiveness (referring to previously defined KPIs and their base values). When the obtained effect of simulating the introduction of a single change is positive, the total effectiveness of the proposed changes can be tested. It may turn out that for two or more changes the positive effect disappears (no synergy occurs). The best solution in the given conditions is obtained iteratively when the client considers that he has adequate process efficiency with the assumed use of resources (Ragin-Skorecka and Nowak, 2017).

3. Research Results – Case Study

The process analysis was conducted at the turn of 2019/2020 in an enterprise providing comprehensive logistics services for the e-commerce industry. The challenges faced by the company in the parcel acceptance process were mainly related to the time spent on manual data entry to the system, the number of errors occurring in these activities, and limited access to this data. The excessive and too widespread paper document workflow was noticed in the company. Therefore, in order to solve the problems mentioned above, it was decided to verify the usefulness of the implementation of a mobile application that could contribute to the improvement of the acceptance process. The process of accepting parcels to the warehouse was subjected to a detailed process examination.

It is worth mentioning here what are the main tasks of the warehouse acceptance process (Niemczyk, Kisperska-Moroń, and Krzyżaniak, 2009):

- identification of the received goods,
- qualitative verification of the received goods,
- sorting products according to the commodity group,

- preparing packages according to the method of storing products in a given warehouse.

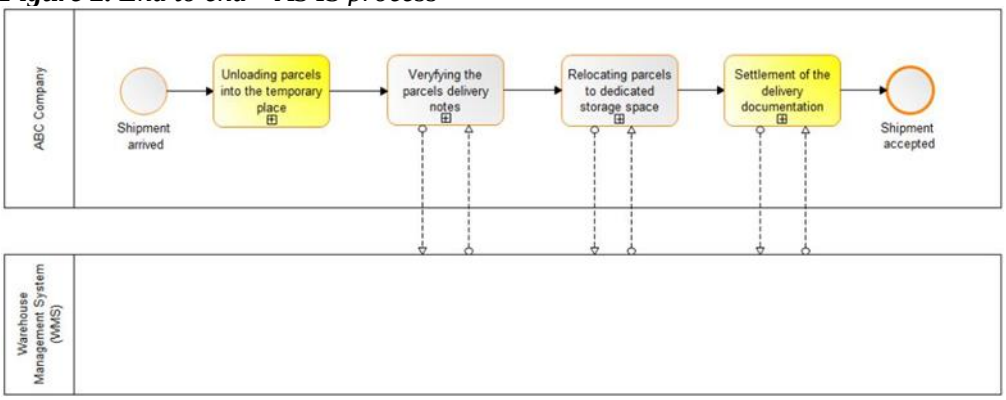
The conducted analysis allows to estimate the effects of the planned implementation of the mobile application and to assess the impact of the planned implementation on the listed problems of the company.

According to the research methodology, in the first phase of the simulation assumptions were defined and basic process data/parameters were obtained. They include:

1. Process transactions: Number of deliveries with packages.
2. Transaction generators: 25 deliveries with packages per week.
3. Business roles:
• warehouse workers,
• 1 security officer.
4. Process service time
• Working days: Monday – Friday,
• Working hours: 8:00 am - 4:00 pm.

In this study, it was decided to adopt a process mapping method based on a top-down approach. The mapping phase started with the identification of the current process of parcels acceptance to the warehouse – End to end – AS IS process - the first part of process mapping (Figure 2).

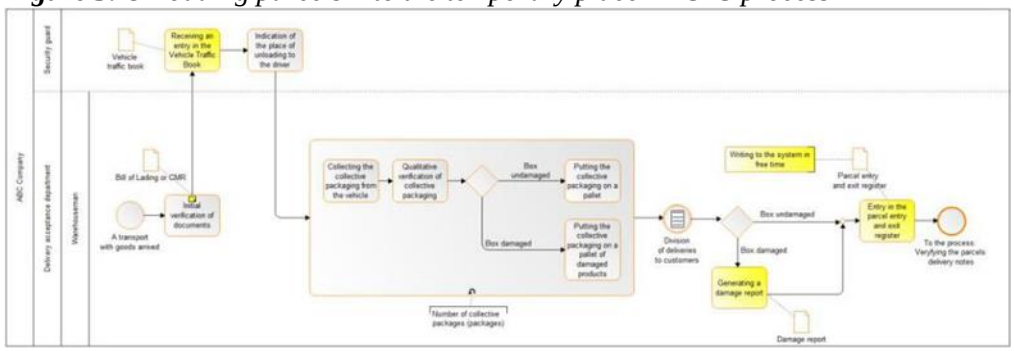
Figure 2. *End to end – AS IS process*



Source: *Own study.*

The currently identified process is as follows: Unloading parcels into temporary place (Figure 3), Verifying the parcels delivery notes (Figure 4), Relocating parcels to dedicated storage space (Figure 5), and settlement of the delivery documentation (Figure 6). The yellow color in the analyzed processes indicates the optimization potential related to the use of mobile technology.

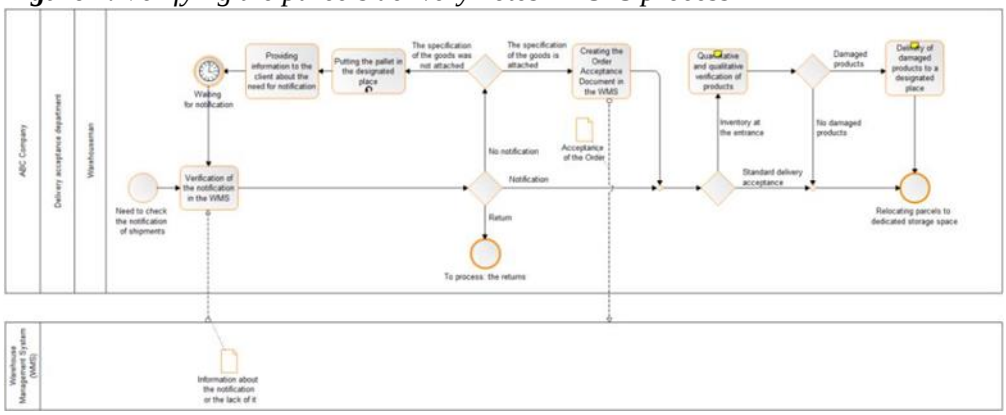
Figure 3. *Unloading parcels into the temporary place – AS IS process*



Source: *Own study.*

The above figure shows the sub-process of unloading parcels from the vehicle and qualitative verification of the received goods. In this process, the following procedural steps (which will be improved in target processes were identified): signing in an entry vehicle traffic register, filling the damage report, and entry in the parcel entry/exit register. All the activities mentioned are made with the use of paper documents. In accordance with the assumptions of the article, these activities will be modified, so that, their implementation could be done using a mobile application.

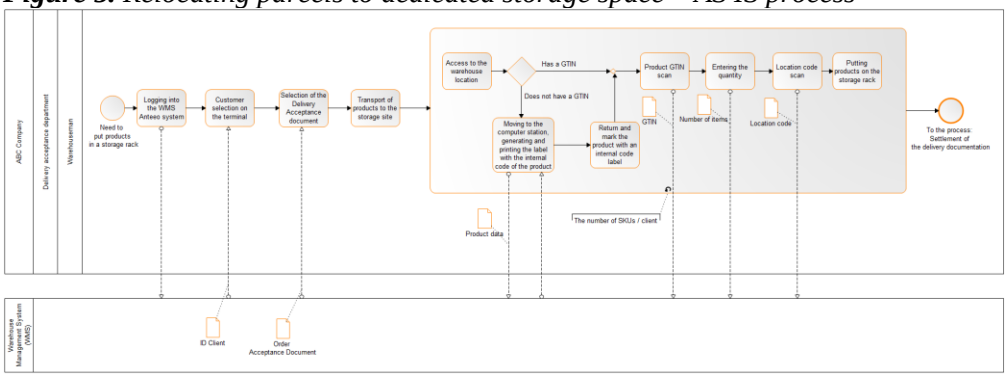
Figure 4. *Verifying the parcels delivery notes – AS IS process*



Source: *Own study.*

The second sub-process (Figure 4) shows the verification of the received parcels delivery note. If the delivery note is sent correctly by the supplier, the process is standardized and its course is relatively simple. However, in a situation where the delivery note has not been sent by the supplier, this process is significantly longer, and its realization needs additional activities explaining the situation.

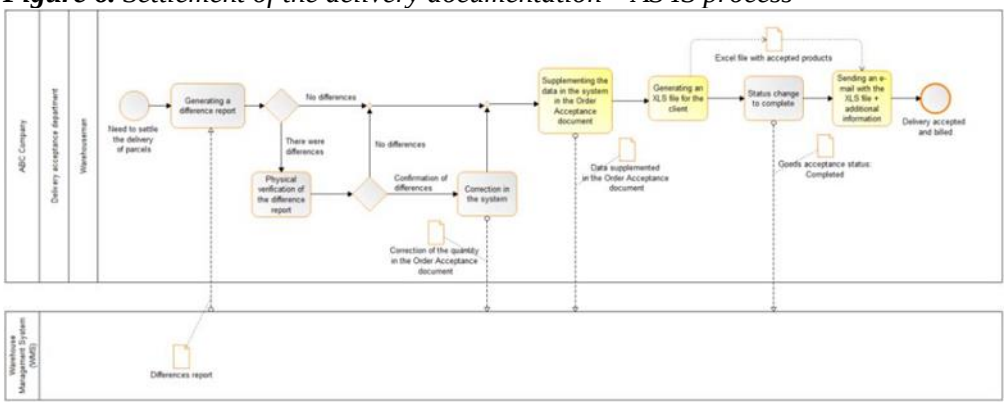
Figure 5. *Relocating parcels to dedicated storage space – AS IS process*



Source: *Own study.*

The next sub-process (Figure 5) shows parcels relocation to the storage place in the warehouse. The analysis of the process showed that it consists of eleven elementary activities. Most of the steps of the analyzed process are done with the support of the WMS (Warehouse Management System). In this process, detailed inventory information (product number, quantity, target location) for each of the products placed on the dedicated storage place is transferred to the system.

Figure 6. *Settlement of the delivery documentation – AS IS process*



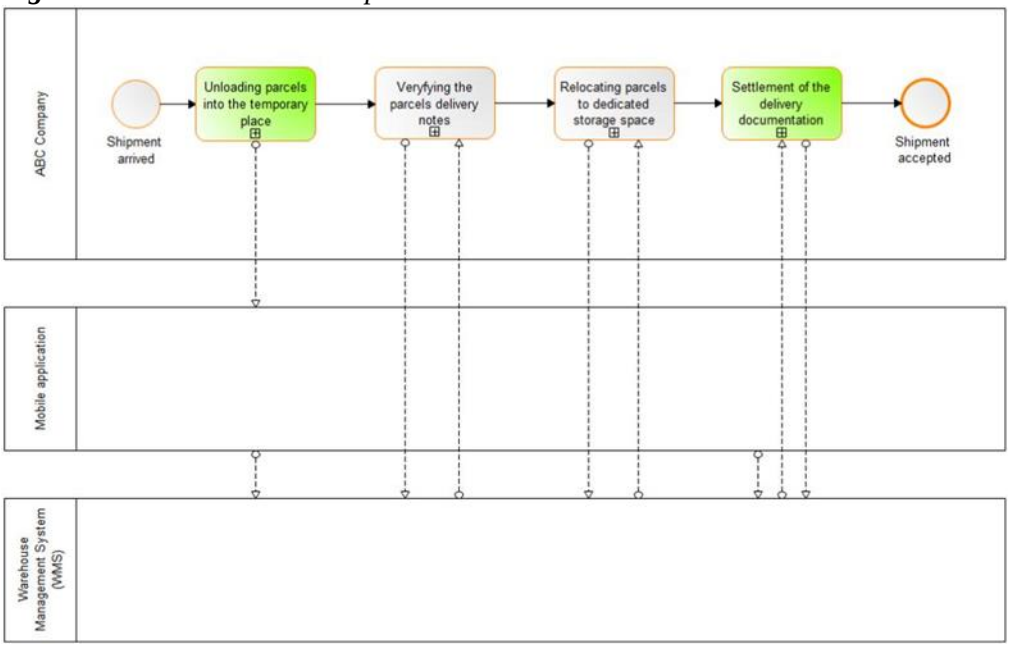
Source: *Own study.*

The last identified sub-process in the AS IS process mapping phase is the sub-process showing the settlement of the delivery documentation. The analysis of the current state has shown that in this process there are activities related to manual data entry into the system (marked in yellow in Figure 6). These activities will be supported in the target process by mobile technologies.

Target process mapping (TO BE) is the second part of the process mapping phase in accordance with the adopted research methodology. In this phase, the processes which in the first part (AS IS process mapping) were indicated as processes with

identified optimization potential were subjected to a detailed analysis. The developed target process of parcels acceptance (end to end – TO BE) is shown in Figure 7. This process also consists of 4 sub-processes. The processes that could be optimized using the mobile application are marked in green. The detailed course of these sub-processes is presented in Figure 8 and Figure 10.

Figure 7. *End to end – TO BE process*

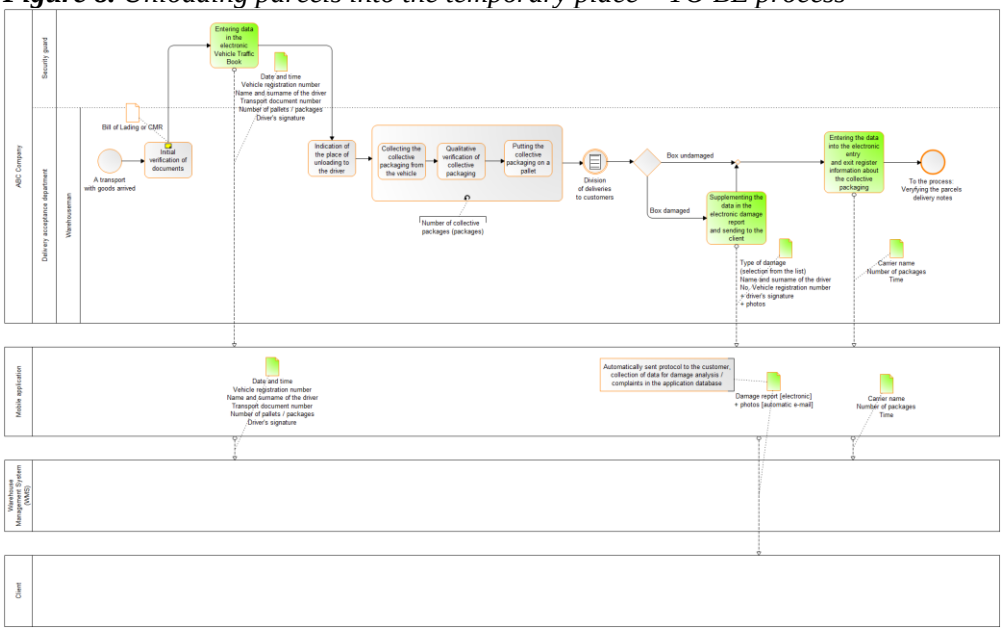


Source: *Own study.*

The target process of unloading parcels to a temporary location is the first of the studied sub-processes (Figure 8), which included the use of a mobile application. In this process, the proposed functionality of the mobile application will allow the elimination of the following paper documents, vehicle traffic book, damage report, and parcel entry/exit register. Figure 9 presents mobile application developed for the analyzed company. Thanks to the digitization of documents, their completion was carried out in a semi-automatic way. Part of the data that is required in the documents could be automatically filled by the app (current date and time) or updated on the basis of previously entered data into the system.

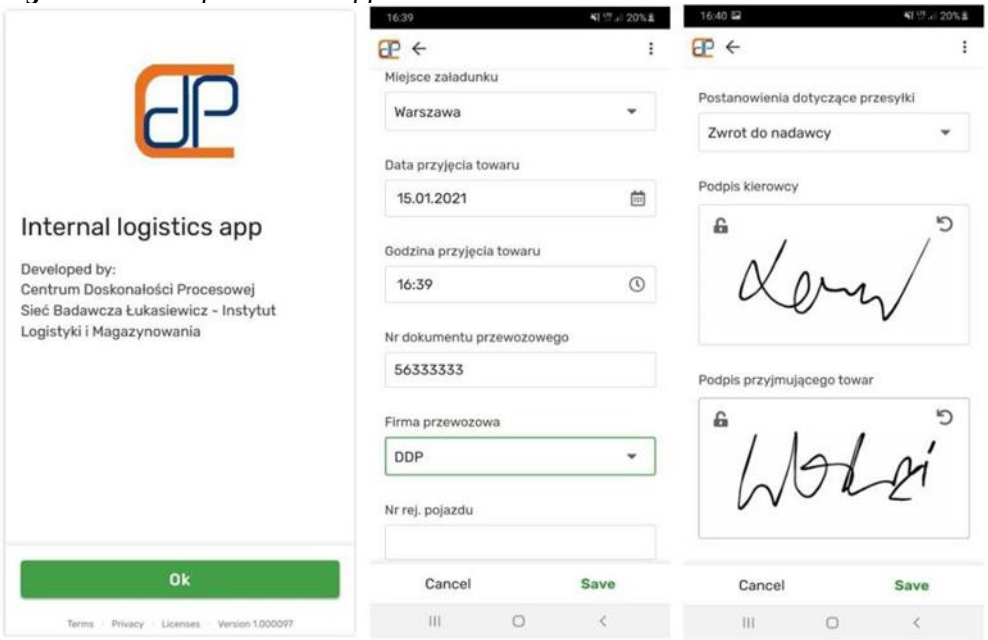
At the final stage of the process of settlement of the delivery documentation, the employees inform the customers (via e-mail) about the resulting inconsistencies. The proposed functionality of the mobile application (automatic sending of a non-compliance report at the time of its creation) would allow reducing the number of emails generated at this stage. In the target process, an e-mail will be sent to the Customer only if there is no information regarding the specification of new products.

Figure 8. *Unloading parcels into the temporary place – TO BE process*



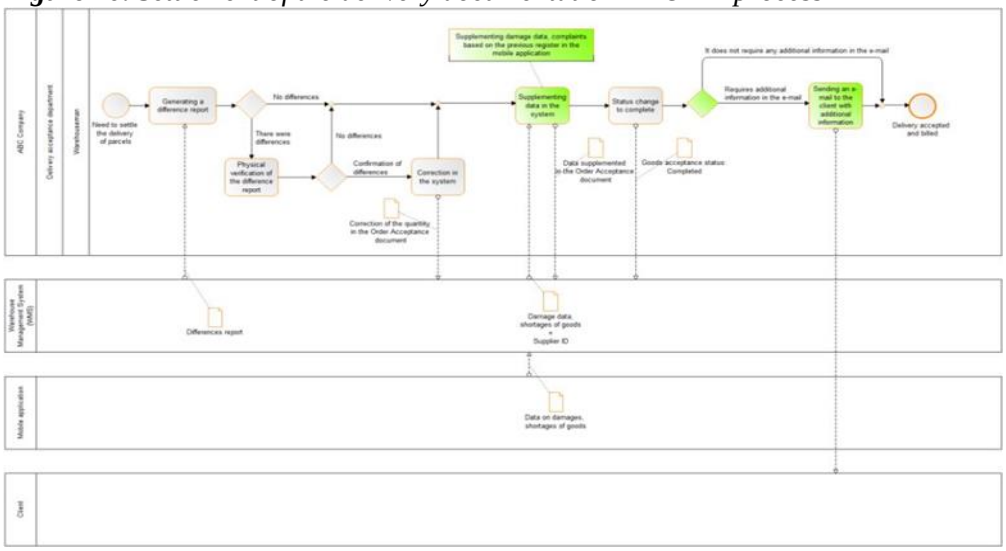
Source: *Own study.*

Figure 9. *Developed mobile application*



Source: *Own study.*

Figure 10. *Settlement of the delivery documentation – TO BE process*



Source: *Own study.*

According to this research methodology, after the development of process maps in the current (AS IS) and target (TO BE) state, the next phase started - process simulation (phase III). The developed process models were simulated in the iGrafx Process for Enterprise Modeling tool, the software complies with the requirements of the BPMN 2.0 standard. Thanks to the simulation of the processes, it was possible to determine the Key Performance Indicators (KPI) of the process of parcels acceptance to the warehouse. In the study, the following KPIs were selected, average working time, total working time - on an annual basis, and the number of generated paper documents - on an annual basis.

The obtained KPI results were used to examine the effectiveness of the currently functioning process and were the basis for assessing the effectiveness of the target concept - with the use of the mobile application. The comparison of the base KPI values with the results obtained on the basis of the developed target processes made it possible to assess whether the recommended changes have a positive impact on the implemented process. The results of the Key Performance Indicators are presented below.

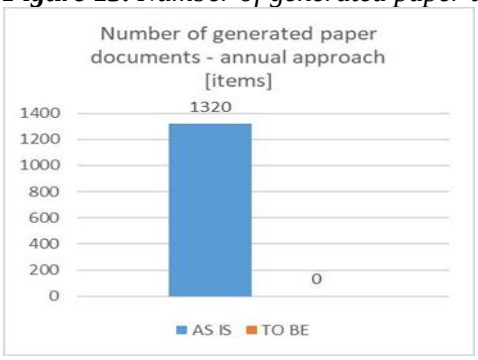
Figure 11. *Average working time*

Source: *Own study.*

Figure 12. *Total working time - annual approach*

Source: *Own study.*

Figure 13. *Number of generated paper documents – annual approach*



Source: *Own study.*

The analysis of the process simulation results showed that it is possible to reduce the average working time needed to accept the parcels into the warehouse from 125 minutes (AS IS process) to 114.7 minutes (TO BE process). Furthermore, it will be also possible to reduce the total annual working time in the target process by as much as 28.4 days compared to the current process. The last process efficiency indicator that was analyzed is the number of generated paper documents. The target process assumes a high level of document digitization. According to the research, thanks to the use of the mobile application, it will be possible to reduce the number of generated paper documents to 0 at the stage of accepting parcels into the warehouse.

4. Conclusions

The conducted analysis showed that developing mobile applications using no-code platforms seems to be justified. The implementation of such solutions allows for a relatively quick increase in efficiency or the elimination of current limitations in processes that are crucial for the company. However, one should remember about proper preparation for such implementation. According to the Theory of Constraints

(Goldratt, 1981), the focus should be on improving those bottlenecks that affect the process the most.

Low implementation costs - free or very cheap open source tools, in comparison to expensive and time-consuming changes in IT systems, are a great incentive to undertake such activities from the company's point of view. These changes also can often be carried out within the resources available in the company, so there is a big potential in an efficient and quick way to implement improvements that may become popular in the future, regardless of industry and field.

The omission or significant limitation of the implementations made by very expensive and hardly available IT resources seems to be one of the certain trends in the coming years. All system changes and IT implementations are based on previously conducted business analyzes. Implementing solutions based on no-code applications also require previous analysis. However, in this case, its time and costs can also be significantly reduced if one uses a set of techniques and good practices resulting from the BPRPM (Business Process Rapid Prototyping Method) methodology.

In the analyzed example, it was possible to demonstrate the savings resulting from such implementation. In addition to reducing indirect expenses - related to the costs of implementing IT changes, a number of savings were identified that were the original target of implementation. The number of paper documents necessary in the process of goods acceptance into the warehouse has been significantly reduced. Not only the paper documents in the process were reduced (which has additional advantages related to the current situation resulting from the Sars-Covid-19 pandemic, which, however, was not the subject of the study), but also additional activities related to them were limited. It caused the reduction of the total time of the process, and helped to avoid redundant archivization of paper documents related to each goods delivery.

Additional benefits resulting from the digitized method of storing and processing information include faster communication with the client when there are discrepancies additional data and its availability for planning and controlling departments, and reduction of errors resulting from illegible or lost paper documents. The conducted research shows, that the proposed methodology of implementation of improvements using the no-code application is relatively effective in relation to the time and costs necessary to carry it out. It also suggests a continuation of the research on this subject in enterprises of a different scale and representing other industries.

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