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Business Process Reengineering – Process Optimization of Boutique Production SME

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ABSTRACT

The aim of research was process optimization of the current process approach of boutique production SME. Consequentially, optimized labour effectiveness, work efficiency, costs, and competitiveness were acquired. Inevitable need for process optimization required an objective party for process snapshot creation to obtain the current process approach. The latter presented the premise for critical analysis and creation of a solution proposal – optimized process approach for the real boutique production SME environment. Premised on standard ISO 9001 and Total Quality Management, process approach enables better insight into business operations through detailed control of processes, and not only can it improve but is a prerequisite for optimization of business management and performance. Implementation and continuous conduction of a process approach represent a fundamental factor of a business's economic stability increase. To be excellent, companies propose, manage, and improve processes in order to fulfil customers' and stakeholders' requirements. The solution proposal was implemented gradually over the course of two years. After this time interval, an analysis of the proposal's implementation was carried out, premised on an assessment scale. It is estimated that the optimized process approach has been implemented in 68%. The latter facilitates achievement of business goals, which yet need to be realized with information technology. The boutique production SME's results have exponentially improved – increased products demand by 8% due to further efficiency, agile order fulfilment and heightened income by 4%, compared amongst previous years and within the implementation time interval. The main purpose of this research is in process reengineering, which exemplifies foundation for IT solutions reengineering for business support.

INTRODUCTION

The business environment inequality for SMEs is an object of many scientific research fields. SMEs have mostly definite characteristics akin to their (limited) size, (low) level of diversification, (low) capital strength, (limited) market, and (higher) risk. Despite all these, and many other, difficulties, the SMEs are known for their: flexibility, since they are efficiently adaptable to new challenges and conditions; (dare we argue) personal customer relations and are in close contact with them; importance for employment economy and surrounding entrepreneurial growth environment (Wach, 2020; Vavrecka et al., 2021; Virglerova et al., 2020).

An important disadvantage of SMEs is the limited access to external financing (bank loans and other forms of external financing), which is caused by the high level of risk of SMEs, as they are generally characterized by a high level of indebtedness and a limited ability to guarantee their obligations. This makes obtaining commercial loans problematic for SMEs (Kljucnikov et al., 2016) because they obtain them on less favourable terms, even assuming that their business plan is feasible and profitable. (Májková, 2012).

The quality of the business environment is vastly determined by various social factors, such as: social ideas about entrepreneurs, the quality of the educational system in the context of business activities, cultural aspects, and the attitudes of the closest environment to the individual's business activities (Kljucnikov et al., 2016; Kot et al., 2018; Onwe et al., 2020). Competitive and market conditions force the company to achieve long-term success by achieving business excellence, and today achieving operational excellence is a requirement for businesses (Wahab et al., 2017).

If the important values of SMEs are achieving customer satisfaction by meeting agreed deadlines, cost optimization, then a small business can be very successful, even though its organization is informal and rarely written down in any organizational documents (EU SME - FIT, 2004). As with grand organizations and corporations, the challenges of the business environment have a great impact on the performance and competitiveness of SMEs (Voronkova et al., 2018; Meyer and Meyer, 2017), which makes it even more important for them to succeed in the business market due to the aforementioned advantages they possess and the opportunities they offer.

Although the number of employees is the most common determining criterion, there is considerable variation in equivalent sources of statistical reporting on SMEs (Voronkova et al., 2018). Various sources define SMEs as having a limited scope of 0 to 250 employees (Ayyagari et al., 2003; Firova & Bikezina 2016). Considering the absence of sufficient number of employees and high demand volume in SMEs, it is very important to optimize internal logistics processes to the possible extent. Such optimization enables the SME to have more efficient production, which then reach customers in a timely manner, at lower costs.

The development of internationally recognized business quality systems is linked to the high technology of the industrial sector (in the field of space technology, aircraft manufacturing and nuclear technology) and their standards. At this point, it is necessary to define the meaning of a standard: “it is a document reached by consensus and confirmed by a verified institution or authority. This document contains instructions or specifications for products, activities, or their results, both for general and repetitive use. [...] Standards are documented, voluntarily agreed agreements that create important criteria for products, services, and processes.” (EU SME – FIT, 2004). Standard ISO 31000 states that a standard “is the basis for deciding on the most appropriate approach for managing an individual risk, it is an aid in the implementation of the principles of risk management” (Jereb, 2014). It can be argued that standards help companies make products and services that serve a purpose and are comparable to the products of competing companies. EU SME – FIT (2004) further states: “The purpose of a standard is to achieve an optimal level of regulation in the market and promote optimal benefits for the community. [...] When products and/or services meet our expectations, we usually don't think about the role they play in increasing quality, safety, reliability, and efficiency. Of course, the cost efficiency achieved by using standards should not be neglected either”.

Organizations struggle with the challenges of bureaucracy, slower responses and the prescription of numerous, sometimes unnecessary, internal instructions, regulations, and forms. Because of this, quick

decisions are almost impossible, as it is necessary to examine good and bad decisions for each one. SMEs are at an advantage in this respect because they can adapt quickly due to clear responsibilities regarding the achievement of customer satisfaction. The biggest and most important advantage for SMEs is the use of Total Quality Management (hereinafter: TQM) and standard ISO 9001, which, as a tool or accessory, enables a more detailed review of the company's operations. This is also considered a competitive advantage that puts SMEs alongside organizations. (EU SME - FIT, 2004)

TQM is a management framework, that refers to management methods used to build long-term success by having all its stakeholders focus on improving quality and enhancing productivity of the business (Inc., n. d.).

TQM is considered as a thorough management approach, which consists of intertwined system of improvement practices, tools, and training in desire to manage a business in ever-changing environment with objective to ensure reduced challenges, increased success, and customer satisfaction through quality (Ali & Johl, 2021; Bhamra et al., 2020; de Souza et al., 2021; Dieste et al., 2021; Haffar et al., 2021; Hsu et al., 2021; Jasti et al., 2021; Jevanesan et al., 2021; Karamouz et al., 2020; Kulenovic et al., 2021; Niñerola et al., 2021; Permana et al., 2021; Sader et al., 2021; Tsou et al., 2021; van Kemenade, 2021; Wemmerlöv, 2021; Zhang et al., 2021). TQM is premised on four paradigms (van Kemenade, 2021): (a) empirical; (b) reflective; (c) reference; and (d) emergence. The latter suggests that TQM consist of soft and hard criteria (Ali & Johl, 2021), where:

- the soft criteria encompass recognition system; customer focus; employee empowerment, involvement, knowledge, and education, training, and learning; environmental uncertainty; human resource management, and teamwork; leadership and top management commitment; operations and process focus; quality assurance; quality information and analysis; strategic quality planning; and zero defects mentality)
- the hard criteria encompass computer-based technologies; continuous improvement and feedback; product and process management and control; quality information; quality management tools and techniques; statistical process control; and technology utilisation.

Continuous process improvement requires the intertwinement of small goals toward the main business objective, which is total quality. Main objectives are accomplished by small, sustainable improvements over a longer time interval. The concept entails a long-term approach, enthusiasm to invest in the present, for benefits of the future. Any SMEs, which is searching for a business approach that is ideal for their environment, must consider adaptation of TQM. The approach can be implemented in various environments, from services and retail, to manufacturing, although measurement of quality will differ. (Inc., n. d.)

Standard ISO 9001 was first published in 1987 by the International Organization for Standardization and is suitable for use in companies and organizations of various sizes, although it was originally implemented by grand organizations (International Organization for Standardization, 2015). Due to development and adaptation, the mentioned standard has also become useful for SMEs, which from the near future are increasingly striving to establish a business system according to the prescribed standard. The advantages of the implementation of the whole standard are well known and also proven, but since adapting the company to the requirements of the standard is quite laborious, requires an extensive financial and time investment, achieving this implementation is very difficult. (EU SME - FIT, 2004)

The ISO 9001:2000 standard specifies in detail the requirements for a quality management model that is useful for internal company evaluation. It provides an assessment that can be used to obtain certifications or to enter new contracts. In addition, it focuses on efficient and high-quality operations in order to satisfy the needs of the company's customers. (EU SME - FIT, 2004)

Processes can be defined as “set of interconnected or interacting activities that convert inputs into outputs” (International Organization for Standardization, 2008), with activities requiring the necessary resources allocation. A generic process subsists of input requirements, which interrelate between themselves through numerous activities and methods, which at last provide the necessary output requirements or in other words: the process result (International Organization for Standardization, 2008). Out-

puts of processes can be and often represent inputs of other processes, which are interrelate throughout the system. Control points (specifics controls and measurement control points; hereinafter: CP) are necessary for processes management and can vary correspondent to the risks associated with the individual process (International Organization for Standardization, 2015).

Standard ISO 9001:2015 is based on seven quality management principles, which are: (a) engagement of people; (b) customer focus; (c) leadership; (d) process approach; (e) improvement; (f) evidence-based decision making; and (g) relationship management. Premised on TQM, eight principles are known: (a) customer focus; (b) leadership; (c) involvement of people; (d) process approach; (e) system approach; (f) continual improvement; (g) factual approach to decision-making; and (h) mutual beneficial supplier relationship.

The main quality management principle of this research is process approach (d), which enables companies to plan their processes, including their interaction. Standard ISO 9001:2015 emboldens the adoption of process approach in stages of developing, implementing, and improving the quality management systems' performance. It also facilitates better insight into companies' operations with accurate and comprehensive control of processes, and it should be a prerequisite of business management and performances' optimization.

Standard ISO 9001:2015 uses a process approach that includes the "plan-do-check-act" cycle (hereinafter: PDCA cycle) and risk-based thinking. The PDCA cycle helps the company to support the company's processes with appropriate resources. In addition, it helps the company to manage and identify opportunities for improvement, based on which the management can take appropriate action. Processes and the entire company system can be managed using the PDCA cycle (International Organization for Standardization, 2015). The latter, along with a general emphasis on risk-based thinking, is intended to prevent undesirable outcomes (International Organization for Standardization, 2015).

Considering the absence of sufficient number of employees and high products demand, the researched SME was futile in attempts to introduce a well-established process approach thus far. In inevitable need of business management improvement and performance optimization with process approach, control over processes is enabled and it can be used for their optimization. Thus, the use of process approach in a quality management system allows perception of input and output requirements with their persistent fulfilment, acclamations of processes in terms of added value, accomplishing successful implementation of optimized, convalescence and processes improvement based on information and data evaluation. Therefore, the SME (and any other company) should establish, implement, maintain, and document a quality management system with continuous development and improvement of its efficiency, in accordance with standards ISO 9001:2015 requirements.

The research was conducted in real environment of a boutique production SME. This paper is organized as: the following chapter introduces the methods that were used in perpetration of this research. The results are presented after, where they are divided into current process approach with the associated solution proposal – optimized process approach, premised on standard ISO 9001 and TQM. In the final chapter of this paper, the assessment of the proposal's implementation is presented with an assessment scale, followed by the conclusion.

1. METHODOLOGY

The research began with specification of a target company, which is a real boutique production SME of plexiglass products. After establishing an objective party of decision-makers and observers, interviews with the CEO and employees of the SME were conducted. The first presidential step was to confine our research on internal processes, which present the SMEs fundamental processes. Researching external SMEs processes would require the cooperation of business partners, stakeholders, and customers, which represents a more complex acquisition and processing of data.

The objective party observed the business operations and determined, that the researched SMEs integral part of the current process approach is a broad palate of simple and complex processes, with various activities within. The objective party thus had to conclude the number and type of processes required

to meet the core business objectives. Thus, the current process approach was divided into fundamental processes, as followed: (a) procurement; (b) demand and supply; (c) custom product production; (d) retail product production; and (e) product handover and sale.

The current business operations were divided into: (a) a snapshot of current process approach, which involve all SMEs fundamental processes, premised on which (b) a critical analysis was conducted.

The snapshot of current process approach enabled to retrieve an objective image of SMEs business operations, that enabled the creation of process organization and optimization. All the latter was possible based on the following:

- identifying critical points, their causes, and consequences;
- obtaining basic data and information for decision-making;
- quick search for solution proposals, which can be implemented promptly;
- elimination or minimization of unnecessary or redundant activities.

The current process approach snapshots are presented as flowcharts, which show the selected processes conduction. Many methods and graphic symbols can be found in the literature to illustrate the different process' parts. For the purposes of our research, we adapted the specified graphic symbols by standard ISO 9001 and limited their number. The following graphic symbols were then used to create processes flowcharts by the selected charting software:

- an ellipse – indicating the process approach beginning and end.
- a dashed ellipse – indicating the process beginning and end.
- an arrow – indicating the direction, and/or input or output requirements into/out of activities or processes.
- a rectangle – indicating studied activities or processes.
- a rhombus – indicating the decision-making points – CPs.

The second part presents critical analysis of the five fundamental processes. The latter was done on the premises of an overview of individual processes activities. This part provided insight into particular internal activities, consequentially revealing potential challenges and obstacles within the individual process. Optimized activities are marked with: (a) dark grey colour where a completely new activity was created; and (b) light grey colour where the existing activity has been given different execution sequence. New and optimized activities have an asterisk next to the execution sequence number. The dominant purpose of critical analysis was to resolve processes optimization.

2. RESULTS

Firstly, the current process approach of the researched SME is presented in the beginning of each sub-chapter. Every company's desire is to stay competitive in the overcrowded business market, especially now when we must deal with the uncertainty of tomorrow. For this purpose, we reviewed the processes current situation and, on the latter's premises, provided a solution proposal, which includes improved and optimized process approach, which are presented in the second part of each sub-chapter.

Acquiring standards and certificates is voluntary and in no way mandatory. However, the advantages and opportunities that arise when following the guidelines and directives of the standards cannot be denied. Since the acquisition of these can represent a considerable financial burden for a SME, which is also a family business, the focus is given on a more cost-effective solution proposal.

When reading the following chapter, it is necessary to consider that improvements are not always a reflection of shortened processes, but of precise, accurate and up-to-date procedures that include detailed activities. As life is not black and white, the composition of processes cannot be simple either. The presentation of seemingly simple processes can only be summed up with the idiom "*the devil is in the details*".

2.1 Procurement process

2.1.1 Current procurement process

The current procurement process in presented with the Figure 1. The procurement process begins with an inspection of warehouse stock of materials, which requires a blank document with a table for the materials inventory, which was created by the CEO. An employee reviews and counts the material in stock and writes it in the table. The completed table represents the starting point for the necessary material orders, as it shows material shortage. The employee then hands over the completed table to the CEO, who reviews the suppliers' offers for the necessary materials, based on the table, and selects the appropriate one. The latter is sent the necessary material order, for which the order confirmation by supplier is needed. The waiting period for the ordered material delivery begins. When the supplier delivers the ordered material, an employee must first check the purchase order issued by the CEO. It states the material type, its quantity and price. This is followed by checking the material – whether the material type, quantity, quality, and price are correct. It has already happened that the supplier delivered the wrong material or that one ordered material type was not delivered. In this event, the reviewing employee must immediately notify the CEO and report the defect to the supplier. The material ordering activities are then repeated – if all the material has arrived and met the criteria (material type, quantity, quality, and price), the reviewing employee must sign the delivery note and accept the invoice from the supplier. The invoice is then submitted to the CEO, who forwards it to the accounting department for payment transfer. The material is then transferred to the warehouse room, where it awaits production.

From the sole beginning, it was possible to observe the long-term and redundant activity, where employees inspect material warehouse stocks on hand. The employee needs a warehouse inventory table, which must be completed whilst inspecting the material stocks and upon completion delivered to the CEO. This activity is ineffective since a lot of valuable time could be used more optimally. Overall, the SME takes the procurement process very seriously. They are aware that without good procurement they cannot maintain a competitive position in the market, so they spend a lot of time reviewing the supply market for plexiglass material. Although the SME does business with a few regular suppliers, they are constantly reviewing other suppliers offers. In the past, one of the regular suppliers had higher prices of plexiglass material than the others – one might think it was because of better material quality. After the comparison, a conclusion was made that both suppliers have the same quality material, except that the permanent supplier raised prices due to the higher demand caused by the COVID-19 pandemic. Thus, the SME changed one of its permanent suppliers, by which they reduced purchasing costs and maintained the same quality.

Delivered material on request is inspected every time it is received. If damaged panels of plexiglass material arrive, they will be rejected, and new ones are ordered immediately. In this event, the cost of damaged material is paid by the supplier, and the delivery time of new material is shorter since the error was made on the supplier’s side. The same procedure occurs in case of wrong material delivery or forgotten delivery of a specific material type. As described, an employee must sign the delivery note upon material receipt – if the material was not suitable, the delivery note is not signed. After material receipt, the latter is transported to the warehouse room of the SMEs premises, where the material stand is installed. The stand has sorted drawers for different plexiglass material types, which differ in thickness and colour. The SME does not own a hefty storage facility, which could be a big advantage.

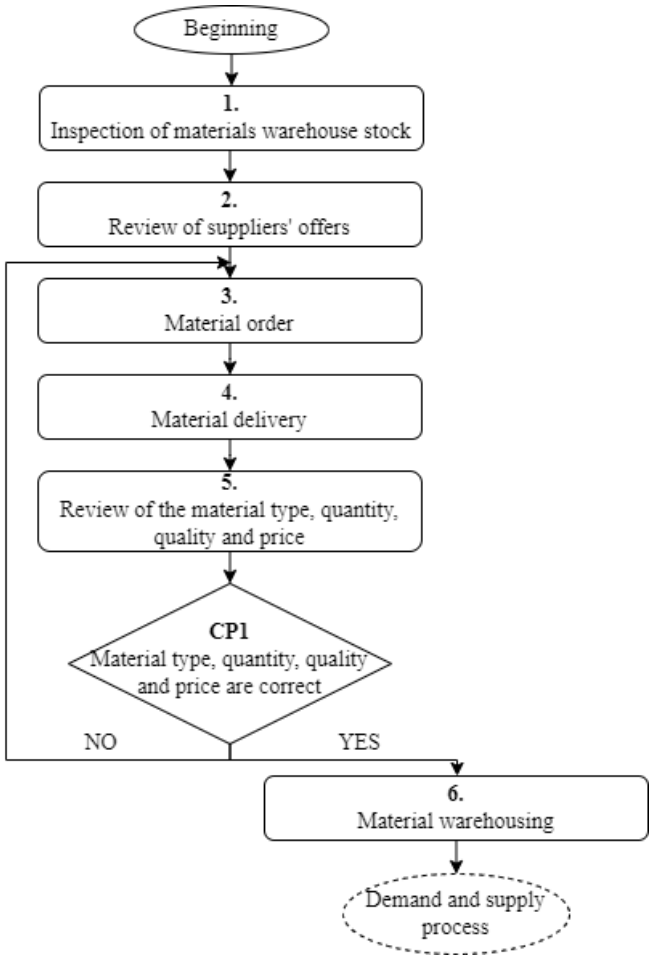

Figure 1. Current procurement process

Source: own

2.1.2 Optimized procurement process

An improved and optimized procurement process flowchart, presented with the Figure 2, eliminates ineffective and redundant activities whilst including optimized activities, which would help with efficiency of SMEs business. The procurement process may seem more complex and extensive, but it includes basic procedures to improve the process.

Proposed optimized procurement process begins in the same way as the current process – with an overview of material stocks. For the first activity (inspection of materials warehouse stock), employees no longer need a document with inventory table, as the first improvement would be the implementation of material recording by a computer system. The procedure would take place when the material is taken directly from the warehouse and / or by issuing an invoice to the customer. As part of this improvement, the implementation of a computerized invoicing system is suggested, which would record the amount of plexiglass material used for a product. The amount of produced waste material would also be recorded in the program – this would not be visible on the customer's invoice. Currently, the SME is issuing delivers notes upon products receipt by customers. Such recording would update the material stocks quantity on an ongoing basis, which eliminates the need to manually review materials stock, enables real-time data and employees' time optimization.

Computerized invoicing system implementation would save space used to store delivery notes, annihilate search time for old invoices and stock inspection (since it would already be in the system). The system would also increase SMEs transparency and reduce environmental impact of paper consumption.

For system's optimized use, it is recommended to purchase at least one tablet which would prevent running around the SMEs premises, as employees cannot carry around stationary computers. Thus, all the necessary data would be at the grasp of hand and entered directly into the system through the tablet, which should support such a system.

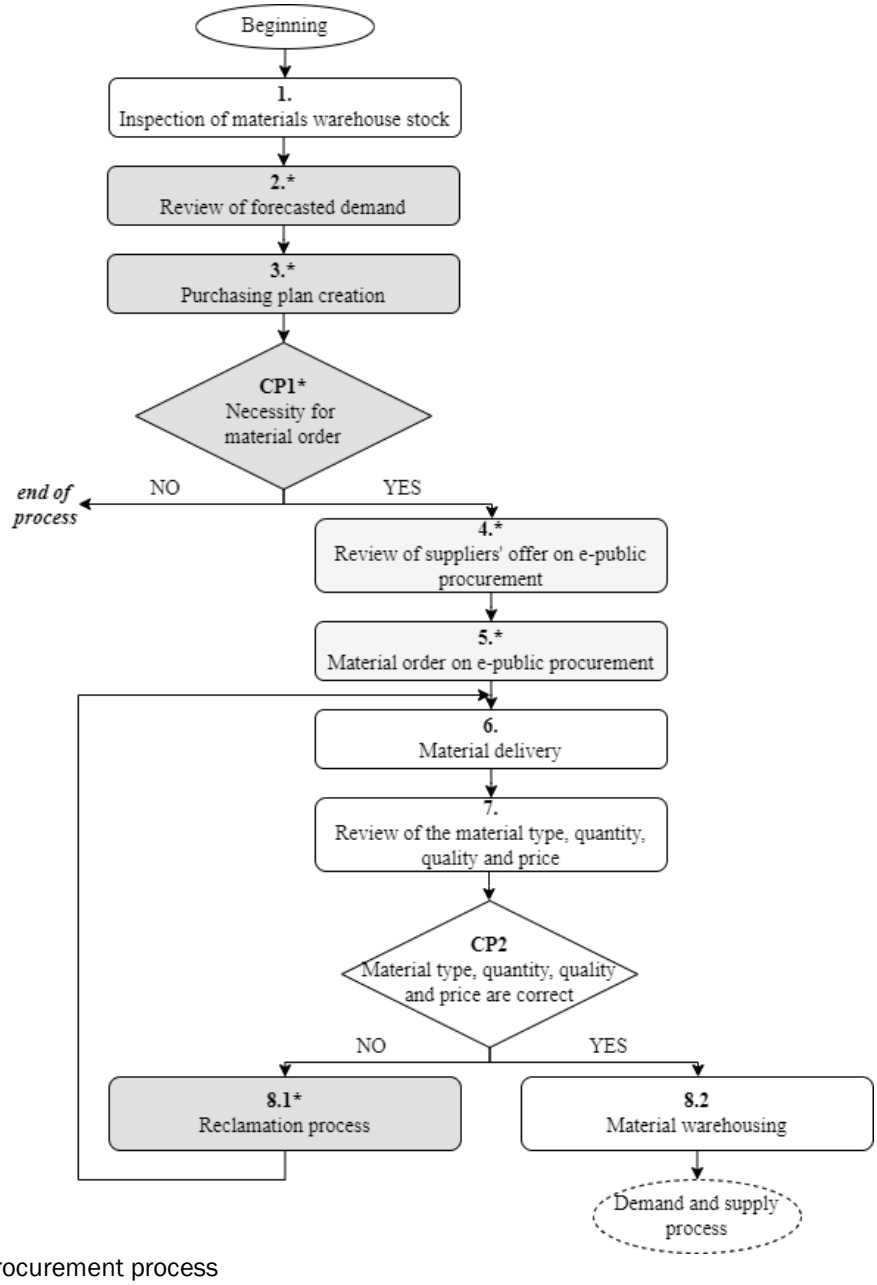

Figure 2. Proposed procurement process

Source: own

Next proposed solution would be the implementation of the Kanban system, which manages lean Just-in-Time production. It was developed to improve production efficiency through the main advantage of the system – setting a permissible stock limit to avoid low or high stock levels (Wallace & Spearman, 2004). The CEO would specify and determine the allowed minimum and maximum materials stock limit as, for example, for transparent plexiglass material at 40% (this material type is used on daily basis), and for non-regular plexiglass material at 10%. When the stock of transparent plexiglass material would reach 40% or less, the system itself would report a shortage through the computer system. An upgrade

would be for the system to communicate the material shortage directly to the supplier, which saves time with the order placement.

As third proposed improvement, but primarily necessary, demand forecasting was suggested. The demand forecast can be calculated based on past sales data. An example of such calculations model is ARIMA, which allows various settings based on the company's needs. The most up-to-date information for future demand can be obtained from massive amounts of data. The more values entered, the more accurate the calculation will be – data for consecutive years, where monthly, weekly, or daily data are entered. Thus, the SME would avoid in-bulk purchases and the material shortage challenges.

In event of non-implementation of material recording computer system, the materials stock reviewing and demand forecasting would be assigned to the CEO, who regulates the necessary materials purchase. Despite the non-implementation of the computer system, implementation of demand forecasting is strongly recommended. Obtained past sales data represent the foundation to prepare and create a purchasing plan, which is one of the most important parts of the company's business plan. The latter specifies the exact material requirement quantities, the calculation of orders number and their cost. At this point, the CEO decides whether a material order is necessary. If not, the procurement process ends here. In event of an affirmative answer, a review of suppliers' offer on e-public procurement website follows. This activity is not imperative with every order, but it is recommended to execute it every few months, since it checks various suppliers offers, which change with time. The use of e-public procurement or e-purchasing is similar process to using consumer goods (Collins, 2012). It starts with browsing the suppliers' websites of the selected material. The comparison and purchase website can be visited to compare prices. The company's material requirements are specified to suppliers on the website, and the process ends with a transaction via electronic payment. This option provides the benefits for managers by helping them communicate with suppliers and potential suppliers, reducing the time of e-mails, costs of purchased goods, and the administrative costs associated with transactions. The process is faster and at the same time encourages better communication.

After the order is placed, the delivery waiting period begins. Upon delivery, the material is inspected as before (or with the help of material recording computer system). If the wrong materials have been delivered, the activity continues in the reclamation process – the CEO and the supplier are informed of the error and re-delivery is needed. If all the material is suitable, the delivery note is signed, the invoice is accepted, and the material is warehoused until use.

2.2 Demand and supply process

2.2.1 Current demand and supply process

A formidable procurement process is insignificant if there is no market demand for plexiglass products. Thus, the following process, demand, and supply, is of ample significance for the successful SMEs business operation.

The responsibility of demand reviewing and offer preparing lies with the CEO. Certain requests or offers can also be regulated by employees (in this event, it is about special kind of demands or customers). Correspondence with customers can take place in physical form or online form (via phone or email). Premised on the reviewed demand, an offer is then made, which must contain specifications about material type, necessary quantity, (estimated) product production time, and price. The latter is consistent of labour and material costs. The formal product production time is 14 days, depending on the season.

Before confirmation of the offer, the receiving customer can suggest corrections or changes for the demand, thus continuing in the offer re-making activity. In this event, the customer is obliged to provide corrected information and/or data, as are product's physical characteristics (e.g., thickness, colour, measurements). The customer can also not agree with the prepared offer and/or corrections are not an option, whereas the said business is then terminated. After offer confirmation, the customer is obliged to provide an order form with information about the order and personal information.

Upon order receipt, the CEO reviews the customers information to conduct whether they are a regular customer or if the order is minor. If the customer is new (not a regular customer) or if the order is in bulk, a pro forma invoice is necessary. The identity of the payment receipt must be verified upon receipt of the pro forma invoice payment. After, the SME can issue the order confirmation. In case of a regular customer, or minor order, the pro forma invoice and proof of payment activities are superfluous. It must be stated, that this action has caused some challenges in the past for the said SME (which is disclosed in the optimized process). Based on the order and the order form, a work order is created for the purposes of product production. The activities then continue in the next process. The current demand and supply process in presented with the Figure 3.

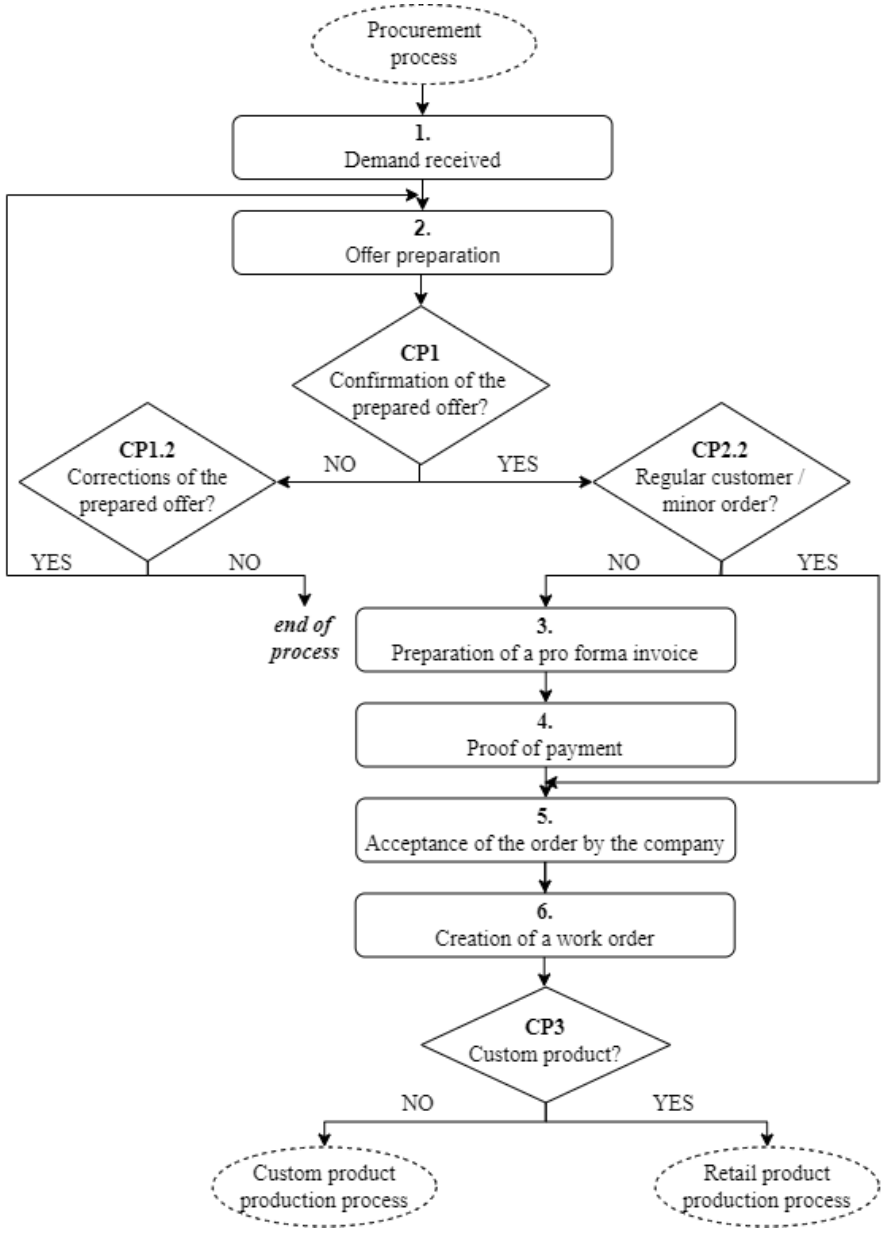

Figure 3. Current demand and supply process flowchart

Source: own

2.2.2 Optimized demand, supply, and sales process

Optimized version of lastly disclosed process has been enhanced into demand, supply, and sales process, which takes place in the last current process. The improvement was done on the premise of appeared challenges in events of non-payment and product non-acceptance. Despite of the well-known mantra "customer is king", such customer irresponsibility must be eradicated. The initial activities thus remain the same as before, introduced improvements are found towards the end of the process.

Figure 4. Optimized demand, supply, and sales process

Source: own

After receiving customer's demand, an offer is made and forwarded to the customer. After order confirmation by the customer, they must state the expected product production time. As aforementioned, the formal product production time is 14 days. The time interval for product completion depends on products' production complexity. When customers abide impatience, they can demand the product within few days, or even the same day, which leads to overtime for the employees. Occasionally customers, despite

the time-bound demand, do not pick up the product for weeks. The first improvement correlates to this challenge: upon time-bound demand, the customer has to be inclined to meritorious payment. Three conceivable propositions were made for time-bound demands (where the customer must firstly agree with the set payment):

- product production time is maximum one week – the product costs rise up to 10%;
- product production time is one day – the product costs rise up to 40%;
- product production time is over two weeks – the product costs rise from 5 to 10%.

As next improvement here, we introduce the payment of a pro forma invoice for all customers. Thus, the SME would no longer have problems with defaulters or unclaimed finished products, as the product production would start only in case of a settled pro forma invoice.

The demand revision and offer preparation should be the CEOs domain, and employees would focus solely on products production. Only in the event of at least one new employment position, the demand and offer activities could be arranged by an employee. The optimized demand and supply process in presented with the Figure 4.

2.3 Product production process

The extent of the production process necessitated a division into two segments: process of custom product production, and process of retail product production.

2.3.1 Current custom product production process

The first mentioned process begins with a meeting where the CEO presents formed work orders and distributes them among employees. Together they determine the work process – which work assignments take precedence, which are necessary for immediate production, which are more or less complex in nature. They must also consider the work assignments they have received in previous days and have not yet been completed. This way of working seems commendable, as few company managers work closely with employees in a way that takes their opinions into account in the work process. Perhaps the atmosphere in the SME is more “friendly”, as it is a family business that does not have a substantial number of employees, so the team can be more cohesive.

It is also necessary to determine whether a software scheme (e.g., a plan required for an automated processing of semi-finished products on a laser or CNC machine) is required for the product production (e.g., the ordered product is a square, the software scheme for which computer drawing contains each side of the square and is then cut by a laser from plexiglass plate). Complications can occur here, as all products that require a software scheme are taken care of by an employee, who has been appropriately trained for it during their education. This means he has to cease his work and create a software scheme for a co-worker’s product. They try to mend the situation by making all the software schemes in the morning, which means that an employee cannot continue working on their products. If there is a need for a software scheme, the employee creates it and uploads it on the device on which it is needed. If the order for the product arrived with the attached software scheme, the process continues in the activity of preparing the necessary material.

Next activity is preparation of necessary materials, which is done by an employee, who prepares the materials for himself, possibly also for co-workers. He must first check if the material is in stock in the inventory table. This can be a time-consuming process as the table is printed on a sheet that can misplaced quickly. The employee must find the necessary material in the warehouse room and deliver it to the right workplace. Due to the relatively modern technology, they can process semi-finished products in different ways, depending on the needs of the final product. Methods of processing include:

- processing on a CNC machine (milling);
- laser cutting and / or engraving;

– mechanical or thermal bending (method used depends on the material);
– diamond grinding;
– thermal or manual polishing;
– manual milling with milling machines;
– joining or gluing a broad number of semi-finished products.

The products quality is inspected after each activity by the responsible employee, which is not included in the flowchart, as the same CP would be repeated constantly. The damages and irregularities must be noticed prematurely in order to reduce labour, material, and time costs with the immediate reproduction process. Such quality control is commendable and exhibits exceptional operations quality significance.

Every completed product is protected with foil and then packaged for protection from various external influences. The latter must be done since the materials protective foils are removed. Packaged products are lastly transported to the customer handover point. The current custom product production process in presented with the Figure 5.

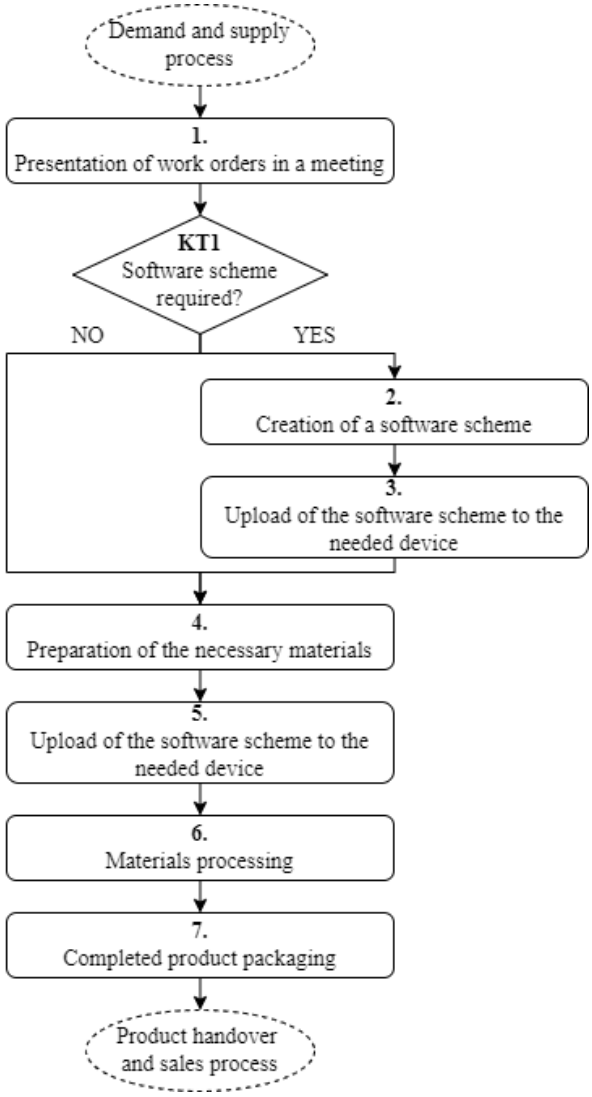

Figure 5. Current custom product production process

Source: own

2.3.2 Current retail product production process

The current retail product production process in presented with the Figure 6. Retail includes products for the purpose of mass sale (e.g., racks for sheets or drawers, coasters, and document boxes, and whole or cut and optionally processed plexiglass panels). The retail product production process is in some respects similar to the previous process - the first activity is too a meeting between CEO and employees, but it is followed by inventory inspection. If the product is in stock, the retail process is completed as there is no need for intermediate activities. Similarly, if the customer wants to buy a semi-finished product on site – in the event that only a cut plexiglass plate required.

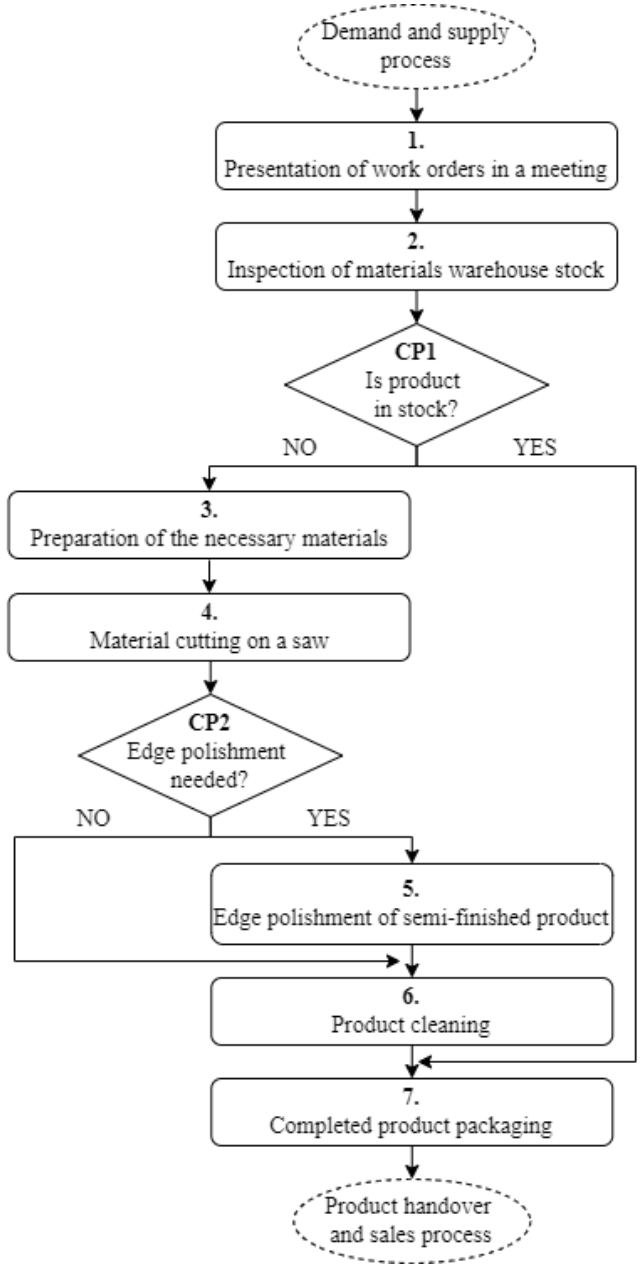

Figure 6. Current retail product production process

Source: own

If the product is not in stock, the activity from the previous process is repeated (e.g., the preparation of the necessary material, followed by material cutting). Then the employee must check on the work or-

der if additional edge processing is required. This is done when a semi-finished product is ordered, where the edges must not be sharp or rough. The latter properties are eliminated by means of thermal or manual polishing. Manual polishing also includes manual products cleaning with a special liquid, which can be a very time-consuming process. Especially in case of bulk product quantities and if these products have a print on them, which is done with special paints for plexiglass material and are very sensitive to manual cleaning. Employees check the semi-finished products quality after each completed activity, which we did not include in the flowchart. As with the previous process, severely damaged products need to be rebuilt. Therefore, accuracy is a very highly valued virtue in this SME.

The final product is formed from the semi-finished product, which is cleaned with air during the last activity. The latter is needed for every product, since each plexiglass plate that needs cutting activity, is left with minor waste particles that need to be removed. Since every plexiglass plate has protective foil on, there is no need for packaging activity. The finished product is transported to the pick-up point, thus completing the process of retail product production.

2.3.3 Optimized product production process

Tangible and visible optimization of production processes are superfluous at present time. Despite, intangible improvements are necessary in both overall production processes, such as new workplaces and employments, in general and business specific employee training courses, enhancement of machinery with equipment layout optimization, and modern hardware investments.

The number of SMEs employees is minor – to be more specific, three, including the CEO. The optimization of worktime for such minor employee number, considering the extensive workload, is extremely complex but essential. Thus, at least two new employments would be required to maximally optimize the production and work process in general.

General and business specific employee training courses are required for smooth production process flow (e.g., sage of specific programs and software, preparation, and creation of software schemes), which would consequentially relieve employees, as they would optimize time used for individual tasks due to the acquired knowledge.

Equipment and machinery layout optimization is also desired. The proposition is to organize the hardware in the sequence it is most often used during production processes.

Lastly, modern hardware and technology investments are essential for the competitiveness and optimized business management. Purchase of new, modern machinery and equipment would enable facilitation of the work process, as performing manual tasks would become superfluous. The aforementioned improvement would reduce production time, consequentially reducing labour costs and enabling additional time for other, more prominent work assignments.

2.4 Product handover and sales process

2.4.1 Current product handover and sales process

The current product handover and sales process in presented with the Figure 7. Production processes collide in the beginning of the last fundamental process – product handover and sales process. The CEO or employee must inform the customer about the finished product they have ordered. Product demands often do not include an entire plexiglass panel, which can result in the still usable panel parts becoming waste material. Individual panel parts or pieces are partially included in the material per square meter price, which does not reimburse the full cost of waste. Occasionally, customers desire products, that are panel parts or pieces, where the product price has to be lower than the prescribed material per square meter price. The SME attempts to produce as little of waste material as possible, showing favourable interest in waste material management, reducing material ordering and disposal costs, whilst contributing to revenue and income at the expense of waste.

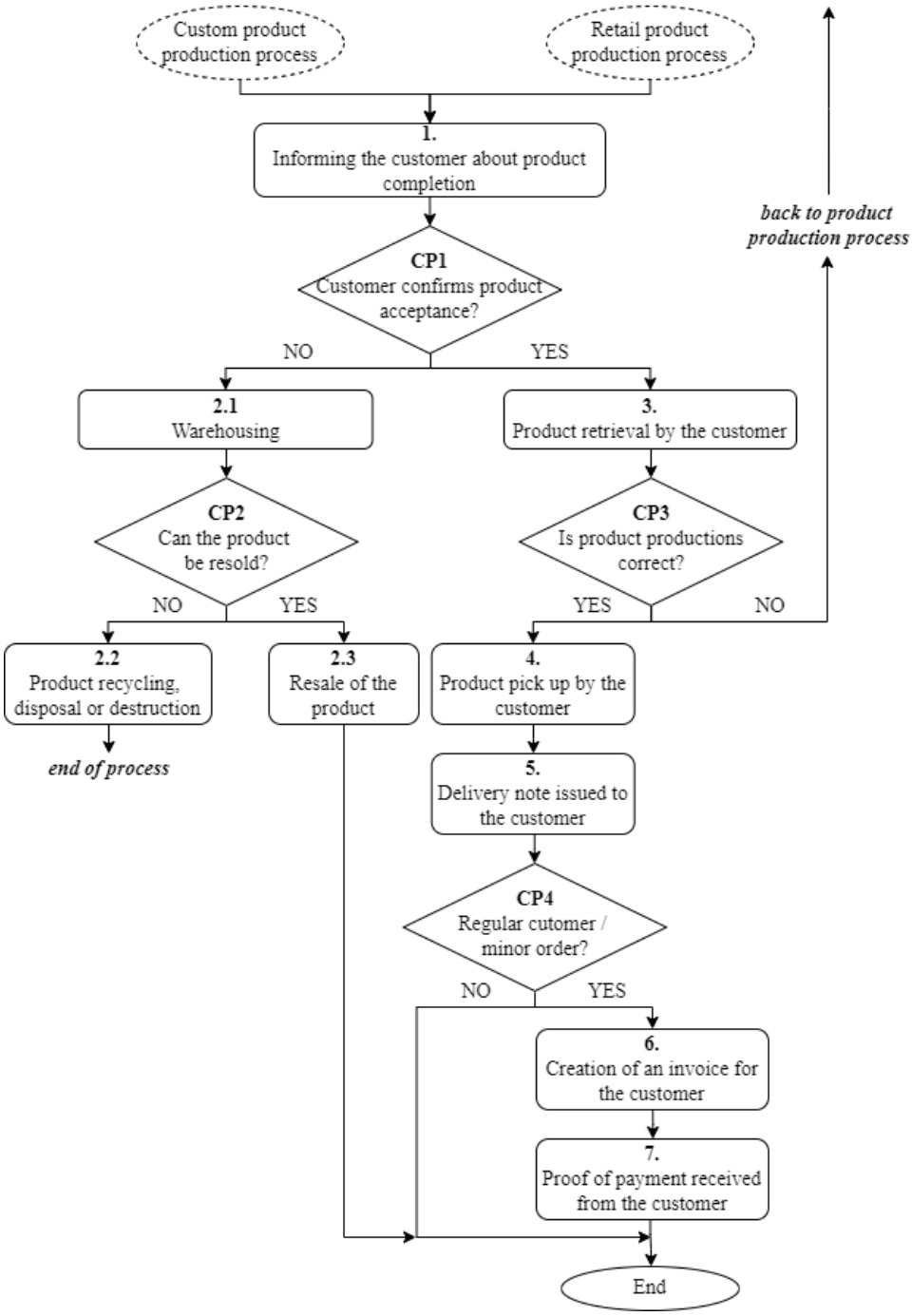

Figure 7. Current product handover and sales process

Source: own

Upon product completion, the customer is informed and is required to pick up the completed product. In rare cases, the customer does not decide to take over the product for various reasons (e.g., customer goes bankrupt at the product production time, or they forget about the order and no longer need it). In this event, the product is placed in the warehouse room. The CEO then has two options: either try to re-sell the product or dispose it. Retail products are easier to sell than custom products, as the latter have been made according to specific information for a specific customer and use purpose. The customers' obligation of product payment is not always achievable; for negligible amounts the initiation of legal proceeding is not worth. Such products are eligible to be resold, if possible, or they are recycled, disposed,

or destroyed. In the event of a minor order or a regular customer, the latter is obliged to pay for the product that he ordered but did not accept. If the customer confirms the acceptance, the correctness product production must be reviewed by the customer upon product retrieval. In the event of errors or irregularities, the perpetrator must be determined – the customer with faulty design or the SME. Customers tend to send wrong documents or files with incorrect measurements, information, and data about the desired product, which results in the product incapability to meet expectations or is unusable for the original purposes. In this event, the products manufacturing cost is borne by the customer, otherwise the SME. Improperly manufactured product is sent back to production, where, if possible, is repaired or rebuilt, upon submission of correct plans. In the event of its own fault, the SME makes every effort to ensure the product is manufactured correctly in the shortest possible time.

When the product meets the criteria and expectations, the customer can accept it. The data from order form and work order are then transcribed on the delivery note, issued to the customer. One copy of the delivery note, the order form and the work order must be submitted to the accounting department by the SME. At this point, it is necessary to check whether the order was for a regular customer or a minor order. The accounting department then creates an invoice, which is sends to the customer. The latter must provide the proof of payment to the SME, which is verified and processed by the accounting department. If the product was ordered by a random customer or if it was an order in bulk, the last two activities are skipped, as the proforma invoice has been settled. In the time interval of last two years, the SME established that business operation, premised on product production without previously settled pro forma invoice is not always successful. If the customer does not want to accept the product, the SME would be protected in of the pro forma invoice payment. At this point, the process of product handover and sale ends, thus ending the SMEs current process approach.

2.4.2 Optimized products handover process

The second presented process has integrated with the sales process, enhancing this to be optimized products handover process. The process begins after the product production processes is completed and the customer must be notified of the finished product. In the event of product non-accept, the latter is stored in the SMEs warehouse room until possible resale, thus completing the product handover process. Otherwise, the introduced renewed activity would include product recycling option. This could be done via an external service provider (3PL) or a supplier, which recycles such materials. The non-accepted products would be recycled and reused, consequentially leading to material costs reduction, along with negative environmental impacts of improperly discarded products.

When the customer picks up the completed product, the delivery note challenge currently occur. Recording inventory amount by issuing an invoice was already proposed. The latter should be enhanced with a computerized invoicing system, which records plexiglass quantity usage. Such system enables: (a) inventory updates in real-time, whereas manual inventory checks are redundant; (b) up-to-date data with corresponding information; and (c) time optimization. Three copies of delivery notes are currently issued by the SME: for the customer, for the SME, and for accounting department. A computerized invoicing system would firstly enable cloud storage of issued delivery notes, shortened search time for previous delivery notes, increased transparency, and reduction of paper consumption and environmental impact. Optimized product handover process simplifies current long-winded invoicing system. Thus, in the optimized process of product handover the customer would receive only product receipt upon product pick up. The optimized product handover process in presented with the Figure 8.

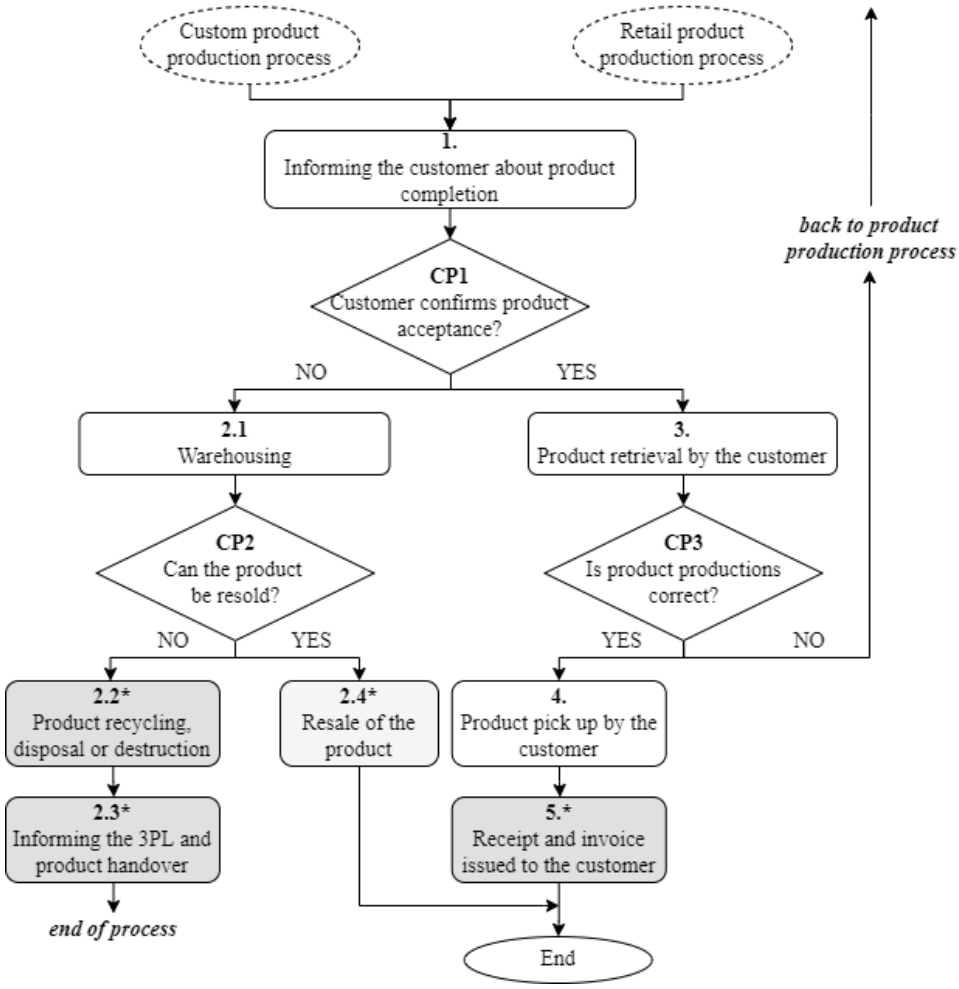

Figure 8. Optimized product handover process

Source: own

2.5 Proposed online retail product sales process

The proposed online retail product sales process in presented with the Figure 9. The SME has its own website and social media profiles, where it regularly notifies its customers about retail products. To this end, we have created a new process that could be introduced into the SMEs business – the online retail product sale process. The SME has a partially implemented online sales process for custom products, but not for retail products.

When visiting the website and wanting to purchase a product, the customers would be able to choose between a retail product or a portion of plexiglass panel. In the first case, they could choose the desired product, which must be in stock. In the second case, a window would open on the website, where the customer should specify: material type (thickness), material colour (according to the available colour scale), dimension specification (length and width of the piece) and whether additional edge treatment is required. For the material type, we would recommend a legend construction, where each material type would be state and briefly described. The prices of plexiglass (per square meter) should also be entered on the website so that customers are immediately notified of the order cost. The latter would also depend on the product production time and the method of product handover. After the order is placed, the customer would have to pay for the ordered product.

Upon order receipt, the CEO would check whether the product cost has been paid – so the SME is protected from frivolous customers and material loss. After received payment, CEO would check whether

the order was placed for a plexiglass panel. If so, four retail activities are repeated (marked as RP3, RP4, RPCP2, RP5 and RP6).

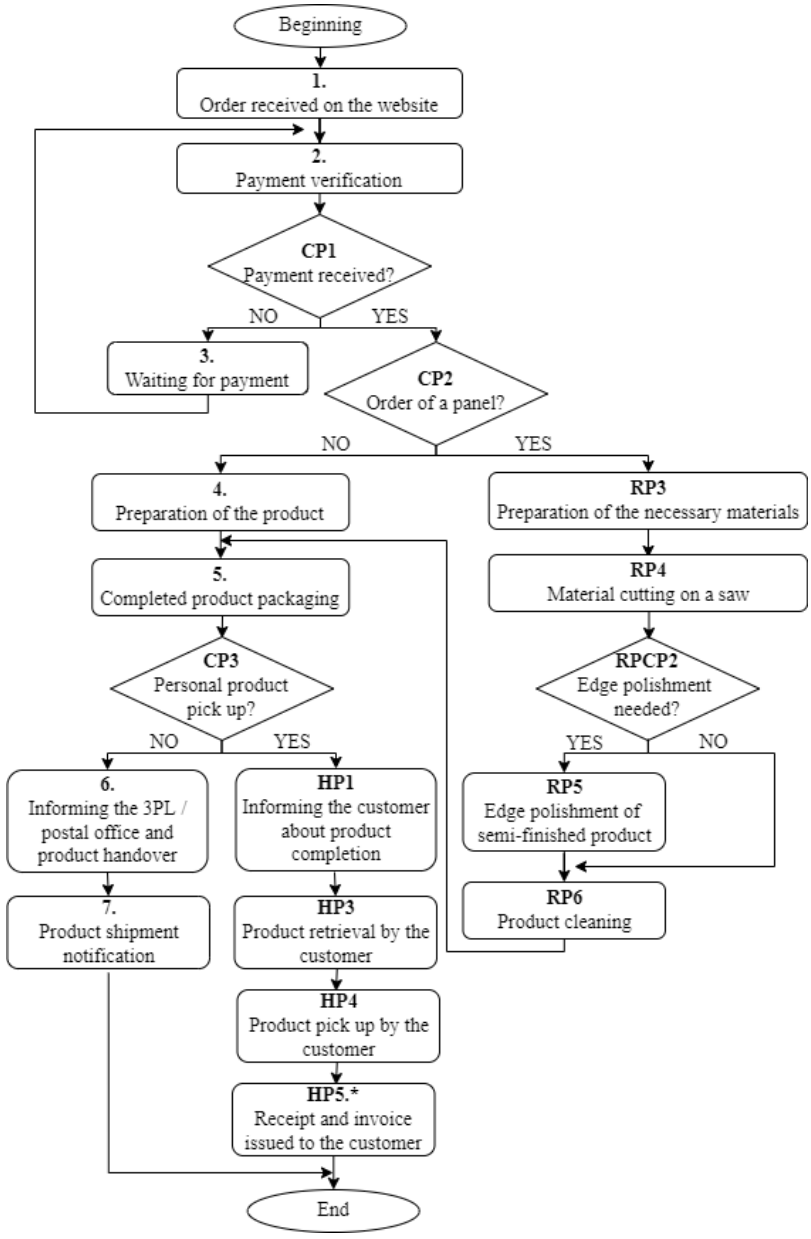

Figure 9. Proposed online retail product sales process

Source: own

The customer had to indicate method of product handover. If they selected product handover via mail, the CEO must notify their 3PL, who provides delivery services for them. Upon 3PL's arrival, the product is handed over and the 3PL issues a receipt for product acceptance. The CEO must then notify the customer about the product shipment. However, if the customer wants to accept the product personally, some of the activities from the proposed improved product handover process are repeated (marked as HP1, HP3, HP4 and HP5). This would complete the proposed online retail product sale process. The process overlaps in part with two aforementioned processes, namely retail production, and product handover.

3. DISCUSSION

3.1 Assessment of the implementation

After two-year time interval, an analysis of the proposal's implementation was carried out, premised on an assessment scale. The interest was focused on number of implemented proposed improvements by the SME.

To obtain tangible results, assessment table was prepared, where the proposed improvements were divided into six areas (Table 1): (a) general; (b) procurement; (c) demand, supply, and sales; (d) production; (e) product handover; and (f) online sales. Within each of the introduced six areas, there were from minimum two to maximum six proposed improvements, altogether 25 proposed improvements. The implementation of the proposed improvements was evaluated based on a three-point assessment scale: (a) 0 for non-implementation; (b) 0.5 for partial implementation; and (c) 1 for total implementation. The decision for the partial implementation premised on matter, that not all improvements can be fully implemented in a short time interval.

Table 1. Assessment of the optimized process approach implementation

General		
1.	Obtaining certificates/standards	0
2.	Obtaining a vocational diploma	1
3.	Participation in training courses	1
4.	Employment of an additional worker	1
5.	Digitalization	1
6.	Online sales for retail products	1
Procurement		
7.	Demand forecasting	1
8.	Creating a procurement plan	1
9.	Computerized system for entering existing stocks	0
10.	Implementation of KANBAN system	0
11.	Choice between several suppliers; order from the most favourable (price, delivery time)	1
12.	Use of e-procurement	0
Demand, supply, and sales		
13.	Higher order price in connection with the production deadline	1
14.	Proforma invoice before the product production, regardless of the origin of the customer	0,5
Production		
15.	Employment of an additional worker	1
16.	Employee training courses (for production, software, and programs)	1
17.	Hardware layout change (based on the sequence of machines usage)	0
18.	Purchase of newer, more modern equipment (laser, iPad, band saw)	1
Product handover		
19.	Recycling (3PL or the SME itself)	0,5
20.	Based on the invoice, the material stock is recorded	0
21.	Establishment of a computer system for issuing invoices	0
Online sales		
22.	Custom product products for everyday usage	1
23.	Retail products (prefabricated, panels)	1
24.	Delivery of products via 3PL	1
25.	Renewed website	1
Together		
17 out of 25	**68%** out of 100%	

Source: own

Seen in Table 1, the SME was able to: fully implement 16 improvements; partially implement two improvements; and has not yet implemented seven improvements out of 25 altogether.

Amongst honourable acknowledgement of improvement implementations are:

- demand forecasting was implemented at the beginning of the year and has enabled yearly finance planning, which was divided into various areas;
- a new workplace (currently for one employee);
- purchase of an iPad tablet for graphic and software schemes design;
- new machinery (CNC laser and automated band saws).

Premised on standard ISO 9001 and TQM principles, an improved process approach enabled insight into redundant and wasteful activities, which were improved through detailed overview. As seen from Table 1, optimized processes improved the company's performance and its management. Continuous improvements and process management represented a fundamental factor for economic stability increase of this SME. These improvements enable the necessary IT solutions reengineering to support business operations with new, optimized processes.

3.2 Future research

The first fundamental condition for implementation of the proposed process approach is undoubtedly the interest of the SMEs CEO and employees, which they have shown. Another key condition is the time needed to make improvements. And as third crucial condition, we can mention the CEO's willingness for financial investments that would be needed. However, as the researched SME is a family business, with minor number of employees, without unlimited financial resources, the recommendation would be to implement various minor improvements, such as propositions from this optimized process approach. Then, gradually, the SME can begin to implement various guidelines, frameworks, models, and standards to improve their business operations. Time is not money, so it can be used to wisely and to SMEs advantage.

Many improvements can be achieved through various trainings, educational programs and co-financing provided by organizations. For the improvements' implementation, joint work is needed, which is easier with a substantial number of employees.

Based on the observed and obtained data, further development and research are also possible, such as:

- inquisition of raw material processing providers for material recycling and research about the procedure of plexiglass material processing into raw material;
- research about modern information technology and the provided opportunities of implementation (such as Digital Twins for hardware, machinery or even processes);
- introduction of Capability Maturity Model (CMM) as a methodology to detect and improve processes with a five-level evolutionary path (Lutkevich, 2022), as it provides a framework for assessment of business management capability (Wei et al., 2019);
- investments in the SMEs digitalization. Thus, the researched SME would grow with new knowledge, transforming it into opportunities, and steadily accumulating competitive advantages, all leading to preponderant revenue and profit, whilst diminishing the environmental impact.

CONCLUSION

On the premise of the research's findings, it can be concluded that the SME has successfully started implementing the proposed improvements. The solution proposal of optimized process approach was implemented immediately but gradually. It is estimated that the proposed optimized process approach has been implemented (certain improvements completely, others partially) namely in 68%. Although only partial implementation of the optimized process approach was conducted, the latter led to economic

stability increase of the researched boutique production SME's. Its business results have exponentially improved, which is reflected in: increased product demand by 8% due to further efficiency, agile order fulfilment; and heightened income by 4%, compared amongst previous years and the implementation time interval. Precise financial improvement information could not be obtained due to their private nature.

To optimize and successfully reengineer logistics processes in companies, the harmonization of all processes and their activities is needed within the company's objectives, scope, and complexity. The implementation of a process approach enables improvement of business' performance since processes can be managed as a system of process' network with their interactions. The latter constitutes a better transparency and consideration of the system as a whole, which allows its optimization with consequent increase in added value and revenue, followed by an investment in the IT solutions reengineering for business operations support, premised on proposed optimized process approach. The emphasis here should be directed onto IT resources: (a) hardware, (b) software, (c) people, and (d) information assets. All of the specified represent a core of any company – the essential capacity for accomplishing mundane business operations.

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