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How software robots can facilitate the procurement process? A case study of Siemens in the Czech Republic

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ABSTRACT

Objective: The objective of the article is to evaluate whether technological changes adopted in procurement can support the strategy of the firm and to observe the software robots' implementation phase in procurement.

Research Design & Methods: In order to reach the article objective, a single case study methodology was applied. The analysis focused on the Siemens company.

Findings: Digitalisation strategy in procurement can support the firm's strategy of global leadership and further growth through increased efficiency, focus on value-added activities, increased transparency in processes, easier cooperation between the involved parties, and the worldwide reach of suppliers. The potential for further use of software robots has been identified among repetitive processes with no value-added but securing the smooth and errorless flow of information and documents. For this purpose, we propose a more detailed definition of the procurement cycle.

Implications & Recommendations: Three processes were selected for potential dedication to software robots which can serve as a recommendation to companies to improve the efficiency and competitiveness of their supply chains.

Contribution & Value Added: To identify gaps for digitalisation in the procurement process, the "procurement cycle" was used. We found that the processes must be defined in a more detailed way in order to serve the analysis.

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INTRODUCTION

For companies involved in international supply chains, it is necessary to monitor and actively respond to changes in the production process of the most important trading partners and consider the effects they have in the areas of digitalisation, production automation, and related processes. Implementation of digital solutions under Industry 4.0 technologies supports horizontal integration of supply chains with the potential to increase their competitive advantage (Veile, Kiel, Müller, & Voigt, 2019; Liao, Deschamps, Loures, & Ramos, 2017).

Still, there are companies that postpone the necessary steps towards digitalisation. Based on local research from the Czech Republic from 2019, 32.4% of companies did not have any digital strategy, and 29.5% of companies were in the phase of preparation of a digital strategy (Confederation of Industry of the Czech Republic, 2019).

The conventional approach points to the headquarters of multinationals being in charge of strategic activities such as the adoption of new technologies (Filippov & Duysters, 2014). On the other

hand, Szalavetz (2016), in her research, states that subsidiaries such as shared service centres may be playing an important role within multinationals as they are often initiators of technological changes. Such a subsidiary's initiative can positively stimulate its entrepreneurial efforts and thus the corporate goals (Filippov & Duysters, 2014).

Digital technologies under what is called Industry 4.0 are associated with opportunities that can be exploited when the digital solutions are implemented in targeted and suitable ways (Veile *et al.*, 2019).

Our research is therefore focusing on the implementation phase of advanced information technology solutions in procurement. In our research, we adopt a single case study approach and have selected the Siemens company that is considered to be one of the world leaders in the development and implementation of digital solutions. The literature review is an essential phase of the case study research (Merriam, 1985) and is addressing the research questions, i.e., the implementation of digital technologies and the impact digital technologies have on the organisation. The research methodology is followed by the results and discussion chapter, where we present the research findings. Finally, we conclude with the implications, limitations of our research, and future research suggestions.

LITERATURE REVIEW

Digitalisation has changed the way many companies serve their customers nowadays. This attitude is changing customers' expectations and has an impact on all companies, including those which are still resistant to accepting the change. The president of SAP, Ariba Alex Atzberger, adds that large companies are aware of the change and are not afraid of experiments, even if they could result in unsuccessful outcomes or financial losses (Busch, 2016). Technologies behind automation and value-seeking that directly impact procurement processes are: Internet of Things, IoT, social media, cloud technologies, artificial intelligence, AI, cognitive computing, big data, big data analytics, mobile technologies, augmented reality, Blockchain, and additive manufacturing (Srai & Lorentz, 2019).

Benefits and barriers to new technology adoption in procurement

Procurement will be defined by the processes it usually consists of. Despite technological changes in procurement, there are still steps that are, in most cases, inevitable. Rushton, Croucher, and Baker (2017) described these steps as the "procurement cycle" including 1) the identification of the need to procure a good or service, 2) documentation approval and passing to procurement, 3) a request for quotation, RfQ, sent to suppliers, 4) a response from suppliers (and potential negotiation), 5) a selection of supplier and creation of purchase order, PO, 6) authorisation and sending of the PO to the supplier, 7) the delivery and inspection of goods and services, 8) the invoice sent to the supplier, 9) the invoice approval and payment or pending, 10) post-contract review of the purchase.

The drivers and the speed of the adoption of digital solutions vary among companies. Kosmol, Reimann, and Kaufmann (2019) divide the factors affecting the readiness to adopt digital technologies in procurement into technological, organisational, and environmental factors. Research by Srai and Lorentz (2019) shows that companies that have experience in basic technologies are more likely to employ advanced digital technologies. This research supports the earlier research results by Anaya, Dulaimi, and Abdallah (2015), who brought the evidence that digitalisation expands the potential for innovation. Digitalisation creates data that can be used not only to cut costs but also for value creation, which could result in increased profitability and competitiveness (Bienhaus & Haddud, 2018; Nagy, Oláh, Erdei, Máté, & Popp, 2018; Sieja & Wach, 2019). Bienhaus and Haddud (2018) name increased collaboration, traceability, and transparency among the benefits of procurement 4.0, Neil (2018) describes increased connectivity and real-time integration, and Rushton *et al.* (2017) suggest a partnership-based approach.

Qualitative research into advanced manufacturing technologies employed in Hungarian subsidiaries identified a piece of evidence that supported the technology adoption, which strengthened the competitive position of the firm not only through increased resource efficiency but also through process efficiency, and this led to an upgrading of the environmental performance of the firm (Szalavetz, 2017). Procurement is one of the key activities having the potential to contribute to environmental

sustainability. If companies employ technologies that work with data in terms of waste reduction and energy and emissions saving, they can significantly contribute to this strategic decision. Ghadimi, Wang, Lim, and Heavey (2019) go beyond the one company focus view and suggest incorporating sustainability dimensions in criteria that will be applied in supplier selection and evaluation processes. Software solutions enable regular suppliers' performance monitoring without the need for any human interaction. The information obtained may then support managerial decisions.

Despite the widespread use of computers, the Internet, and wireless communication, there are still barriers described in various sources of literature. Not only in the field of supply chain management have the authors identified factors that slow down the transformation process towards what is in the context of industry 4.0 called a smart factory, advanced manufacturing, smart capabilities in supply chains, and procurement 4.0 (Neil, 2018). Capital constraints represent an apparent barrier to digital transformation. Costs of maintenance, adjustments of systems to individual environments, adaptation, and modification are all to be considered as well.

Serious concerns have been raised concerning the security in the cyber environment and the protection of intellectual property (Geissbauer, Weissbarth, & Weitzstein, 2016; Rymarczyk, 2020).

Bienhaus and Haddud (2018) stress the importance of reaching a strategic decision about digital transformation first. Managers who see digitalisation as more of a threat than an opportunity can be considered as a barrier to introducing changes. Among other cited barriers inside organisations there is a change in organisational culture, existing limits in managing a cross-functional approach (Neil, 2018), existing work positions, capabilities of recent employees, and organisations' need to provide training and to hire new employees (Bienhaus & Haddud, 2018; Rymarczyk, 2021; Veile *et al*., 2019).

There are also technical barriers named by McKinsey (Szozda, 2017), such as the need for uniform standards for data transmission and the connection of all process participants by means of wireless networks and problems occurring during the integration of information technology, IT, systems (Vaidya, Ambad, & Bhosle, 2018).

Digital strategy of procurement

The digital strategy of procurement can be seen as an alternative to a cost-cutting strategy described by Rushton *et al*. (2017), where the number of suppliers was reduced in order to reduce the costs of procurement and supply. The digital strategy of procurement enables the management of supplies on a global scale and benefits from the possibility to address more potential suppliers (Knudsen, 2003). Additionally, there is a potential to increase cooperation and real-time integration among the stakeholders (suppliers, manufacturers, retailers, and customers) (Pearcy, Parker, & Giunipero, 2008). There are numerous research papers focusing on cooperation. However, only several investigated cooperation in the context of purchasing 4.0.

Companies are looking for ways to automate processes, saving costs, and increasing the efficiency of supply chains (Neil, 2018). The statement "procurement function will be a strategic interface to support organizational efficiency, effectiveness, and profitability" has been supported in the Bienhaus and Haddud's (2018, p. 974) research.

In procurement, the potential is seen in the implementation of software robots. Artificial intelligence is often associated with the use of robots. Artificial intelligence, AI, also called machine learning, can be defined as a "broad set of methods, algorithms, and technologies that make software "smart" in a way that may seem human-like to an outside observer" (Noyes, 2016). The ISO standardisation norm distinguishes between industrial and service robots (ISO, 2012). The features that characterise the implementation of software robots are relatively easy configuration and compliance with company safety standards, easy integration with company software, and relatively fast implementation compared to other company software (Kedziora & Kiviranta, 2018; Lacity & Willcocks, 2016).

In procurement, software robots have attracted the attention of various companies. IBM has implemented robotic process automation in order to deal with high-volume repetitive tasks. Deloitte (2019) also suggests robotic process automation in highly repetitive, prone to error, rule-based, time-critical, and seasonal processes. This automation will allow focusing on value-adding activities, service and product development, and individual customer approach (Vollmer, 2017; Murphy, 2017; Kedziora

& Kiviranta, 2018). The future is seen with further integration of machine learning and cognitive technologies in robotic process automation (Schatsky, Muraskin, & Iyengar, 2016). A huge potential is also seen in forecasting and data analytics (Szozda, 2017).

New opportunities for adopting software process automation have been identified among routine and repetitive processes, present in all stages of the procurement process, including purchase request, authorisation, ordering, delivery, payment, and the exchange of documents (including documents used in international business for transportation or customs purposes) (Rushton *et al*., 2017). The employment of digitalisation in procurement has delegated repeated manual processes from employees to computers, reduced time spent by sending emails or by daily submission of data to portals and dedicated platforms. The solution can be especially useful when suppliers are not using electronic data interchange, EDI, as the solution does not require EDI (Vollmer, 2017). The public concern is whether AI can take over human tasks completely. In research by Bienhaus and Haddud (2018), the statement that AI would take over decision-making processes was among less supported statements. On the other hand, we can see a clear shift from routine operational tasks to a supportive role in the decision-making processes. It is evident that under the new conditions, digital transformation creates the key for success, which is the redefinition of business models, concepts, and business practices (Szozda, 2017; Neil, 2018).

Stuart, McCutcheon, Handfield, McLachlin, and Samson (2002) identified gaps in operations management, with a potential for future case study research. Among the topics, they included "understanding procurement" with a proposed research question: "What are the interactions between a firm's supplier management expertise and electronic purchasing?" (Stuart *et al*., 2002, p. 432). This is not a recently asked question, but the researchers' proposal is, nevertheless, rather relevant. Gaps remain in understanding the role of procurement. There are still many questions associated with the role of procurement in the context of technological development regarding the challenges arising from technological and global changes.

The aim of our research is to answer two main research questions:

RQ1: How can digital technologies be employed to support the strategy of the firm through procurement?

RQ2: What steps and challenges are there in the software robots' implementation phase in procurement?

RESEARCH METHODOLOGY

For our research, we selected a case study methodology that is a suitable method when focusing on a contemporary phenomenon. The case study method is especially useful when addressing "how" and "why" questions (Yin, 2018).

In our research, we move from the existing theory in procurement and industry 4.0 adoption theoretical base to the particular implementation of the software in procurement and the interconnection of these fields. This approach, when researchers advance from general to particular, is characterised as deductive (Woiceshyn & Daellenbach, 2018). The case study methodology enables researchers to provide a deep insight into the development of processes, to describe in detail the set of events to consider multiple variables, external and internal environments, changing conditions, and company specifics (Stuart *et al.,* 2002).

To achieve this in-depth and extensive understanding of the single processes in procurement, we opted for a holistic single case study that was enabled by close cooperation with a selected company. This study design is found appropriate in case of studying unusual cases (Yin, 2018). We consider the Siemens company an outstanding example of a company that is recognized as a world leader in industrial digitalisation. The company employs 385 000 staff members worldwide (Siemens, 2019) and the procurement functions are secured by cross-functional multinational teams called Global Business Services centres, GBS. In our research, we addressed the GBS centre in Prague in the Czech Republic. The holistic approach consists of observing the procurement under this GBS centre solely. The procurement team consists of circa 20 team members and provides purchasing services for roughly six customers in Germany.

In the case research, we do not find one strict methodology. The set of methods is flexible and, in the end, adjusted to the particular case (Johansson, 2007). On the other hand, researchers stress the need for credibility, trustworthiness, and replicability (Yin, 2018). To address these challenges, emphasis is put on studying the existing literature sources to address possible explanations (Merriam, 1985; Yin, 2018). The pieces of information from face-to-face in-depth interviews were put into the context of multiple sources or evidence, i.e., triangulation (Yin, 2018), the company representative commented on the draft of the research, and the final manuscript was checked for its accuracy by the team leader to increase its reliability and validity. The observations on-site paid attention to the detailed explanation of existing processes to serve the evaluation of the results of new systems implementation in the context of the particular company (Anaya *et al*., 2015). Five stages of research were followed as suggested by Stuart *et al*. (2002): (1) definition of the research questions, followed by (2) instrument development, (3) data gathering, (4) data analysing and results sharing, and lastly, (5) dissemination phase.

For the purpose of our research, eight interviews were carried out, encompassing the team leader, process expert of the procurement team, and six team members. The interviews and on-site observations were scheduled within one week in March 2019. The applied semi-structured interviews were intended to develop a detailed understanding of the procurement processes and the role of the software used. The inquiries paid attention to the systems and processes already in place and to the introduction of new software solutions. Besides the focus on implemented software solutions, the procurement processes were investigated to elaborate on the role of procurement in the organisation. The main questions were: "Can you describe the procurement process step by step? What are the main IT tools used in procurement? What can be done to make it more efficient? What are the benefits and disadvantages of robotisation of the processes?".

The triangulation was achieved by the study of annual reports and other internal materials, press articles, and company websites.

RESULTS AND DISCUSSION

The company's latest strategy was presented in Vision 2020+, and it includes the accelerated growth of revenue and profit margin of the company's industrial business. The company is regarded as the world leader in industrial digitalisation, and the strategy aims to retain this leading position. The named steps to support the growth strategy are leaner and simplified company's structure, expansion of digital business, and investment in new growth fields (Siemens, 2018).

Firstly, we identify the role of procurement in relation to the company's strategy. We refer to Porter's Value chain theory (Porter, 1985), where procurement is regarded as supporting activity, and the derived virtual value chain theory, in which technologies affect value creation by "spanning over the functional boundaries" and thus affecting the value creation process (Nagy *et al*., 2018, p. 6). Secondly, the implementation phase of new digital solutions is observed to name the challenges in the process with the aim of generalising the findings and implications for the industry. The theoretical base for answering RQ2 is the Rushton's *et al*. (2017) procurement cycle.

The strategic role of procurement services

Siemens' strategy is to do its business as well as the best competitors in the global market. Part of the strategy is the redefinition of the company's structure that includes "operating companies," "strategic companies," and service companies, and that is defined as customer-oriented (Siemens, 2018). Focusing on the service companies, the key concept of GBS centres is to provide service of high quality, and in the best case, finding individualised solutions for customers. This would firstly fulfil the basic function of procurement, and secondly, it would support the company's competitive position through procurement by time and cost savings.

The provided purchase service includes all parts of the procurement process depending on the individual needs of their customers; it mostly concerns requests for quotations, control of purchase orders, or negotiating better purchasing conditions (e.g., price, delivery or payment conditions). Addi-

tionally, the purchase service includes extensive communication with external suppliers as well as customer's employees from logistics, project management, the ability to take over responsibility for the delivery of goods on time and in the right quantity, the control of price, delivery and payment conditions, the acquirement of all necessary export documents from suppliers on time, and the receipt of invoices which includes concise and agreed purchasing conditions.

The performance of Siemens GBS centre employees is measured by hard and soft data, hard data are quantified by Key Performance Indicators, KPIs. KPIs included are total purchase volume order absolutely and relatively, the total number of processed POs/relevant buyer's desk, and savings expressed either in an absolute or a relative figure. Some customers prefer to know the amounts saved in absolute figures, and thus a minimum sum that has to be achieved per month is agreed with them; other customers prefer targets in relative figures.

The current state of the implementation of digital technologies in procurement

The on-site interviews were focused on the existing purchasing processes and the technologies used to support them. The current purchasing functions insured by digitalisation are secured by SAP (enterprise application software) purchase orders processing and an online Siemens strategic procurement platform (the supplier portal). Most recently, software robots have been introduced to take over processes previously insured by the buyers. The current state of the automation of processes in procurement is described in the initial phase of the model of the procurement cycle (Rushton *et al*., 2017). The procurement process starts with the identification to procure a good or service. The buyer's first questions are: "What am I going to buy?", "At which company?" "For what price?". The purchase requisition is converted automatically into a purchase order in SAP.

Another way to send the RfQs, is digitalised. Especially for Siemens, digitalisation takes place with a developed online tool called SCM STAR. Especially in procurement (from the experience of our interviewed team members), this tool is used for RfQs, e-auctions, or for checking frame agreements that Siemens has with its suppliers. There are two parties that have access to SCM STAR: Siemens employees (mostly from supply chain management) and suppliers. Related companies are responsible for keeping their data (mainly contact data) updated in the system. The buyers can create their RfQs directly in SCM STAR, depending on their needs, wishes, and the complexity of the quotation they want to receive. The selected suppliers respond directly with this tool. This process is more challenging than the method of using RfQs sent via EDI or software robots. Subjects to the challenge are not only the buyers but also the suppliers.

If we compare the options that have just been described, we can state that the use of the online Siemens strategic procurement platform brings advantages such as transparency in the RfQ process. This benefit has been proven when a buyer or supplier had to be deputised by a colleague. Additionally, the tool can complexly evaluate received quotations which are essential for the buyer in order to choose the right supplier. The barriers identified are connected with the complexity of the system – the buyers have to provide help to the suppliers when needed, and for the buyers themselves it was not always straightforward to learn all of the functionalities and it requires time to "get into the process."

Particular attention has been paid to price and sales conditions negotiations that follow the supplier's response unless there is a frame agreement in place previously negotiated by the strategic procurement in the headquarters in Germany. This procurement phase is still mainly entrusted to the buyers who negotiate more preferable sales conditions, most often via phone calls, rather than via emails. Successful negotiation increases the personal professional "scores" of the buyers measured by KPIs. It enhances employees' motivation and builds closer relations between companies. Growing motivation and employees' enthusiasm are important elements to consider, alongside hard data collected by KPIs.

To meet the strategic goals, the company has changed its organisational structure. Procurement services are included in the GBS centre's function and are supposed to support the company's strategic growth through increased efficiency. To accelerate the growth of profitability and profit, a company can either reduce costs, add value to its products, find new markets for the products, or sell more on existing markets (Hill & Hult, 2018). The cost-cutting strategy achieved by the digitalisation of procure-

ment was supported by previous research (Bienhaus & Haddud, 2018; Neil, 2018). The customer orientation of service companies increases pressure on the efficiency and productivity of the service centres involved in procurement, i.e., on costs and purchasing results. The greatest benefits described resulted from improved procurement processes and cost savings achieved by closer cooperation with customers, more time dedicated to bargaining, and the minimisation of mistakes. Also, for this statement we find support in the previous studies (Bienhaus & Haddud, 2018; Vollmer, 2017; Neil, 2018). A company strategy of growth in new fields of business is supported by the cooperation with customers on individual solutions. Another factor that has not been as greatly stressed but is of great importance is the reach of customers who are not involved in a dedicated platform or using SAP. For a present-day global multinational, a wide reach of RfQs and automated follow-up processes can be an important factor in the highly competitive global market.

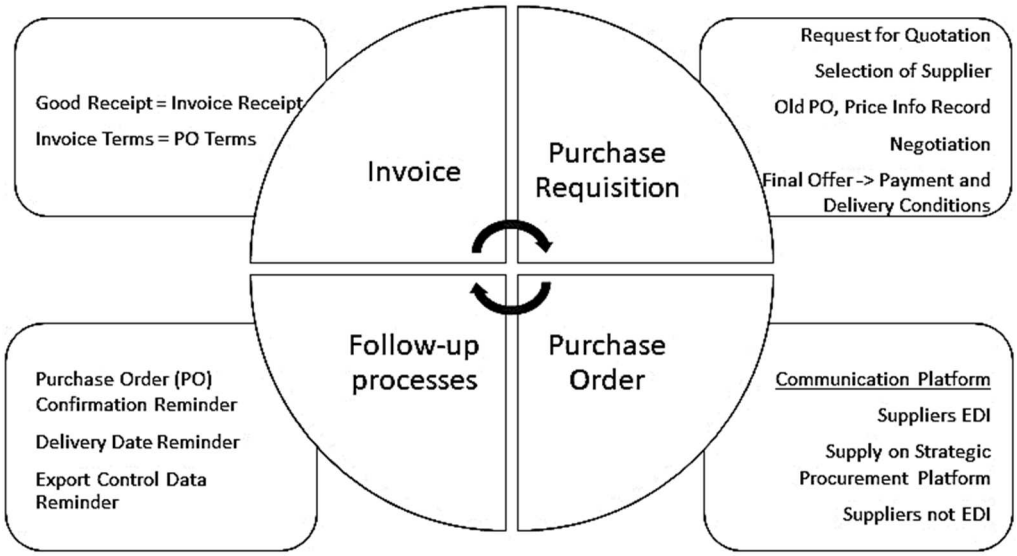

Figure 1. Analysis of current procurement process
Source: own elaboration.

Opportunities for the implementation of software robots in procurement

The observation phase is followed by a discussion about processes that can be further dedicated to robots.

Software robots have already been used to send RfQs in situations when there is no current supplier and no price, or the price is older than one year. A buyer sends an email including an excel file attachment that both meet a strict guideline to a software robot. The robot processes all requests twice a day. The most important accomplishment is that the implementation of software robots has saved time and manual work, which would have to be done by the buyers. The use of software robots in procurement processes under observation indicates the implementation of highly repetitive processes that can be highly standardised. Also, the implementation of this solution was less complex than in the case of the SCM STAR.

The next steps of the procurement cycle (Rushton *et al*., 2017) that follow the supplier's response to the RfQ are: negotiation, the selection of supplier and creation of PO, sending the PO to the supplier, the delivery and inspection of goods and services, sending the invoice to the supplier, invoice approval and payment, and the post-contract review of purchase. These phases were observed in terms of manual work requirements, frequency and repetition, standardisation of processes, time factor, transparency and clarity of the process, and level of difficulty.

To address processes that can be further dedicated to robots to answer our second research question, the procurement cycle by Rushton's *et al*. (2017) has been found insufficiently detailed. There are activities that are important for ensuring smooth faultless processes, including sub-processes that need to be initiated early on when it is discovered that data or a piece of information is

missing. Such tasks are not included in the procurement cycle according to Rushton *et al*. (2017). These are PO confirmation reminding processes, reminder of delivery terms processes, maintenance of export control and customs documents.

Purchase order confirmation reminding that includes PO acceptance check, PO confirmation reminder, and PO confirmation check were identified as the first area requiring improvement of the process with the employment of digital technologies and robots.

In order to process the purchase order, suppliers have to confirm the PO within ten days. Once the PO is sent either via EDI or email, the deadline for the receipt of the order confirmation runs. The GBS centre's buyers used to remind suppliers regularly. This now happens manually through SAP transactions and via email. Firstly, the buyers must identify missing purchase orders, and secondly, they must generate reminders in PDF form from SAP. Lastly, all reminders must be sent via email; it does not matter whether the supplier is connected through EDI or not. Simultaneously, this part of the process has several disadvantages. Once the reminder for the order confirmation is sent, there is no control over whether the document has been received, as it is not generated again during the next reminding period. Moreover, due to high overcrowding of processed POs, the buyer has no chance to check if the PO has been accepted or confirmed by the supplier.

Order confirmations are regarded as essential for buyers. Based on this document, the buyer can check all the conditions (delivery and payment conditions) for the PO, price, correctness of material, and lastly, the delivery date. These reminding documents are still manually sent via email to suppliers who are connected with EDI instead of reminding them directly through SAP, which has been identified as an area of the process requiring improvement. This process was the first to be suggested for the implementation of software robots.

Together with the reminder of PO confirmations, there is another follow-up activity, which is the reminder of delivery dates. Delivery date reminding is done in a very similar way to PO confirmation reminding. Suppliers are reminded regularly and manually by the buyers through SAP transactions and by sending emails of PDF documents. In case the delivery dates are requested by other departments, e.g., logistics or project management, the reminding cannot proceed on a regular basis. Urgent requests are solved by phone calls. If this process could be automated through a robot, the human workforce would be substituted in the process.

The third and final follow-up activity that is significant in the process is the reminding of export control and customs documents, ECC documents. Without these documents, the material that is purchased by the GBS centre cannot be re-exported and can only "lie in stock." This leads to increased costs and, more importantly, can delay projects. The suggestion for the assignment of this process to the software robots would not be through the reminder of ECC documents, but for the automation of the whole process, by sending out blank ECC documents due for completion by suppliers, who are connected to the EDI. As so-called EDI suppliers do not automatically receive blank ECC documents with the purchase order, these have to be sent additionally via email. Suppliers who are not connected to EDI and obtain the PO only via email, also get a blank ECC document together with the PO.

For the team in GBS centre Prague, the sending out of ECC documents represents a minimum of around 8 working hours/week, depending on the exact number of processed POs. The time factor was counted from the average length of the process, which was 4 hours, and it was regularly scheduled twice a week. The process selection criteria are summed up in Table 1.

The selected processes suggested for further dedication to robots are highly repetitive processes with no value-added, which corresponds to the previous literature findings (Rushton *et al*., 2017). On the other hand, securing the smooth flow of information and documents prone to errors processes can significantly increase the quality of the procurement services provided, which can positively impact the other interconnected activities of the Siemens company.

The second research question was designed to examine the steps and challenges in the implementation of software robots in procurement. Challenges in the implementation phase included the need and cooperation of technical experts, cooperation with other departments, and meeting customers to understand their needs. Training of employees and support to users must also be provided in the early stages of the implementation phase.

Training and support to suppliers' employees must also be implemented. Suppliers must often introduce Siemens' designed platforms or applications (e.g., RfQs SCM STAR platform) and invest in automated solutions such as electronic data interchange. The support is provided mostly directly by Siemens' buyers, who must be well-trained and capable of learning by working with new systems. One of the stated problems is the lack of detailed information provided throughout training that encompasses different departments and the organisation units (e.g., strategic buyers, operative buyers, GBS centre buyers, managers, and logistics). Therefore, further support besides the training must also be provided.

Table 1. ECC document maintenance and reminding

Process criteria	Process description
Frequency and repetition	Twice every week
Standardisation of processes	High – the same repeated process
Time factor	4 hours
Transparency and clarity of process	High – easy to track and to communicate to IT technicians
Level of difficulty	Low – downloading documents from SAP, sending out standardised emails, maintaining data

Source: own study.

Regarding the implementation of the automation of the follow-up processes of purchasing, the initiation came from the buyers themselves. The implementation involved the GBS centres' employees. The pre-implementation phase included the analysis and detailed description of the processes and the assessment of propositions by IT experts. The challenges in the implementation phase, together with the benefits seen, are summarised in Table 2.

Table 2. Benefits and challenges of the implementation of software robots

Identified benefits of software robots	Identified challenges of software robots
+ Time saving -> workforce hours (e.g., in the case of the process of ECC documents reminding minimum 8 hours/week)	- Need for technical experts for the training of employees and the introduction of new robotised processes
+ Dedication to value-adding activities which are not replaceable by a robot -> negotiation and building relationships with the suppliers	- Unwillingness of suppliers for the launching of new digitalised tools or platforms (training of supplier's employees, high introduction costs, need of support from Siemens)
+ From the perspective of personal development -> stress on soft skills instead of mechanical work	- Buyers and experts often act as contact persons for suppliers for technical questions
+ Reduction of repeated processes -> increased motivation for employees	- Possible technical outages that need to be deputised by manpower - Need for a back-up plan in the case of a blackout
+ Increased transparency of processes -> better substitutability (e.g., tool SCM Star), ease of control	- Often "learning by doing" (for employees when introducing a new tool/application or robotised process)
+ Easier and faster tracking and tracing of activities	- High costs for the implementation (processes need to be analysed beforehand to determine whether they will pay off)
	- Involvement of buyers as additional workload

Source: own study.

Among the benefits of digitalisation with relation to the strategy of the firm, we identify the workforce time saved, which is invested in other activities that bring higher levels of efficiency. The key activities that were identified to be supported by employees and not dedicated to robots are negotiation, establishing relationships, cooperation (resulting in cost-saving, increased visibility in the supply chain, and improved services for the buyers), and problem-solving.

The robots can be used in procurement processes that involve customers outside the EDI network and enhance the global market strategy providing a wide reach to cover worldwide markets. The number of potential suppliers is not limited when most of the processes are automated and dedicated to robots. This can become an important tool to support the differentiation strategy of the firm.

The increase of the digitalisation and automation of processes suggests that there is a threat of a negative impact on employment and recently defined working positions. This statement was not supported in the case company. Our findings support the findings of Schatsky *et al*. (2016), who concluded that rather than a reduction in the number of employees, the companies would consider the redesign of jobs. Our arguments are based on the finding that although robots and robotised processes save time, there are activities such as negotiating with suppliers and building relationships with companies that are not substitutable by robots.

CONCLUSIONS

This research article dealt with two main research questions: (1) how digital technologies can be employed to support the strategy of the firm through procurement and (2) what the steps and challenges in the implementation phase of the software robots in procurement are. For the role that procurement in the case company has in supporting the company's strategy, we found strong support from previous studies. The innovation of products and processes has become vital for keeping the competitive position of companies. Digital technologies can support the strategy by responding to the innovative needs by global sourcing capabilities development. Companies should consider the options of digitalisation strategies that will enable them to focus on their core business. The proactive approach may be vital also due to supply chain integration.

A new contribution has been brought by answering RQ2, observing the steps and challenges in the software implementation phase. Firstly, such practical examples are still rare among research studies. Secondly, our research contributes to the theory by extending the Rushron *et al*. (2017) procurement cycle. There are three phases identified in the procurement of the case company with the potential for further automation and the employment of software robots. These are: the automation of purchase orders confirmation reminding, the reminder of delivery dates, and the reminder and maintenance of the ECC documents.

To address these challenges, companies need capital and workforce with information technology capabilities (Veile *et al.*, 2019). This is where the state can play a supportive role. The questions of preparedness of the workforce towards the changes in digitalisation and capital constraints were not addressed by our research and need to be further investigated also in regard to the size of the companies and regional differences. Small and medium-sized enterprises, SMEs, might be particularly limited by low innovation motivation, limited human and financial resources. Further research may be focused on a more detailed analysis of the relationship between the multinationals and SMEs, notably measuring SMEs, responding to the requirements of multinationals related to digitalisation.

Given the qualitative nature, the case study methodology is limited in terms of applicability and generalisability. Further research is needed to apply the extended procurement cycle framework in other cases and industry fields. The adoption of technological changes is developing over time, and further research needs to be carried out to evaluate the changes and generalise the findings.

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Conflict of Interest

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