Managing employees when implementing automation in procurement: A qualitative study

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ABSTRACT,
In today's society, innovation is important. Businesses use new technologies to automate many of their business practices. Implementing new technologies can have many benefits for organisations. Though, these new technologies also have their own challenges when it comes to their implementations. This study investigates the challenges that come with implementing new technologies. Next to this, it is investigated which skills are important to manage the new systems. The study followed a qualitative research approach, combining the interviews that were held with six purchasing professionals to identify the most important new technologies, their respective challenges and the skills that have become more or less relevant as a result of the new innovations. The study has shown that several technologies are highly important to organisations, and these all have their respective advantages and challenges.

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1. INTRODUCTION

Innovation is a major aspect of today's society. All over the world, new innovations and technologies appear. New innovations and technologies can completely change the way that organisations operate. While these technologies can greatly increase efficiency of organisations, it can also lead to change within the organisation, creating new tasks, roles and skill requirements (Delke et al., 2023, p. 1).

Automation is an important technological improvement for organisations. It improves efficiency, quality, reliability and it also increases productivity (Goldberg, 2011, p. 1). With Industry 4.0, some new technologies also play a role in this, furtherly improving the automation. Some examples of this are Artificial Intelligence (AI), robotics and blockchain. These changes furtherly increase the flexibility of organisations and even less human control is needed (Jahani et al., 2021, pp. 7-8).

The new advanced technologies are considered to be the fourth industrial revolution. According to Pfohl et al. (2015, p. 37), "*Industry 4.0 is the sum of all disruptive innovations derived and implemented in a value chain to address the trends of digitalization, autonomisation, transparency, mobility, modularization, network-collaboration and socializing of products and processes.*". Industry 4.0, similar to the previous industrial revolutions, brings significant technological improvements. It can greatly increase the efficiency, flexibility and transparency of various organisations (Müller et al., 2018).

Automation can be implemented across all departments of organisations. For most departments and aspects of automation, academic research is already available. In Purchasing and Supply Management, there has been some research involving automation as well. However, not all aspects involving the implementation of automation have a lot of academic research. While the advantages of automation are well-researched, there is limited research regarding the challenges that organisations face when implementing automation. The skills needed to properly manage these challenges also have very limited research surrounding them.

To address this gap in the research field, the following research question has been formulated:

Which challenges arise during and after implementation of automation in procurement, and which skills are needed to manage them?

This research question is answered using a qualitative research approach, with several steps. First, a literature review was conducted, with the goal to review the existing academic and industrial knowledge of automation in Purchasing and Supply Management. Then, in order to collect data, interviews were conducted with purchasing experts across various organisations that have implemented automation within their procurement practices. Finally, the collected data provides insights in which types of automation are common within the procurement field, and which skills are considered to be important when dealing with automation.

The answer to this research question provides practical insights in the field of Purchasing and Supply Management. It provides procurement organisations with a greater understanding of automation. It outlines how automation with regard to Industry 4.0 is often implemented and it assists in identifying and addressing any potential challenges. This means that organisations can make a more informed decision on whether the way they wish to implement automation is the most effective. Additionally, it makes the entire process smoother as issues are identified more easily and it becomes easier to manage these difficulties before, during and after the implementation.

2. LITERATURE REVIEW

2.1 The purchasing process and automation

Purchasing is a critical part of organisations, that contains various activities that make sure maximum value for the organisation is obtained (Colombo et al., 2023, p. 2). Purchasing is defined as follows according to Van Raaij (2016, p. 13): *"The design, initiation, control and evaluation of activities within and between organisations aimed at securing inputs from suppliers at the most favourable conditions."*. This mean that all activities regarding supplying are involved in the process and it reinforces that maximum value for the organisation is prioritised.

The activities within the purchasing function can be split into two different sections, one being strategically oriented and the other being operationally oriented. The strategic side of purchasing contains planning supply, and selecting and contracting suppliers. The operational side of purchasing represents all activities that involve placing the actual order: placing the order, expediting the order and making the payment (Schiele, 2018, pp. 47-48).

Automation means the independent acting, without any human intervention. Automation has been around for a very long time, with various technologies, starting with irrigation channels and aqueducts in the times of the Romans, and evolving to the factories that can mass-produce all kinds of products that are used daily (Nof, 2009, pp. 14-15). An important part of modern automation is robotics. Robotics focuses on making a machine to take care of the repetitive tasks, so that humans can focus themselves on other specific tasks that are not as easily automated, usually involving human contact (Goel & Gupta, 2020, p. 168). However, multiple other parts are also important for automation, such as infrastructure (such as infrastructure used for telecommunication), nonrobotic devices such as sensors and other systems, such as computers and software packages. Artificial intelligence also plays an important role in this (Nof, 2009, pp. 19-20). Next to the obvious cost reductions, automation has several benefits for organisations, such as workload reductions, less stress, less fatigue and a higher level of stability due to consistency. However, apart from the implementation costs, some long-term costs may be less human skill and less awareness of the situation (Breton & Bossé, 2002, p. 10).

According to Colombo et al. (2023, p. 10), "*Automation prevails at the operational level of the purchasing process, especially for simple and lower value-added activities.*". In conclusion, looking at the previously mentioned research by Schiele (2018), this means that automation is mostly used in the process of placing orders, expediting orders and making payments. When tasks become less operational and more strategic, they require more human interaction (Herold et al., 2023, p. 432).

2.2 Automation technologies in purchasing

2.2.1 ERP systems

Several automation technologies have proven to have relevance in the purchasing field. All of these bring their own benefits, though these may also have their own challenges. Enterprise Resource Planning systems, ERP systems for short, are systems that are widely used among businesses and are considered important by many. ERP systems aim to give organisations access to all relevant information of the entire organization on one platform. This means that there is one standardised system. This can lead to reduced costs and support change within the organisation (Njualem, 2018, p. 26).

Considering ERP systems span across all departments of the organisation, they are relevant to purchasing and supply management as well. Most operational processes can be performed more efficiently with assistance from the ERP system. Strategic processes such as supplier selection, but also operational processes such as purchasing or processing invoices can be performed using the ERP system. The ERP system is also able to include other relevant business departments in the processes as well (Banerjee, 2018, p. 78).

2.2.2 Robotic process automation

Robotic process automation is often one of the first steps that organisations take towards automation. Robotic process automation refers to the automation of repetitive processes, such as automated e-mail responses. This way, it replicates what a human would do in its place (Boulton, 2018). A study by Hartley and Sawaya (2019, p. 709) found a company using robotic process automation for consolidating and entering customer orders. The company wants to expand the automation to other areas as well, such as reviewing and responding to emails, creating purchase orders, and entering data. In conclusion, this would make robotic process automation mostly effective for the operational part of procurement.

2.2.3 Artificial Intelligence

Artificial Intelligence can be used throughout the entirety of the purchasing process, for various use cases. Some used techniques are automation and optimisation of processes, relation management, supplier selection, predicting and decision-making (Allal-Chérif et al., 2021, pp. 5-10).

Process optimisation

Artificial intelligence is able to process massive amounts of data, with less errors and fewer costs than humans (Topol, 2019, p. 6). It makes processes easier to control and monitor, leading to less delays, less mistakes and ensuring good results (Allal-Chérif et al., 2021, p. 6). Artificial intelligence will be able to be used for automation of several business processes, for example spend analyses. However, it is still very new and relatively unused in many sectors (Li et al., 2025, p. 1).

Relation management

The relationship an organisation has with its suppliers is very important. Good relationships with suppliers provide massive competitive advantages, including getting priority in cases of emergencies or new innovations. Becoming a privileged customer is important for many organisations. Artificial Intelligence can assist in measuring key indicators of supplier and buyer performance, using much more data and measuring in real time (Allal-Chérif et al., 2021, p. 9).

Supplier selection

Supplier selection is a process that has many variables. Given that organisations are also able to source all over the world, there is a lot of choice with a lot of variables. With this, Artificial Intelligence can help by comparing the suppliers, as it can handle large amounts of data far more efficiently than a human can (Allal-Chérif et al., 2021, pp. 6-7).

Predicting and decision-making

When making decisions or when forecasting future orders, there are also a lot of variables that may be relevant. Artificial Intelligence has proven to be very effective to assist in forecasting. Machine Learning allows the machines to make more accurate predictions based on the past experiences. Machine Learning, combined with the data-processing capabilities of Artificial Intelligence, enable it to make reliable, accurate forecasts (Kiefer & Ulmer, 2019, p. 78). The same is true for decision-making, as its data-processing and forecasting can help identify problems in organisations that would otherwise be difficult to find, sometimes even identifying problems before they can harm the organisation (Allal-Chérif et al., 2021, p. 8).

These use cases show that, in contrast to the other technologies that were identified to be highly important, Artificial Intelligence can mostly be used to automate parts of the strategic process of procurement.

2.3 Interaction between people and systems

When examining new technologies, it is important to consider in which ways humans interact with them. There are a couple of interactions that are important to consider, both during and after implementation of technologies.

2.3.1 Human-System Integration

Human-System Integration (HSI) is a field of study that designs the interactions that humans have with the systems they have to work with. The interactions are designed in a way that makes them safe, consistent and efficient (Madni, 2010, p. 233). It combines various disciplines, such as psychology, mathematics and computer science (Boy, 2021, p. 3). Its advantages often do not involve direct benefits, but rather indirect benefits. Taking Human-System Integration into consideration can increase the satisfaction of users with the system (Stark & Kokini, 2010, p. 18).

Colombo et al. (2023, p. 9) have designed a model showing the different socio-technical impacts of digitalisation. Within this model, it is shown that automation has an effect on task autonomy. Automation leads to more free resources as less important tasks are automated, which can give purchasers the opportunity to develop additional competences to interact with systems and to develop skills that are useful for other tasks as well. What is not included in the model, however, is that the automation can also reduce certain skill requirements. As earlier identified by Marton (2023), new skills will appear and some old skills will start losing relevance. For this reason, the model has been modified to add an additional relation, the shift in purchasing-related skill requirements. This model can be viewed in figure 1.

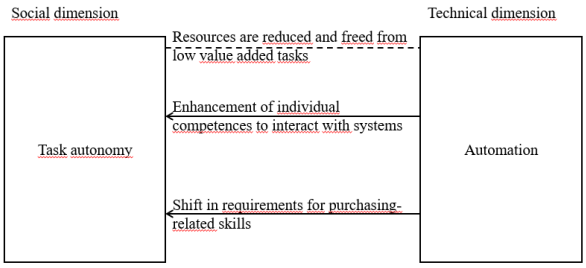

Figure 1. Part of the socio-technological model from Colombo et al. (2023), modified to include skill requirements.

2.3.2 Change resistance

Implementing new technologies means that the processes of the organisation will change. Change resistance means that employees do not want the change to be implemented in the organisation. This can lead to various consequences, which mainly involve slowing down the entire process, or increasing costs (Pardo del Val & Martinez Fuentes, 2003, p. 148). Change resistance may stem from an employee's psychological response, but it can also be due to cultural aspects (Borland & Hall, 2021, p. 17). Resistance might also stem from other factors, such as uncertainty about the effects it will have on the employee's role.

A lack of understanding of the new technologies can also spark resistance. Insufficient support from management or unclear communication regarding the change will also contribute to this (Ramadhani et al., 2024, p. 348).

Change resistance can be identified using the Technology Acceptance Model (Davis, 1989). This model shows the degree to which people accept certain technologies, using several variables. Firstly, External Factors can have an influence on Perceived Usefulness of the system, and the Perceived Ease of Usage. External Factors can include the user's qualities, but also the entire environment. The Perception of Usefulness will also improve if the Perceived Ease of Usage increases. The Perception of Usefulness and Ease of Usage will impact the user's Attitude Toward Using, which, in turn, will improve Behavioural Intention to Use. Finally, this influences the Actual Use of the system. The perceived usefulness is considered the most important factor towards the use, while the ease of use is considered a secondary factor (Du et al., 2024).

Properly addressing change resistance is important, as it can have negative consequences. Kotter and Schlesinger (1989, pp. 5-7) have identified six different methods for addressing resistance: education and communication, participation and involvement, facilitation and support, negotiation and agreement, manipulation and co-optation, and explicit or implicit coercion. These all have their own benefits and drawbacks, but all serve to keep change resistance to a minimum.

2.4 Skills needed in purchasing

A broad skillset is required in order to effectively perform as a purchasing and supply manager. These skills are in all different fields, ranging from strategic thinking and negotiation to sourcing and communication. While the skillset is very broad and will definitely continue to be very broad, the introduction of Industry 4.0 and its technologies do cause a shift in the competences that are considered the most important for purchasing managers. Purchasing as a whole is a broad topic and has many different tasks, all requiring different parts of the skillsets. This means there is no one skill that is the most important, and some skills are more important than others depending on the scenario (Stek & Schiele, 2021, p. 2). However, a couple of competences that are considered as important among most purchasing professionals are analytical skills and thinking, leadership skills, negotiation skills, and business and PSM knowledge (Stek, 2021, p. 309).

With the new technologies, it has become clear that data analytics and data management is becoming increasingly important. Most Purchasing Managers are involved with massive amounts of data. While Industry 4.0 technologies can assist in analysing the data, it is also important for a purchasing manager to interpret and analyse the data themselves (Marton, 2023, p. 34).

As new skills become more relevant and other skills will lose some relevance, a skill gap will appear, and in order for organisations to continue operating effectively, it is important to address this skill gap. One of the most effective ways to close the gap is by offering trainings to staff, to assist them in building the skill. Another solution could be to hire new staff, as the 'new' skills could also open new job opportunities (Marton, 2023, pp. 38-39).

3. METHODOLOGY

3.1 Research design

In order to collect the data and identify how task automation is implemented, which challenges arise and which skills are needed for it, a qualitative research approach was followed. This is done through desk research and through conducting interviews with experts in the field of Purchasing and Supply management across various organisations. This approach has been chosen in order to get first-hand experiences from purchasing professionals of different organisations. The interviews followed a semi-structured format, using an interview guide involving both open and closed questions, and leaving room for follow-up questions or questions for additional explanations (Saunders et al., 2019). For this, it is important that the research questions align with the literature well (Yin, 2014). This ensures that the interviews can go further in-depth, and it also gives the opportunity for finding issues and uncovering data that is not expected to be found (Adams, 2015, p. 366).

3.2 Sampling

The approach taken for the sampling has followed the four-point approach as outlined by Robinson (2014, pp. 25-37). This approach consists out of four steps: defining a sample universe, finding a sample size, constructing a sampling strategy and sourcing the sample. This provides a clear strategy for ensuring a good sample, which contributes to the accuracy of the research.

Sample universe

In order to define a sample universe, it is important to have clear criteria that can include or exclude certain cases. Inclusion criteria define a required attribute that has to be met in order to fit into the sample. Exclusion criteria can exclude certain cases from the study (Robinson, 2014, p. 26). For this study, a set of inclusive criteria has been determined. These criteria are listed in Table 1.

Table 1. Criteria for selection of interview participants

Criteria
1. Participant must have a specialised role in purchasing within their organisation.
2. The organisation must have implemented automation within their procurement department.
3. The participant must have regular involvement with the automation practices that are a part of the procurement practices.

Sample size

The sample size is essential for the representativity of the study. Since this study investigates different organisations, and it is important for all the responses of all individuals to be of importance, a relatively small sample size is more suitable (Robinson, 2014, p. 29). For this reason, a sample of six participants had ultimately been chosen. This has guaranteed that there are some different responses among the interview participants, while also making sure that every case has been analysed thoroughly within the time frame, ensuring that every case is important.

Sample strategy

The sample strategy determines the way that the specific cases are selected from the sample universe. The samples will be purposely chosen. This study has used a purposive sample strategy, namely convenience sampling. This form of sampling means that the ease of access to the researcher is important to the sample. This is often done when working with low accessibility or with severe resource constraints (Simkus, 2022). Since purchasing professionals are not always readily available and time constraints are in place, convenience sampling was necessary in order to have received the chosen amount of interviews.

Sample sourcing

The sourcing of samples means that the actual samples are sourced. It is important to inform all participants of the goal of the study, what their, completely voluntary, participation contains, and that their anonymity will be upheld, so that all participants can choose to give informed consent to the interviews (Robinson, 2014, p. 35). Participants were reached and recruited by making contact with them on social platforms, such as LinkedIn, and by directly contacting organisations.

3.3 Data collection and analysis

In order to collect the data, semi-structured interviews have been held with the PSM professionals. For this, an interview guide was constructed. An interview guide is a document that guides the interview, containing a couple of themes and specific questions. It also states the information that the participants will be given ahead of the interview (Karatsareas, 2022, p. 103). The interview guide has been divided into four themes: Automation, Automation in the future, Skills required for purchasing and Interaction between people and systems. To ensure the questions are valid for this research, the specific questions have been based on desk research involving automation and its possible complications. Each theme has several questions and sub-questions. Every question is based on the literature research that was performed before the interview guide was constructed. This gives the questions a strong basis to make sure the questions are clear to the interview participants. The full interview guide excluding the information for informed consent can be found in Appendix 1.

By performing the interviews, the data has been collected. Audio of the interviews has been recorded. The audio recordings have been used to make transcripts, and after completion of the research the audio recordings have been deleted for ethical considerations. Interviews have been held in person. This has many advantages, such as being able to see participants' body language. The alternative to this were video calls, as video calls provide similar advantages to in-person interviews (Adeoye-Olatunde & Olenik, 2021, p. 1363). However, video calls were not held, and all interviews were held in person.

The participants will be referred to as Interview Partners, labelled 1 through 6. In Table 2, a short overview with relevant information of the selected Interview Partners and their respective organisations is given.

Data analysis has followed the thematic analysis approach. After transcribing the interviews, it is important to read the transcripts to get familiarised with the interview and make sense of what is mentioned during it (De Casterlé et al., 2012, p. 363). Then, the transcripts are coded. The codes can be used to identify themes, which will give the opportunity to interpret the data effectively (Clarke & Braun, 2017, p. 2). Finally, this data can be used to analyse some of the core technologies that are used to automate procurement practices, and give an answer to the research question.

4 RESULTS

4.1 Technologies used

First of all, the new technological systems used are identified. The main benefits and thus the main reasons for choosing these systems have been identified, in order to give insight in the use of the new technologies. Next to this, technologies that the organisations of the Interview Partners are planning to use in the future were also discussed, to get a broader view on the new technologies.

4.1.1 Operational automation

During the interviews, all Interview Partners have mentioned that their organisations are using an ERP system, with a provider such as SAP, in their regular day-to-day operations. It is used across all departments, including purchasing. According to Interview Partner 6, *"Actually the most important is the ERP system of SAP."*. The systems are responsible for the automation of several important tasks related to direct purchasing, meaning all purchasing of goods or services that are related to the end product of the organisations. It also makes forecasts of orders, determining when and how much has to be ordered. This is mostly done based on previous patterns of sales according to Interview Partners 2, 3 and 4.

These systems have several benefits. Interview Partners 1, 2 and 3 stated that the system rarely makes errors, greatly reducing mistakes that are made when ordering. However, according to Interview Partner 4, *"An automated system is handy, but fairly error-prone."*. However, more mistakes do happen when people are more involved, though this implies that control is still necessary. Decrease in costs was also mentioned. Since the automation makes less mistakes, less employees are needed, reducing costs. Next to this, Interview Partners 2, 3 and 4 noted that the automation can save a lot of time, as it helps eliminating tasks, mainly administrative. Finally, Interview Partners 1, 5 and 6 mentioned having a higher level of control. An ERP system provides all data, and the system itself forces one specific way of working amongst employees.

While ERP systems already encompass most of the organisation, including purchasing, Interview Partners 1, 5 and 6 reported using other systems for different purposes as well. Interview Partners 5 and 6 use a couple of similar systems. Firstly, while the ERP-system is used for all direct flows, a separate system is used for all indirect flows. Next to this, a system for relationship management is used. Interview partners 1 and 5 also use a separate system for contract management. Finally, a couple of other minor systems are used, some of which are linked to the ERP system, all of which have their own specific use cases.

4.1.2 Strategic automation

AI is a technology that is considered and closely monitored by all Interview Partners, with the exception of Interview Partner 4, though it is not used by all of them. Only Interview Partner 3 reported having AI integrated in its purchasing process, using it

Table 2. Identifiers of the Interview Partners

Participant	*Organisation sector*	*Organisation size*	*Interview duration*
Interview Partner 1	Manufacturing	Large	35 minutes
Interview Partner 2	Retail	Large	33 minutes
Interview Partner 3	Retail	Large	32 minutes
Interview Partner 4	Retail	Large	40 minutes
Interview Partner 5	Manufacturing	Large	41 minutes
Interview Partner 6	Manufacturing	Large	28 minutes

to help with forecasting order quantities. This functionality was also reported by Interview Partner 2 as one of the main use cases for them. Interview Partners 5 and 6 did report using AI within their company. However, there is not a clear policy or system for the use of it, and it is also not required. All Interview Partners that do not use it yet did emphasize its growing importance, and it was reported that using AI is being researched for their organisations.

The main benefit that was reported for AI is its ability to analyse data, as stated by Interview Partners 2, 3 and 5. Next to this, Interview Partner 5 also stated that AI can be useful for retrieving data. *"I think you can think of anything and they use it for that. But especially for collecting data about markets, con-colleagues and suppliers."*. This way, it may also assist in supplier selection, or supplier assessment, as mentioned by Interview Partner 2 and 5 respectively.

4.2 Challenges of technologies

These technologies can all bring great benefits to organisations in different ways. However, these systems also bring their own challenges. These have also been identified, both for systems that are already in use, and for systems that the organisations the Interview Partners work for are looking into using in the future. Interview Partners have especially identified challenges with ERP systems and AI, as these stood out to have distinct features for organisations.

4.2.1 ERP systems

The ERP systems bring several challenges when looking at its implementation. Interview Partners 1 and 2 mentioned that it was the decision of the entire management team to implement the ERP system, and getting agreement upon the entire team is a challenge in itself. They emphasised that not only agreement within the management team is important, but that agreements with different departments of the organisation is also essential, as resources have to be selectively allocated. Interview Partner 1 also mentioned the importance of the technical feasibility of the systems with the organisation. Interview Partners 1, 2 and 3 mentioned the price of a system with a scale like the ERP system as also being potentially restrictive. The time that it takes for an ERP to be implemented across the entire organisation is also a barrier. Interview Partners 1, 5 and 6 mentioned the process taking years, especially when implemented globally.

While the implementation of ERP systems itself brings its challenges, it is an ongoing effort to keep the ERP system working as intended. Interview Partners 2, 4, 5 and 6 all mentioned that the correctness of data within the system is crucial for its functioning. If the data is not correct, it can lead to various issues, including automatic orders that are wrong. Keeping the data correct and up-to-date is important. For that reason, Interview Partners 2 and 4 report regularly checking the orders or the stocks to ensure correctness. Interview Partner 4 emphasizes the importance of this due to their system being error-prone.

4.2.2 AI

Since AI is only a major part of automation for Interview Partner 3, the reasons that other Interview Partners give for not using AI in their procurement practices have been identified.

Data security is a major concern regarding AI. As reported by Interview Partner 1, *"We are very much bound by certain guidelines here with regard to cyber security."*. While they are investigating use cases for AI, there are chunks of data that their organisation will not be able to deliver to the AI, introducing difficulties to use it effectively. While Interview Partners 2 and 3 are both keeping a close eye on developments involving AI, both are struggling to see any additional use cases at the moment, so no clear developments are made in their organisations. For Interview Partners 5 and 6, there is no clear policy for the usage of AI. While employees are free to use it, there is no guideline. Also, in the case of Interview Partner 6, the support from the management team is lagging behind, hindering development.

4.2.3 Other systems

As identified earlier, Interview Partners 1, 5 and 6 also have other systems in place to help automate specific tasks. There are a couple of difficulties when it comes to other systems, especially when combined with ERP systems. As stated by Interview Partner 1, *"The digital tools also need to be able to communicate with each other."*. This is affirmed by Interview Partners 5 and 6, who also emphasise the advantages this may bring. For some tasks, multiple systems have to be used, and performing tasks will be much easier when the different systems are connected to each other and can be accessed easily that way. Next, Interview Partner 5 reported that the language of the systems can also be an issue. *"You also have the same English standard in Germany and you also have it in Asia. You have those everywhere at some point so that's an important one."*

4.3 Skills in purchasing

The skills that are necessary for being a good purchaser have also been identified. Next to this, Interview Partners were asked to think about skills that have become more essential or skills that have become less important, or even obsolete, as a result of new technologies automating certain tasks, which changes roles and tasks.

4.3.1 Necessary skills

The Interview Partners have been asked which skills they deem essential for purchasing. Several relevant skills have been identified, though, their importance is also partially role-dependent.

Analytic thinking is considered very important. As stated by Interview Partner 5, *"Sometimes you have to put things in perspective and act as a filter."*. Similarly, understanding data is considered essential for making informed decisions, or drawing clear conclusions by understanding what the actual meaning of the data is.

When it comes to relationships with suppliers, negotiation was considered an essential skill. Going to a negotiation well-prepared, knowing the position opposed to the supplier and knowing what the best possible results for the organisation are during the negotiation process, were considered very important. Next to this, contract management is regarded to be a significant skill, knowing when contracts expire, what the terms are and how to draft new contracts. Related to this are relationship management, and stakeholder management as well. Having a good relationship with a supplier can give an organisation a preferential status for that specific supplier. Stakeholder management is an extension of this, requiring to stay in contact with all internal and external parties.

Digital proficiency is also identified to be important for purchasing, as well as following developments. Flexibility is also essential as the world of procurement is constantly moving, which also requires good leadership.

4.3.2 Shift in necessary skills

The Interview Partners were asked to identify any skills that they would consider to be more important, or less important due to recent automation developments. This way, a possible shift in required skills can be identified.

Firstly, a couple of skills have been identified to have become more important according to Interview Partners 1, 2, 4 and 6. Interview Partners 1, 2 and 4 stress that it has become more

important to be proficient with the systems, or at least be open to learning to use them. In the words of Interview Partner 2, *"It's just become so much more important to have some technical aptitude with systems."*. While Interview Partner 4 said that required skills are mostly similar next to the digital proficiency, Interview Partner 1 said that analysing risks and contract management have become more important, as there are more potential suppliers overall as well. Interview Partner 2 highlighted the importance of good leadership, and ensuring that all employees are willing to work together within the function. This can assist in making the implementation easier, as good leadership causes employees to follow you and trust the decisions more easily. Finally, according to Interview Partner 6, *"Interpreting data and being able to assess that properly is really quite important."*.

Only Interview Partners 1 and 2 have identified skills that they deem to be less important. Both Interview Partners mentioned that the administrative part of purchasing has largely become obsolete due to the automation. Furtherly, Interview Partner 2 highlighted that since most orders are made automatically for them, and the quantities are rarely checked, forecasting has become less important.

4.3.3 Skill development

Interview Partners were asked to identify whether certain skills can be learned or developed, and in which way this would be done.

All Interview Partners highlighted that trainings can assist in skill development. However, most of the Interview Partners do mention some restrictions with this. Interview Partners 1 and 2 highlight the importance of practice, rather than only following trainings. Furthermore, Interview Partners 3 and 4 mention that trainings will never be enough to properly develop a skill, highlighting that it is also important to have a form of natural talent to develop the skill. Finally, Interview Partners 5 and 6 also mention that trainings are offered through their organisation, that can help with the development of certain skills. Interview Partner 5 even noted that there is a high level of encouragement from the organisation for following these trainings.

4.4 Change management

The degree to which employees have been resistant to change have been identified. Next to this, Interview Partners have given their opinions on how change resistance amongst employees is best managed.

4.4.1 Change resistance

Change resistance in employees is recognised as an issue among most Interview Partners. The only exception is Interview Partner 1, who noted that there were few issues among employees. All other Interview Partners identified that there were some forms of change resistance amongst employees during the implementation of new technologies. According to Interview Partners 2, 4, 5 and 6, the main cause of this is that employees often have the assumption that changes to systems or operations result in negative outcomes for them. In the words of Interview Partner 6, *"People often find it difficult or awkward when a new system is introduced or when an existing one is changed."*.

4.4.2 Addressing change resistance

All Interview Partners do recognise the importance of addressing change resistance. Interview Partner 1 mentions that the employees take up an advisory role when new systems are implemented, giving them the opportunity to voice their opinions and what they would like to see within the systems. Interview Partner 3 also recognised this, stressing the importance of including employees in the entire process as this can also speed up the learning process. Interview Partners 2, 3, 4, 5 and 6 recognise the importance of trainings for keeping change resistance to a minimum. Interview Partner 2 noted: *"You really have to get people on board. Point out to them the benefits it brings."*. Interview Partner 5 specifically mentioned change management as well, stating that it is important to give employees enough time to adjust to the changes, and to give the employees what they need to adjust. This can be done by changing roles or responsibilities, or changing their positions if they are not a good fit for working with the new systems.

4.5 Support for employees

With regard to change management, the way that employees use the system has also been identified with regards to usability of the system. Next to this, the support that employees receive on a long-term basis when using the new systems has also been discussed during the interviews.

4.5.1 Using systems

The way that humans interact with the systems is important, and Interview Partners were specifically asked about their opinion on how easy-to-use they considered the implemented systems to be.

While Interview Partners 3 and 4 mentioned that their system is quite user-friendly at the moment, all other Interview Partners noted that they considered the systems they use to not be user-friendly. Furthermore, Interview Partner 4 did not consider the system to be user-friendly either until some recent developments that have been made to their system.

Interview Partners 1, 4, 5 and 6 explained that the systems do become easier to use when it is used more often. Though, when not involved with them on a regular basis, it can become a challenge to use them. Also, as the systems get more and more capabilities, it also results in a higher level of complexity, making the systems harder to use. However, as stated by Interview Partners 1 and 4, most employees already have extensive knowledge of the system, even before starting work at their current organisations, which makes interacting with the system easier.

4.5.2 Internal and external support

Interview Partners were asked which kinds of support are given to employees that are working with these systems on a longer-term basis, with the goal of identifying how human interactions are managed.

Internal support is a factor for every Interview Partner. Interview Partners 1, 2, 3, 5 and 6 mentioned having organised their own courses or trainings, which are made to help employees with using the systems. For Interview Partners 1, 2 and 3 specifically, these trainings were provided when the systems were implemented. For Interview Partners 5 and 6, these trainings are structured more as a learning course, being available at any time for any employee that needs the training. As explained by Interview Partner 5, *"There are quite a lot of trainings on all the individual systems and Powerpoints that you can access, recorded and presentations."*.

Interview Partners 1, 3, 4 and 5 explained having a form of a helpdesk or support centre in their organisation. These can be contacted when there are any issues with the system, or when instructions are needed for certain functionalities.

Support from experienced co-workers is also highlighted by Interview Partners 2 and 6. They mention that employees are always able to contact someone else from their department that can explain how the system works. This is also an important part of the onboarding process for new employees.

Interview Partner 5 also mentioned having external support for their systems. They explained that SAP gives a training on their own software when implementing an ERP system. Furthermore,

they mentioned that SAP also provides the possibility to contact them in case any issues arise after implementation.

5 DISCUSSION

5.1 Results interpretation

It has been identified that there is a lack of understanding of the challenges that automation can bring in the purchasing department or organisations. This research aimed at providing a better understanding of some key technologies that are used to automate procurement practices, and the challenges these technologies bring.

Through conducting interviews with experts in the field of purchasing, working for various organisations, some commonly used technologies and the challenges involved with these have been identified. The data suggests that there are a few systems that are very commonly used among organisations. However, it was also found that the technological development within procurement is not very advanced.

Furthermore, skill requirements for procurement have been identified, as well as a shift in the importance of certain skills. Finally, the human part of interacting with systems was analysed, including the support given to employees, as this appeared to play an important role in the implementation of new automation technologies.

5.1.1. Operational

ERP systems are confirmed to play an important role for automating procurement. They have a central role in organisations, integrating all processes and departments. Its benefits are widespread. It brings a high level of standardisation to organisations, enforcing one way of working. Next to this, It gives employees insight into the entire organisation, which also helps reducing errors. Furthermore, it can help forecast order quantities. These benefits can lead to massive time saves and cost reductions.

However, these ERP systems also still introduce challenges. Most of these challenges lie in the implementation of the system. The main concerns mentioned are the high costs of the system, and the long implementation periods of the system. Additionally, technical feasibility is an important prerequisite.

After the implementation, challenges still appear. To optimise the ERP system's functioning, managing these challenges is essential. Data accuracy is important, as more errors stem from incorrect data. Within purchasing, order quantities and timings get affected the most. Routinely checking the data in the system can prevent this.

5.1.2 Strategic

The findings show that the usage of AI in procurement is very limited, with only one of the Interview Partners using it in their day-to-day processes. Despite this, its potential is widely recognised. Potential use cases for organisations are to provide more accurate forecasts of order quantities, or analysing data that can be used for selecting or assessing suppliers. New developments involving AI occur continuously, and most organisations are monitoring these developments closely, and do consider implementation.

An important concern that was shared is the security of data by AI. The ability of AI to store any data provided to it raised concerns involving unauthorised access of data and data leakages. This leads to an increase in scepticism towards AI, driving organisations towards using other methods for automating their procurement practices.

Beyond this, some Interview Partners state that developing AI and implementing it on a broader scale is simply not a priority, showing a lack of support from organisations towards implementing it. Due to the challenges and risks, some Interview Partners have admitted that they would prefer to invest into other technologies that can provide similar benefits, but do not come with the same types of risks.

5.1.3 Skills in purchasing

For purchasing, a wide skillset is needed. While the importance of certain skills is role-dependent, a couple of skills were named that were always considered to be essential. Analytical thinking was emphasised, which involves making informed decisions and deciding what is in the best interests of the organisation. For this, data interpretation is essential as well. Additionally, digital proficiency is highly relevant, as being able to use systems effectively can assist in getting data needed to improve decision-making.

Negotiation is another commonly named skill. This requires good preparation, and knowing the position of the organisation compared to the supplier. Contract management is tied with this, ensuring that the contracts are valid, compliant, and effective.

An additional important skill mentioned is relationship management. Relationship management involves maintaining a good relationship with the suppliers, which can give organisations a preferential treatment by the supplier, or give them better value. Similarly, stakeholder management is considered important as well, stretching beyond relationships with suppliers only and also looking at the interests of other stakeholders of the organisation.

Due to the automation technologies and new systems introduced in organisations, shifts have been identified in the importance of some skills. Firstly, the decline in administrative skills was highlighted, as routine tasks like these are easily replaceable by automation, making the skill largely obsolete. Similarly, forecasting is less relevant. Most Interview Partners reported having built-in forecasting systems in their ERP systems, which are largely accurate. On the other hand, especially digital proficiency has been mentioned to have become more relevant, as the new technological developments introduce increasingly complex systems. Furtherly, leadership is noted to have become more important, which is mostly tied into change management as it can help employees embrace change.

Finally, it has become clear that some skills can be developed. Mostly technical skills can be improved by trainings or courses. However, the importance of practice was highlighted, especially with regard to soft skills.

5.1.4 Change management

The Interview Partners have explained the importance of effectively managing changes within the organisation when it comes to automating practices. Change resistance among employees appears when the employees feel uncertain about the impact that the automation can have on their roles or responsibilities. It was noted that employees often assume that the new technologies may threaten their job security or significantly alter their responsibilities and tasks. These perceptions lead to distrust towards the adoption of new systems, even when the benefits are quite apparent.

Involving employees and communicating clearly regarding the change is essential towards keeping change resistance to a minimum. The Interview Partner that identified the most employee involvement during implementation also faced the lease change resistance. As people are involved, uncertainty decreases, decreasing change resistance.

Trainings are also considered essential for overcoming change resistance, as these can give the employees confidence in the new

technologies. Additionally, it was explained that demonstrating the new benefits that the technology has can increase trust in the system as well.

Finally, it is important to give employees a proper amount of time and resources to adjust to changes. Some systems and technologies require structural changes to the organisation, including different roles and responsibilities, and time is important for this matter. This can improve stability and will gradually reduce change resistance over time.

5.1.5 Support for employees

The findings have indicated that support for employees is also important in order to secure long-term success. Purchasing systems are often complex, and while some systems are considered to be quite user-friendly, some organisations face challenges involving user-friendliness. In those cases, having functional support systems is essential, as it can help solve any issues.

It was noted that using systems on a regular basis can significantly improve the ease of use, while infrequent use can give employees more challenges. This highlights that learning opportunities for employees are essential. One way to achieve this is through training employees, and ensuring that these instructions can be accessed for reference at any time.

Beyond trainings, internal support structures also impact the ability for employees to work with the system more efficiently. Internal support is often present. Besides trainings, internal helpdesks are common. These can be contacted when any issues arise, and they help solving any problems, and offer instructions when necessary. Furthermore, having experienced co-workers is considered to be important. Experienced employees can also offer explanations or solve common problems as they usually have more knowledge about the systems as they have been involved with them for a long period of time.

Finally, external support is also valuable to organisations. Some organisations have received ERP-related trainings from the organisation that provides the system. Additionally, there is still a possibility to contact the ERP provider in case any problems arise.

5.2 Literary contributions to automation in the operative procurement field

The findings indicate that the automation in procurement mainly involve the operational procurement process as identified by Colombo et al. (2023) and Schiele (2018), as it is mainly used for automating orders and forecasting quantities. However, it has also been identified that there are forms of automation that can assist with the strategic side of procurement, helping with supplier assessments and selection. While automation does significantly reduce the tasks, the need for human oversight is not completely eliminated.

The discovered use of ERP systems is mostly in line with the literature, leading to reduced costs and giving standardisation (Njualem, 2018). Additionally, ERP systems give a lot of insight into the operations of the organisation. AI is mostly used to make forecasting more accurate. While this supports the found literature by Allal-Chérif et al. (2021), other uses of AI have not been discovered, as there is a high level of hesitance due to several concerns involving security and reliability. The reliability concerns contradict the literature, as AI has been found to make less errors than humans do (Topol, 2019).

The results confirm that there is a shift in the skill requirements for procurement. The importance of analytical skills, leadership and negotiation is highlighted, which is consistent with the found literature (Stek, 2021). The identified shift shows that digital proficiency and change management have significantly increased importance due to the addition of new technologies, while administrative skills have greatly reduced importance. The existence of a shift is also confirmed by prior research, though the skills that have gained or lost importance are different to the found literature, as previous research found that data management is gaining importance (Marton, 2023). Skill development is also highlighted in previous studies. The importance of trainings to develop skills is explained by both this and previous research (Marton, 2023).

The findings of this study align with theories involving change resistance. It was found that employees who found the system to be difficult to use, or did not see the usefulness of the new technologies, often found it more challenging to use the new technologies. These findings support the Technology Acceptance Model, which states that the perceived ease of use and perceived usefulness have a great impact on the usage of a system (Davis, 1989).

The way change resistance is addressed aligns with the theories of Kotter and Schlesinger (1989). The main strategies to combat change resistance used are education and communication, participation and involvement, facilitation and support.

5.3 Practical contributions

The results show that ERP systems can provide great benefits. ERP systems can improve accuracy, standardisation and reduce mistakes. It can also take on some tasks, including automatically forecasting orders and placing orders. This means that less human involvement is needed, which can lead to cost reductions. However, some challenges must be considered when attempting to implement ERP systems. Firstly, ERP systems are found to have a very high initial investment cost. Secondly, it is noted that any inaccuracy in data can have great impacts on the effectiveness of ERP systems, as it may lead to incorrect orders or other mistakes. This makes data regular data validation important.

Artificial Intelligence has great potential for automating procurement practices. It can give more accurate forecasts, and it can automate the analysis of massive amounts of data. However, organisations have several concerns regarding AI that hold back its implementation in practices. Data security is a major issue, as sensitive data gets stored in the AI's systems. Furthermore, while a lack of reliability is often disproven by recent studies, it remains a source of distrust towards AI, hindering its adoption.

An example of an AI provider is the organisation Terzo. Terzo has developed an AI-powered contract platform, which specialises in forecasting, consolidating and budgeting (Terzo, 2025). These tasks can be performed through data-analysis, which the Interview Partners recognised to be the main advantage towards using AI.

The finding indicate that the skill requirements related to purchasing are shifting. While most core skills, such as negotiation skills and analytical skills remain important, a shift in importance for certain skills also appears. Digital proficiency and effective change management have gained importance as new technologies bring massive changes to organisations. Reversely, administrative skills have become mostly obsolete. To develop these skills among employees, proper trainings are essential. Though, not every skill can be developed easily, and it is also part of a person self to develop skills.

An example of an ERP provider is SAP. They state that their ERP system also assists with supply chain management, giving end-to-end insight. Furthermore, the system automates data reporting, and it produces forecasts. When a system like this is implemented, trainings are offered (SAP, 2025). This is in line

with the findings. It also confirms that the skills of forecasting and administrative tasks have become less relevant, while digital proficiency is more important.

A central theme that involves any new technology involves change management. Employees often resist changes involving technology. This is caused by several factors. Firstly, following the Technology Acceptance Model (Davis, 1989), employees will have negative behaviour towards using the system when they feel like the system is not useful, or is difficult to use. This emphasises the importance of giving individuals proper training to help them understand the system and its benefits. Giving employees involvement in the implementation will also decrease the resistance to change, as this will help employees improve their perceptions of the system.

Finally, the findings explain that long-term support is also essential in ensuring success following the implementation of automation technologies. Effective problem-solving and assistance appears to be crucial towards ensuring long-term success. Internal helpdesks, such as a specific IT department or consultant are common among organisations to assist employees whenever they need help with understanding the system. Furthermore, regular exposure to the system will improve the proficiency of employees. Externally, some providers of the new systems also give their own trainings upon implementing, and remain available for providing assistance.

6 LIMITATIONS AND FUTURE RESEARCH

There are a couple of limitations that were faced during this study, most of which could also give way for possible future research. Firstly, the sample size is a limitation for the results. The data was received from semi-structured interviews with six participants. However, getting some additional interview participants would have caused greater variation in the answers to the interviews, and could have increased the ability to identify certain trends among interview participants. Next to this, the usage of convenience sampling is also a limitation, as convenience sampling is often considered to skew interview results due to similarities between interview participants (Emerson, 2015, p. 166).

Another limitation is the subjective nature of some questions used for this research. For example, some interview participants were asked how other employees responded to the implementation of certain technologies in order to identify any signs of change resistance. This gives the view of the interview participant, but it did not gain any knowledge from the employees first-hand to identify change resistance using their responses. A form of quantitative research among employees of the organisations that were interviewed could have given more insight into the degree of change resistance within the organisation, and how the change resistance can be addressed most effectively.

Additionally, this research remained mostly limited to ERP systems and Artificial Intelligence, as these are well-known and were expected to be widely used among procurement, which would make identification of challenges possible. However, Industry 4.0 uses multiple other technologies that were not touched upon, such as blockchain or the Internet of Things. Further research involving the challenges of these technologies can provide different results.

Furthermore, the interview participants in this research were part of large organisations, meaning that only the impact of new technologies on large organisations has been explored, while the impact on small organisations has not been analysed. Since small organisations are often known to have less automation practices, the challenges that they face can also be different.

Next to the future research recommendations that stem from the limitations of this study, there are a few other future research recommendations that could provide additional perspective.

Firstly, an industry-specific analyses could provide interesting results. This study had interviews within several different business sectors, but an in-depth analysis of a specific sector can provide additional insights for specific sectors.

Secondly, research involving the development of skills regarding automation could provide useful data. As this study proves that there is a shift in skill requirements and that skill development is important, a study involving the most effective ways to develop important skills related to purchasing would be relevant.

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In section 4, the results, quotations from specific interviews are given. These quotations have been slightly altered to make them more comprehensible, though their meanings remain the same as their originals. This research has received ethical approval from the BMS ethics committee of the University of Twente.

Finally, I do acknowledge that generative AI of the likes of ChatGPT and Copilot have been used in order to refine the text of this thesis. Furthermore, the software program of Atlas.ti was used for coding, and DeepL was used for translation of the transcripts. However, its outputs have always been reviewed and I still take full responsibility for this complete thesis.

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APPENDIX 1: INTERVIEW GUIDE

INTERVIEW GUIDE

Introduction

Tell a bit about myself

Consent procedure:

Tell them about the consent procedure using the separate form. Only start the recording after consent was given.

Interview questions

Q1: **Could you please introduce yourself, and your function?**

- Time period
- Main responsibilities
- Outline of how the purchasing looks in the organization, and which tasks are relevant.

Block 1: Automation

Outline of Question 2: Automation involves independent acting, without human intervention (Nof, 2009). It has been around for a long time, but the new I4.0 technologies bring new ways for automation to make organisations even more efficient. (Müller et al., 2018)

Question 2: **Which tasks within the procurement for your organization are automated?**

2a: Which tasks specifically are automated?

2b. Which technologies are used to automate these tasks?

Backup:

- Some common tools are ERP systems, AI tools for decision making and data analysis, or robotic process automation.

- RPA can automatically answer emails, AI can analyse data etc.

Outline of Question 3: Next to the obvious cost reductions, automation has several benefits for organisations, such as workload reductions, less stress, less fatigue, and a higher level of stability due to consistency. However, apart from the implementation costs, some long-term costs may be less human skill and less awareness of the situation (Breton & Bossé, 2002).

Question 3: **What were the main reasons for automating these tasks?**

3a: Less errors, time save, cost reduction or something else?

3b: Who made the decision to implement the automation?

3c: Were there any external drivers for the implementation?

Backup:

- The decision can be made by the purchasing manager, but the idea also could have been from other employees.

- Of course, some of the mentioned reasons are internal drivers. However, external drivers, such as pressure from other stakeholders also play a role

Outline of Question 4: Implementing different forms of automation has its challenges. For example, implementing automation can be very expensive. Next to this, it may bring new roles or tasks (Delke et al., 2023).

Question 4: **Which challenges occurred when implementing these forms of automation?**

4a: Which specific challenges occurred, and how have they been overcome?

4b: How did the other employees react to the change?

4c: Did the implementation disrupt the regular practice until the challenges were all completely addressed? In which ways, and how did you manage this?

Backup:

- Specific challenges such as not understanding the process properly, or needing layoffs due to the tasks that are no longer in play

- Employees might not like the change even if it did not directly affect them

- Solutions to keep the organization running such as keeping the old system until the new one can be completely implemented and used to its capacity

Block 2: Automation in the future

Question 5: **Are there any tasks that you plan to automate in the future?**

5a: Which new tasks are being considered?

5b: Which benefits do you plan to get from them?

Backup:

- AI can have all sorts of new functions, is its implementation considered?

- Benefits, the same as Q2

Question 6: **Which potential challenges do you see in these new technologies?**

6a: Which challenges are expected (guaranteed) to happen?

6b: How will they be addressed?

6c: Have the previous technologies influenced your view on challenges of the new technologies?

Backup:

- Mostly the same as Q3

- If you had implemented a previous technology and found that employees were having a difficult time adjusting to it, would you add trainings for the new technology before implementing it?

Block 3: Skills

Outline Question 7: Being a purchasing professional requires a wide skillset, such as negotiation, leadership and analytical skills (Stek, 2021). There are many different skills, and many of them are very important as well (Stek & Schiele, 2021).

Question 7: **Which skills do you deem essential for purchasing?**

7a: Which technical skills do you need?

7b: Which soft skills do you need?

7c: How can you learn or develop these skills?

Backup:

- When implementing an ERP system, it is an important skill to be able to manage this. When implementing AI into a process, it is important to know how to efficiently use it.

- Soft skills involve how someone can interact with other people, such as leadership, or work ethic.

- Technical skills are usually learned via e.g. a course, while soft skills usually require feedback on the workplace itself as well.

Outline Question 8: The new systems will naturally require new skills, and it will make some old skills obsolete. For purchasing managers, this may lead to shifted responsibilities and tasks (Marton, 2023).

Question 8: **How have the required skills changed following the implementation of the new technologies?**

8a: Which new skills have emerged, that have become more relevant?

8b: Which old skills have become obsolete, and are no longer required for your role?

Block 4: Skills regarding interaction with systems

Question 9: **How does the procurement personnel interact with the automated systems?**

9a: Are the systems understandable for personnel?

9b: What kind of training or learning process was provided?

Backup:

- If a person does not understand how the system works, is this explained? Was a training given?

Question 10: **What kinds of support is available for the staff that interacts with the systems?**

10a: Is there a help desk that can be contacted, or is there always someone present that has experience with the system?

10b: How are issues with the system resolved?

10c: Is the staff able to give feedback about the system? If so, can you outline how they have/are able to change it?

Backup:

- Some systems in organisations are implemented by other parties, that often have a help desk available in case of malfunction or other potential troubles

- Are certain employees trained to fix the system, or is the help desk used?

Closing

Thank you for your time and insights. Do you have any questions regarding the interview right now?