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Master's thesis

Leveraging the Usage of Procure-to-Pay (P2P) Software to Enhance Purchasing Tactics

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Abstract

The integration of technology into purchasing processes has significantly changed the procurement landscape, with Procure-to-Pay (P2P) software emerging as a transformative force in procurement technology. However, realising the full potential of newly implemented P2P software can be challenging, and its success depends on various factors. Insufficiently planned and executed change management during and after the implementation phase can hinder the adoption levels. This research focuses on analysing and providing insights into the implementation barriers and key success factors of P2P software, specifically focusing on the Coupa software suite. Therefore, a single-case study of a world-leading building materials organisation was conducted. Since the researcher was heavily involved in the day-to-day activities of the case company, action research was another central study method used in this research. This thesis not only proposes actions for improving the adoption of P2P software but also confirms these actions by providing empirical evidence and demonstrating the actual enhancements achieved. Additionally, it provides a unique perspective into the material ID creation lifecycle, offering a valuable template for organisations seeking to map their own material ID creation lifecycle.

Keywords: Procure-to-Pay (P2P) software adoption | e-procurement | purchasing tactics | Artificial Intelligence | product classification | single-case study | action research

Management Summary

The integration of technology has significantly transformed the procurement landscape. E-sourcing tools have improved efficiency, accuracy, and transparency in procurement, benefitting both buyers and suppliers. These tools encourage competition, reduce costs, and minimise (human) errors. In today's complex and competitive business environment, adopting technology in procurement processes has become essential for organisational success.

Among the technological advancements in procurement, Procure-to-Pay (P2P) software stands out as a game changer. P2P software provides organisations with the possibility to lower operational costs and increase efficiency by automating and streamlining their procurement processes. P2P software integrates different functions into one user-friendly platform, enhancing the end-user experience, reducing errors, and lowering training requirements. Centralising procurement processes provides better control over spending, enabling organisations to negotiate lower prices through consolidation of their purchasing power. This consolidation also offers valuable insights into category spending, facilitating strategic decision-making. These enhanced capabilities of P2P software provide valuable insights into optimising strategic purchasing tactics.

However, despite its potential benefits, P2P software has certain challenges that can hinder its optimal utilisation. End-users may not be fully aware of the capabilities and benefits P2P software has to offer. Lack of awareness could result in underutilisation and suboptimal usage of P2P software. For example, users may select free text as a buying channel without knowing that hosted or punchout catalogues are more appropriate. As a result, users may overlook pre-negotiated contracts or catalogues, missing out on cost-saving opportunities.

This research is divided into two parts and aims to address the challenges of P2P software implementation and maximise its full potential. Part 1 provides valuable insights into P2P software adoption barriers and offers practical, data-supported recommendations to enhance the P2P software adoption rate. The empirical evidence of the effectiveness of the used and suggested adoption enhancement methods is a unique contribution to the existing literature. Part 2 of this research delves into standardising data entry with material ID, mapping the current material ID lifecycle at a specific Operating Company (OpCo). Based on this mapping, recommendations are made to improve efficiency and standardise data entry methods, ultimately enhancing data quality in the system. This unique perspective on

material ID creation lifecycles can serve as a reference for other organisations, allowing them to develop standardised procedures and improve data quality.

This research employs an in-depth single case study approach, focusing extensively on a specific P2P software, namely, Coupa. In addition, the action research approach is used as the researcher was heavily involved in the day-to-day activities of the case company. Coupa is an integrated multi-system cloud-based platform that provides a wide range of procurement, invoicing, and expense management solutions. It offers the opportunity to fully automate the purchasing process through the entire transaction lifecycle – from request and approval of a good or service, to the payment and management of suppliers. In 2022, Coupa was named a Gartner® Magic Quadrant™ Leader for Procure-to-Pay Suites for the seventh consecutive year, recognising Coupa as the market leader of P2P solutions.[1] Coupa's main purpose is to help organisations improve their efficiency, reduce costs, and gain visibility into their spending.

To conclude, this research provides valuable insights for organisations planning to implement P2P software, particularly Coupa, into their procurement processes. It helps to understand the factors hindering the full utilisation of P2P software and proposes solutions to enhance P2P software adoption. In addition, it contributes to the understanding of procurement digitisation and its implementation, emphasising the importance of this process for future research. By addressing these critical issues and offering practical solutions, this research improves the understanding of digital procurement, paving the way for future studies in this field.

[1] See Coupa (2022).

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List of Abbreviations

AI	Artificial Intelligence
ERP	Enterprise Resource Planning
OpCo	Operating Company
PR	Purchase Request
P2P	Procure-to-Pay

1. Introduction: Leveraging P2P Software to Enhance Purchasing Tactics

The adoption of technology in purchasing and supply management has revolutionised procurement processes, offering increased efficiency, accuracy, and transparency.[2] E-sourcing tools enable buyers and suppliers to engage in competitive interactions, reducing costs and minimising errors.[3] Digital contract management systems streamline the signing process, saving valuable time and mitigating risk, while also helping organisations improve the quality of their procurement contracts and ensuring suppliers fulfil their contractual obligations.[4] These technical advancements of the past decades enhance communication, optimise procurement contracts, and improve overall supply chain effectiveness. It is essential for organisations who are seeking to thrive in today's complex and competitive business environment, to embrace the use of technology in procurement processes. More and more organisations are doing so with the use of Procure-to-Pay (P2P) software.

P2P software offers benefits that contribute to the overall improvement of an organisation's procurement processes. One primary benefit P2P software provides is the potential for significant cost savings. This technology streamlines and automates procurement workflows, leading to lower operational expenses and increased efficiency. By eliminating manual processes and optimising resource allocation, organisations can achieve substantial cost savings. Traditionally, organisations relied on separate procurement systems resulting in a disjointed and unintuitive end-user experience. In contrast, P2P software offers a seamless interface by integrating multiple functions into one user-friendly platform, providing an Amazon-like experience, thus improving the end-user experience.[5] This improvement in end-user experience not only improves productivity but also reduces training requirements and minimises errors, further contributing to cost savings and efficiency improvements. Furthermore, P2P software enables organisations to leverage their spending more effectively. By centralising procurement processes, organisations gain better control over their spending and can negotiate lower prices through consolidated purchasing power. This consolidation of spend also provides better insights into category spending, enabling organisations to make strategic decisions.[6] P2P software offers enhanced spend

[2] See Rejeb et al. (2018), p. 77.
[3] See Dai et al. (2005), p. 142; Engelbrecht-Wiggans & Katok (2006), p. 581.
[4] See Azizi et al. (2019), p. 1013; Miller (2021).
[5] See Lane (2019), p. 12-14.
[6] See Handfield et al. (2019), p. 12.

analysis capabilities, giving organisations valuable insights into their procurement patterns, optimising their strategies for maximum cost savings and improved supplier relationships.[7]

P2P software, such as Coupa, not only streamlines procurement processes but also plays a crucial role in informed decision-making. Vast amounts of data are collected and centralised within a single user-friendly system, providing organisations with valuable insights. With the introduction of Artificial Intelligence into the procurement landscape in the past decade, advanced analytics using P2P software have also increased the data availability for procurement professionals. This augmentation of P2P software helps procurement professionals to make strategic decisions based on data.[8]

Existing literature has however highlighted challenges associated with procurement systems allowing a significant amount of 'free text' options in their user interfaces and suboptimal adoption of new technologies.[9] While free text provides maximum flexibility for users to create Purchase Requests (PRs), it also introduces several issues. One problem is that users may use it even for non-complex items that have already been included in Hosted or Punchout catalogues. A reason for this is that users are not familiar with the exact description of the materials they are filing a PR for, or don't know the correct translation of the material description. They opt to go for the 'easy' way and fill out a free text with all the required details for the PR. For these items, there is a chance that there are already catalogues for these items in the P2P system or items with identical Short Text descriptions in the Enterprise Resource Planning (ERP) system. These duplications in the system create dirty data, making it more difficult to track spending and analyse these identical items, also lowering the end-user experience when sourcing materials in P2P software.

Additionally, at the case company that will be researched in depth during this research, not all P2P software users are fully aware of the system's capabilities and how to use it most efficiently. They are unaware of the full potential of the system, giving them fewer incentives to use it correctly and most effectively. Or, they lack the knowledge of the disadvantages of not using the system to its full capacity. Using free text as a buying channel whereas Hosted and Punchout Catalogues would have been more applicable, can create several complications. There is a lack of control over the input of the data by the users, possibly affecting the quality and accuracy of the data being entered. Furthermore, as free text

[7] See Handfield et al. (2019), p. 22, 25.
[8] See Colombo et al. (2023), p. 6.
[9] See Handfield et al. (2019), p. 18.

requests don't have (many) pre-defined fields or templates, they require more work by approvers to review and approve. Next to this, by not using pre-negotiated contracts or catalogues, users are missing out on opportunities for cost savings. Users are for example not able to track spend efficiently, making it harder to negotiate better pricing with suppliers.

Next to using the P2P software sub-optimally, the overall usage of the platform falls significantly below the desired levels at the case company. P2P software is being used alongside the old system to accomplish purchasing activities. Both systems can be used to create Purchase Requests but the case company is aiming for a 20% P2P software adoption of the total spend. However, there is a substantial amount of leakage, indicating that this goal is far from being achieved. Several studies have analysed the barriers of e-procurement implementation and its adoption factors (e.g. F. D. Davis (1989); Angeles & Nath (2007))[10]. However, few studies have yet examined the implementation barriers and adoption factors of P2P software specifically. Therefore, this thesis will be split into two parts. Part 1 will focus on the implementation barriers and adoption factors of P2P software.

An additional issue is the lack of a standardised method for creating and entering data into the P2P system. There is no clear documented policy on how data should be entered into the system. This can lead to inconsistencies in how information is recorded and stored, again making it more difficult to analyse spend and track inventory accurately. This also leads to a higher risk of errors and more duplicates in the system, further contributing to the problem of dirty data. This specific issue will be addressed in Part 2 of this thesis.

The objective of Part 1 of this research is to investigate the barriers of why P2P users are not utilising the platform to its full potential, despite its capabilities and benefits. This part focuses on developing strategies to unlock the platform's full potential, specifically by promoting the transition of Purchase Requests from the old system to the new P2P software system. This involves an examination of the various components of one specific P2P platform (Coupa), and the extent to which users are leveraging these tools to streamline their procurement processes. For details on Coupa, please refer to Appendix A. This research provides insights into the barriers that prevent users from adopting to P2P software optimally, which are critical for organisations aiming to enhance their procurement processes through purchasing systems. It provides empirical evidence of effective P2P software adoption methods. Furthermore, this research provides new practical

[10] See Davis (1989), p. 320, 333-334; Angeles & Nath (2007), p. 110, 113.

recommendations on the implementation of an AI Classifying add-on tool to simplify the usage of P2P software for the end-user, thus maximising its full potential.

The second part of this research investigates how to standardise data entry with material ID. This involves mapping the current material ID lifecycle at a specific Operating Company (OpCo). Based on the mapping of the current material ID lifecycle, recommendations are made on how to improve the efficiency of this lifecycle and how to standardise the data entry method. This will contribute to improving the overall data quality in the system. This unique perspective on the material ID creation lifecycle can be used by organisations to map their own material ID creation lifecycle, allowing the development of standardised procedures.

This research provides valuable information to organisations that are planning to implement a P2P platform into their organisations or have already done so, with an emphasis on Coupa. It provides organisations with a better knowledge of the factors that hinder the full utilisation of P2P software by their employees. It specifically aims to clarify the reasons behind the underutilisation and proposes solutions to enhance P2P software adoption.

This research focuses on providing insights into the processes of procurement digitisation and how it is being implemented. It sheds light on the transformation of procurement through digitisation and emphasises the importance of understanding this process for future research. By answering the following research question and sub-questions, this research lays the foundation for future research in the field of digital procurement, enabling other scholars to research topics such as buyer-supplier relationships, preferred customer strategies, and customer satisfaction built upon this research.

Research Question:

How to enhance the usage of P2P software to enable activities that contribute to purchasing tactics?

Sub-Questions:

Part 1:

1. *What are the main barriers of P2P software implementation?*
2. *How to improve end-user awareness and training to increase the adoption and usage of P2P software?*

3. *How does the successful implementation of P2P software influence the effectiveness of purchasing tactics?*

Part 2:

1. *How to standardise the process of data input in P2P software systems to improve data cleanliness and useability?*
2. *How to automate the classification of items in P2P software?*

This thesis applies an in-depth single case study approach to examine the current state of Coupa utilisation within the case company (*company name left out for confidentiality reasons*) and how to improve the utilisation. Another primary method used in this thesis is the action research approach. Action research combines research with real-world application, and it involves the researcher collaborating with practitioners to help improve practice and theory building. To analyse the collected data, qualitative data analysis software was used consistently throughout the data analysis process to enable in-depth analysis of the interview transcripts.

Based on this method, it was found that informing users about the P2P software, its benefits, and the eventual goals before its implementation is critical for achieving a high P2P software adoption rate. It was furthermore found that it is highly crucial to have follow-up trainings after the go-live of the P2P software to increase training effectiveness and adoption of the P2P software. This research also identifies that implementing P2P software provides valuable advantages regarding leveraging sourcing levers, especially when focusing on the volume bundling lever. By providing unique empirical evidence of effective P2P software adoption methods, this research contributes to the existing literature.

The following parts of this thesis are structured as follows to examine the implementation of P2P software and its barriers, along with key factors to increase the adoption. First, the topic is discussed theoretically to establish a theoretical framework for this research. The third chapter describes the in-depth single case study and action research methodology approach. In chapter four, the results of the research are presented and analysed, followed by the theoretical and practical implications of this research in chapter five. The thesis concludes in chapter six by addressing the limitations of this research and by providing potential areas for future research.

2. Theoretical Background: The Nexus of Technology and Purchasing Tactics

2.1 The Implementation of Technology to Achieve Purchasing Objectives

2.1.1 Augmentation and Automation As The Two Roles of Technology in Procurement

Modern supply chains are characterised by their geographical diversity, high complexity, agility, and unpredictability. The increasing complexity of supply chains and the constant technical developments have given procurement teams new opportunities to enhance the effectiveness and efficiencies of procurement processes.[11] These rapid advancements in digital technologies are reshaping business supply chains and have the potential to revolutionise the way procurement provides value.[12] Over the past decade, the procurement function has evolved significantly as a result of the digitisation of procurement activities, resulting in increased efficiency, accuracy, and transparency of various procurement tasks.[13]

Several technology-based solutions have been developed in the past decades to respond to the increasing complexity and competitiveness of supply chains, such as e-sourcing and e-procurement. The latter will be discussed in detail in the next section. E-sourcing refers to the use of internet-enabled tools that enable competitive and collaborative interactions between buyers and suppliers, including online negotiations, reverse auctions, and the supplier selection process.[14] E-sourcing's main advantage lies in its ability to support the traditional procurement process by gathering all information and activities, thus creating a "one-to-one" communication between the buyer and supplier.[15] Further major benefits of e-sourcing are lower procurement costs due to an increase in competition in the tendering process, and a decrease in process errors.[16]

The technical development in procurement has furthermore greatly benefited contract management. Contract management can be defined as the process of ensuring that all parties to a contract understand their obligations and fulfil them efficiently and effectively.[17] Over the years, the process of signing contracts has evolved from analogue methods to digital alternatives, gradually replacing slow, costly, and inefficient contracting practices. Getting

[11] See Rejeb et al. (2018), p. 76.
[12] See Deloitte (2017), p. 2.
[13] See Rejeb et al. (2018), p. 77.
[14] See Engelbrecht-Wiggans & Katok (2006), p. 581.
[15] See Bienhaus & Haddud (2018), p. 968.
[16] See Dai et al. (2005), p. 142.
[17] See Lowe (2007), p. 317.

signatures on documents used to be one of the process' biggest time wasters. It could take days, if not weeks to get an ink-signed document, impacting key areas of organisations. However, due to the technical improvements of the past decades, these could now be done more efficiently via an electronic signature saving valuable time.[18] Today, it is nearly unthinkable to look back at the old way of working. Contract management systems can help organisations improve the quality of their procurement contracts while also mitigating risk by ensuring suppliers fulfil their contractual obligations.[19]

In conclusion, technology in procurement has transformed the way organisations operate by increasing productivity and efficiency. With the ongoing technological advancements, procurement will continue to evolve and drive innovation for the most effective solutions, enhancing purchasing tactics.

2.1.2 Enhancing the Use of Purchasing Tactics Through Technology

According to research, developing a single comprehensive and universally applicable purchasing strategy is challenging in the field of procurement.[20] A good example of this is the discussion of a global sourcing strategy where many scholars have different approaches. According to Lintukangas et al. (2009) & Hultman et al. (2012), global sourcing can be defined as the integrated coordination of supply management requirements across business units worldwide, implying a global-scale integration and coordination of sourcing strategies.[21] Kotabe & Murray (1990) refer to global sourcing as the combination of domestic and international sourcing by organisations to achieve a sustainable competitive advantage, while Schiele et al. (2011) define global sourcing more as a tactical strategy for sourcing a group of materials on an international scale.[22] Thus, it is clear that developing a unified purchasing strategy can be challenging. On the contrary, a hierarchical structure of stages emerges when a general strategy is broken down into actionable and manageable activities. These levels consist of (1) firm strategy; (2) functional strategies; (3) category strategies; (4) sourcing levers (tactical), and (5) supplier strategies (see Figure 1).[23]

[18] See Miller (2021).
[19] See Azizi et al. (2019), p. 1013.
[20] See Hesping & Schiele (2015), p. 138.
[21] See Lintukangas et al. (2009), p.241; Hultman et al. (2012), p. 10.
[22] See Kotabe & Murray (1990), p. 384; Schiele et al. (2011), p. 316.
[23] See Hesping & Schiele (2015), p. 138-139.

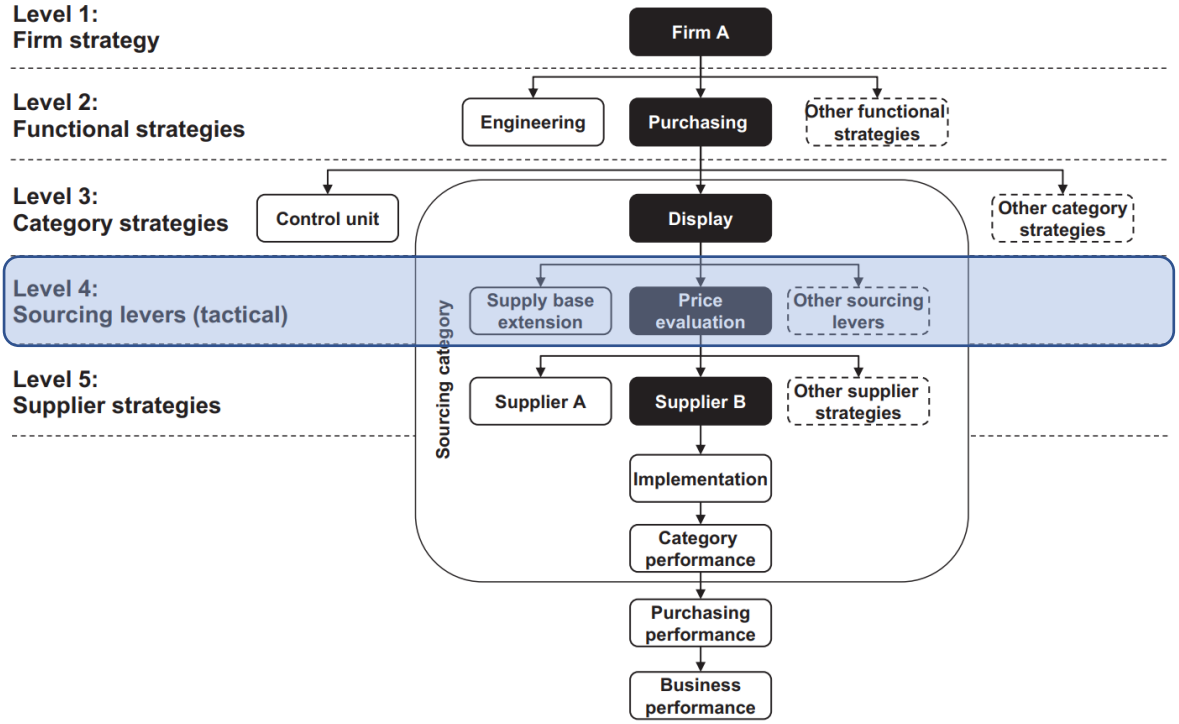

Figure 1: Five levels of strategy development in purchasing

Source: Hesping & Schiele (2015), p. 139.

This research mainly focuses on enhancing purchasing tactics through P2P software technology, thus focusing on the fourth level of the strategy development in purchasing framework by Hesping & Schiele (2015); sourcing levers (tactical).[24] Sourcing levers can be described as tactics to achieve sourcing objectives across different categories of materials or services.[25] In the literature, there are numerous models of sourcing levers, ranging from five to 114 levers. However, the majority can be categorised into one of the following seven types: (1) volume bundling; (2) price evaluation; (3) extension of supply base; (4) product optimisation; (5) process optimisation; (6) optimisation of supply relationship, and (7) category-spanning optimisation.[26] This research focuses on implementing P2P processes to enhance volume bundling through framework contracts (i.e. catalogues). Volume bundling refers to the process of consolidating demand and increasing purchase volume for a quotation. Bundling is defined as "*the aggregation of two or more items (products and/or services) by the buyer into a bundle that is put up for bid to potential suppliers as part of a single RFQ* [Request For Quotation]".[27] To leverage bundling opportunities, demand can be

[24] See Hesping & Schiele (2015), p. 139.
[25] See Hesping & Schiele (2016), p. 473.
[26] See Hesping & Schiele (2016), p. 476-477; Zijm et al. (2019), p. 66.
[27] Schoenherr & Mabert (2008), p. 81.

consolidated across product groups in the form of framework contracts (i.e. catalogues).[28] This is where technological developments have brought many benefits. With the use of P2P software, organisations can establish and enrich catalogues with preferred suppliers to create volume bundling advantages, next to a more efficient way of purchasing.

It has been proved that technology contributes to a more efficient way of purchasing. As beforementioned, one method of achieving higher efficiency can be accomplished by implementing e-procurement technology. This will be discussed in depth in the following section, Chapter 2.2.

[28] See Hesping & Schiele (2016), p. 479.

2.2 The Use of E-procurement Towards More Efficient and Effective Procurement

2.2.1 Early 2000s: The Emergence of E-procurement Solutions to Manage Firm's Spending

Electronic procurement (e-procurement) refers to the centralised management of an organisation's procurement and supply chain using an electronic platform.[29] An e-procurement system is an application software package that enables the entire procurement process to be carried out over the internet, from requisition and order authorisation, to ordering, invoicing, and payment for goods and services. An end-to-end e-procurement system that covers contracts and e-payables within the procurement cycle is referred to as Procure-to-Pay (P2P).[30]

In traditional procurement, purchase orders go through multiple layers of costly labour. Administrative assistants fill out the order, accounting staff authorise it, managers sign it, and mailroom clerks process it. This is a highly inefficient and costly way of procurement as there are many extra costs – labour but also paper for example – and there is a high chance of human error when processing orders.[31] In the 90s, the growth of e-procurement was facilitated by the widespread adoption of Enterprise Resource Planning (ERP) systems, which were driven by the Y2K threat.[32] The Y2K (Year 2000) threat emerged as a result of computer systems storing dates in DD/MM/YY format. Computer engineers left the '19' out as data storage was costly and took up a lot of space. This format may cause miscalculations with dates after December 31, 1999, as computer systems would confuse January 1, 2000, with 1900. In the end, the were very few issues.[33]

The concept of e-procurement is not new and is already been known as a driver of supply chain success since the 1990s, but the practice of e-procurement and the amount of research on this topic has gained popularity over the past 20 years.[34] Studies on e-procurement are particularly important since procurement is one of the most critical functions of the supply chain and typically represents one of the largest expense items of an organisation's cost

[29] See Manutan (2022).
[30] See Johnson et al. (2021), p. 103.
[31] See Attaran & Attaran (2002), p. 17.
[32] See Johnson & Klassen (2005).
[33] See Kaul & Sapp (2006), p. 2.
[34] See Schoenherr & Tummala (2007), p. 2.

structure.[35] The development and possibilities of e-procurement have increased significantly in the past decade and it has revolutionised the procurement process and the way businesses operate. E-procurement is thus no longer in its infancy.

This transformation has changed traditional purchasing processes, shifting operations manuals to an online environment. This shift has resulted in reduced time and resource waste, resulting in several benefits of e-procurement solutions that are worth exploring.

2.2.2 Automation and Efficiency Gains As Benefits of E-procurement Solutions

E-procurement is an augmentation technology and it has countless benefits that organisations can take advantage of.[36] The digitalisation of purchasing departments offers organisations significant opportunities to improve processes, reduce costs, and increase productivity across the supply chain.[37] According to Colombo et al. (2023), there are three main drivers to digitalisation implementation in purchasing departments: efficiency, effectiveness, and data aggregation.[38] In this section the efficiency gains of e-procurement will be discussed, whereas effectiveness gains and data aggregation will be discussed in the next section.

One of the primary advantages of e-procurement is the ability to reduce costs. Due to shifting to an e-procurement system, 30% of organisations in the private sector report a decrease in their total costs.[39] On average, the cost reductions in an e-procurement project range from 50% to 80%.[40] By moving purchasing processes online and tying e-procurement to an organisation's financial system, it can eliminate the need for printing paper-based transactions, resulting in significant cost savings.[41] This 'paperless procurement' is also good for the environment as there is less waste of materials. This can be seen as another great incentive to adopt e-procurement, given the current immense attention and importance of environmental waste and climate change. Next to the ability of going paperless, costs can also be reduced by increased efficiency. Implementing e-procurement systems not only greatly reduces transaction costs, and eliminates rework and errors, it can also decrease the

[35] See Angeles & Nath (2007), p. 104; Quesada et al. (2010), p. 516.
[36] See Colombo et al. (2023), p. 8.
[37] See Attaran & Attaran (2002), p. 17.
[38] See Colombo et al. (2023), p. 4.
[39] See ISM/Forrester (2003), p. 3.
[40] See Puschmann (2005), p. 14.
[41] See Roche (2001), p. 1.

internal order cycle time, thus increasing efficiency.[42] For instance, from 1999 to 2002, FedEx reduced its overall purchasing cycle times by 20 to 70 per cent after implementing e-procurement.[43] E-procurement provides an opportunity to consolidate suppliers and control maverick spending, which can result in significant cost savings. Cost savings can therefore be seen as one of the most important motivations for e-procurement.[44]

Using an e-procurement system can speed up processes as data only has to be entered once into the system, with some being filled in automatically. It reduces the chance of human errors by up to 2%, while also significantly reducing the average cost per purchase.[45] Thus, e-procurement offers greater efficiencies in terms of speed, accuracy, and ease of use, which all can help to reduce transaction costs even further.[46]

E-procurement also allows e-auctions which are a part of the e-tendering process involving multiple suppliers competing to obtain a buyer's contract. Due to the development of e-auctions, lower negotiated prices can be achieved. The combination of greater efficiencies and lower negotiated prices can result in significant cost savings. The creation of greater efficiencies results in a permanent gain in productivity and therefore profit.[47]

Next to the abovementioned efficiency gains of e-procurement, the two other main drivers of digitalisation are also of great significance. The next section will discuss how e-procurement solutions can enhance effective decision-making and augmentation in procurement.

2.2.3 Enabling Effective Decision-Making and Augmentation in Procurement Based on E-procurement Solutions

Purchasing departments have already benefited from technological improvements in the past, such as the introduction of corporate ERPs and the rise of e-procurement. However, the new wave of digitalisation, known as Industry 4.0, has the potential to significantly transform the role of purchasing departments. It has the potential to lift the purchasing

[42] See Neef (2001), p. 8.
[43] See Attaran & Attaran (2002), p. 7.
[44] See Puschmann (2005), p. 13.
[45] See Roche (2001), p.1; Neef (2001), p. 8.
[46] See Faccia & Petratos (2021), p. 2.
[47] See Neef (2001), p. 10.

function from its traditional role as a tactical and administrative unit to a strategic force within an organisation.[48]

One of the three main drivers of digitalisation is effectiveness and this driver is supported by augmentation, where humans and machines work together. Digitalisation and having access to e-procurement software, like P2P systems, enables organisations to have access to a large range of data, helping organisations handle complex and collaborative tasks and come up with faster, more reliable, and more accurate decisions. The digitalisation of purchasing departments improves effectiveness by providing a more accurate understanding of the market and improves decision-making by producing detailed information on suppliers.[49]

Augmentation helps purchasing professionals make improved decision-making and increases effectiveness by providing them with advanced tools and technologies, such as Artificial Intelligence, advanced costing tools, and predictive pricing.[50] Digitalisation enhances effectiveness by ensuring supply chain resilience and reducing risks. The ability to monitor and asses supplier and supply chain performance helps organisations to identify issues before they escalate.[51]

Investing in digital tools like e-procurement leads to greater control of expenses and visibility of suppliers.[52] E-procurement, and the digitalisation of procurement activities, promote better information management and knowledge of suppliers. Through this, purchasing departments can better manage the award of goods, services, or contracts, leading to better control over suppliers.[53] It can lead to greater transparency in procurement, faster and higher quality information processing, and increased quantity of information.[54] This can lead to a significant increase in effectiveness as a result of the implementation of e-procurement into an organisation.

Digitalisation helps accelerate decisional processes and provides increased data availability through the usage of e-procurement software like P2P software.[55] It improves decision-

[48] See Seyedghorban et al. (2020), p. 1685.
[49] See Colombo et al. (2023), p. 5.
[50] See Colombo et al. (2023), p. 6.
[51] See Colombo et al. (2023), p. 5.
[52] See Colombo et al. (2023), p. 4
[53] See Muffatto & Payaro (2004), p. 340, 346-347.
[54] See Essig & Arnold (2001), p. 45; Puschmann (2005), p. 15.
[55] See Colombo et al. (2023), p. 4.

making autonomy by giving more confidence to employees, who can make better decisions as a result of the better availability of data.[56]

Next to all the efficiency and effectiveness gains following the implementation of e-procurement, it is important to note that there are also challenges of e-procurement that must be addressed to fully understand e-procurement. The next section describes the challenges of e-procurement.

2.2.4 The Implementation of E-procurement is Challenged By Standardisation and Willingness to Change

E-procurement has many advantages, but challenges arise when organisations have the ambition to implement an e-procurement system that should be considered. One of the main implementation challenges of e-procurement is the significant initial financial investment it requires. Heavy investments are often needed when organisations implement new technologies. Acceptance across several function areas needs to be gained and the commitment of top management is often seen as crucial for the successful implementation of new systems. Such significant investments are unlikely to be made without the approval and support of top management.[57] Next to the willingness and support of top management, organisations need to have the financial resources to invest in such technology.

As e-procurement operates over the internet, certain security risks can affect the usage of e-procurement software. Examples of these risks are cyberattacks, fraud, identity theft, and data breaches. E-procurement systems involve the transfer and storage of sensitive data, including personal details of buyers and suppliers, and financial information. Organisations must ensure that their e-procurement systems are up-to-date and secure, and protect against potential cyberattacks.[58] Organisations can conduct Network Penetration Testing to discover vulnerabilities in systems. Penetration testing is needed to safeguard an organisation against financial loss, ensure compliance with industry regulations, and protect brand reputation by avoiding loss of confidence, for example from its suppliers.[59]

[56] See Colombo et al. (2023), p. 7.
[57] See Wu et al. (2007), p. 577, 579.
[58] See Stephens & Valverde (2013), p. 3, 8; Oleinichenko (2022).
[59] See Stephens & Valverde (2013), p. 12.

Moreover, there are internal implementation barriers to e-procurement. Implementing a new e-procurement system can be seen as a radical change in an organisation's day-to-day business. Employees might show resistance to this radical change as they are familiar with and used to the traditional procurement methods used, along with being afraid of change as they don't have the needed e-procurement skills yet.[60] Employees may be hesitant to adopt the new system out of concern that the system is too complicated to adapt and learn.[61] This resistance to change can be supported by the fact that employees already have alternative means of accomplishing procurement. Organisations can usually not stop using these older instruments as they are needed to interact with suppliers that are not as technologically developed. Next to this, employees are averse to learning new software that is still in the early development stage, as they are aware that significant changes are still to come.[62] Effective change management is important for successful e-procurement implementation. Insufficiently planned and executed change management is often associated with shortcomings in leadership.[63] It is therefore also important to have senior management sponsoring the project. E-procurement initiatives only deliver the planned benefits when top management support and commitment are present.[64] The lack of e-procurement integration with other systems can also be seen as a major implementation challenge. Rajkumar (2001) has identified systems integration as a key success factor for e-procurement implementation and must therefore be a critical discussion point during and prior to the implementation phase.[65]

The implementation of e-procurement also has external barriers. The lack of preparation of certain suppliers can be a major challenging factor. This immaturity of suppliers can hinder the successful implementation of e-procurement. While most tier-one suppliers will be technologically advanced, it is important to make sure that suppliers have the resources and expertise to take part in the e-procurement process of the buyer. Suppliers will need to learn many new tasks such as catalogue content creation, new invoicing mechanisms, and the process of electronic purchase orders.[66] This can be harder for Small & Medium-sized Enterprises (SMEs) as they don't always have these resources available to them.

[60] See Panayiotou et al. (2004), p. 107; Pop (2011), p. 123.
[61] See Costa et al. (2013), p. 242.
[62] See Angeles & Nath (2007), p. 110.
[63] See Mohungoo et al. (2020), p. 53.
[64] See Vaidya et al. (2006), p. 83.
[65] See Rajkumar (2001), p. 6.
[66] See Angeles & Nath (2007), p. 113.

To effectively deal with the implementation challenges that are associated with the introduction of an e-procurement system, several adoption factors can make the implementation of an e-procurement system a success. These factors will be discussed in the next section.

2.2.5 Adoption Factors For Successful E-procurement Implementation

Incorporating an e-procurement system is a significant technological shift, especially for stakeholders used to manual procurement systems. An effective change management plan that includes training for stakeholders such as internal employees and suppliers, as well as a structured procedure for gathering feedback from stakeholders, is essential for the successful implementation of e-procurement. Panda & Sahu (2012) argue that suppliers are the most important stakeholders for successful e-procurement implementation. Suppliers must be involved in every step of the implementation process and be encouraged to provide feedback for continuous improvement.[67] For employees and suppliers to successfully adapt to new technology, it is crucial to provide appropriate training and education. The successful adoption of the new system and its acceptance by stakeholders is highly influenced by the level of training and support provided. Establishing a supportive environment that addresses challenges faced by the system users in a friendly and time-bound manner is seen as fundamental.[68] Employees must have the opportunity and intention to use the new system both during and after their formal training but before they have to use it in their work at go-live.[69] To improve the impact of training, follow-up activities are an important aspect. Martin (2010) states that follow-up activities result in improved knowledge transfer and have positive effects on operations and firm performance.[70] During these follow-up activities, the environment and support provided to the trainees is particularly important for the knowledge transfer.[71] Having follow-up trainings is thus an important adoption factor of successful e-procurement implementation.

Several determinants influence the behavioural intention of employees to use a new e-procurement system. One of the most used methods to identify the adoption of new

[67] See Panda & Sahu (2012), p. 23.
[68] See Panda & Sahu (2012), p. 20, 22.
[69] See Marler et al. (2006), p. 725.
[70] See Martin (2010), p. 2.
[71] See Martin (2010), p. 5.

technologies is the Technology Acceptance Model (TAM). Studies by F. D. Davis (1989) and Singh & Punia (2011) indicate two main causes that explain the behavioural intention of employees to use a new technology system or not: perceived usefulness and perceived ease of use.[72] Perceived usefulness is defined by F. D. Davis (1989) as "*the degree to which a person believes that using a particular system would enhance his or her job performance*" whereas perceived ease of use is defined by F. D. Davis (1989) as "*the degree to which a person believes that using a particular system would be free of effort*".[73] The TAM suggests that the user's acceptance and adoption of technology are largely determined by the perceived usefulness and ease of use. Brandon-Jones & Kauppi (2018) have more recently studied the antecedents of the TAM model within the context of e-procurement. Their findings revealed a direct link between the perceived usefulness of the system and the intention to adopt new e-procurement technology.[74] This corresponds with F. D. Davis (1989) and Singh & Punia (2011).[75] However, Brandon-Jones & Kauppi (2018) found no direct connection between perceived ease of use and the intention to adopt new technology in the context of e-procurement. Perceived ease of use is however an antecedent of perceived usefulness, having no direct relation to attitude and intention to adopt new technology.[76]

Next to having top management commitment, as mentioned previously, an organisation's ability to learn is another key antecedent of the adoption and implementation of new technologies. This involves not only learning how to use the new systems but also understanding how those systems can be used in existing business processes. Organisations that do not possess strong motivations and capabilities for such learning will perceive significant knowledge barriers. A combination of organisational capabilities and motivations, supported by top management, is required to effectively integrate innovations into organisational routines.[77]

In conclusion, Table 1 summarises the advantages, challenges, and adoption factors of e-procurement. This chapter provided an overview of how technology is revolutionising the way organisations handle procurement processes. However, one critical aspect that underpins the success of e-procurement is the accurate classification of products. Without a

[72] See Davis (1989), p. 333-334; Singh & Punia (2011), p. 9.
[73] Davis (1989), p. 320.
[74] See Brandon-Jones & Kauppi (2018), p. 20.
[75] See Davis (1989), p. 333-334; Singh & Punia (2011), p. 9.
[76] See Brandon-Jones & Kauppi (2018), p. 20.
[77] See Wu et al. (2007), p. 577.

standardised approach to product classification, e-procurement may not reach its full potential. The next chapter will explore the utilisation of standardised product classification schemes and their significant contribution to the effective implementation of e-procurement solutions.

Table 1: Summary of advantages, challenges, and adoption factors of e-procurement software

E-procurement Analysis	**Details**	**Authors**
Advantages	Significant cost savings (lower transaction cost, lower material cost, lower average cost per unit & lower negotiated prices)	(Neef, 2001; Roche, 2001; Faccia & Petratos, 2021)
	Increased efficiency	(M. Attaran & S. Attaran, 2002; Neef, 2001
	Eliminates rework & decreases internal order cycle time	(Neef, 2001)
	Reduces the chance of human errors	(Neef, 2001; Roche, 2001)
	Increased effectiveness	(M. Attaran & S. Attaran, 2002;
	Greater control of expenses & visibility of suppliers	(Essig & Arnold, 2001; Puschmann, 2005)
	Greater transparency, faster & higher quality information processing	(Wu et al., 2007)
Challenges	Significant financial investment is needed	(Wu et al., 2007)
	Risk of security breaches (e.g. cyberattacks, fraud, identity theft, and data breaches)	(Stephens & Valverde, 2013; Oleinichenko, 2022)
	Employee resistance to radical change	(Panayiotou et al, 2004; Pop, 2011)
	Having alternative ways of accomplishing procurement	(Angeles & Nath, 2007)
	Insufficiently planned & executed change management	(Mohungoo et al, 2020)
	Lack of support and commitment of senior leadership	(Vaidya et al, 2006; Wu et al, 2007)
	Lack of integration with other systems	(Rajkumar, 2001)
	Supplier immaturity and lack of preparation	(Angeles & Nath, 2007)
Adoption factors	Have an effective change management plan & have supplier involvement from day 1	(Panda & Sahu, 2012)
	Provide appropriate training and support to employees and suppliers	(Panda & Sahu, 2012)
	Have the opportunity to use the new system after training but before go-live	(Marler et al, 2006)
	Have follow-up activities after training and go-live	(Martin, 2010)
	Have a positive employee perceived usefulness and perceived ease of use	(F. D. Davis, 1989; Singh & Punia, 2011)
	Have top management commitment & support	(Vaidya et al, 2006; Wu et al, 2007)

2.3 Utilising Standardised Product Classification Schemes to Support E-procurement Implementation

2.3.1 Product Classification Schemes As Uniform Systems For Products

Product classification schemes are uniform systems used for classifying and categorising products based on their characteristics, and purposes. They offer a uniform and consistent language for classifying and organising products across different industries.[78] These schemes are essential for efficient and effective supply chain and procurement management. Product classification schemes play an important role in various procurement processes. They enable accurate identification and categorisation of products and services. By classifying products into specific categories and hierarchies, procurement professionals can analyse spending patterns, identify cost-saving opportunities, consolidate suppliers, negotiate volume discounts, and optimise the supply chain.[79]

In Procure-to-Pay systems (P2P), the use of product classification schemes ensures that products are correctly identified and enriched with relevant information such as item number and manufacturer name, descriptions and UNSPSC (United Nations Standard Products and Service Code). This integration enables seamless communication and data exchange between buyers, suppliers, and procurement systems. However, few companies have taken the time to fully embed product classification codes into their P2P systems.[80]

Different organisations may use various product classification schemes, ranging from proprietary codes and government-issued codes to industry-specific codes.[81] Using non-standardised coding systems can create interoperability problems, which are problems related to the ability of two or more software components to cooperate despite differences in language, execution platform, or interface.[82] A reason for these interoperability problems is that non-standardised coding systems lack roll-up and drill-down capabilities for accurate spend analysis. Users can navigate through various levels of product categorisation and hierarchy using features like roll-up and drill-down. Non-standardised coding schemes are often expensive to develop and maintain, and it can be a difficult task requiring trading

[78] See Leukel & Maniatopoulos (2005), p. 203.
[79] See Johnson et al. (2021), p. 104.
[80] See Handfield et al. (2019), p. 23.
[81] See Johnson et al. (2021), p. 104-105.
[82] See Wegner (1996), p. 285; Leukel & Maniatopoulos (2005), p. 204.

partners to use the same code.[83] For efficient collaboration and information sharing, it is crucial to harmonise classification schemes across organisations and supply chains.[84]

Two standard coding schemes that are well-known and often used in procurement are UNSPSC and ECLASS. UNSPSC, the United Nations Standard of Product and Service Classification, is an open, global, multi-sector standard for the efficient and accurate classification of products and services.[85] It provides a single global classification system that can be used for company-wide spend analysis, cost-effective procurement, and full utilisation of e-commerce capabilities.[86] UNSPSC is mainly developed in the United States, leaving the needs of Europe behind.[87] As a result of this missing need, product classification systems arose that were not based on UNSPSC, such as ECLASS.[88] ECLASS is a German-based international classification scheme known for its multilingual support and flexible structure.[89] Both systems have their own advantages and challenges. The advantages of product classification schemes will be discussed in the next section.

2.3.2 Product Classification Schemes Enable the Search and Management of Products

Product classification schemes in procurement offer several benefits and advantages. It provides a significant contribution to the support for hierarchical search, enabling users to search top-down within a class hierarchy and find specific products. This approach simplifies product identification and makes the search process more efficient. In addition, property-based search enables buyers to focus their searches on more specific product characteristics. When similar products are linked to the same class and this class comes with a property list, the search for products can be very detailed and specific, enabling a more accurate and specialised product selection. [90]

Another advantage of product classification schemes is standardised product specifications. The predefined templates for product descriptions provided by property lists ensure consistency and give buyers access to standardised data. Standardised specifications enable

[83] See Johnson et al. (2021), p. 104-105.
[84] See Leukel & Maniatopoulos (2005), p. 206.
[85] See Johnson et al. (2021), p. 104.
[86] See UNSPSC (2022).
[87] See Schulten et al. (2001), p. 4.
[88] See Fensel et al. (2001), p. 57.
[89] See Leukel & Maniatopoulos (2005), p. 206.
[90] See Leukel & Maniatopoulos (2005), p. 204.

efficient product comparison between various competitive suppliers as well as within a supplier's own offerings. Based on standardised product specifications, buyers can easily assess different options and make informed decisions.[91]

Spend analysis is another crucial advantage of product classification schemes. It is often regarded as the most important benefit of having a standard product classification scheme.[92] By categorising procurement activities into specific classes and hierarchies, spend analysis becomes more manageable and insightful. Procurement professionals can analyse spending patterns, consolidate suppliers, negotiate volume discounts, and optimise the supply chain in general.[93] Product and service classification allows an analysis of spend in a uniform way, allowing consequent strategic sourcing decisions. Next to this, it allows integration of internal processing flows and compliance control over spending.[94] It is therefore considered crucial to have product classification schemes for effective spend analysis.

The United Nations Standard Products and Services Code provides additional advantages. It helps organisations gain control over their spend management process by offering an open, global and multisector standard for efficiently and accurately classifying products and services.[95] By using UNSPSC, ambiguities are eliminated and spend data processing can be automated. Organisations can save time by consistently coding spend across facilities and departments. Integrating UNSPSC into enterprise systems and electronic documents allows procurement teams to analyse product functions more successfully, negotiate with suppliers, and enforce policies.[96] Using UNSPSC saves organisations time and effort that would otherwise be needed to develop their own coding system, which can be very expensive to develop and maintain.[97]

It is clear that product classification schemes in procurement have many advantages, ranging from efficient spend analysis and standardised product specifications, to efficient product identification and selection. However, despite these advantages, there are also disadvantages and challenges to consider. These will be discussed in the next section.

[91] See Leukel & Maniatopoulos (2005), p. 204.
[92] See Leukel & Maniatopoulos (2005), p. 204.
[93] See Johnson et al. (2021), p. 104.
[94] See Fairchild & de Vuyst (2002), p. 2.
[95] See Johnson et al. (2021), p. 104.
[96] See GS1US (2022).
[97] See Johnson et al. (2021), p. 104-105.

2.3.3 Need For Manual Input and Data Cleansing Service to Operationalise Product Classification Schemes

More advanced organisations are increasingly looking for the capability to categorise spend to one or more classification schemes simultaneously (for example, customised UNSPSC and ERP material code). ERP systems are typically not built to offer simple user interfaces that support efficient ongoing master data integrity. Therefore, organisations could need additional third-party providers to provide data cleansing services.[98] Managing complex taxonomies within product classification schemes can also be a challenge for organisations. In complex taxonomies, it's possible to have overlapping (sub)categories or (sub)categories that seem redundant.[99] This can confuse users and make it harder to classify products accurately. Because of their complexity, taxonomies need to be updated and maintained frequently to keep up with changes in product lines or market trends. Failing to keep the taxonomy up to date can lead to inaccuracies.[100]

The standardisation of product classification presents another set of complex challenges that affect many aspects of modern business. The constantly evolving landscape of standardisation procedures, data models, and exchange formats challenges decision-makers and frequently leads to uncertainty about the future directions of global standard product classification schemes.[101] The benefits of product classification can only be realised in full when suppliers, buyers and all other market participants, commit to the same way of classifying products following a standard product classification scheme.[102] Structuring and standardisation of product descriptions are significant tasks in the world of B2B e-commerce.[103] However, the increasing number of standard product classification schemes in private e-procurement has confused suppliers and buyers since competition between standards prevents the adoption of a single, well-acknowledged standard, eventually limiting the expected network externalities.[104] Further complicating the harmonisation of product classification schemes is the lack of standards across different organisations and industries, which creates a barrier to seamless exchange.[105]

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[98] See Handfield et al. (2019), p. 19.
[99] See Rich (1992), p. 759.
[100] See Ng et al. (2002), p. 106.
[101] See Leukel & Maniatopoulos (2005), p. 206.
[102] See Leukel & Maniatopoulos (2005), p. 205.
[103] See Fensel et al. (2001), p. 54.
[104] See Leukel & Maniatopoulos (2005), p. 205.
[105] See Sibenik & Kovacic (2019), p. 1.

To conclude, a summary of the advantages and challenges of product classification schemes is provided in Table 2. As mentioned earlier in this chapter, the product classification process has its challenges. Artificial Intelligence has however emerged as a prominent technological advancement in recent years. It has the potential to enhance product classification and serve as the solution for solving complex challenges in procurement processes. The next chapter will discuss the utilisation of Artificial Intelligence to support the adoption of E-procurement solutions.

Table 2: Summary of advantages and challenges of product classification schemes

Product Classification Schemes Analysis	**Details**	**Authors**
Advantages	It enables users to search top-down within a class hierarchy, simplifying product identification and making product search more efficient	(Leukel & Maniatopoulos, 2005)
	Property-bases search enables buyers to focus on more specific product characteristics	(Leukel & Maniatopoulos, 2005)
	Predefined product description templates ensure consistency and give buyers access to standardised data, enabling efficient product comparison	(Leukel & Maniatopoulos, 2005)
	It enables more manageable and insightful spend analysis	(Johnson et al., 2021)
	Ambiguities are eliminated and spend data processing can be automated, saving time	(GS1 US, 2022)
Challenges	Managing complex taxonomies within product classification schemes can be challenging	(Rich, 1992)
	Overlapping or seemingly redundant (sub)categories can confuse users, making it harder to classify items accurately	(Rich, 1992; Ng et al., 2002)
	Taxonomies need to be updated and maintained frequently	(Ng et al., 2002)
	The constantly changing landscape of product classification standardisation poses challenges	(Leukel & Maniatopoulos, 2005)
	The benefits of product classification can only be realised in full if all market participants commit to the same standard product classification scheme, which is a significant task	(Fensel et al., 2001; Leukel & Maniatopoulos, 2005)

2.4 The Use of Artificial Intelligence to Support the Adoption of E-procurement Solutions

2.4.1 Is Artificial Intelligence the Game Changer in Procurement?

Artificial Intelligence (AI) is already known since the 1950s as an academic discipline but it remained an area with limited scientific visibility and limited practical interest for over 50 years. With the rise of Big Data and significant improvements in computing power, AI has entered the business environment and public conversation.[106] The definition of AI focuses on the ability of a machine to perform cognitive functions that can be associated with human minds and perform tasks using cognitive functions.[107] Min (2010) refers to AI as "*the use of computers for reasoning, recognising patterns, learning or understanding certain behaviours from experience, acquiring and retaining knowledge, and developing various forms of inference to solve problems in decision-making situations where optimal or exact solutions are either too expensive or difficult to produce*".[108] In general, AI aims to imitate intelligent human behaviour.[109]

Scholars and practitioners are more and more recognising the competitive advantages AI can bring to business processes.[110] McKinsey's 2022 Global survey on AI shows that leaders are making large investments in AI, increasingly engaging in advanced practices to enable faster AI development. In 2018, 40% of the respondents to McKinsey's 2018 Global survey on AI reported that more than 5% of their digital budgets went to AI. In 2022, this number has increased to 52%, expected to rise to 63% over the next three years. Respondents to the McKinsey survey have reported increased adoption of AI in at least one business area, more than doubling from 20% in 2017 to 50% in 2022. However, this percentage has levelled of the past years.[111]

AI is a multidisciplinary topic that has fascinated researchers in many fields, ranging from mathematics and psychology, to neuroscience and computer science. AI involves the development of hardware and software systems that have similar capabilities to those of humans and have the ability to make difficult decisions themselves. AI applications, such as

[106] See Haenlein & Kaplan (2019), p. 1.
[107] See McKinsey&Company (2022), p. 2.
[108] Min (2010), p. 13-14.
[109] See Guida et al. (2023), p. 3.
[110] See Guida et al. (2023), p. 1.
[111] See McKinsey&Company (2022), p. 3-4.

chatbots, recommendation systems, and robotic process automation, are more and more becoming essential for tackling difficult business problems.[112]

Generative AI has seen significant development in the 21st century, but it has become immensely known by the public since the release of ChatGPT in November 2022. Generative AI is a machine learning framework that operates unsupervised or partially supervised. It generates manmade outcomes based on statistics and probabilities using existing digital information.[113] Sachs (2023) expects that generative AI could increase global GDP by 7% in ten years.[114] A key aspect of generative models is that they are built on and have access to enormous amounts of data. For instance, it is possible to feed generative models with contents of the whole Wikipedia, Google images, and social networks.[115] Generative AI tools have different forms. Large Language Models (LLMs) are most commonly used with ChatGPT being the most prominent example. Other Generative AI tools can produce sounds or images.[116]

The use and benefits of AI have mainly been researched in the fields of marketing & sales or risk management. However, more and more academics are discussing the potential advantages it can provide in procurement functions. This will be discussed in the next section.

2.4.2 Artificial Intelligence Supporting Repetitive and Standardisation Tasks in Procurement Activities

When AI is applied to real business problems, its main characteristics are smartness and automation, increasing the efficiency and effectiveness of employees.[117] These characteristics are particularly relevant to procurement as human actions and decisions play a big role throughout the procurement process.[118] Since procurement functions are very analytical in nature, the adoption of AI into procurement processes could bring a lot of improvements and opportunities.[119]

[112] See Guida et al. (2023), p. 2-3.
[113] See Baidoo-Anu & Ansah (2023), p. 52-53
[114] See Sachs (2023)
[115] See Gozalo-Brizuela & Garrido-Merchan (2023), p. 1-2.
[116] See Jo (2023), p. 214.
[117] See Boute & Van Mieghem (2021), p. 179.
[118] See Guida et al. (2023), p. 1-2.
[119] See Handfield et al. (2019), p.6.

AI has played a transformative role in procurement in the past years, enabling a shift towards digitisation and automation. With the extensive digitisation of procurement and increasing transparent value chains, AI and specialised bots are being used to automate operational procurement processes, enhancing the efficiency of transactions and reducing staffing needs. Additionally, the combined use of Robotic Process Automation (RPA) and AI brings efficiency gains in complex value chains by automating repetitive tasks, such as material classification. The adoption of AI in procurement has been recognised by many CPOs as a top priority, as it allows end-to-end management of data-intensive processes and allows procurement professionals to make data-enhanced strategic decisions. Organisations can gain significant advantages in procurement processes by leveraging AI and adopting a holistic approach.[120]

AI in procurement, specifically in inventory control and planning, offers a promising solution to managing inventory efficiently and reducing costs. Results of McKinsey's 2022 Global survey on AI show that the highest cost benefits from AI are in supply chain management.[121] Traditional decision rules based on mathematical models often fail to account for the complexities and uncertainties involved in inventory management. By leveraging AI techniques, accurate and real-time information can be utilised to estimate desirable inventory levels and timing, avoiding the bullwhip effect and optimising inventory resupplies.[122] AI enables greater visibility and control over procurement processes, allowing for better monitoring and management of the supply chain.[123]

The use of AI in procurement brings several advantages to risk management. It enables a data-driven approach by identifying and modelling disruptive events, helping procurement professionals recognise the interrelation of risk data.[124] AI-based frameworks and algorithms improve the prediction of supply chain risks, providing a reliable and interpretable risk assessment. Additionally, AI enhances supply chain visibility, allowing procurement managers to map suppliers and better understand the complexities of global supply chains. This increases the opportunity to monitor and identify potential risk positions across the supply chain. AI offers customised solutions to specific industries, integrating with multiple information providers to assess and mitigate risks effectively. AI supports the dynamic

[120] See Berger (2018), p. 4-5.
[121] See McKinsey&Company (2022), p. 6.
[122] See Min (2010), p. 20.
[123] See Guida et al. (2023), p. 7.
[124] See Ivanov & Dolgui (2021), p. 5.

capabilities required for successful risk management, including supply chain, alignment, adaptive strategies, and collaboration.[125]

Next to providing advantages in standardisation and risk management, AI can also support the product classification process. This will be discussed in the next section.

2.4.3 How AI and Other Technologies Can Support Product Classification Schemes

The use of (generative) Artificial Intelligence can also support the product classification process. Natural Language Processing (NLP) is considered a discipline within Artificial Intelligence. NLP can be defined as a set of computational methods used to analyse and represent real-world text, aiming to achieve human-like language understanding for various applications.[126] Classification is a classic topic for NLP as it assigns text inputs into predefined categories (e.g. catalogues).[127] Generative AI can automatically classify products based on visual and textual data using NLP and image recognition algorithms. This simplifies the process of classifying products in catalogues.

By using NLP, generative AI, and information extraction from images, product descriptions, and other unstructured data, Artificial Intelligence can enrich product data.[128] AI can recognise a product's colour, size, brand and material. By enriching sparse data, data-driven decision-making can be enhanced.[129] Thus, AI can improve the depth and richness of product data, making it easier for organisations to accurately classify products.

Artificial Intelligence in procurement also brings significant other benefits regarding classification. It enables efficient spend analysis and categorisation by automating the consolidation and cleaning of spend data, normalising and tagging suppliers, and identifying purchasing patterns where improvements can be made. AI-based solutions leverage clustering algorithms and natural language processes to process data, design category trees, and analyse unstructured information.[130] However, challenges remain due to the complexity

[125] See Guida et al. (2023), p. 12.
[126] See Liddy (2001), p. 3.
[127] See Zahavy et al. (2018), p. 7874.
[128] See Jiang et al. (2017), p. 231.
[129] See Wang et al. (2017), p. 2.
[130] See Guida et al. (2023), p. 11-12.

of spend classification and the diversity of classification schemes used.[131] These and other challenges of AI in procurement will be discussed in the next section.

2.4.4 Challenges and Future Steps for Implementing Artificial Intelligence in Procurement

Although the use of Artificial Intelligence in procurement has significant potential, its challenges are not to be overlooked. According to Guida et al. (2023), the biggest challenge related to the adoption of AI in procurement processes is the lack of availability and systematisation of data.[132] Although procurement produces a large amount of data, this data is oftentimes scattered among many systems and departments within an organisation. When the available data is dispersed, it is difficult to access and consolidate the data into a format which is suitable for AI analysis. This can make it more difficult for the AI to automate tasks and provide meaningful information. The lack of data standardisation also makes it difficult to use AI as accurate suggestions and automation depend on data that is consistently labelled, structured, and formatted. As AI software is heavily reliant on the data it is programmed on, the accuracy of this data is also of great importance as when programmed incorrectly, the outcomes of the AI will be incorrect and could lead to wrong decisions.[133]

It has furthermore been stated that a poor presence of adequate analytical skills and a lack of clear understanding of the potential of AI can hinder the adoption of AI in procurement processes.[134] According to Handfield et al. (2019), the lack of internal skills in procurement departments can be seen as a barrier to AI adoption in procurement processes. The technological power of AI alone is not enough for the successful adoption of advanced procurement platforms. It is fundamental to have data management, leadership & strategy, cultural change and skills to have a successful adoption of AI in the procurement processes of organisations.[135] This was also emphasised by Min (2010) who stated that implementing AI solutions may be difficult as understanding the principles of AI can be difficult for ordinary decision-makers.[136]

[131] See Guida et al. (2023), p. 11-12.
[132] See Guida et al. (2023), p. 7.
[133] See Min (2010), p. 34.
[134] See Guida et al. (2023), p. 7.
[135] See Handfield et al. (2019), p. 6.
[136] See Min (2010), p. 34.

Although there is a tendency for people to think of AI as highly capable compared to humans, in reality, AI software is subject to a number of performance limitations.[137] Firstly, hidden biases of AI software. As a result of using a small set of training data or due to biases within the data itself, AI software may have many hidden biases.[138] Because Machine Learning-based AI software is often non-transparent (i.e. making it difficult for human inspection), these biases may go unnoticed.[139] Secondly, perceptual limitations of AI. Despite advancements, many AI algorithms still have difficulties understanding natural language and reliably identifying objects in 'noisy' situations.[140] If information inputs are not correctly registered, the use of AI may be hindered, hence the importance of accurate data input. Thirdly, the brittleness of AI. AI will only be effective in situations that are covered by its training data and programming.[141] The AI system may perform poorly by overgeneralising from prior training when new kinds of situations are encountered that require behaviours different from what it has previously learned. Even though AI systems can learn in real-time, training from this learning cycle may result in performance issues as it requires time and repeated exercise, as well as meaningful feedback on decision outcomes.[142]

Finally, as with any new software technology, there will be resistance to change. AI adoption into procurement processes is no different. To counter this resistance, adequate change management is of high importance.

To conclude, the adoption of AI in procurement offers significant potential but is challenged by systemisation issues, lack of internal skills and potential biases. A summary of the advantages and challenges of Artificial Intelligence in procurement is provided in Table 3.

[137] See National Academies of Sciences (2021), p. 8.
[138] See Ferrer et al. (2021), p. 73.
[139] See National Academies of Sciences (2021), p. 8.
[140] See Akhtar & Mian (2018), p. 14423.
[141] See Woods (2016), p. 3.
[142] See National Academies of Sciences (2021), p. 8.

Table 3: Summary of advantages and challenges of Artificial Intelligence in procurement

Artificial Intelligence Analysis	**Details**	**Authors**
Advantages	Enhances the automation of operational procurement processes, & reduces staffing needs	(Berger, 2018)
	Improved (transaction) efficiency of employees & the automation of repetitive tasks	(Boute & Van Mieghem, 2021; Berger, 2018)
	Allows procurement professionals to make data-enhanced strategic decisions	(Berger, 2018)
	More efficient inventory management with accurate & real-time information	(Min, 2010; McKinsey & Company, 2022)
	Cost savings	(McKinsey & Company, 2022)
	Greater visibility and control over procurement processes, allowing better monitoring and management of the increasingly complex global supply chain	(Guida et al., 2019)
	Improves the data-driven approach of identifying supply chain risks	(Guida et al., 2019; Ivanov & Dolgui, 2021)
	Enhances product classification through efficient and automated spend analysis & categorisation	(Guida et al., 2019)
Challenges	Lack of data availability & data systematisation	(Guida et al. 2023)
	AI software programs based on inaccurate data can provide incorrect outcomes	(Min, 2010)
	Lack of adequate internal (analytical) skills & lack of understanding of the potential of AI	(Min, 2010; Handfield et al., 2019; Guida, 2023)
	AI software may have hidden biases	(Ferrer et al., 2021)
	AI algorithms have difficulties understanding natural language & reliably identifying objects in 'noisy' situations	(Akhtar & Mian, 2018)
	AI software will only be effective in situations that are covered by its training data and programming	(Woods, 2016)

3. Methodology: Conducting a Single-Case Study to Optimise P2P Implementation

3.1 The Case Study Approach to Identify How P2P Implementation Can Be Improved and Support Procurement Activities

The chosen method to investigate the current state of P2P software utilisation is an in-depth single case study. According to Yin (2009), a case study is "*an empirical inquiry that investigates a contemporary phenomenon in depth and within its real-life context, especially when the boundaries between phenomenon and context are not clearly evident*".[143] There are various reasons why an in-depth single case study is the best method for this research. First and foremost, multiple case studies can be very expensive and time-consuming to implement.[144] Given the fixed and limited timeframe for this research, a single case study was chosen. Dyer Jr & Wilkins (1991) argue that single case studies are superior to multiple case studies for producing high-quality theory since they produce more and better theoretical insights.[145] Additionally, there are characteristics of action research in this research as the researcher has acted with practitioners to help improve practices at the case company in question. Action research combines research with practical actions, and it involves the researcher working alongside practitioners to help improve practice and theory building.[146] The action research approach makes it possible to formulate strategies and recommendations while simultaneously observing their impact in real-world settings.[147] The researcher has insights into ERP and Excel data, along with having (in)formal conversations with employees of the case company, gaining insights on the current processes and way of working. With action research, the situation is unique, but there are elements that can be used by other researchers in different circumstances.[148] Qualitative research was determined to be the most suitable approach to gather the necessary data through conducting interviews with the employees of the case company. With the combination of interviews, practical actions, and data (ERP & Excel), this research is able to connect various data points within a single case, making the single case study a strong and reliable approach.

Next to an in-depth single case study approach, benchmarking of the current processes & their implementation and best-in-class cases are also conducted. Benchmarking refers to the

[143] Yin (2009), p. 18.
[144] See Gustafsson (2017), p. 3.
[145] See Dyer Jr & Wilkins (1991), p. 614.
[146] See Nielsen (2016), p. 419.
[147] See Avison et al. (1999), p 94.
[148] See O'Brien (1998), p. 12.

systematic process of measuring your performance versus the best-in-class and using this analysis to meet and/or surpass the best-in-class to achieve sustainable improvements.[149] Benchmarking has already been recognised as an essential tool for the continuous improvement of quality in organisations. This is supported by the large number of publications that reflect the interest and applicability of this technique.[150]

3.2 The Case: A World Leading Multinational Building Materials Organisation

Company background of the case company left out for confidentiality reasons

[149] See Fifer (2009), p. 25, 29-30; Camp (1992), p. 3.
[150] See Dattakumar & Jagadeesh (2005), p. 176.

3.3 Sampling Data and Data Collection Process

Through internal benchmarking, a mapping of the current processes and their implementation was done via analysing quantitative data of OpCo 1's usage of Coupa. Full access to data such as ERP and Excel files is provided to the researcher to analyse, make edits, and observe the impact of actions taken. Next to analysing data on Coupa utilisation and adoption, the current way of working was benchmarked through qualitative analysis. This involves conducting surveys and semi-structured interviews with key stakeholders of the case company and OpCos, including a Senior Manager P2P, a Coupa Consultant, a project manager, and other key users, to identify the main barriers and challenges for effective Coupa utilisation, along with identifying new opportunities. The full list of interviewees and their corresponding functions can be seen in Table 4. Eisenhardt & Graebner (2007) state that interviews are a very efficient way of gathering rich, empirical data.[151] Semi-structured interviews were chosen as data collection method as it has been proven to be both a versatile and flexible data collection method.[152] To lead the interviews, interview protocols were made beforehand. Interview protocols can be used as a focused guide during the interviews but should not be followed strictly. The structure should steer the interviewees toward the main topics of the interview, but there should still be room for flexibility for improvised follow-up questions based on the interviewee's responses. The specific order of the questions and topics was undefined. This depends on the flow of the discussion.[153] In addition, the face-to-face nature of semi-structured interviews can give the interviewer a lot of extra information to the verbal answer through facial and non-verbal expressions.[154] Questions regarding the barriers of P2P software implementation, current processes & policies, and known best practices were asked during the interviews. The full interview protocol with the purpose and content of each phase of the interview is provided below in Table 5. Figure 2 shows the data collection process in the five different phases, also pointing out which phase relates to which part of the research.

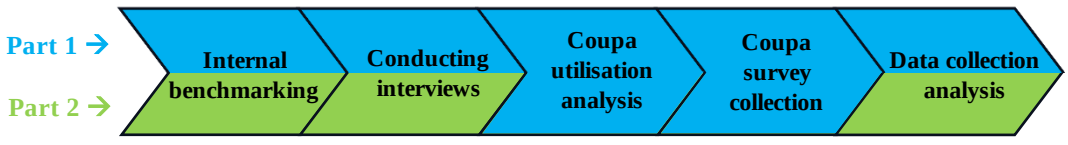


Figure 2: Data Collection Process Phases

[151] See Eisenhardt & Graebner (2007), p. 28.
[152] See Kallio et al. (2016), p. 4.
[153] See Hardon et al. (2004), p. 24.
[154] See Opdenakker (2006), p. 3.

Table 4: Function interviewees with corresponding related topics, date and duration of interview

Function interviewee & interviewee #	Part 1	Part 2	Related topics during the interviews	Date interview	Duration interview
(1) P2P Project Manager	X	X	• Barriers of Coupa implementation at OpCo 1 • Coupa's initial implementation plan versus execution	16/05	1:15h
(2) Global Spend & Master Data Manager		X	• Getting his insights on the material creation process in general • Getting his insights and knowledge about material classification	07/06	0:30h
(3) Master Data Specialist		X	• Getting his insights on the material creation process in SAP • Getting his insights and knowledge about material classification	07/06	1:00h
(4) Coupa Business Consultant	X	X	• External insights and viewpoints on barriers of Coupa implementation • Getting his insights on the material creation process and how it relates to Coupa • Getting his insights and knowledge about material classification and how it relates to Coupa • Getting his insights on P2P training to increase adoption and usage	08/06	1:00h
(5) Senior Manager P2P	X	X	• External insights and viewpoints on barriers of Coupa implementation • Getting his insights on the material creation process and how it relates to Coupa • Getting his insights and knowledge about material classification and how it relates to Coupa • Getting his insights on P2P training to increase adoption and usage	08/06	1:00h
(6) Business Process Expert SAP MM		X	• Has broad knowledge of the material creation process in SAP • Getting his insights and knowledge about material classification and how it relates to SAP	12/06	0:45h
(7) Purchasing Manager at OpCo 2		X	• Has broad knowledge of the material creation process at OpCo 2	12/06	0:45h
(8) Procurement Data Administrator (local Coupa user OpCo 1)	X	X	• Getting her insights and perspective on the material creation process (mapping of the process) • Getting insights and feedback on how she perceived her Coupa training to gain improvement points	20/06	0:30h
(9) Head of Planning (local Coupa user OpCo 1)	X	X	• Getting her insights and perspective on the material creation process (mapping of the process) • Getting insights and feedback on how she perceived her Coupa training to gain improvement points	21/06	0:45h

Table 5: Interview protocol

Phase	**Purpose and content**
1. Introduction to the subject and gaining general information about the role and responsibilities interviewee	• Introduce the goal of the interview and what the research is about. Explain definitions of used concepts. Gathering general information about the interviewee.
2. Questions related to barriers and implementation of P2P software	• Understand what barriers there are to P2P software implementation and explore key aspects of implementation
3. Questions related to the standardisation of data input in P2P software	• Understand and map the material creation process at Opco 1 and examine best practices of the material creation process
4. Questions related to the automation of item classification in P2P software	• Identify opportunities and key aspects of item classification and the automation of this process to enable more and better content in the system.
5. Questions related to improving the end-user experience of P2P software	• Understand key points and pitfalls of P2P software training to determine improvement points for future rollouts of P2P software.
6. Conclusion of the interview	• Ask any remaining questions and conclude the interview. Provide contact details to the interviewee.

The interviews were all automatically transcribed using the online tool Otter.ai after which the transcriptions were checked to confirm the correctness of the automated transcriptions. Transcribing interviews structures the interview dialogue in a format that is more accessible for detailed analysis and can also serve as an initial analysis.[155] Transcribing the interviews ensures capturing the interviewees' responses in their own words, not a summarised, potentially biased version of the interview. This reduces the number of inaccuracies and potential data loss.[156]

[155] See Kvale & Brinkmann (2009), p. 180.
[156] See Bailey (2008), p. 127.

Next to interviews, a survey was sent to local Coupa users of OpCo 1, asking them about key success factors of Coupa implementation, how they perceived their training of Coupa and their opinion about their usage of Coupa in general. Out of the 23 Coupa users identified through ERP data, twelve people responded to the survey invitation. Therefore, n = 12 in this survey. This survey would help to understand the main barriers and challenges of effective Coupa utilisation. The survey results are anonymous as no personal details of respondents were collected or stored. A survey allows for the collection of a large amount of quantifiable data that can be compared and statistically analysed to draw conclusions. In addition, survey research can be used to make comparisons between groups or cases.[157] The overall level of English proficiency of the people at OpCo 1 could hinder the comprehension of the questions stated in the survey. This misunderstanding could lead to wrong or unintended answers in the survey. To overcome this language barrier, the survey was translated and sent in the local language of this specific OpCo. For an overview of the survey questions sent to the local Coupa users (English version), please refer to Appendix B.

3.4 Data Analyses Based on Qualitative Gap Analysis Approach

Based on the mapping of the current process and its implementation, comparisons concerning implementations can be made with literature and best-in-class cases. To ensure a reliable output, this research uses a qualitative data analysis software package called Atlas.ti. This powerful tool can process and analyse a large variety of data collections, enabling efficient visualisation and coding.

The main purpose of using Atlas.ti for this research is to systematically analyse the interview transcripts and identify relevant themes within the data. The coding process involves assigning codes (labels) to specific sections of the interview transcript that correspond to specific themes discussed by the interviewees.[158] A detailed gap analysis can be done through the use of coding schemes and the identification of themes. This analysis can help to identify areas where improvements can be made to achieve optimal P2P software adoption. By examining the gaps between the current state and the best-in-class practices, recommendations and solutions can be made to close these gaps and enhance the overall P2P software adoption along with the purchasing tactics. For a comprehensive overview of the interview coding themes and their corresponding codes, please refer to Appendix C.

[157] See Sukamolson (2007), p. 4.
[158] See Campbell et al. (2013), p. 299.

4. Results and Analysis: The Implementation of P2P Processes to Boost Purchasing Activities

4.1 Part 1: Enhancing the Adoption of P2P Software Through Understanding the Implementation Barriers and Training

4.1.1 Insufficiently Executed Change Management As the Main Barrier of P2P Software Implementation

P2P software offers benefits for optimising procurement processes, but the successful implementation of P2P software also faces challenges and barriers that should be addressed. This section will discuss the barriers of P2P software implementation discovered during this research. The barriers of P2P software implementation found in this research are summarised in Table 6 and will be further addressed in the following paragraphs.

Table 6: P2P Software Implementation Barriers Summary

P2P software implementation barriers
1. Insufficiently executed change management
2. Not clearly communicating the benefits of the new P2P software well in advance
3. Lacking support and commitment of (senior) leadership, especially during the readiness phase
4. Not communicating and agreeing on the golden rules and guiding principles at the beginning of the project
5. Non-interactive (in-person) training
6. The Covid-19 pandemic prevents in-person training
7. Not having the opportunity to get familiar and used to the new system after training and before go-live
8. Having alternative ways of accomplishing procurement

Effective change management is one of the key success factors of new software implementation, as is stated in the literature and mentioned by several interviewees. It was most clearly mentioned by the senior P2P manager who stated that "*change management is the biggest barrier to P2P software implementation*" (interviewee 5). It is crucial to inform the people who will work with the tool about what will be expected from them, what the tool will look like, and how it will work. It was by the same senior P2P manager mentioned that change management and user adoption were not getting the right level of attention at OpCo 1. A big part of change management is communicating the benefits of why people should

change their current way of working. If this is not clear and communicated in advance with end-users, they will have less incentive to change and will therefore not fully adopt to the new system. Based on the survey sent to local Coupa users of OpCo 1, 66.7% of the respondents stated that the benefits of using Coupa were not clearly communicated and explained in advance. One respondent to the survey stated, "*we didn't have a clear picture in advance of what Coupa would bring*" [English translation]. Based on these points, it is evident that the change management for the P2P software implementation at OpCo 1 was inadequate and could have been done better.

Insufficiently executed change management is oftentimes associated with shortcomings of (senior) leadership. The support, commitment, and buy-in of top management are crucial for a successful P2P software implementation, especially during the readiness phase of this implementation. Having the support and commitment of senior management was mentioned as a key success factor of P2P software implementation by 75% of the survey respondents. Here, employees were requested to change their current way of working, although top management's support and commitment to these changes were not always consistent. Senior leadership support is needed to motivate employees to change their current way of working. Senior leadership buy-in is therefore critical for successful P2P software implementation. This support and commitment of senior leadership was not always on the level it should have been at OpCo 1. This can be explained by that the golden rules and guiding principles of the project were not agreed upon and communicated at the beginning of the project (April 2021). Only as of the 22nd of May 2023, these were made clear to senior leadership on a Steering Committee level. But it is unknown whether the golden rules and guiding principles are also cascaded downwards. Local senior leadership was thus not fully informed soon enough by global management about the project, leading to less support and commitment. As was stated by the Head of Supplier Relationship Management during a meeting on the 10th of May 2023, "*you cannot support and commit to something you are not fully informed about*", accentuating the importance of communication. A shared vision company-wide is therefore critical for successful change.

As was mentioned in Chapter 2.2.5, studies indicate two main causes that explain the behavioural intention of employees to use a new technology system or not; perceived ease of use and perceived usefulness of the new system. This is therefore also linked to the implementation of P2P software. The Technology Acceptance Model discussed in Chapter 2.2.5 suggests that the user's acceptance and adoption of new technologies are largely

determined by the perceived usefulness and ease of use. Through a survey, the local Coupa users of OpCo 1 were questioned regarding their perceptions of Coupa's usefulness and ease of use prior to implementation. Most respondents to the survey expected that using Coupa would significantly (16.7%) or somewhat (50%) improve their job performance. 25% expected that the usage of Coupa would significantly hinder (8.3%) or slightly hinder (16.7%) their job performance, and 8.3% expected no influence of Coupa on their job performance. On average, the perceived ease of use of using Coupa prior to implementation was positive. Regarding perceived ease of use, 66.7% of the survey respondents believed that using Coupa would be very easy (33.3%) or somewhat easy (33.3%). Whereas 25% believed that using Coupa would be very difficult (8.3%) or somewhat difficult (16.7%). 8.3% had a neutral perception of the ease of use of Coupa. So in general, both the perceived ease of use and perceived usefulness were positive. In correspondence with the literature, this should therefore not have been a barrier to the implementation of P2P software in this specific case.

Furthermore, 66.7% of the survey respondents mentioned appropriate employee training and mentoring as key success factors for successful P2P software implementation. Inadequate training can therefore also be seen as a barrier to P2P software implementation. The training given was for example not interactive and mainly consisted of PowerPoint presentations. One respondent to the survey mentioned, *"more time was spent on presentations than on actual work in the Coupa tool"* [English translation]. An important factor of training is the in-person element. Both the literature and the local Coupa users at OpCo 1 emphasise a preference for in-person training as this allows more hands-on learning.[159] This aspect of the training was repeatedly mentioned as lacking by the respondents to the survey. One respondent to the survey stated, "*more live training is needed, not online, simulations of real situations from everyday work, less presentations - more practical work*" [English translation]. This preference for in-person training was made clear to global management during the implementation. However, due to the outbreak of the Covid-19 pandemic in early 2020, travel restrictions took over and the whole world switched to online, making it rather impossible to give on-site training at OpCo 1. This also influenced the relationship building between the global procurement team and the local team of OpCo 1 as according to a study by Forbes, 85% of people build stronger and more meaningful business relationships via in-

[159] See Austin et al. (2021), p. 2

person, face-to-face meetings.[160] In addition, according to a Harvard study, 95% of people say that face-to-face meetings are a key success factor for building and maintaining long-term relationships.[161] The Covid-19 pandemic was therefore a significant barrier to the implementation of Coupa at this specific OpCo, again explicitly mentioned by a P2P project manager during a meeting on the 11th of July 2023.

In Chapter 2.2.5 it was stated by the literature that employees must have the opportunity to use a new system both during and after their formal training but before they have to use it at go-live. Several interviewees mentioned that having this time between training and go-live to test and 'play around' is key for successful P2P software implementation. The senior P2P manager stated, "*because if you don't do it* [time between training and go-live to test]*, the moment they go live, they will have forgotten everything*" (interviewee 5). It is therefore key to have the option to get more familiar with the system without being afraid to make mistakes. If you do not have this option, users will be afraid to make mistakes at go-live, will become hesitant, and might go back to their old way of working and use the old system. This is why the User Acceptance Testing (UAT) phase of the implementation is critical. Having alternative ways of accomplishing procurement, namely using the old system (SAP), has also been stated by the Senior P2P manager as a barrier to P2P software implementation. Most respondents to the survey (75%) stated that they did have this time between training and go-live. In correspondence with the literature, this aspect of the P2P software implementation should therefore not have been a barrier in this specific case.

In this section, the challenges and barriers linked to the implementation of P2P software were discussed. Effective change management, leadership support, and user acceptance were identified as critical factors in achieving success. Understanding these barriers, however, also paves the way for solutions. The strategies and measures aimed at increasing the adoption and utilisation of P2P software, specifically in the context of OpCo 1, will be the main topic in the following section.

[160] See Forbes (2009), p. 2-3.
[161] See HarvardBusinessReview (2009), p. 6.

4.1.2 Increasing the Adoption and Usage of P2P Software Through Training and Awareness

An eventual increase in the Coupa adoption levels at OpCo 1 was achieved through dedicated awareness creation and training efforts. These efforts of increasing the adoption spanned over a period of several months, eventually successfully increasing the Coupa adoption levels to the desired goal of 20% of the total spend. The steps taken in this process are shown in Figure 3 and will be further addressed in the paragraphs below.

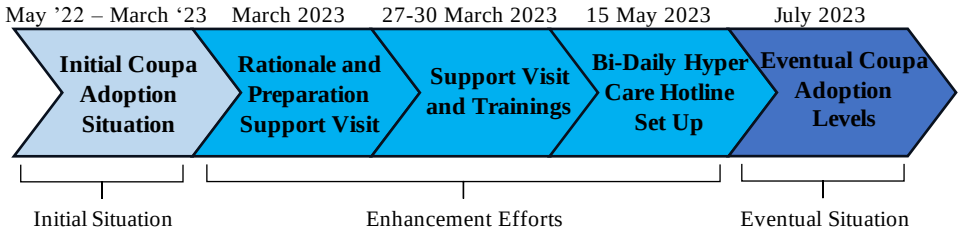


Figure 3: Coupa Enhancement Efforts Process Steps

Step 1: Initial Coupa Adoption Situation

The initial planned go-live date of Coupa at OpCo 1 was the 5th of November 2021. However, the barriers of P2P software implementation mentioned in the previous section, along with the underestimated magnitude of the whole project, resulted in a six-month delay in Coupa go-live, eventually going live on the 23rd of May 2022. In the months following the Coupa go-live of May 2022 at OpCo 1, there was no real focus and monitoring effort on the adoption levels of Coupa at OpCo 1. However, it was clear that the Coupa adoption level was not reaching its target of 20% of the total PR spend. As can be seen in Figure 4 and Figure 5, in the first months of 2023 the Coupa adoption levels based on PR Spend were not reaching its targets on a regular base. Only in week 3, this target was reached but this can be explained by a single outlier item that represents 84.45% of the total spend in that week. Were this single item to be excluded from the report, generating a more representative report, the adoption rate in week 3 would have been 0.45%, thus also significantly below the 20% target.

Step 2: Rationale and Preparation to Support Visit (mass upload)

In an effort to increase the adoption level of Coupa, an on-site support visit was scheduled at the OpCo in question. After the Coupa go-live in May 2022, there was no follow-up training. As was mentioned in Chapter 2.2.5, follow-up trainings result in improved knowledge transfer and have a positive effect on operations and firm performance. Having

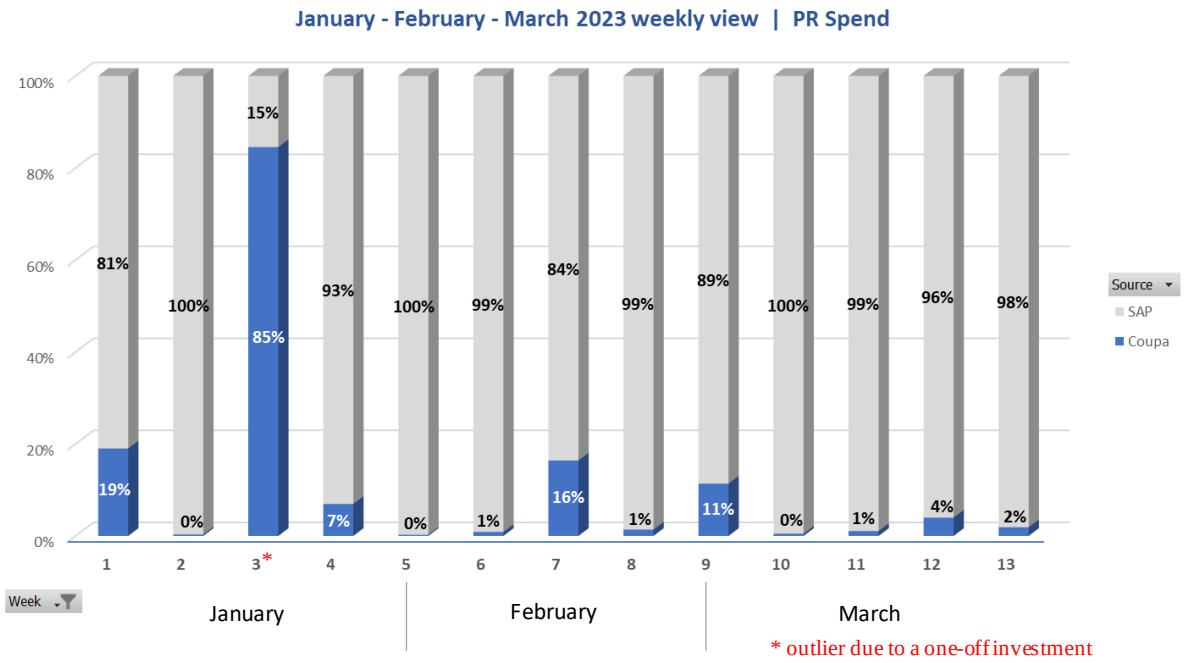


Figure 4: Coupa/SAP PR Spend OpCo 1 | Jan – Feb – Mar 2023 weekly view

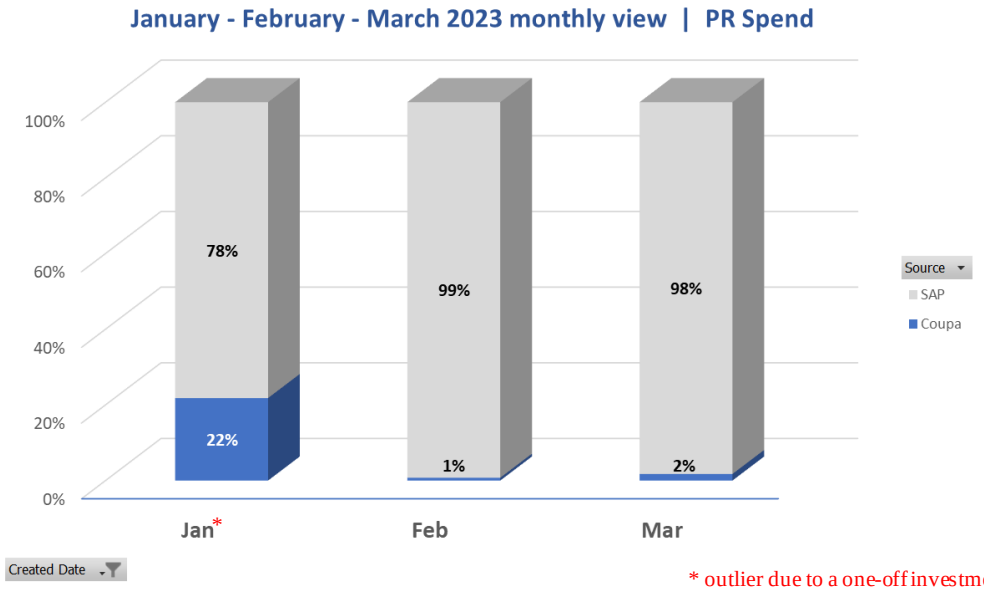


Figure 5: Coupa/SAP PR Spend OpCo 1 | Jan – Feb – Mar 2023 monthly view

follow-up trainings is therefore another important factor in increasing the effectiveness of training and thus the adoption rate of Coupa. The importance of these follow-up trainings was again emphasised by the Coupa consultant mentioned during the interviews stating that "*it is absolutely important having these* [follow-up trainings and FAQ sessions 1 or 2 months after go-live]" and "*you have to make sure that when you have gone live, that you have*

sufficient opportunities of retraining" (interviewee 4). But this was never done at OpCo 1, until March 2023.

In preparation for the support visit, a mass upload of 3600 items into Coupa production was done on the 24th of March 2023. The uploaded items were bought by OpCo 1 in the past four years and had material IDs. These items were non-supplier catalogue items as it was a temporary solution to get more items into the system, making more items available for Coupa users to choose from when using the system, thus increasing the end-user experience and Coupa adoption.

Step 3: On-Site Support Visit and Training

During the on-site support visit, which lasted from March 27th until March 30th 2023, the full procurement team and key Coupa users of OpCo 1 were taken by the hand and shown all the relevant Coupa processes in the system step by step. It was four days full of awareness and point-by-point training. The training sessions covered a range of topics including the End-to-End Coupa process flow, PR creation in Coupa, the creation & updating of materials in Coupa, the mini-RFQ (Request For Quotation) flow in Coupa, and invoice discrepancies review in Coupa. Next to these trainings, the overall objective of the support visit was to re-establish the relationship with (new) key stakeholders (e.g. managing director, financial director, and accounting manager) and to ensure the commitment from Executive Committee members on the further rollout of the project and Coupa at this specific OpCo.

Step 4: Bi-Daily Hyper Care Hotline Set Up

In addition to the training sessions during the on-site support visit of March 2023, a bi-daily hyper-care hotline was set up, beginning on May 15, 2023. Through these scheduled calls, the Senior P2P manager collaborates with local key users of Coupa to promptly discuss and address any arising issues, ensuring their swift resolution. This hotline enhances the end-user experiences and will therefore also increase the Coupa adoption level at OpCo 1.

Step 5: Measure and Current Coupa Adoption Levels

To measure the effect of the extra efforts and emphasis that were now being put in to increase the Coupa adoption rate, a decision was made to report the adoption levels. Starting on the 1st of May 2023, the researcher did a weekly report on the Coupa adoption levels, based on Purchase Requests (PRs), starting with data per the 1st of January 2023. The reporting on a PR level was chosen as this would reflect real-time Coupa adoption levels and would show

the immediate extra efforts that were being put in by the local team. Whereas reporting on a Purchase Order level would have had a delayed representation.

With the continuous efforts of the global procurement team and the local team at OpCo 1 to enhance the Coupa adoption, there was a steady increase in the adoption rates, ultimately achieving a consistent 20% adoption rate (see Figure 6). This highlights the combined efforts of both teams to boost the Coupa adoption levels.

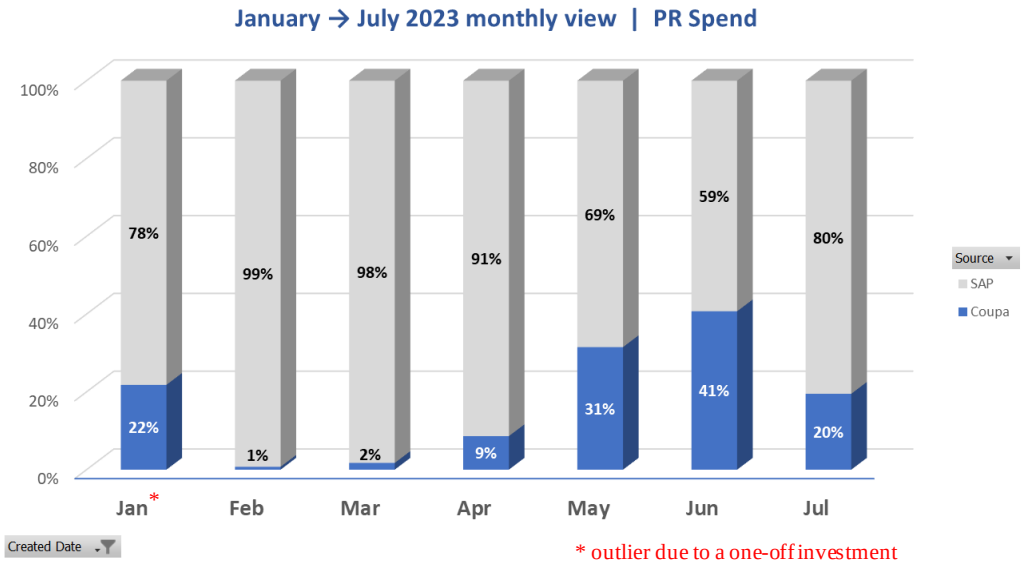


Figure 6: Coupa/SAP PR Spend OpCo 1 | January → July 2023 monthly view

To further improve the adoption rate, the interview and survey results highlight several important points of interest. Firstly, both the Coupa consultant and the Senior P2P manager emphasise the importance of accurate master data quality prior to the implementation of Coupa. Having high-quality master data before P2P software implementation "*is key to success or failure"*, as stated by the Senior P2P manager (interviewee 5). To achieve high-quality master data, the readiness phase prior to the implementation phase is essential. However, OpCo 1 did not have a formal readiness phase due to the unique nature of the project within the case company. As it was the first of its kind, data gaps were still being discovered even as the design and system development were in progress. With a better preparation of the master data, users would have had optimised search and navigation capabilities within Coupa, resulting in a smoother end-user experience and ultimately contributing to an increase in the Coupa adoption rate.

Involving users from 'day minus 1', as highlighted by the senior P2P manager, is crucial for boosting Coupa adoption. A survey respondent's view emphasised the significance of timely

involvement of all stakeholders, stating "*all interested parties should have been involved in time in order to have a broader picture of the requirements and capabilities of Coupa*" [English translation]. Early engagement with the relevant stakeholders identified challenges, customisations and training needs. This helps with a smoother adoption, and a more personalised implementation, enhancing the success of Coupa.

Finally, 25% of the respondents to the survey stated that they preferred to have more documents and manuals explaining the use of Coupa in the local language. An additional 41.7% stated that they only had English documentation or manuals. As the overall English proficiency level at OpCo 1 could potentially hinder the understanding of the provided documents, more documents and manuals in the local language should be provided in future Coupa rollouts in order to resolve this issue and have a higher Coupa adoption sooner after go-live. For the full English-translated Coupa survey results, please refer to Appendix D.

This section focused on enhancing the adoption of Coupa at OpCo 1 through awareness and training. In the following section, the impact of P2P software on more effective purchasing tactics will be discussed in more detail, with a particular emphasis on volume bundling. This section discusses how P2P software enables organisations to bundle purchases, negotiate better terms, and achieve cost savings.

4.1.3 The Influence of P2P Software For More Effective Purchasing Tactics

As discussed in Chapter 2.1, this research mainly centres on the enhancement of purchasing tactics through P2P software. It specifically focuses on the fourth level of the strategy development in purchasing framework by Hesping & Schiele (2015), which is discussed in Chapter 2.1, namely sourcing levers (tactical).[162] When organisations have implemented P2P software, they gain access to vast amounts of data and opportunities for analysis. One of those opportunities being the use of certain sourcing levers. The seven sourcing levers model was discussed, with an emphasis on the use of the volume bundling lever through the application of P2P processes in this specific research. By leveraging P2P software, the main way to achieve volume bundling is by consolidating product groups in the form of framework contracts (i.e. catalogues).

P2P software plays a crucial role in volume bundling as it 'provides' a central platform where procurement teams can combine their purchasing needs. This enables organisations to take advantage of their combined purchasing power, leading to larger order volumes. As a result of the increase in order volume, they are able to negotiate better terms and discounts. This improves overall cost savings while also lowering the cost per unit. P2P software also enables organisations to strengthen their negotiation positions. P2P software provides procurement teams with valuable information for negotiations offering real-time insights into vendor performance and historical purchasing data. By using this data-driven strategy, they can negotiate better terms, prices, and conditions with suppliers because they will have a stronger position during the negotiations.

For OpCo 1, efforts were made to increase the number of catalogues in Coupa and reduce the supply base, working towards the 75% supplier reduction goal of the project. An increase in Coupa catalogues would in turn also enhance the end-user experience for local Coupa users, ultimately increasing the Coupa adoption. To achieve this, specific 'tender baskets' consisting of five product categories were created based on PO-level data from SAP. These tender baskets strategically focus on categories with the greatest potential to increase the number of catalogues and reduce supplier numbers. These tender baskets cover bundles of items that displayed a substantial volume and spending at OpCo 1 between January 2022 and May 2023.

[162] See Hesping & Schiele (2015), p. 139.

Based on these created tender baskets, an opportunity emerges to go to the market more strategically. 81.77% of the total distinct items of the five categories would be added to catalogues in Coupa. These tender baskets would simultaneously reduce the number of suppliers of these five specific categories of OpCo 1 by 49%, as can be seen in Figure 7. The specific data for certain numbers has been blacked out due to confidentiality reasons. With this consolidation of suppliers, the purchasing volume per supplier increases significantly. This leads to a better negotiation position for the case company and OpCo 1 and therefore better pricing, along with rebate clauses. Rebate clauses serve as mechanisms for suppliers to stimulate buyers to increase their purchasing volume.[163] When doing so, the supplier agrees to refund a portion of the customer's purchase price upon meeting a pre-specified target level. This rebate, or 'discount', can be provided in the form of units or monetary value.

					Tender Baskets				Expected Supplier reduction
Cat_Tree_L1	Distinct Items	PO Value EUR	Vendors in the Category	Vendors - Potential for future	Vendors in the Baskets	Vendors in the Tender	Items	Baskets Value EUR	
BCMM	415	927.928	51	1	13	1	168	590.933	65%
FM&E	997	2.286.476	175	17	58	1	682	1.567.568	30%
IT & telecom	221	649.381	14	2	12	1	149	499.243	32%
Mobile_Eq	318	1.308.379	51	4	20	1	107	1.020.174	23%
Production_Eq	1.794	3.996.559	194	1	185	45	1.698	3.448.644	88%
*RCM strategy	166	1.635.559	1	1	1	1	166	1.635.559	
Total	**3.735**	9.368.716	402	**159**	243	48	**3.054**	8.724.214	49%

Figure 7: Tender Baskets Summary

By implementing P2P software and leveraging volume bundling, organisations can reap the benefits of economies of scale and therefore cost savings. The ability to consolidate suppliers and bundle volume not only improves procurement effectiveness but also contributes to the strategic cost management of organisations. By optimising purchasing tactics through P2P software, organisations can achieve substantial cost savings, maximise their procurement resources, and move towards a more strategic procurement.

Chapter 4.1.3 examined the influence of P2P software on enhancing purchasing tactics, particularly through volume bundling. The strategic use of P2P software was demonstrated by OpCo 1's initiatives to increase Coupa catalogues and decrease suppliers. The following chapter will focus on data input standardisation with an emphasis on the material ID lifecycle of OpCo 1 to enhance data quality and useability.

[163] See Chiu et al. (2011), p. 2.

4.2 Part 2: Supporting Material ID Standardisation With the Use of Technology

4.2.1 Standardising Data Input to Improve Data Cleanliness and Useability

Data input standardisation is crucial for organisations to ensure efficient and effective procurement processes. P2P systems are no exception to this. Even after successful implementation, their success relies on data accuracy. Without standardised data input methods, information is created and stored inconsistently, making it more challenging to analyse spend and track inventory accurately. This inconsistency also increases the risk of errors and duplicates in the system as the same information or material could be noted differently by different individuals. This intensifies the issue of dirty data and hinders the full potential utilisation of P2P systems. Part 2 of this research delves into the standardisation of data input methods, to enhance data accuracy and useability.

At OpCo 1, the lack of data input standardisation has caused a number of issues when creating new material IDs in the system. There are multiple cases of newly created material IDs with incorrect information, for example, incorrect English descriptions or incorrect material groups. To identify the causes of these incorrect data inputs and standardise the data input method, it is essential to understand the current material ID creation process flow. To map the current process flow of the material ID lifecycle, the local head of planning and a procurement data administrator of OpCo 1 were interviewed. Both individuals were heavily involved in this process flow so were able to provide a good clarification on the current material ID lifecycle at OpCo 1. The full current material ID lifecycle can be seen in Figure 8. Based on the identified current process flow of creating a new material, three recommendations can be made to improve the material ID lifecycle. These will be elaborated in this section, alongside discussing the current material ID lifecycle of OpCo 1.

The lifecycle begins when a supervisor fills in a material order form with materials that this supervisor needs to have ordered. This order form is being sent to one of the two material requesters at OpCo 1. These two persons are the only ones who can create a new material request. The materials on the material order form all have to be ordered for the supervisor but some of those materials might already exist in the system (SAP) and therefore don't have to be created. To check this, the first thing the requester does is choose the correct PCS (Product Code System) code for this material. Based on this PCS code, they have to fill in a naming convention connected to this specific PCS code to search the system if the identical material exists or not. Or when there is no naming convention linked to the PCS in question,

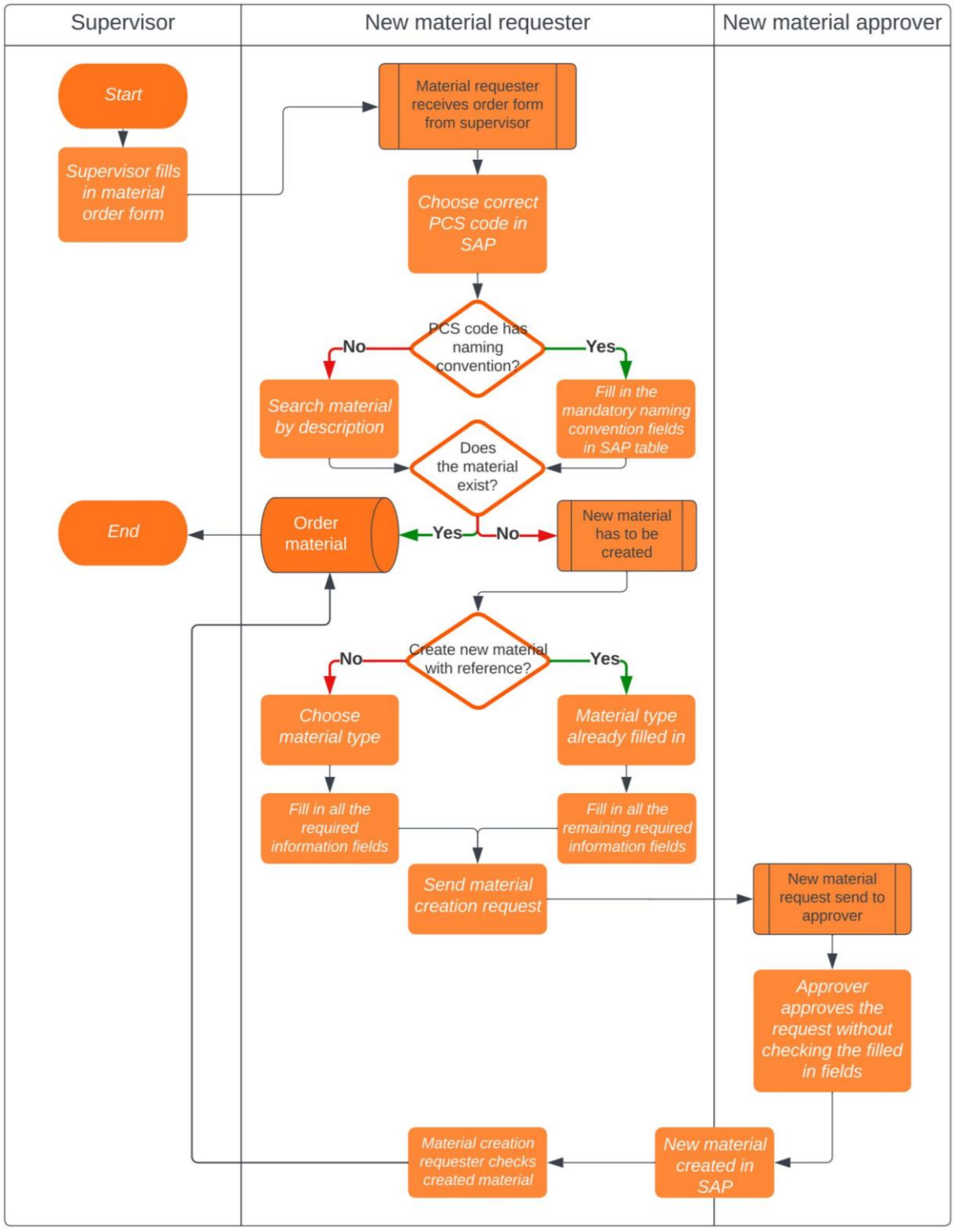


Figure 8: Current material ID lifecycle OpCo 1

they search the system by material description. Via both ways, the system will show whether the identical material exists or not. If the material does exist, it will be ordered, and if it does not exist yet, the material has to be created. Noticeably, the requesters only search for 1 on 1 identical materials in the system. When the requesters don't find an identical material, they

continue to create the material. No efforts are being made to search for similar already existing items in the system. It is therefore recommended to add an additional step in the process flow, between 'does the material exist' and 'new material has to be created', where the requester searches for similar items in the system that could potentially do the same job as the requested item. When one or multiple similar items are found, the requester refers back to their supervisor to verify that this similar item can also be used, instead of the exact material on the material order form. When this is possible, this will decrease the amount of new materials that have to be created.

When a material has to be created, the requesters have the option to create a new material with or without reference. When an item is created without reference, all the information fields are empty and have to be filled in manually by the requester. When an item is created with reference, the requester selects an already existing material that is similar to the one being created and uses it as a template. This way, there are already certain pre-filled in fields with information that are most likely to be similar to the one being created. Creating with reference is very useful as it reduces time and manual work and is therefore often used by requesters. However, oftentimes the pre-filled in information fields are not changed correctly or at all, leading to wrong information when a new material ID is created. Examples of this are wrong material groups, purchasing groups or wrong English descriptions of the material. An example was given by the procurement data administrator during the interview stating "…*they* [the requesters] *copy from any old material and forget also to change English description*" (interviewee 8). With 'copy from any old material' is being referred to creating a material with reference. To prevent this from happening, it is recommended to oblige the requesters to check and verify whether all the pre-filled information fields are 100% correct when creating a new material with reference. Creating a documented policy of this material ID lifecycle would standardise the data input method and in turn decrease inaccurate or duplicate information in the system, improving data quality and useability.

After all the information fields are supposedly correctly filled in by the requester, the new material request is sent to one of the two material approvers. They receive the new material request in their email and have 24 hours to create the new material. At this stage, the approver simply selects a box to approve the creation of a new material ID. No checks are being done to validate the information fields, such as material group or English description, for correctness. This could lead to additional work in the future because, as the procurement data administrator mentioned, when an issue with a material ID arises, people will refer back

to the approvers to request corrections of this material ID. This reactive approach is not the most effective of working. The approval process is the second opportunity to review all the information fields, and this opportunity should not be wasted. When approvers do not thoroughly review what they are approving, they have little added value beyond creating the material ID itself. It is therefore recommended to make it mandatory for the approver to revisit the system, check for duplicates, and confirm the correctness of all information fields, working more proactively.

After the approver has approved the new material request, the material ID is officially created in SAP. The material requester receives confirmation of this and checks whether the created material is actually what was created. After this, the newly created material can be ordered for the supervisor and the material ID lifecycle is complete. Figure 9 shows an updated process flow of the current material ID lifecycle, including the three previously mentioned recommendations outlined in blue.

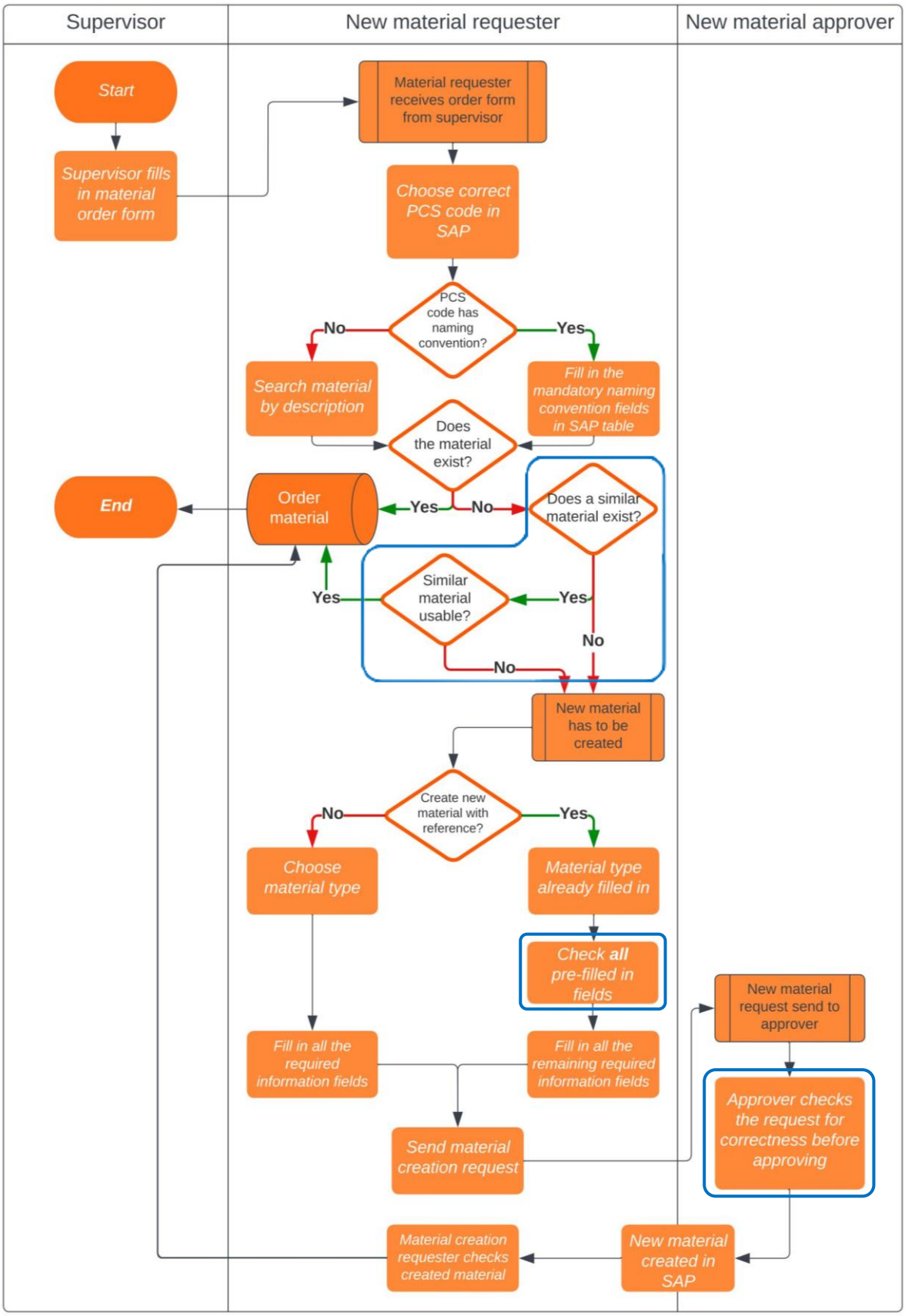


Figure 9: Updated material ID lifecycle OpCo 1

To explore the concept of material ID further, the purchasing manager of another OpCo was interviewed. This United States-based OpCo, hereinafter referred to as 'OpCo 2', was selected due to its strong material ID process in place, which can serve as a benchmark for material control.

At OpCo 2, they have clear criteria for determining when to create a new material ID and when not to. They refrain from creating new material IDs for one-time, small-amount purchases with short lead times and no inventory requirements. In contrast, new material IDs are created when the material characteristics are the opposite of the previously stated criteria, particularly when the material is intended to be used as a spare part. This way, maintenance teams can easily find spare parts with the use of material ID.

Additionally, OpCo 2 uses a standardised naming convention for its parts in an effort to name all items consistently. One of the biggest advantages of naming convention is that by having a standard format for material descriptions, duplicate materials can be found much easier as it is known how this material should be noted in the system when it exists. Several interviewees have emphasised the importance of naming conventions in material control, including the master data specialist (interviewee 3) and SAP expert (interviewee 6).

On multiple occasions, the purchasing manager of OpCo 2 stated that having very few people that have access to change or create material, is key for having accurate master data. However, we have the same situation at OpCo 1 where also only two people have access to change or create data. But the reality is different, OpCo 1 does not have as accurate data as OpCo 2 does. There are most likely other factors influencing the data quality such as training and more commitment possibly, but this has not further been investigated in this research.

This section focused on the mapping and improvement of the current material ID lifecycle at OpCo 1 and working towards a more standardised data input method. It also highlighted several interesting points regarding material ID at OpCo 2. However, manual processes are sensitive to errors and inconsistencies, highlighting the need for automation. In the following chapter, the automation of item classification will be discussed, as well as exploring the potential of AI in this process.

4.2.2 Automated Item Classification and the Potential Use of Artificial Intelligence

The classification of items is a critical step in procurement processes as it enables effective categorisation, organisation, and tracking of resources and spend. However, manual classification can be sensitive to human errors, inconsistencies, and inefficiencies. Therefore, investigating the possibility of automating item classification has become a potential solution for improving accuracy, efficiency and productivity in the classification process. This chapter will discuss the importance of correctly classifying new materials by material group and the advantages and difficulties of automating item classification from the perspectives of subject matter experts. Furthermore, the potential use of Artificial Intelligence (AI) in the automation process will be explored.

Correctly classifying materials into the correct material groups is of great importance. By categorising materials into specific groups, you gain a better understanding of their purposes and you can do more accurate spend analysis based on material groups. This information helps to make more informed decisions on how to use materials more optimally. The purchasing manager of OpCo 2 mentioned that with this classification, they can send spare parts from one plant to another plant much easier as they have everything accurately classified, stating "*having all that stuff correctly classified and organised, all that is definitely important for a host of different reasons. But that especially*" (interviewee 7). With 'but that especially' is being referred to sending spare parts from one plant to another easier.

The potential of using tools to help with item classification was a recurring theme in the interviews. The master data specialist mentioned that using tools can reduce human errors and typos in the classification process. Utilising such tools will be less time-consuming and it will steer the users to the right material group, decreasing possible misclassifications. It will therefore not only save time and valuable resources but also guarantee consistency and accuracy in the classification process. However to be able to provide accurate suggestions, the importance of having very accurate data was emphasised as having such a tool can be consistently accurate, but when the data is wrong, it can also be consistently inaccurate. The concept of garbage in, garbage out applies here well. It was however also pointed out that implementing such a new tool would require training, awareness and knowledge transfer, which can present new challenges as people prefer to stick to their old way of working. Additionally, the purchasing manager of OpCo 2 stated that their technological adoption is relatively slow. It would therefore again be critical to have adequate change management, as was discussed in the previous chapters in order to ensure a high adoption rate.

During the interview with the purchasing manager of OpCo 2, the classification process of this specific OpCo was discussed. During the interview, the complexity of the transition from their local classification system to the global company category tree was greatly emphasised. OpCo 2 has a very specific and detailed categorisation of materials, whereas the global category tree of the case company is more grouped and less aligned with this OpCo. By going through the exercise of trying to assign an old category to a new category, it was found that the global company category tree has far less categories than the original local category tree of OpCo 2. This results in the problem that items are being put in more general, less specific categories, making it much more difficult for them to find the correct material in the categories, whereas this was fairly easy in the past. Also, it was stated that because the categories are so general, it is not exactly known how everybody is putting materials in them. For example, person 1 could put material X in category Y, whereas person 2 could put the same material X in category Z, contributing to the problem of misclassification and dirty data. The purchasing manager of OpCo 2 mentioned that it seemed that the global company categories were created more for building products and small parts than for OpCo 2's industry in terms of cement plants.

To prevent misclassifications from happening, an AI-driven tool can help with this classification process. The interviewees expressed optimism about AI's capabilities and acknowledged the technology's potential to automate item classification. Several interviewees emphasised the value of using AI technology to simplify the classification process. An example was given by the senior P2P manager stating "*it will be brilliant if you just type in what you need and by using AI technology, it can already* [make item classification suggestions]" (interviewee 5). It was however stated by the global master data manager that for AI systems to work, a high volume of data and a low mix of data are needed.

One specific tool capable of AI-driven automated item classification was examined in depth, namely, Creactives. Creactives has the built-in 'MG Prompt' option which helps in automating the classification process when a free text order has to be created. Via the MG Prompt option, the AI suggests the most relevant material group classification in SAP with an accuracy of 95%. This unique option helps to ensure the right material group of free text orders. A second option of Creactives, the 'Material Search' option, suggests the top 10 most similar items available in the material master and catalogues when a free text order is being created. By suggesting materials that are already in the system, users can select existing materials, therefore reducing the amount of free text orders.

5. Discussion: Enhancing P2P Software Adoption to Move Towards a More Strategic Procurement Using Material ID

5.1 Best Practices to Enhance the Use of P2P Software and Enable Purchasing Tactics

To address the central research question, '*how to enhance the usage of P2P software to enable activities that contribute to purchasing tactics?'* this research conducted a comprehensive exploration of strategies and factors influencing the utilisation of P2P software in the context of purchasing tactics. This discussion chapter aims to provide key insights and implications derived from the research. By integrating the findings and analysing their significance, this chapter offers valuable insights and recommendations for enhancing the adoption and effectiveness of P2P software in procurement processes.

Key P2P software implementation barriers

It is known that implementing new software into an organisation brings challenges and barriers with it. In this research, the barriers of P2P software implementation were researched and identified within a specific single case study. It was found that the most critical success factor of successful P2P software implementation is having adequate change management. A crucial part of adequate change management is effective communication and this was specifically lacking in the single case studied in this research. The benefits of the new P2P software were not clearly communicated with the end-users in advance. Without having this clearly communicated, the end-users didn't have as much incentive to change their current way of working, hindering the implementation of new P2P software. Furthermore, it is key to have the support and commitment of (senior) leadership to have a successful and smooth implementation of new P2P software. When this support and commitment is deficient, it is much harder to have a successful implementation in a timely manner. Another significant aspect of successful implementation involves establishing clear goals and guiding principles that are communicated and agreed on by all relevant parties at the beginning of the project. This ensures that everyone involved is well informed about the project's goals and the standards they should adhere to. A final significant aspect of successful P2P software implementation is providing adequate training, preferably in person. The Covid-19 pandemic however posed significant challenges for conducting in-person training sessions. After training, end-users must have the opportunity to familiarise themselves with the new system in a test environment before the actual go-live. This will significantly enhance the end-user's ability to work with the new system once it's in use.

P2P software adoption enhancement efforts

After successfully implementing P2P software, the next challenge is to reach the desired level of software adoption. At OpCo 1, efforts were made to boost the adoption rate, as it fell short of the 20% adoption goal within the initial ten months after the go-live date. In preparation for an on-site support visit, 3600 items were mass uploaded into the system to enhance product availability, aiming to increase the end-user experience and further enhance adoption. During the support visit, hands-on training was provided to all relevant procurement teams, offering valuable insights and promoting further enhancement of P2P software adoption. After the support visit, a bi-daily hyper-care hotline was established to provide timely assistance to OpCo 1's local teams whenever needed. This ensured OpCo 1's continued engagement and active efforts to increase the P2P software adoption rate. With the continued efforts of both the global procurement and local teams, the goal of achieving a 20% P2P software adoption rate was eventually reached.

Optimising P2P software to enhance purchasing tactics

P2P software plays a central role in a specific purchasing tactic; volume bundling. With access to vast amounts of data, organisations can leverage their collective purchasing power when consolidating their purchasing needs, resulting in larger order volumes. As order volumes grow, organisations can negotiate more favourable terms, prices and conditions with suppliers, strengthened by their stronger position during negotiations. This data-driven approach to purchasing receives a significant boost from the data availability and control P2P software brings. By optimising purchasing tactics through P2P software, organisations can maximise their procurement resources, achieve substantial cost savings, and transition toward a more strategic procurement approach.

Further enhancement of P2P software adoption through automated item classification

To further increase P2P software adoption, material group standardisation can play an indirect but crucial role. An AI-driven automated item classification tool, Creactives, can assist regarding this matter. As discussed in Chapter 4.2.2, Creactives offers the MG Prompt option, which achieves a 95% accuracy in suggesting the most relevant material group when creating a free text order. These accurate automated material group recommendations guarantee the correct classification of material groups for free text orders. Creactives provides a standardised method for classifying materials into the correct material groups by eliminating human involvement in the classification process. This results in a more

standardised and accurate classification of new materials. Improved material group accuracy enables organisations to approach the market more strategically, requesting tenders based on more precise material groups. This would increase the number of catalogues in the P2P system, improving item availability and end-user experience, and ultimately enhancing the P2P software adoption rate. It is therefore highly recommended that organisations implement a tool like Creactives to assist in their item classification process.

Enhancing data quality and the useability of P2P software

To enhance data quality and the useability of P2P software, standardising data input methods is crucial. The analysis of the current data input process involved identifying the existing material ID lifecycle. From this analysis, three recommendations emerge for further improvements to ensure a more accurate material ID lifecycle. Based on the identified and updated material ID lifecycle, a new material ID creation manual can and should be made to have a consistent and standardised data input method. This, in turn, enhances data quality and the useability of the systems in use.

5.2 Implications For Literature: The Renaissance of E-procurement to Enable Strategic Purchasing Tactics

Over the past two decades, e-procurement has faced limited adoption largely due to implementation challenges.[164] However, the modern-day landscape has evolved, making implementation more accessible thanks to factors like product classification standardisation and uprising technologies. The transformation of procurement into a strategic function over the past 20 years offers an opportunity to leverage the benefits of automation alongside advanced purchasing tactics. This research not only paves the way for the successful implementation of purchasing tactics using standardised P2P data but also establishes a crucial link between strategic decision-making improvements and system availability. This research builds on decades' worth of strategic insights (e.g. Hesping & Schiele (2015); Hesping & Schiele (2016)), allowing more strategic and informed decision-making during procurement processes.

While numerous studies have analysed the barriers and adoption factors related to e-procurement (e.g. F. D. Davis (1989); Angeles & Nath (2007)), this research addresses a significant gap by focusing specifically on the implementation barriers and adoption factors of P2P software.[165] By doing so, it not only makes a valuable contribution to the existing body of knowledge of purchasing systems, but also offers valuable insights into how the utilisation of P2P software, such as Coupa, can be optimised. This provides critical guidance for organisations seeking to optimise their procurement processes to achieve maximum efficiency. Furthermore, this research sheds light on the transformative power of digitisation in the field of procurement, highlighting the importance of understanding this process for future research. By doing so, it lays the foundation for future research in the field of digital procurement.

Following Makadok et al. (2018) guide on the taxonomy of contributions to theory, this research explores a *different level of analysis* compared to previous studies.[166] Instead of examining the general state of e-procurement through a single case study, as often done before, this research delves into the specifics of a particular e-procurement software solution, especially P2P software. By offering a more in-depth analysis of P2P software's role in

[164] See Hawking et al. (2004), p. 23.
[165] See Davis (1989), p. 320, 333-334; Angeles & Nath (2007), p. 110, 113.
[166] See Makadok et al. (2018), p. 1532.

enhancing purchasing tactics within procurement, this research contributes to the literature, providing a focused and specific perspective on P2P software's impact.

This research contributes to the literature by offering empirical evidence of effective P2P software adoption methods. It not only outlines suggested and projected actions for improving the adoption to a specific P2P software but also confirms these recommendations with real data, demonstrating the actual enhancements achieved. This aspect of research is often lacking, as practical testing of software adoption strategies can be challenging for researchers.[167] Therefore, this research provides significant new insights into the factors influencing P2P software adoption, confirming their effectiveness through tangible real-world evidence.

Angeles & Nath (2007) have stated that having alternative ways of accomplishing procurement can support the already existing resistance to change to new e-procurement software by employees.[168] This research provides evidence that confirms this challenge to e-procurement. It has been stated that having alternative ways of achieving procurement, in this specific case SAP, can hinder the adoption to a new (P2P) software, such as Coupa. This research confirms the already known challenge of e-procurement, but now also in a more specific field of e-procurement. This research therefore confirms that the general statement of Angeles & Nath (2007) also holds true in the specific case of P2P software.

Complementing on research by Angeles & Nath (2007) on the key preparation factors of e-procurement, or P2P software specifically, this research offers empirical evidence highlighting the importance of a readiness phase prior to the implementation phase ensuring a successful P2P software implementation. This phase ensures comprehensive readiness, covering aspects like master data quality, end-user involvement, and training. A well-planned and structured project design before implementation emerges as a key factor for successful P2P software implementation. In this research' case study, data gaps continued to emerge as the design and development phase progressed, underscoring the importance of comprehensive project planning.

Hawking et al. (2004) and Wu et al. (2007) have identified high technological costs and financial investments as key barriers to e-procurement.[169] However, this was not found to be

[167] See Gray (2021), p. 6.
[168] See Angeles & Nath (2007), p. 110.
[169] See Hawking et al. (2004), p. 7; Wu et al. (2007), p. 577.

a barrier in this research's specific case. In this specific case, the projected benefits of the first five years after implementing a new e-procurement software (specifically P2P software) were 276.88% higher than the expected implementation cost. Consequently, heavy financial investments were not seen as a barrier to e-procurement implementation, specifically in the context of P2P software. Following M. S. Davis (1971) inquiry into social and sociological theories, it can be argued that *what seems to be a general phenomenon, is in reality a local phenomenon.*[170] This means that while Hawking et al. (2004) and Wu et al. (2007) suggested heavy financial investment as a generalisable barrier to e-procurement implementation, in our specific case, such investment was not seen as a barrier to the implementation of e-procurement, specifically P2P software.

This research provides a unique perspective on the material ID creation lifecycle in a specific case study. This lifecycle can serve as a template for other organisations to map their own material ID creation lifecycle, allowing the development of standardised procedures. Such standardisation aims to improve data quality and useability. The research sheds light on potential pitfalls in creating new material IDs that organisations may overlook, while also proposing solutions to address these pitfalls. Additionally, this research confirms the emerging trends and ambitions regarding the implementation of Artificial Intelligence in the product classification process.[171] It underscores the significance of this implementation while acknowledging the associated challenges.

[170] See Davis (1971), p. 317.
[171] See Guida et al. (2023), p. 11-12.

5.3 Managerial Implication: Automation and Augmentation of Procurement Based on P2P Solutions

This research provides a range of valuable insights and recommendations for practitioners, industry professionals, and decision-makers. First and foremost, it uncovers the key barriers to P2P software implementation. By identifying the barriers of new software implementation, specifically for P2P software, organisations can proactively prepare and make more informed decisions when implementing or planning to implement a new P2P software into their organisation. This knowledge is particularly valuable for organisations seeking a smooth and successful P2P software implementation. Without the specific knowledge provided in this research, organisations may experience significant challenges and delays implementation phase.

Secondly, this research enhances organisations' understanding of the factors hindering full P2P software utilisation. It identifies key success and adoption factors for improving employees' adoption rates of a new P2P software while providing empirical evidence of the effectiveness of the suggested methods. Furthermore, it clarifies the reasons for underutilisation and offers specific solutions to enhance P2P software adoption within organisations. This information is valuable for organisations considering P2P software implementation or those seeking to increase their adoption levels after implementation.

Thirdly, this research provides valuable insights into the current capabilities of P2P software, particularly in the context of volume bundling based on the lever analysis by Hesping & Schiele (2016). It highlights the existing potential of P2P software but also suggests future possibilities with the integration of augmented decision-making support, such as generative AI tools, and the increasing availability of data. To leverage these opportunities, organisations must recognise the role of P2P software in this process and integrate these advancements into their procurement strategies. By doing so, they can remain competitive in the ever-evolving procurement landscape.

Fourthly, this research identifies the current material ID lifecycle within a specific case. This identification of both the current and updated material ID lifecycle can serve as a valuable guide for organisations seeking to standardise their new material ID creation process. The recommended material ID creation manual can be used as a template for creating an organisation-specific, more detailed manual. This standardised approach to generating new material IDs has the potential to enhance data quality and useability within organisations.

Finally, many organisations recognise that automation and augmentation are the future, especially in procurement. This research explored the possibilities of automating the item classification process, highlighting its advantages. Automating and standardising the classification process reduces manual effort, minimises errors, and enhances the accuracy of item classification. More software provides are exploring automation and augmentation solutions for standardising the item classification process. A specific AI-driven tool was identified in this research, Creactives, providing valuable insights into the value of such tool. Creactives provides the Material Search option, reducing the need for free text orders, and the MG Prompt option, suggesting the most relevant material group when creating free text orders with 95% accuracy. This tool not only decreases the number of free text orders but also improves the item classification accuracy, two crucial factors in procurement for any organisation. Additionally, it frees up organisational capacity, enabling procurement professionals to shift their efforts toward strategic and value-added decision-making processes.

By applying the insights and recommendations gained in this research, organisations have the opportunity to decrease their procurement costs, optimise the full potential of their P2P software through enhanced purchasing tactics, and boost the ROI on their P2P software investment through increased framework contract utilisation. This research provides valuable insights and recommendations for organisations that are considering or have already implemented Procure-to-Pay (P2P) software, specifically focusing on Coupa. In order to have a successful implementation and adoption of P2P software, organisations must give enough priority to a readiness phase prior to implementation. This includes end-user involvement, master data quality, and comprehensive training. Identifying and addressing the adoption barriers is crucial to increase employee usage and overall success. This research emphasises the potential of automation and augmentation to optimise item classification and improve decision-making processes, particularly through AI tools. By standardising the material ID creation process, organisations can enhance data quality and useability. P2P software has been highlighted as a transformative tool for procurement, providing significant cost savings and strategic advantages. It is therefore recommended to embrace and leverage emerging technologies like P2P software and generative AI to remain competitive in the ever-change landscape of procurement.

6. Limitations and Future Research Directions

This research has limitations primarily associated with the scope and content of the research. It exclusively investigated one P2P software, namely, Coupa. There are however other P2P software such as Oracle, SAP Ariba and PRM360 which could have different research outcomes than Coupa specifically. The outcomes of this research may not fully represent the broader spectrum of P2P software solutions due to this limited scope, potentially impacting the research results. In addition, Creactives was the only AI classification tool that was investigated in this research, while there may be other tools with similar capabilities. This research did not explore the distinctions between various AI classification tools, which could have influenced the research outcomes.

An in-depth single case study approach was used in this research, which also brings its limitations. Case studies focus on the behaviour of a specific person, group or organisation. The behaviour of this one unit of analysis may or may not reflect the behaviour of similar entities. A case study can provide insights into what may be found in a similar organisation, but additional research would be needed to verify whether the findings of this research are generalisable elsewhere.[172]

Another potential limitation of this research is the researcher's potential bias due to their deep involvement in the case company. Action research involves the researcher's active participation in day-to-day activities, which can introduce biases like selection bias, social desirability bias, or other cognitive biases. Unlike many other disciplines, action research makes no attempt to remain objective, but openly acknowledges and addresses its potential bias.[173]

Future research in this field should focus on two main areas. Firstly, in-depth research is needed to determine how Robotics Process Automation (RPA) and generative AI can further streamline and standardise processes within P2P systems, including product classification. RPA has gained more attention as a result of digital transformation as this cutting-edge technology can automate human behaviour and has promising future possibilities.[174] RPA has the potential to optimise tasks that require a lot of man-hours, but future research should delve deeper into the integration of RPA with P2P software to support efficient procurement processes. Investigating the synergy between RPA, generative AI and P2P systems can

[172] See Simon & Goes (2013), p. 2.
[173] See O'Brien (1998), p. 4.
[174] See Flechsig et al. (2022), p. 1.

provide organisations looking to improve their procurement operations with valuable insights and best practices.

Secondly, future research should focus on the development of reliable methodologies for measuring the true value and impact of P2P software on purchasing tactics and strategies. Understanding how P2P software contributes to improving purchasing tactics, cost reduction, and overall procurement efficiency is crucial for organisations looking to make informed decisions about their software investments. The effectiveness of P2P solutions should be assessed using both quantitative and qualitative measures in such research. Addressing these research directions can help with the measurement of the value of P2P software in enhancing purchasing tactics and strategies, as well as understanding the potential benefits and strategies of optimising the integration of RPA with P2P systems.

Appendices

Appendix A: Additional Information Coupa P2P Software

Coupa is a cloud-based platform that provides a wide range of procurement, invoicing, and expense management solutions. In 2022, it was named a Gartner® Magic Quadrant™ Leader for Procure-to-Pay Suites for the seventh consecutive year, recognising Coupa as the leader of P2P solutions on the market.[175] Coupa's main purpose is to help organisations improve their efficiency, reduce costs, and gain visibility into their spending. Coupa offers four buying channels to create Purchase Requests (PRs). These channels include (1) Punchout Catalogues, (2) Hosted Catalogues, (3) Webform, and (4) Freeform. With a (1) Punchout Catalogue, Coupa users are redirected to the supplier's e-commerce website where they can shop as normal. Once the user proceeds to checkout, they are brought back to Coupa with their selected items in the Coupa cart. Subsequently, users can submit a request in Coupa using the items, costs, and details obtained from the supplier's website.[176] (2) Hosted Catalogues in Coupa are searchable collections of items that can easily be accessed from the Coupa Home page. Hosted Catalogues allow users to access a pre-negotiated/pre-defined set of items from suppliers within the Coupa platform by searching for items within the catalogue using keywords or product codes.[177] (3) Webform is another type of buying channel within the Coupa platform where users can make PRs for items that require more personalised and specific information, like business cards. Coupa Webform is a simple tool for creating PRs and is particularly useful for purchasing items that are not available in Punchout or Hosted Catalogues, or for one-off purchases that do not require a lot of detail. For the more complex, detailed, or unique items, (4) Freeform can be used. These items normally do not fit into a standard catalogue or template and are too complex to be captured in a Webform. Freeform is essentially a black canvas that allows users to enter any details they want about their purchase (e.g. item description, price, quantity, etc.).

[175] See Coupa (2022).
[176] See Compass (last edited on: 2019: August 22nd).
[177] See Compass (last edited on: 2017, July 6th).

Appendix B: Coupa Survey Questionnaire | English Version

Question 1	Literature provides numerous success factors of P2P software implementation. What are in your opinion the **top 5 key success factors** of P2P software implementation based on this list?
	
	1. Having early stakeholder involvement
	2. Having senior management support & commitment
	3. Having enough financial resources
	4. Having the system integrated with other systems in use
	5. Having appropriate supplier preparation and training
	6. Having appropriate employee training & mentoring
	7. Having a positive employee's *perceived usefulness* level
	  1. Definition of *perceived usefulness*: "the degree to which a person believes that using a particular system would improve his or her job performance".
	8. Having a positive employee's *perceived ease of use* level
	  1. Definition of *perceived ease of use*: "the degree to which a person believes that using a particular system would be easy".
	9. Having a supportive, trusting, positive environment
	10. Having a support plan after go-live
	11. Having clear & relevant goals
	12. Having reviews (i.e. inspections/checks)
	13. Having experienced staff
	14. Other:

Question 2	Were the benefits of using Coupa clearly communicated and explained in advance? 1. Yes (*Da*) 2. No (*Ne*)
Question 3	On a scale of 1 to 5, where 1 represents 'significantly improve' and 5 represents 'significantly hinder', how much did you think that using Coupa would improve your job performance? (perceived usefulness) 1. Significantly: I believed that using Coupa would significantly improve my job performance 2. Somewhat: I believed that using Coupa would have a moderate positive impact on my job performance 3. No influence: I believed that using Coupa would have no influence on my job performance 4. Slightly hinder: I believed that using Coupa would have a slight negative impact on my job performance 5. Significantly hinder: I believed that using Coupa would have a significant negative impact on my job performance

Question 4	On a scale of 1 to 5, where 1 represents 'very easy' and 5 represents 'very difficult', how did you think that using Coupa would be easy to use? (perceived ease of use) 1. Very easy: I believed that using Coupa would be effortless and straightforward 2. Somewhat easy: I expected that using Coupa would be relatively simple and uncomplicated 3. Neutral: I had no strong expectations regarding the ease or difficulty of using Coupa 4. Somewhat difficult: I anticipated that using Coupa would pose challenges and require effort 5. Very difficult: I expected that using Coupa would be very complex and demanding
Question 5	On a scale of 1 to 5, where 1 represents 'positive and supportive' and 5 represents 'negative and unsupportive', how would you describe the training environment for Coupa and its influence on the effectiveness of the training? 1. Positive and supportive: the training environment was highly positive, creating a supportive and engaging atmosphere that improved the effectiveness of the training 2. Somewhat positive and supportive: the training environment had some positive aspects and support, contributing slightly to the effectiveness of the training 3. Neutral: the training environment had no significant influence, it was neither positive nor negative 4. Somewhat negative and unsupportive: the training environment had some negative aspects which slightly hindered the effectiveness of the training 5. Negative and unsupportive: the training environment is mainly negative and unsupportive, impacting the effectiveness of the training negatively
Question 6	During your Coupa training, did you feel adequately guided and supported when encountering difficulties in understanding the material? Please provide a rating from 1 to 5, where 1 represents 'not at all' and 5 represents 'absolutely'. 1. Not at all: I did not feel guided or supported when facing difficulties in understanding the material during Coupa training 2. Slightly: I felt a minimal level of guidance and support when encountering difficulties during Coupa training 3. Somewhat: I felt some level of guidance and support, but not to a significant extent when facing difficulties during Coupa training 4. Significantly: I received a moderate level of guidance and support when facing difficulties curing Coupa training 5. Absolutely: I felt fully guided and supported when facing difficulties in understanding material during Coupa training.

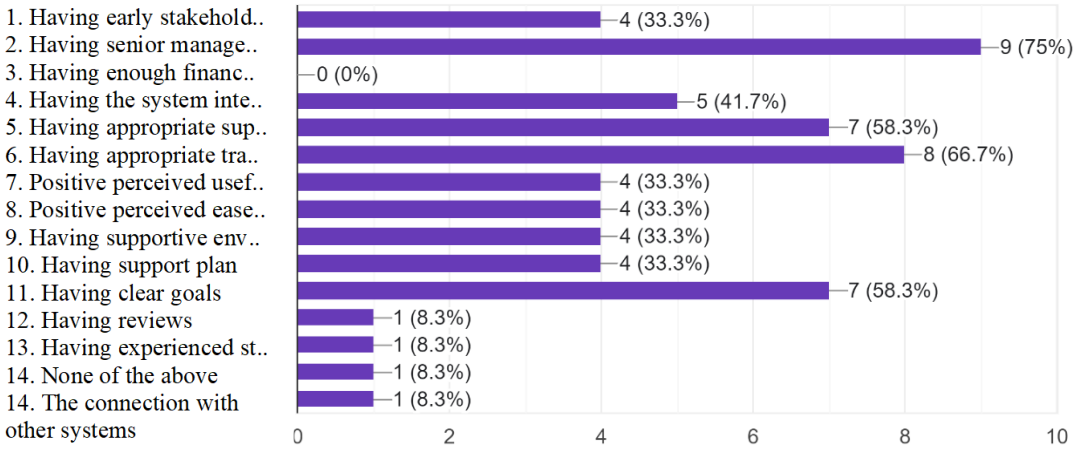
Question 7	Did you have manuals or documents in local language that explained and guided you on how to use Coupa? 1. Yes, I had enough documents in local language 2. Yes, but I preferred to have more documents in local language 3. No, I only had English documents
Question 8	Were you able to use Coupa after training was finished but before the actual go-live? Having the option to 'play around' and get more familiar with the system without being afraid to make mistakes? 1. Yes 2. No
Question 9	On a scale of 1 to 5, where 1 represents 'very satisfied' and 5 represents 'very dissatisfied', how satisfied were you with the overall training you got for Coupa? 1. Very satisfied 2. Satisfied 3. Neutral 4. Dissatisfied 5. Very dissatisfied
Question 10	If you look back and could name 3 points of the implementation of Coupa that could have been better in your opinion, what would these 3 points be? 1. 2. 3.

Appendix C: Interview Coding Themes and Corresponding Codes

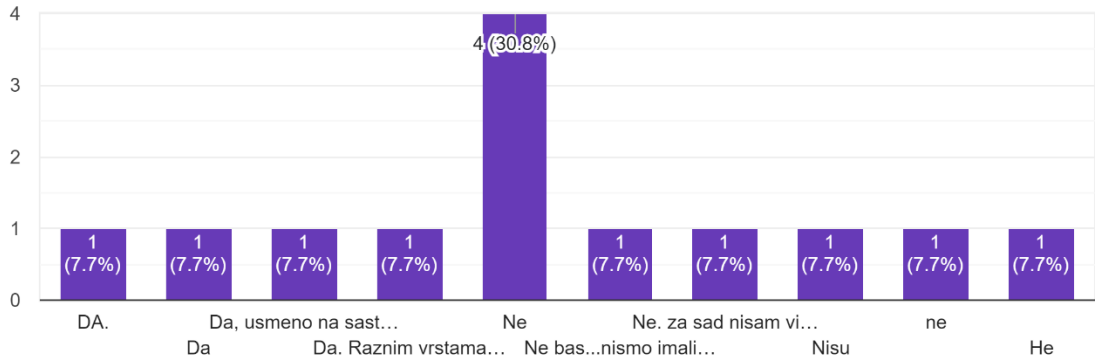
Coding Theme	Corresponding Codes
Miscellaneous codes	Role and responsibilities interviewee Company information No material ID needed to do a purchase Document with roles and responsibilities Changing material information Master Data Management Artificial Intelligence Technology adoption
P2P software (Coupa) implementation	Successful Coupa usage criteria SAP/Coupa interface tool Coupa in-scope/out-scope discussion Best-in-class P2P Challenges and barriers of P2P Influence senior leadership System integrator Readiness phase Training and user awareness Effect of culture
New material creation	Best practice item management/creation Key aspects of material creation Material creation policy/guidelines Material creation criteria and thought processes Creation of a new material Check for duplicates Quality check of new material request The issue with wrong information fields with created materials Perfect scenario material creation New material request Naming convention Apex for materials Material creation central or decentral
Material classification	Current material classification Classification issue old vs. new Classification criteria and choosing correct one Choosing the coding scheme type Automating classification Classification local or central effort Standardised classification or not

Appendix D: Coupa Survey Results

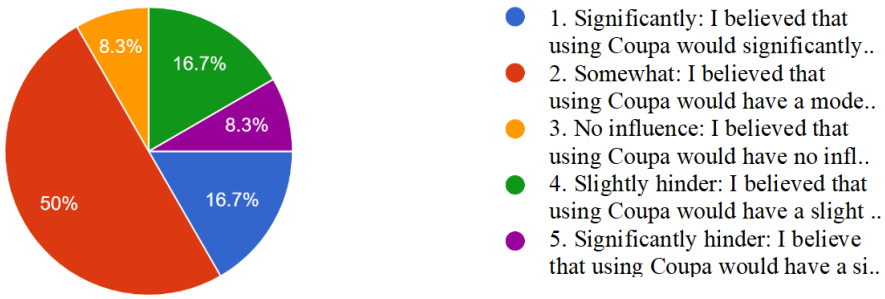
1. Literature provides numerous success factors of P2P software implementation. What are in your opinion the **top 5 key success factors** of P2P software implementation based on this list?



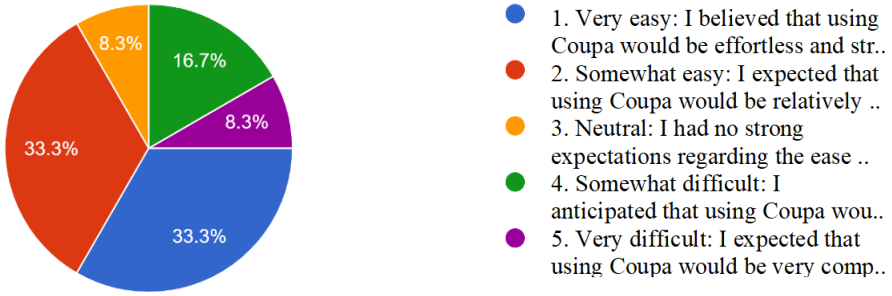
2. Were the benefits of using Coupa clearly communicated and explained in advance?
Da = yes, ne = no



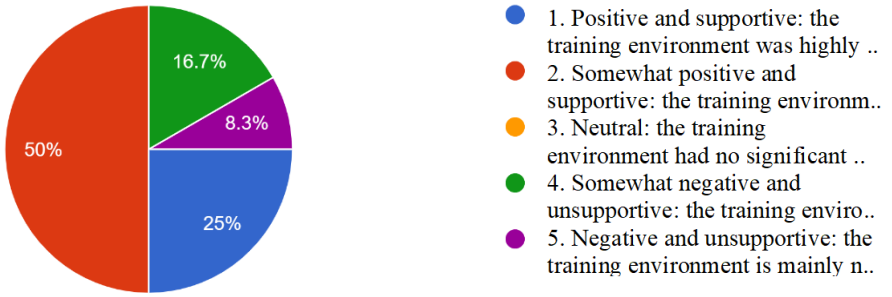
3. On a scale of 1 to 5, where 1 represents 'significantly improve' and 5 represents 'significantly hinder', how much did you think that <u>using Coupa would improve your job performance</u>? (perceived usefulness)



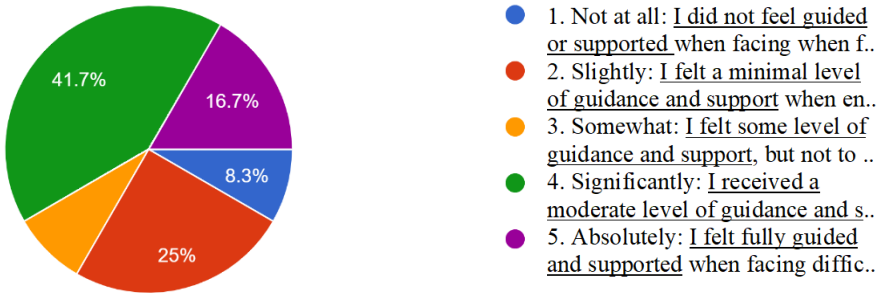
5. On a scale of 1 to 5, where 1 represents 'very easy' and 5 represents 'very difficult', how did you think that using Coupa would be easy to use?



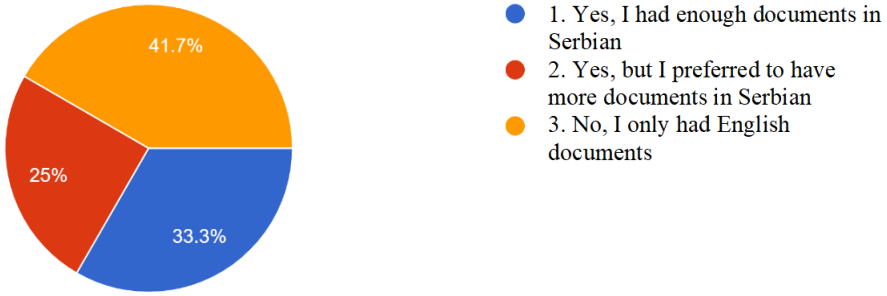
6. On a scale of 1 to 5, where 1 represents 'positive and supportive' and 5 represents ' negative and unsupportive', how would you describe the training environment for Coupa and its influence on the effectiveness of the training?



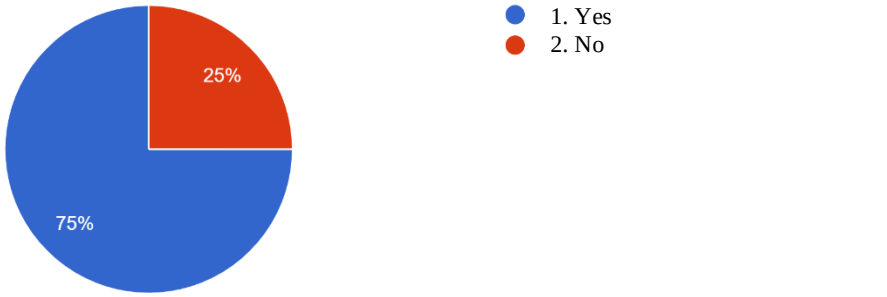
4. During your Coupa training, did you feel adequately guided and supported when encountering difficulties in understanding the material?
   Please provide a rating from 1 to 5, where 1 represents 'not at all' and 5 represents 'absolutely'.



7. Did you have manuals or documents in Serbian that explained and guided you on how to use Coupa?



8. Were you able to use Coupa after training was finished but before the actual go-live? Having the option to 'play around' and get more familiar with the system without being afraid to make mistakes?



9. On a scale of 1 to 5, where 1 represents 'very satisfied' and 5 represents 'very dissatisfied', how satisfied were you with the overall training you got for Coupa?

10. If you look back and could name 3 points of the implementation of Coupa that could have been better in your opinion, what would these 3 points be?

- *"Beginning of implementation - the organisation of the project itself was not sufficiently clear and precise, more time was spent on presentations than on actual work in the Coupa tool, Many open questions have not been resolved since the beginning of the project until today,"*
- *"Commodity groups are impenetrable and unclear"*
- *"Multiple suppliers cannot be connected from one PR with multiple lines"*
- *"The impossibility of reviewing the PRs of other colleagues in order to better monitor the process of procurement and receipt of goods in the warehouse"*
- *"Work on improving various reports for tracking costs, goods received, services completed, and better PR/PO connection"*
- *"Employees should have been introduced to the capabilities of the Coupe earlier, all interested parties should have been involved in time in order to have a broader picture of the requirements and capabilities of the Coupe, the material groups should have been better connected with the Commodity groups (more accurate mapping)..."*
- *"More live training, not online, simulation of real situations from everyday work, less presentations - more practical work."*
- *"Higher quality training for work, Better support at the beginning, User friendly application"*
- *"I joined the training process late, I should have shared the material earlier and communicated better among the employees. It seems that after one training session, we started using it, which did not turn out to be a good practice. "We learn on the fly."*
- *"Invoicing"*
- *"Training and communication. Better system testing before commissioning"*

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