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USAGE AND IMPLEMENTATION OF INTER-ORGANIZATIONAL INFORMATION SYSTEMS

Supplier perspectives for efficient utilization

Faculty of Management and Business
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ABSTRACT

Niko Leppänen: "Usage and implementation of inter-organizational information systems – Supplier perspectives for efficient utilization"

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The objective for this thesis is to examine how a case company should develop its web-based inter-organizational information system so that its implementation to new suppliers would require less effort and that the existing suppliers would be willing to utilize it more effectively. The theoretical part of the thesis addresses topics related to supply chain integration and IOIS adaptation, while also presenting models related to acceptance and utilization of new technologies.

The empirical research for the thesis is based on a questionnaire, which was sent to those supplier users that have been using the Supplier Portal actively. Through the questionnaire, over 500 supplier users shared how they perceive topics related to Supplier Portal performance and usability, while also addressing elements related to social influence and facilitating conditions.

Based on the questionnaire responses, it was possible to identify improvement opportunities that the case company should consider if it wants to support its suppliers in improving Supplier Portal utilization. While the identified opportunities include technical developments, there was also feedback related to existing processes, facilitating conditions, and collaboration in general. From technical perspective, case company should improve some of the core features related to usability and improve high-volume data processing. In addition, supplier feedback reveals their interest towards having communication functionality that would facilitate flexible discussion about different documents.

On the other hand, research didn't reveal any missing functionality that suppliers would like to have developed in close future. Related to facilitating conditions, case company should consider improvement opportunities related to instructions and other supportive documentation. From communication perspective, biggest improvement would be related to how case company interacts with their suppliers when new functionalities are developed and implemented.

As a conclusion for this thesis, managerial implications are provided for the case company. Based on these recommendations, case company should be able to create roadmap of development activities that will enable it to improve utilization of its inter-organizational information system.

Keywords: supply chain management, integration, inter-organizational information systems

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TIIVISTELMÄ

Niko Leppänen: "Organisaatioiden välisten tietojärjestelmien käyttö ja käyttöönotto – toimittajanäkökulmia järjestelmän tehokkaan hyödyntämiseen"

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Tämän diplomityön tavoitteena on tutkia kuinka case yrityksen tulisi kehittää organisaatioiden välistä verkkopohjaista tietojärjestemäänsä siten, että sen käyttöönotto uusien toimittajien kanssa olisi vaivattomampaa ja että järjestelmää jo nykyisin käyttävät toimittajat hyödyntäisivät sitä tehokkaammin. Diplomityön teoreettisessa osuudessa käsitellään aiheita koskien toimitusketjun integraatiota sekä organisaatioiden välisten tietojärjestelmien käyttöönottoa. Lisäksi esitellään uuden teknologian hyväksyntään ja hyödyntämiseen liittyviä teoreettisia malleja.

Tutkimuksen empiirinen osuus perustuu kyselytutkimukseen, joka lähetettiin nille toimittajakäyttäjille, jotka ovat käyttäneet toimittajaportaalia aktiivisesti. Kyselyn avulla yli 500 toimittajakäyttäjää antoivat palautetta kokemuksistaan toimittajaportaalin suorituskyvystä ja käytettävyydestä. Lisäksi vastaajat käsittelivät järjestelmän käyttämiseen liittyviä sosiaalisia vaikutteita sekä käyttämistä tukevia tekijöitä.

Kyselyn tulosten perusteella oli mahdollista tunnistaa kehitysmahdollisuuksia, joita case yrityksen tulisi arvioida mikäli se haluaa tukea toimittajiensa hyödyntämään toimittajaportaalia paremmin. Teknisten kehityskohteiden lisäksi, vastaukset sisälsivät myös palautetta koskien nykyistä prosessia, käyttämistä tukevia tekijöitä sekä yhteistyötä yleisesti. Teknisestä näkökulmasta case yrityksen tulee parantaa tiettyjä käytettävyyteen vaikuttavia keskeisiä ominaisuuksia, sekä kehittää suurten datamäärien käsittelyä. Lisäksi toimittajien antama palaute paljastaa mielenkiinnon sellaista kommunikaatio toiminnallisuutta kohtaan, joka mahdollistaisi joustavan keskustelun erilaisiin dokumentteihin liittyen.

Toisaalta, tutkimus ei paljastanut yhtään sellaista puuttuvaa toiminnallisuutta, joka case yrityksen tulisi lähiaikoina kehittää. Kosken käyttöä tukevia tekijöitä, case yrityksen tulisi harkita kehitysmahdollisuuksia liittyen ohjemateriaaleihin sekä muihin tukimateriaaleihin. Viestinnän näkökulmasta, merkittävimmät kehitysmahdollisuudet liittyvät siihen kuinka case yritys kommunikoi toimittajiensa kanssa silloin kun uusia toiminnallisuuksia kehitetään ja otetaan käyttöön.

Diplomityön lopputuloksena case yritykselle esitetään liikkeenjohdollisia suosituksia. Näiden suositusten perusteella case yrityksen on mahdollista muodostaa kehityssuunnitelma, jota toteuttamalla voidaan parantaa organisaatioiden välisen tietojärjestelmän hyödyntämistä.

Avainsanat: toimitusketjun hallinta, integraatio, organisaatioiden väliset tietojärjestelmät

Tämän julkaisun alkuperäisyys on tarkastettu Turnitin OriginalityCheck –ohjelmalla.

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LIST OF ABBREVIATIONS

COA	Consensus on appropriation
EDI	Electronic Data Interchange
eSCM	Electronic supply chain management
FOA	Faithfulness of appropriation
IOIS	Inter-organizational information system
IS	Information system
IT	Information technology
KPI	Key process indicator
RFQ	Request for quotation
S2S	System to system
SC	Supply chain
SCI	Supply chain integration
SCM	Supply chain management
TAM	Technology Acceptance Model
TRA	Theory of Reasoned Action
TTF	Technology-Task Fit
UTAUT	Unified Theory for Usage and Acceptance of Technology

1. INTRODUCTION

To achieve sustainable competitive advantage in a modern industrial environment, many organizations have decided to focus on their key competences through outsourcing of activities that are not considered as their own core operations. While applying business strategy that is based on outsourcing, contribution and dependency of external suppliers to the overall business performance has increased. This is because suppliers are responsible for performing increasing share of operations related to manufacturing and delivery processes (van Weele 2010: 32, 164-166).

One of the core tactics that buyer organizations can implement to improve supply chain performance is called supply chain integration (SCI). SCI describes strategy where supply chain partners actively identify and implement practices that enable them to connect their previously internal processes across the organizational boundaries so that they would form integrated flow of materials, information, and resources (Flynn, Huo and Zhao: 2010). One typical element that supports reaching higher level of SCI, is the implementation of inter-organizational information systems (IOIS) which are designed to help organizations in sharing of information and to collaborate more efficiently with their partners (Gunasekaran & Ngai 2004; Kauremaa & Tanskanen 2016).

While SCI as a concept covers integration between all the different supply chain partners regardless of their role, the focus of this thesis will be on a use of IOIS between the focal company (buyer) and its suppliers. This kind of integration can be called external backwards integration and it typically covers first-tier suppliers (Mangan, Lalwani, Butcher, Javadpour 2012: 48). Limiting the scope only to suppliers is due to practical reasons, as the requirements related to supplier collaboration can differ notably from ones related to customer integration. In addition, different IOIS solutions are typically used with different stakeholder groups.

The value and performance benefits created by an information system are typically dependent on how actively it is used by its users (Goodhue & Thompson

1995). In other words, when the system is used more actively, it is also able to create more value to its users. Based on the theoretical framework that is presented later in the thesis, utilization and acceptance of information systems can be affected by elements like perceived effort and expected performance improvements (Venkatesh, Morris, Davis and Davis (2003).

Similar elements are also considered relevant when evaluating the use of IOIS solutions. In addition, IOIS implementation is often impacted by the relationship between the two organizations and their common operative objectives (Wang, Sun and Zhang: 2018). When these factors are combined, evaluation of expected IOIS utilization and acceptance can become more complex.

To address above complexity, the objective of this research is to understand how inter-organizational information system should be developed in an industrial supply chain environment, so that its implementation would be more effortless and that supplier users would be willing to utilize the solution more actively. While the research will be performed as a case study and it focuses on one company and its suppliers, the question can be considered important for all organizations that aim to implement and develop IOIS solutions with an objective of increasing integration with their suppliers through enhanced collaboration, speed, and transparency.

To meet the research objectives of understanding how the IOIS solution should be developed, two research questions are established for the thesis. The first research question aims to answer on question how the implementation can be made more effortless and the second research question mainly focuses on long-term utilization through usability and efficiency. These research questions will be addressed in the discussions chapter.

RQ1: *How the case company should develop its current inter-organizational information system, so that it would require less effort to implement it with new suppliers?*

RQ2: *What kind of improvements should be done to current inter-organizational information system, so that it would create more value to the suppliers and thus it would be utilized more actively?*

Empirical research is supported with a theoretical part, which aims to provide a good overall introduction to the key concepts that are relevant for the thesis. Section related to supply chain management covers topics like supply chain integration, inter-organizational information systems and their adoption. Purpose of reviewing these concepts is to clarify case study environment in which the information system implementation and utilization will be examined. Achieving the research objectives requires also that theory related to the acceptance and utilization of information systems are considered when planning the empirical research. Therefore, different frameworks for information system utilization are also addressed.

The research conducted during this thesis is focused on a specific case company and the way how it has implemented, developed, and utilized inter-organisational information systems with its suppliers. This setup provides a natural scope for conducting the research in a specific supply chain environment and organizations that are operating within that network. The limitations and restrictions are explained more in detailed during the fourth chapter that focuses on research methodology. The theoretical and empirical parts of this thesis follow these limitations.

The thesis is divided into seven chapters, with the aim of achieving comprehensive and logical structure that is easy to follow. During the Chapter 1, research objectives and questions have been already explained. Chapters 2 and 3 establish the theoretical framework for the thesis, first by focusing on topics related to supply chain management and following with an introduction of models that explain acceptance and utilization of information systems.

Empirical part of the thesis includes Chapters 4 and 5. During the Chapter 4, the case company, research approach and research process are explained. The chapter also includes review of research methods and data after the data had been collected. The actual findings are presented in Chapter 5.

Discussion of the findings is conducted more in detail during Chapter 6. During this chapter, the findings are categorized based on different factors that typically impact information system utilization and acceptance. This is done so that the findings would be more comprehensible and practical to understand. When com-

paring Chapters 5 and 6, the authors own perspectives will be more present during the discussion. The thesis is concluded with the Chapter 7 that includes managerial implications, short summary of limitations and considerations related to future research opportunities.

2. SUPPLY CHAIN MANAGEMENT

Supply chain management (SCM) includes management of information, financial resources and operative activities related to the material flow. SCM is characterised by involving cooperation with various stakeholders such as customers, suppliers, and other service providers. Importance of SCM can be evaluated through the importance of purchasing activities. For example, in a typical industrial company, share of purchased goods and services can reach almost 80% of cost of goods sold. While companies can improve their performance by reducing cost related to purchased parts, they should also focus on improving operative performance through supplier collaboration. (van Weele 2010: 13-18).

Objective for this chapter is to provide an introduction of the key concepts related to supply chain management and especially to the usage of inter-organizational information systems as part of supplier collaboration. This includes discussion about how supply chain integration leads to better supply chain performance, and how integration can be supported by using interorganizational information systems. Finally, there is an introduction about experiences related to adoption of interorganizational information systems. The contents of this chapter will help us to establish a framework needed for conducting the empirical research as part of this thesis.

2.1 Supply chain integration

Supply chain integration (SCI) describes activities and practices that are implemented by the supply chain partners to connect their processes and flows in a way, that enables them to achieve higher efficiency and performance through the effective use of resources. According to Flynn et al. (2010), SCI can be defined as a degree on which the manufacturing company collaborates strategically with their internal and external supply chain partners to achieve efficient flow of materials, information, and financial resources. Positive relationship between improved supply chain performance and supply chain integration has been widely supported and acknowledged in different articles (Sezen 2008; Flynn et al. 2010; Leuschner, Rogers & Charvet 2013; Chang, Ellinger, Kim & Franke 2016). While

SCI as a concept covers both customers and suppliers, focus area of this thesis restricts the evaluation on how suppliers can be integrated to create most value with maximal speed and minimal cost.

In overall, SCI covers multiple collaborative activities between supply chains partners, including strategic, managerial, operational, and fundamental levels. A comprehensive model for SCI was introduced by Zhang, Gunasekaran, Yu and Wang (2013). According to the authors, strategic integration covers topics like communication of strategic goals and policies, collaborative planning of investments, capacity, and facilities. Managerial level, on the other hand, includes integration of activities like planning and control, performance evaluation, and organizational integration through compatible structures and inter-organizational linkages. On operational level supply chain integration covers wide range of activities related to management of processes, finances, knowledge, information, and materials. At a more detailed level, operational integration includes activities like procurement, aligned payment schedules, information sharing, order fulfilment and manufacturing flow. Finally, the fundamental level of integration covers mechanisms that describe how supply chain partners share profits, costs, and risks so that long-term commitment and trust can be ensured.

Successful supply chain integration typically requires that supply chain partners actively strengthen their interpersonal relationships to improve collaboration and transparency, adopt advanced technological solutions that support integration, and actively share technical know-how (Zhang, Lettice, Chan & Nguyen 2018; Bag, Wood, Mangla & Luthra 2020). Benefits of long-term relationships supported by transparency and trust between buyer and suppliers was also recognized by Bienhaus and Haddud (2018) who studied factors that can influence implementation of Procurement 4.0 and digitisation of supply chains. The authors also highlight different technical concepts like the artificial intelligence and internet of things that both have notable potential in digital transformation of supply chains. The authors also note that common processes and procedures for collaboration must be agreed between the organizations to enable efficient digital transformation and this way also supporting SCI.

Inter-organizational information systems have been often implemented to support especially operational integration between supply chain partners (Gunasekaran

et al. 2004; Kauremaa et al. 2016). Proof of positive impact to operational performance has been reported for example by Cámara, Fuentes and Maqueira Marín (2015), who conclude that alignment of IT-enabled capabilities and SCI are important factors in improving operational performance of supply chain, and that new technological capabilities, like cloud computing, have potential to return even more benefits. Additionally, the authors report that higher level of integration through shared IT capabilities, also increased commitment to supply chain effectiveness through increased flexibility and better delivery capabilities.

Positive connection between inter-organizational information systems and supply chain performance is also reported by Vanpoucke, Vereecke and Muylle (2017) who highlight how IT solutions have potential to increase speed and accuracy of the supply chain. As a slight contradiction to other studies, the authors note that IT systems might not improve agility of the supply chain processes, but this could be highly dependent on the setup and environment. The authors also note the difficulty of achieving similar integration that enables coordination between different supply chain partners without using information technology. Therefore, it could be considered that IT solutions have become critical enablers that cannot be overlooked when organizations evaluate ways to improve supply chain performance through stronger integration.

Criticality to increase level of supply chain integration and IT capability simultaneously is also emphasized by Liu, Wei, Ke, Wi and Hua (2016), who emphasize how simultaneous implementation allows management to orchestrate resources efficiently. In addition, the authors identify that different levels of integration will require implementation of different kind of IT systems, and therefore, strategic management of IT systems should be performed. Finally, it is noted that different SCI configurations and IT competency will have different effects on financial and operational supply chain performance, as the SCI and IT competency improves financial performance at all levels, while positive operational performance improvements are achieved only after certain thresholds are exceeded. This can be important to understand when an organization is making investment decisions and evaluates expected costs against the expected improvements.

Connections between supply chain integration and Industry 4.0 were examined in a recent article published by Tiwari (2021). In this framework, Industry 4.0 is

considered as an approach that supports horizontal and vertical digital integration that covers the whole end-to-end supply chain (Thoben, Wiesner & Wuest 2017). According to the many different studies there is strong evidence how practices related to Industry 4.0 and implementation inter-organizational IT systems can be utilized to support supply chain integration and deliver business values (Telukdarie et al. 2018, Tiwari 2021, Vanpoucke et al. 2017). Most prominently Industry 4.0 is identified as a way to increase manufacturing integration through advanced IT solutions that enable collaboration and support interoperability. Especially Industry 4.0 increases integration when it comes to logistics, design, development, and return processes. In addition, there is proof that Industry 4.0 practices can have significant positive impact to supplier performance when it comes to flexibility and quality (Salam 2021).

While the discussion related to SCI often includes objective to increase level of collaboration between supply chain partners, it is good to recognize that as such integration does not require that partners would be actually collaborating in any other way (Mangan et al. 2012: 47). This kind of integration can be for example achieved through electronic order processing that improves efficiency of order handling, while keeping the relationship between the partners on a transactional level rather than collaborative. While SCI and supply chain collaboration can be clearly separated from each other, it is not critical to strictly follow this distinction during this thesis. Instead, the use of IOIS can be considered as a practice that increases efficiency through supply chain integration and also enables collaboration when collaborative relationship has the potential to create most value.

2.2 Inter-organizational information systems

Inter-organizational information systems have been typically implemented to facilitate real-time information sharing and collaboration, and to integrate business processes and workflows between organizations with the aim of achieving competitive advantage (Pu, Chan, Tsiga & Niu 2018, Asamoah, Agyei-Owusu, Andoh-Baidoo & Ayaburi 2021). Originally the technical focus on IOIS research and discussion was mainly focused on electronic data interchange (EDI) and other system to system (S2S) solutions between two supply chain partners with high level of specificity and high implementation cost. During the past years, the

discussion has been expanded also to other solutions that are enabled by web technologies and open standard communication (Pu et al. 2018, Kakhi & Gargeya 2019, Pu, Chong, Kai, Lim & Tan 2019). This development has decreased the implementation cost of IOIS solutions through standardised interfaces. In addition to cost reductions, web-based solutions typically have better flexibility when working with complex system requirements without a need for large scale technical implementation work.

From the perspective of business decision-making, emergence of different technical solution alternatives has brought new opportunities for IOIS utilization. For example, Laukkanen, Sarpola and Kemppainen (2007) report that it can be useful for an organization to combine and implement different type of IOIS for different use cases and between different partners. S2S or EDI implementation can be considered reasonable when partnership maturity and transaction volumes are high and when both partners are able to carry the cost and technical complexity of the implementation. On the other hand, web-based solutions can be considered more suitable when partner IT capability is not mature enough or transactions volumes remain low. Laukkanen et al. (2007), also highlighted how web-based solutions can enable more straightforward and fluent integration with multiple partners. This could allow more efficient implementation process when compared to other IOIS implementations.

Different use cases for inter-organizational information systems have been discussed and recognised in literature during the past years. For example, Lancioni, Smith and Oliva (2000) reported how extranet systems can be implemented for operational processes such as inventory management, order management, purchasing and transportation. Similar use cases for IOIS were also identified by Kärkkäinen, Laukkanen, Sarpola and Kemppainen (2006), who also additionally emphasized IOIS use for vendor-managed inventory processes. Unlike expected, Kärkkäinen et al. (2006) noted that their study did not provide proof of IOIS implementation related to more complex business processes like collaborative planning.

The observation related to lack of IOIS use with complex business processes could be related to specific companies that were studied, but also to the evolution, where first versions of IOIS were developed with a focus on transactional and

straightforward business processes, while leaving more complex IOIS implementations to wait for technology to develop. On the other hand, recent literature review by Kakhi et al. (2019) still reports that there are discrepancies between literature and practice, when it comes to IOIS implementation for complex processes such as planning and control. In other words, there might be actual discrepancy between perceived benefits of digitizing complex business processes between theory and practitioners.

As IOIS can be implemented to support many different business activities, there is also many different drivers for IOIS implementation. These drivers and objectives for IOIS implementation, should impact the decisions on what kind of information system organizations need to develop. This is to ensure that most suitable system solution is selected and developed to meet the requirements of a specific business process.

Kärkkäinen et al. (2006) examined expected and observed drivers of IOIS usage. Summary of their expectations and observations is presented in Figure 1. Based on the figure, it can be noticed that for example high volumes and intention to reduce costs, leads organizations to implement systems that support efficient processing of transactional activities. Similarly, transaction processing systems expectedly help to eliminate wastes related to human errors and delays in communication.

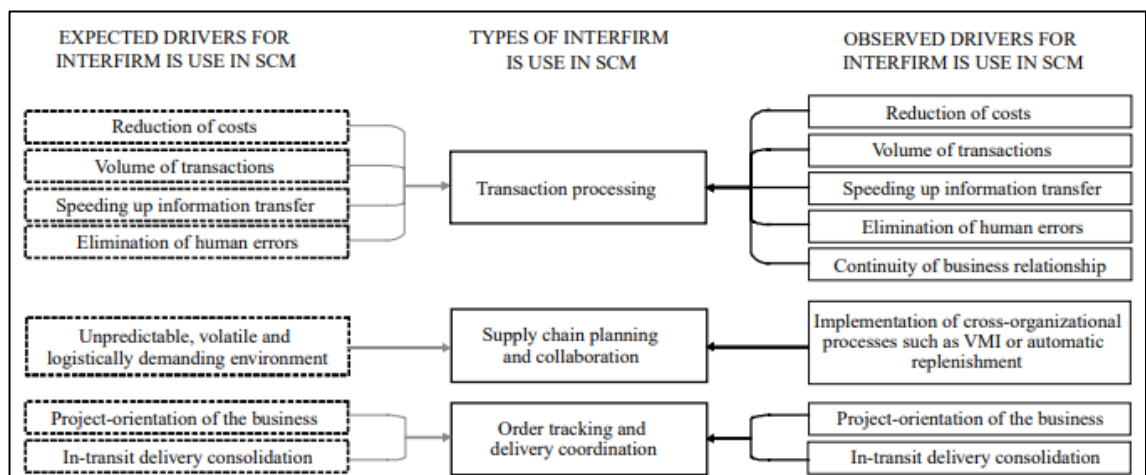


Figure 1. Expected and observed for IOIS usage (Kärkkäinen et al. 2006)

Positive performance improvements related to adoption of IOIS systems with suppliers are typically aligned with benefits of supply chain integration. Related to

SCI and IT competency, Liu et al. (2016) emphasized how IOIS adoption should be evaluated also from the perspective of expected integration level so that proper fit between technology and integration can be found. Similar findings are reported by Rajaguru and Matanda (2013) who highlight the critical importance of strategic, cultural, and technical compatibility in IOIS integration, and by Asamoah, Agyei-Owusu, Andoh-Baidoo and Ayaburi (2021) who emphasize the importance of concurrent management and deployment of IOS and SCM capabilities to achieve optimal performance benefits.

Close relationship between SCI and IS capabilities was also addressed by Teng and Tsinopoulos (2021) in their study of services supply chain. Although authors highlight that IT capabilities don't automatically mean supply chain integration, there is evidence how IS capabilities and IOIS implementation can support closer relationship with focal company and its suppliers, especially when IOS is implemented to support collaboration between the partners. Consequently, improved integration can then lead to improved cost performance and higher productivity as a result of more transparent and effective in information sharing. Thus, meaning that IOIS implementation can have indirect benefits through increased integration.

Impact of using electronic supply chain management (eSCM) applications to support buyer-supplier collaboration and improve performance were reported by Wiengarten, Humphreys, McKittrick and Fyne (2013). In their study, the authors conceptualized model where eSCM applications for interaction, integration and coordination will improve collaboration through information sharing, better alignment of incentives and joint decision-making. As a result, this was expected to improve operational performance on dimensions like cost, quality, flexibility, and innovativeness. Findings from the research suggest that use of applications to improve interaction and integration had positive impact to buyer-supplier collaboration. Better collaboration, on the other hand, improved performance on all dimensions.

Positive impact of IOS visibility to supply chain performance was studied by Lee, Kim and Kim (2014). In their study, IOS visibility was considered as sharing information towards focal firm about inventory, orders, production schedules and capacity, and demand forecasts. Based on their study, the authors conclude that

IOS visibility can lead to improvements in operational performance related to cost, process management and profitability, but that there should also be practices that are designed to mitigate risks related to opportunistic behaviour by some of the supply chain partners. Cho, Ryoo and Kim (2017) proposes that this risk can be controlled better when the dependency of supply chain partners is increased. At the same time, stronger dependency between SC partners also allows organizations to achieve higher benefits from IOS implementation.

Similar findings related to supply chain information integration and visibility were reported by Li, Liu and Wei (2021) who report how IT integration improves collaborative planning, and IT flexibility supports collaborative planning and improves information sharing. Positive impact of collaborative planning to SCM performance has been reported also by Singhry and Rahman (2019). Cho et al. (2017) highlights that to achieve maximal benefits from IOS usage, information exchange should be bidirectional.

Relationship between SC technology internalization and SC performance was studied by Pattanayak and Punyatoya (2020), as the adoption of new technological capabilities will not lead to expected performance outcomes unless the capabilities of new technology are not embedded to daily working practices. Based on their findings, the authors highlight that supply chain managers are often lacking understanding about SC technology and that they should focus more on effective use of technological solutions that can support efficiency in SCM activities. In addition, it is critical for SC technology that it can be utilized with wide range of suppliers. This finding, together with previous findings related to positive relationship between IOIS usage and SCM performance, helps to justify relevancy of the thesis objective, as it concludes that implementation challenges and low utilization will reduce possible SC performance benefits.

2.3 Adoption of inter-organizational information systems

Adaption of inter-organizational information systems between buyers and suppliers has been studied relatively actively during the past decade. On a high level, existing studies have been focusing typically either on relationship between the SCM partners or alternatively technical factors that can support or impact adoption. Similarly, there seems to be also distinction between studies that focus on

antecedents that will likely lead to IOIS adoption, and studies that focus more on factors related to successful implementation.

When considering IOIS adoption within supply chain environment, it is good to remember that use of IOIS is typically part of broader digital transformation between buyers and suppliers. Salo, Tan and Makkonen (2020) defined three stages of digitalization between buyers and suppliers. These include normal business relationship with mainly physical collaboration and traditional structure. This is followed by digitized business relationship where utilization of technology is experimented more actively, and communication starts to be impersonal. Digital business relationship is the final stage where most of the communication takes place through technological tools, and digital channels are used for both directions. The description of different stages again emphasizes the importance of finding most suitable IOIS solution for the level of technological maturity and based on relationship between the parties.

Elements that, according to Salo et al. (2020), impact digital transformation between buyers and suppliers are presented in Figure 2. For example, commitment, loyalty, and common objectives are considered to support digitalization together with compatibility of IT systems. After the initial steps in the digital transformation, organizations start to collect feedback and experiences related to outcomes and already happened change. These will impact the future steps related to digitalization as organizations evaluate positive impact of their investments.

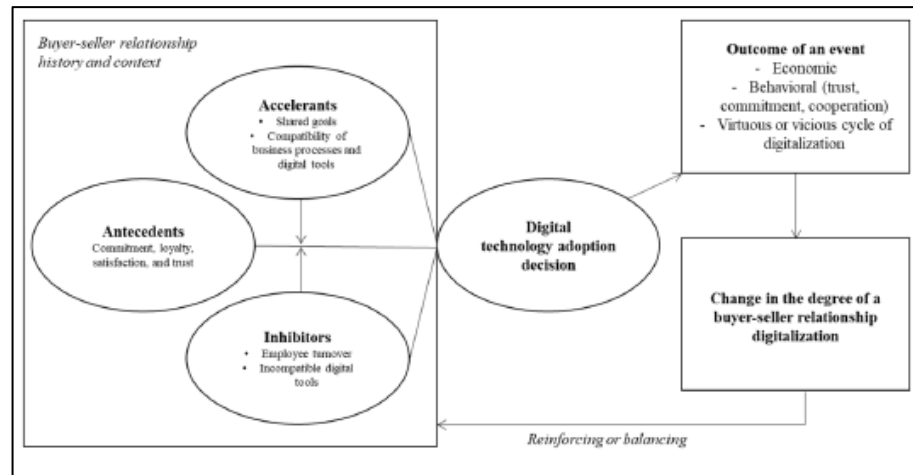


Figure 2. Factors that influence digital transformation in buyer-supplier relationship (Salo et al. 2020)

Lyytinen and Damsgaard (2011) studied IOIS adoption after having observed the variation in adoption of similar technologies between same kind of organizations. Based on their study, the authors highlight how adoption is impacted by social and technological factors like resource dependency, decision-making power and capabilities related to specific IOIS functionalities. Impact of institutional power related to especially normative and coercive pressure was also recognised by Liu, Ke, Wei, Gu & Chen (2010a), and Liu, Ke, Wei, Gu & Chen (2010b). These authors also highlighted importance of organizational culture that fosters flexibility, innovativeness and continuous improvement. To ensure successful IOIS adoption, Liu et al. (2010a) highlight the importance of engaging and motivating supply chain partners to work towards common objectives.

To provide simple overview, Wang et al. (2018) summarize five contributing factors related to diffusion of IOIS. This model includes technical, environmental, organizational, individual and trust related elements. Their summary is presented in Figure 3. The main contribution of this model is to clearly explain how complex the topics related to IOIS adoption, implementation and diffusion can be. Therefore, it is important that organization developing IOIS solution, would recognize and evaluate all the relevant factors without neglecting or underestimating any specific topic.

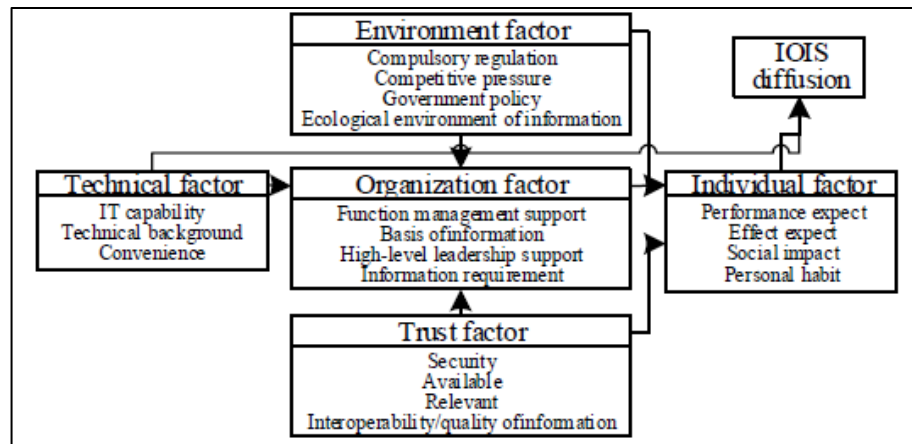


Figure 3. Key factors affecting IOIS diffusion (Wang et al. 2018)

Contradicting to the other studies, Chong, Ooi, Lin and Tang (2009) reported how partner power and trust didn't have notable impact on adoption of e-business tools in their study, while role of inter-organizational relationship and communication had important role. Together these three studies already imply how IOIS adoption is highly context dependent, and it might be impossible to provide detailed instructions how to adopt IOIS successfully. Therefore, this section aims to provide examples that should be recognized when activities related to IOIS adoption are planned.

As explained in previous section, one of the key benefits of IOIS utilization is the improved communication efficiency and transparency between the supply chain partners. Therefore, need to share information with the supply chain partners is one of the factors that can predict and explain IOIS adoption. Pu, Wang and Chan (2020) studied how information sharing can predict organizations intention and willingness to start using IOIS. Their research results suggest that especially interdependency between the partners increases the need for enhancing information sharing. In addition, organizations that actively need to share information are more willing to start using IOIS. When IOIS adoption is combined with a need for information sharing and relationship duration, the study results propose that shorter relationship duration indicates higher willingness for IOIS adoption. This can be related to a lack of already matured communication channels that would be considered hard to replace with technical solution. The finding provides good implication for IOIS adoption, as it suggests that potential momentum for adoption exists already in the beginning of relationship.

Pu et al. (2018) studied also differences related to how buyers and suppliers consider adoption of internet enabled SCM systems. Based on their study, the authors conclude that for example product complexity drives supplier to actively adopt internet enabled SCM systems while it is not significant driver from buyer perspective. Additionally, the report indicates that supplier dependency on buyer is not a significant factor when it comes to adoption. While this finding contradicts with many previous studies, it could be considered as a recommendation that buyers should not be too comfortable about expecting that high supplier dependency would automatically help with adoption.

Adebanjo and Laosirinhongthong (2014) focused on adoption of web based VMI system with first tier suppliers. In their research, the authors examined motivation for adoption, enabling factors and implementation outcomes, while also expressing existence of identified implementation barriers. Regarding motivation, the study revealed perceived importance of operational improvement objectives like information transparency, reduction of inventories and higher transactional efficiency. When considering long-term strategic focus, the companies implementing IOIS were aiming to improve their ability to quickly react changes within the industry, and in building of competitive advantage.

Enabling factors for web based VMI adoption included topics such as leadership, system integration and technological capabilities. From these topics technological capabilities were considered most important and especially need for continuous training and education were highlighted. Related to leadership, special emphasis was given to financial support and top-management commitment. (Adebanjo et al. 2014).

When considering implementation outcomes, especially importance of improved customer satisfaction was highlighted. In other words, supplier integration should have positive impact also to customers. Other important outcomes included reduced risk of missing documentation and increased purchasing and planning accuracy.

Notable barriers were divided into deployment capabilities, technology-related resources, and leadership elements. Single most important barriers included high frequency of technological change, inadequate knowledge and users' skills, and

high initial investment cost. As a summary of their findings Adebajo et al. (2014) conclude that most of the respondents considered barriers and difficulties less important than benefits, motivation and enabling factors, which indicates that in overall IOIS adoption has been considered positively.

Importance of top management commitment and capability of IT infrastructure to IOIS adoption was also highlighted by Hartano, Li, Na and Simpson (2010). In addition, the authors emphasize the importance of information quality when it comes to IOIS usage. As a result of being incentive for active utilization, information quality also contributes to supply performance. In contrast, poor information quality will reduce motivation to utilize IOIS and thus reduces supply chain ability to perform up to its potential.

One strategy to reduce initial investment cost is to use open standard solutions and web-based technologies. Pu et al. (2019) examined how open standard IOIS could be adopted to support process adaptability and alignment between supply chain partners. In their article, the authors report that use of open standard IOIS has potential to increase process alignment and support adaptability. One of the benefits of open standard IOIS is that it has higher flexibility than many of the previous technologies like EDI. This ensures ability of supply chain to adopt changes in their operating environment without need for major investments each time. As a result, it could be concluded that open standard IOIS solutions can be potential especially for young supply chain networks that constantly evolve and therefore require agility, or for supply chains that operate in volatile environment.

de Mattos and Barbin Laurindo (2017) studied relationship between supplier portal assimilation, SCI and performance. Based on the study, the authors confirm that topics like technology, perception about its use, organizational factors and environment are all positively associated with assimilation of supplier portal. From technological perspective adoption can be supported through standardization, common language and by ensuring scalability of the solution. In addition, also the importance of compatibility with existing systems was highlighted. de Mattos et al. (2017) also mention the impact of collaborative relationship, while also recognizing that external power is a critical factor in supplier portal adoption.

As an outcome of their study, de Mattos et al. (2017) also conclude that assimilation of supplier portal is positively associated with supply chain integration. Similarly, supply chain integration is associated with improved supply chain performance. In practice this finding confirms how use of IOIS helps to increase level of supply chain integration and therefore also allows higher supply chain efficiency and performance.

Supplier portal adoption was also focus area of study by Garcia, Grabot and Paché (2019). Unlike many other studies, the authors focused on industrial portal which would be used by multiple organizations within the same industry and to support their multilateral collaboration. As part of their study, the authors propose framework that include factors on organizational, supply chain and industry level (Figure 4). When evaluating these factors more in depth, it can be noticed that adoption of industry level supplier portal includes characteristics that have been already mentioned related to IOIS adoption in general, but also more unique characteristics like position in the tier structure and central position within the network.

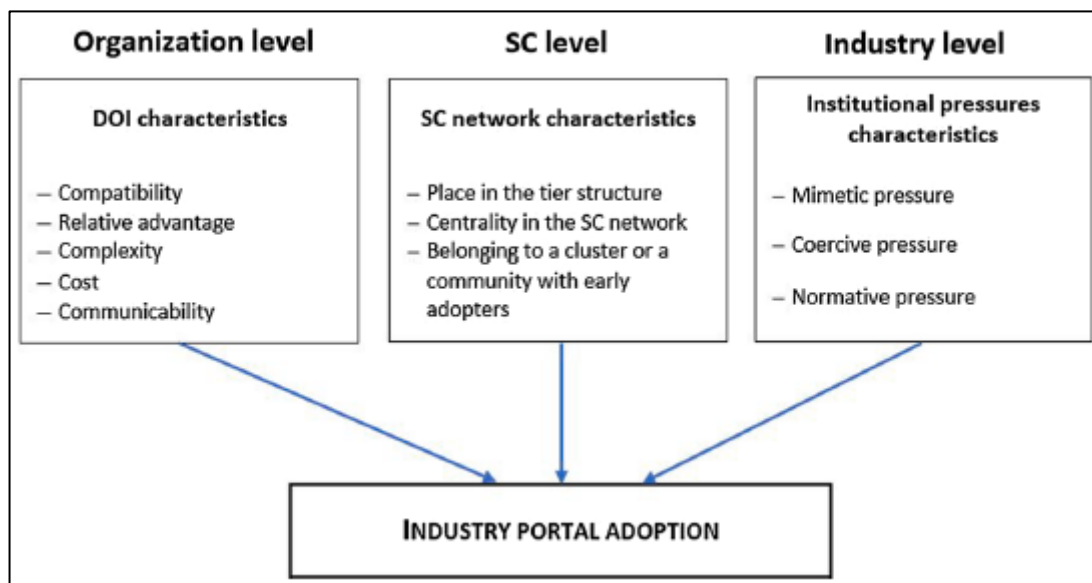


Figure 4 Characteristics impacting industry level supplier portal adoption (Garcia et al. 2019)

Garcia et al. (2019) conclude that none of the three levels related to industrial supplier portal adoption can be neglected when evaluating mechanisms that support successful adoption. Based on the study, it was recognized that negative

characteristics related to one of the levels typically lead to postponement of supplier portal adoption. Similarly, negative characteristics related to two of the levels basically meant that focal company decided not to adopt portal.

The purpose of this chapter has been to introduce how inter-organizational information systems can be utilized to support supply chain performance through higher integration between the buyers and suppliers. Positive impact for operational performance from IOIS adoption is often related to improvements in communication, information sharing, processing of transactional activities, and collaborative planning. Based on the examples introduced during the chapter, it is evident that there are multiple different drivers related to IOIS adoption.

From managerial perspective this indicates that the adoption approach should be always determined based on the unique characteristics of business environment and relationship between the supply chain partners. Especially findings related to the use of negotiation power to drive IOIS adoption were contradicting between different studies. As an outcome, it would make sense that focal companies remain at least very careful when pressuring their suppliers to start using IOIS.

While the objective of this thesis is not to study IOIS adoption as such, this chapter has provided justification for relevancy of the topic. In other words, it is relevant to study how IOIS utilization can be supported when there is proof that use of IOIS can positively improve supply chain performance, and that actions of buyer can impact how suppliers perceive IOIS. Similarly, the chapter has provided valuable insights related to factors that can impact adoption of IOIS and these can be utilized when formulating research questionnaire during the empirical part of the thesis.

3. IMPLEMENTATION OF NEW TECHNOLOGIES

The purpose of this chapter is to provide introduction to some of the most important and acknowledged theories that explain how information system implementation and acceptance can be evaluated and assessed. As the adoption mechanisms related specifically to IOIS were already discussed in the previous chapter, this chapter aims to address the topic from a more generic perspective and expand scope outside of SCM context. This approach serves the research objective that is to understand how the IOIS should be developed especially from the perspective of supplier users so that it creates more value for both parties. This way we can also highlight those dimensions that were not specifically mentioned related to IOIS adoption and could be more connected to personal rather than organizational characteristics.

Introduction of these theories has a two-folded role when considering the thesis work itself and its objectives. First, explaining these theories helps in providing the theoretical justification why the topic itself is valuable and why it should be examined. In other words, business decision-makers and IOIS developers should recognize those factors that support IS acceptance and implementation. When these factors are understood, they can be recognised during planning and in different stages of development work. Similarly, it is also important to recognize that failure to address these topics, or underestimating their importance, can result in IOIS development failing to reach its objectives.

Secondly, theoretical background related to critical success factors of IS implementation and acceptance will help when conducting the empirical research. More specifically, the theories will help to formulate research questionnaire in a way that most important dimensions will be addressed and taken into consideration. Based on the questionnaire results, it is also possible to conduct comparison of findings and theory to see whether the findings are aligned with expectations. On the other hand, it is good to highlight that the questionnaire will not be based on any specific theory, and it is not performed to validate any of the models.

While some of the introduced theories are having same background and share similar perspectives to explain implementation or adoption of technologies, they

also contribute by extending the framework and filling the gaps included in other theories. From the perspective of this research, it is beneficial to formulate questionnaire based on factors from different models rather than strictly follow one specific model that explains technology adoption. For this purpose, the final section of this chapter aims to summarize key points from all these models from the perspective of this study.

3.1 Technology Acceptance Model

Technology Acceptance Model (TAM) describes how user perceptions can impact their attitude and acceptance of new technologies. TAM originates from the Theory of Reasoned Action (TRA), which explains how personal intentions, beliefs, and attitude impact actual behaviour. This for example, means that attitude towards a certain behaviour is a result of beliefs about consequences and their severity related to that behaviour. The purpose of TAM is to expand TRA scope by including also external factors that are impacting personal beliefs. In addition, TAM aims to contribute by helping developers of new technologies to predict proactively if certain technology will be accepted, while also providing explanatory insights on why the technology might not be accepted or used. (Davis, Bagozzi and Warshaw 1989a)

Based on TAM, there are two externally affected beliefs that impact individuals' attitude towards use of technology and their intention to use. These are called perceived usefulness and perceived ease of use. Perceived usefulness is defined as a level on which the user subjectively considers that the use of a certain technology will positively impact their performance within a specific organizational context. Perceived ease of use on the other hand describes the degree to which the user thinks that the use of technology will be effortless. Based on TAM, eventual system use is an outcome of attitude towards use and intention to use. Figure 5 provides visual explanation on TAM and relationships between different factors. (Davis et al. 1989a).

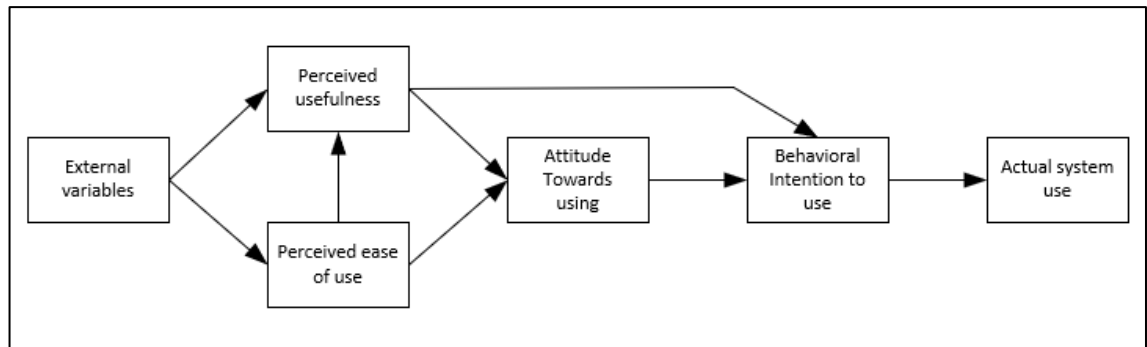


Figure 5. Technology Acceptance Model (Davis et al. 1989a)

When comparing the impact of two perceptions, Davis (1989b) reports about significant difference between perceived ease of use and perceived usefulness. According to the author, perceived usefulness is having notably stronger impact on usage than the perceived ease of use. While this finding supports the idea that usefulness of technology should be considered and prioritized before ease of use, topics related to usability shouldn't be overlooked. This was highlighted already by Adams, Nelson and Todd (1992) who replicated TAM related studies and concluded that the relationship between usage and perceived usefulness and perceived ease of use can be significantly complex and impacted by various different factors. Similarly, Yousafzai, Foxall and Pallister (2007) highlight how perceptions can impact differently when use of technology is voluntary compared to environment where use is enforced through rules and procedures. In addition, the authors highlight that if perceived usefulness and expected performance gains are remarkable enough, users might be more willing to use technology, although it would not be easy or pleasant.

As a result of this complexity, possibility to predict actual system use can be challenging based on only the factors explained in TAM. On the other hand, the model itself provides practical set of factors that should be recognized when developing technologies such as information systems. This can be considered useful at least when risks related to user acceptance need to be mitigated or controlled.

Since introduction of TAM, it has been a target of wide academic interest and subject of research and applications (Marangunic & Granic 2015). For example, Venkatesh and Davis (1996) extended TAM by explaining how computer self-efficacy and objective usability can be considered as antecedents that explain perceived ease of use when considering TAM for IS. Especially computer self-

efficacy can be considered important when developing information systems for professional use, as knowledge workers evaluate IS based on their ability to directly start using the technology without too much preparation.

With additional extension called TAM2, Venkatesh and Davis (2000) continued by introducing social influence processes and cognitive instrumental processes to the model. This was done to highlight how elements related to social influence like subjective norms, voluntariness and image can impact prospective user and their perception of ease of use when making decisions about usage of technology. Factors impacting the cognitive instrumental process were job relevance, output quality and result demonstrability.

The original research related to TAM2 provide interesting insight that could be still considered as valid. For example, it is explained that approaches based on compliance appear to be less effective over time when compared to implementation approaches based on social influencing. Similarly, it was concluded that from a technical perspective, information systems should be designed so that they remain relevant for their objective and improve quality of performed activities, while making the requested action easier for the users to perform. (Venkatesh et al. 2000).

While the value and usefulness of TAM has been widely recognized, there has been also criticism against the approach. This critique is for example related to complexity of external variables that impact perceived ease of use and usefulness, but also about the self-reporting nature that TAM research typically has had (Legris, Ingham and Collerette 2003). Related to criticism and possible shortcomings of TAM, Legris et al. (2003) propose that TAM should be integrated to a more extensive model that would include factors like human and social change processes, and adoption to innovation models.

Brandon-Jones and Kauppi (2018) examined use of TAM related to e-procurement application and how individual employees accept their use and what kind antecedents support system implementation. In their study, the antecedents related to perceived system quality were defined as processing, content, usability, training, and professionalism. Based on their findings, most important factors related to system quality and supporting e-procurement system acceptance were

processing and usability, while the impact of other factors remained low or insignificant.

In other words, when evaluating e-procurement systems, employees tend to focus on the possible process benefits that system usage could provide. This means for example potential for improving speed of order processing, reduction of lead times, and enhanced delivery accuracy. Other important factor is usability, which basically refers to topics like system availability, loading speed and ease of navigation through and between different activities. These findings can be considered interesting for the topic of this thesis as they address technology acceptance in a very similar field that IOIS use between supply chain partners.

From the overall perspective of this study, TAM mainly contributes by explaining how perceived ease of use and perceived usefulness can influence user's intention to use IOIS, and eventually also their actual use. While it is good to recognize the complex nature of factors impacting user perception, the objective of this study is not to utilize TAM model to proactively predict IOIS usage, but instead TAM can be used as a valid and tested theoretical framework that helps with determining relevant questionnaire questions that aim to reveal how users currently experience IOIS features.

3.2 Unified Theory of Acceptance and Use of Technology

Unified Theory of Acceptance and Use of Technology (UTAUT) is an approach that combines elements from previously introduced theories about technology acceptance models such as social cognitive theory, TRA, TAM, motivational model and theory of planned behaviour. Based on the earlier models Venkatesh et al. (2003) defined four constructs that have critical role in predicted and realized user acceptance and usage behaviour. These were defined as performance expectancy, effort expectance, social influence and facilitating conditions. The four constructs and their definitions are summarized in Figure 6. In addition to these four constructs, Venkatesh et al. (2003) identified four moderators: age, experience, gender, and voluntariness, that explain possible differences between users. Consequently, factors mentioned in previous studies such as existing attitude towards technology usage, self-efficacy and anxiety were not considered to be direct determinants for intention of use.

<p>Performance expectancy</p> <p><i>"Degree to which individual believes that using the system will help him or her to attain gains in job performance"</i></p>	<p>Effort expectancy</p> <p><i>"Degree of ease associated with the use of the system"</i></p>
<p>Social influence</p> <p><i>"Degree to which an individual perceives that important others believe he or she should use the new system"</i></p>	<p>Facilitating conditions</p> <p><i>"Degree to which an individual believes that an organizational and technical infrastructure exists to support use of the system"</i></p>

Figure 6. Four constructs predicting technology usage according to UTAUT (Venkatesh et al. 2003)

Performance expectancy is common construct that is shared by UTAUT model and many of its predecessors. It is defined as a degree to which user believes that use of certain technology will have positive impact to their performance. Similar constructs in other related models include for example perceived usefulness in TAM, extrinsic motivation in motivation model, and job-fit in a model of PC utilization. When compared against other construct included in UTAUT, performance expectancy has been typically considered as most significant when comparing predicted use and actual usage. Although performance expectation has strong importance related to voluntary and involuntary utilization environments, Venkatesh et al. (2003) state that age and gender are likely to impact how different users consider the importance of performance construct.

Effort expectancy describes difficulty related to system use, and high level of difficulty leads to higher expected effort. Similar constructs in earlier models include perceived ease of use (TAM and IDT) and complexity which is included in model of PC utilization. Based on the earlier models, effort expectancy has significant impact when evaluating system usage in both voluntary and involuntary settings. But unlike performance expectancy, significance of effort expectancy will be reduced over time when experience and skills are accumulated. In other words, more experienced employees are more likely to overcome barriers related to high effort for system use. (Venkatesh et al. 2003)

Social influence extends UTAUT to cover interpersonal elements as it describes the level of importance that individual thinks other persons give to their system usage. In other words, social influence predicts that system utilization will be higher if an individual experiences social pressure or believes that there is pressure to start using specific technology. In previous models, social influence was recognised for example in TAM and IDT. Social influence as a construct to predict system usage is mainly significant in an environment where system usage is mandatory or notable pressure to use certain technology exists.

Venkatesh et al. (2003) express that social influence can impact usage and acceptance in multiple different ways and correlation to outcome might not be straightforward. Compliance, internalization, and identification are mentioned as mechanisms that impact individual behaviour through social influence. While compliance describes how individual acts under pressure to utilize technology, internalization and identification describes how individual considers possible personal gains related to use of technology.

From the perspective of this thesis, social influence is interesting topic as it can be evaluated also from inter-organizational perspective and related to the relationship between the focal company and its suppliers. For example, if the focal company implements pressure for the supplier to start using IOIS this could be considered as a dimension of social influence. Similarly, some suppliers might be eager to use IOIS so that they would look like to be more committed towards common relationship and goals. The relevancy of social influence was significant in SCM context based on the previous chapter that addressed IOIS adaption.

The fourth construct included in UTAUT is called facilitating conditions. This construct includes expectations of an individual about the level of support that organization provides for usage of technology. In overall, facilitating conditions include elements like technical infrastructure that support usage, training, and availability of support personnel to assist in case of issues. Based on earlier studies, significance of facilitating conditions in prediction of usage has been reported differently. According to Venkatesh et al. (2003) facilitating conditions were considered insignificant for behavioural intention as similar topics are already considered in effort expectancy. On the other hand, facilitating conditions were significant contributor to actual usage especially within more experienced users as the more

senior users typically tend to expect and appreciate support and training during implementation for new technology.

Related to facilitating conditions, Harris, Mills, Fawson and Johnson (2018) examined the impact of training in UTAUT model. In their article, the authors validate the positive impact of training reaction and intention to use technology. This means that through availability of proper training, positive implementation outcome can be supported. It is also highlighted that these positive impacts extend beyond just learning how to use the system as training can also impact the way how users feel about the technology.

Like other technology acceptance models, also UTAUT has been topic of wide range of research varying from model validation to development of different approaches. Literature review by Williams, Rana and Dwivedi (2015) illustrated how UTAUT model has been used to study wide range of IT systems like mobile communications and mobile consumer applications, e-learning solutions, and general office software. Regardless of wide range of applications addressed in UTAUT, the authors didn't report any IOIS specific studies that could be used as a benchmark for this thesis. Practical example of applying UTAUT in supply chain collaboration was presented by Chan, Chong and Zhou (2012) who studied diffusion of e-collaboration within SME supply chains. Based on their study, the authors emphasize the importance of focusing on performance and effort expectations related to tool usage as these will have notable contribution to adoption.

One of the proposed additions to UTAUT model included inclusion of attitude into the model. This was proposed by Dwivedi, Rana, Jeyaraj, Clement and Williams (2019), who noticed how attitude impacts implementation of information systems and information technology through social influence and facilitating conditions. Similarly, attitude has an impact to behavioural intention to use new IS/IT. The authors also express how attitude can overrun mediating effect of behavioural intention, which means that strong attitude towards usage of technology can finally lead to actual usage, although the user didn't intend to use system. On the other hand, it is good to remember that attitude is impacted also by performance expectation and effort expectation, which means that these factors should be in the central focus of IS/IT developers.

3.3 Task-Technology Fit

Task-Technology Fit (TTF) describes the relationship between technology like information system, its utilization and fit for a specific purpose. In practice, TTF can be defined as a degree in which a technology supports its users to achieve expected performance outcomes especially at individual level. In practice, TTF is a combination of task requirements, user capability and functionalities of a given technology. High level of TTF means that user and technology interact seamlessly when a given task is performed. Correspondingly, TTF is considered low if the technological functionalities fall short from the requirements or it is too complex to use when compared to abilities of user. Figure 7 illustrates TTF model with combined elements of fit and utilization. (Goodhue et al. 1995).

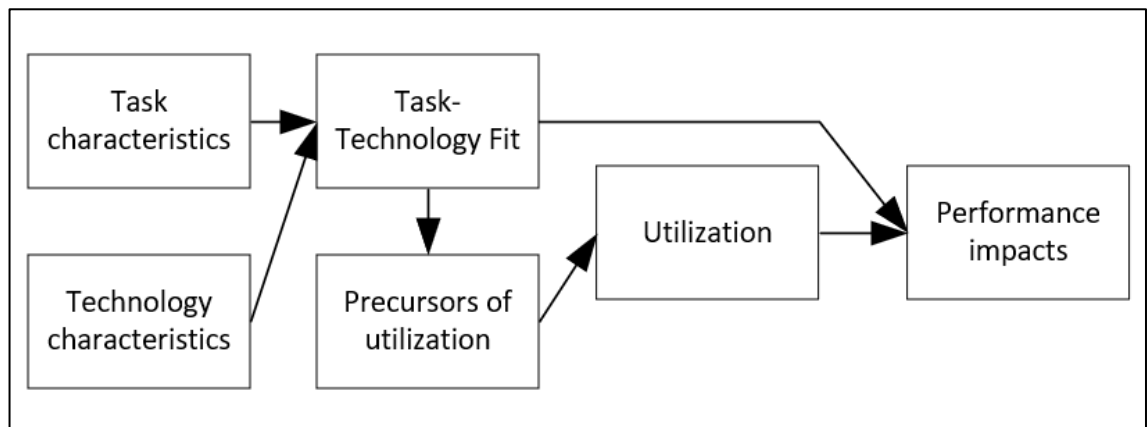


Figure 7. Task-Technology Fit (Goodhue et al. 1995)

According to the original model, there are eight different factors that are important for task-technology fit. These include quality, locatability, authorization, compatibility, ease of use / training, production timeliness, system reliability, and relationship with users. First five dimensions are mainly related to data characteristics of a technology, while remaining three dimensions are more focused on day-to-day business requirements and possible changes. These factors were utilized when formulating the set of questions to assess information system TTF in the original study. (Goodhue et al. 1995).

The original set of dimensions have been later modified and adjusted for different questionnaire needs and setup. For example, Im (2014) expanded the model to cover topics related to performance, learning outcomes, system usage, TTF, faithfulness of appropriation (FOA) and consensus on appropriation (COA).

Based on the study, Im (2014) states that while system utilization predicts performance outcomes, it is dependent on both TTF as well as COA, which means how a team or group has agreed together to use technology as part of their daily activities. In practice, this finding expands the individual focus of TTF also towards acknowledging the impact of social factors.

TTF related to employee performance and IS implementation was also studied by Ratna, Utami, Astuti, Wilopo and Muflih (2020). Based on their research, the authors report how the TTF had significant effect on the usage of IS. Correspondingly, the usage impacted the performance of the user. On the other hand, the research didn't find support that use of technology would have impact on users' satisfaction. This could have been related to the case company policy that allowed users to decide themselves whether to use certain technology or not. As a result, users could decline from using technology that would impact their satisfaction negatively.

Combination of TAM and TTF has been also proposed in the literature to achieve more extensive model for assessing technology acceptance and utilization behaviour. According to Dishaw and Strong (1999) combined model of TAM and TTF provides more explanatory power to explain variation in IS utilization. The authors recommend that the combined model could provide useful support when IT managers are evaluating possible tools that could be used by different users. In addition, understanding the models would be beneficial for IS developers who must understand how technology characteristics and task characteristics together impact the user behaviour and willingness to utilize the tool.

While Dishaw et al. (1999) combined TAM and TTF by including the individual constructs from TAM like perceived ease of use and perceived usefulness with TTF related tool experience and tool functionality, also other combinations have been used. For example, Schrier, Erdem and Brewer (2010) replaced individual constructs with experimental constructs to achieve better fit to their research problem. The authors report that their hybrid model of TTF and TAM was also a good predictor of technology utilization. This can be considered as an encouraging finding regarding this study as the intention is to include characteristics from different models when trying to understand IOIS utilization within the supplier group.

In general, the previous studies related to TTF can be considered supportive for the perspective of the research objectives for this thesis. By listening to the supplier representatives who are using the IOIS, the case company should gain better understanding about task-technology fit of their current system and its characteristics. By improving the system and its TTF, the case company should be able to improve utilization rate of IOIS. This on the other hand should improve user performance and create value for the suppliers and focal company.

3.4 Summary of theoretical models

During this chapter three different models for evaluating and predicting utilization and acceptance of technological innovations have been introduced. These models were Technology Acceptance Model, Unified Theory of Acceptance and Use of Technology, and Task-Technology Fit. The objective for introduction was to establish general overview about constructs that impact users' attitude about certain technology and predict if users are willing to start utilizing for example new information systems. When considering objectives for this thesis, this review of theoretical models will help when determining relevant questions for the empirical study and also assist in the interpretation of results.

Based on the review of the models, it can be concluded that UTAUT and TAM are overlapping when it comes to perceived ease of use and effort expectancy, and perceived usefulness and performance expectancy. This is expected when considering that UTAUT combines multiple previous models and includes elements from TAM. Due to similarity and overlapping constructs, this thesis will follow UTAUT model with four dimensions that impact system utilization and acceptance.

In practice this means that questionnaire will include questions targeting to understand how IOIS users perceive performance and effort expectancy, and how they evaluate facilitating conditions and social factors related to IOIS usage. In addition, the questionnaire will be supplemented by questions related to task-technology fit, so that it will be possible to evaluate if current IOIS is meeting the supplier requirements for efficient utilization. When setting up the questionnaire,

questions related to perceived performance and effort expectations will be emphasized as they were considered as most critical factors according to UTAUT and TAM models.

While TTF model will have only supplementary role when planning the research questions, it will be considered when evaluating the results. This approach is selected because TTF can facilitate discussion about whether the Supplier Portal is able to meet the requirements related to different activities that it should facilitate and support. In addition, TTF framework also allows to evaluate whether Supplier Portal delivers positive outcomes related to supplier integration and more efficient collaboration. In other words, TTF can be considered as a construct that enables to summarize the overall acceptance and usability of Supplier Portal.

4. RESEARCH METHODOLOGY

Purpose of this chapter is to provide introduction to the case company and to discuss about empirical research methods that were applied during the thesis work. As the objectives for this thesis and relevant research questions have been already discussed during the introduction chapter, they will not be repeated here. Instead, this chapter will focus on describing the research environment where the research was performed. This is done by representing the case company and its operating environment.

In addition, this chapter will discuss about research methods that were implemented during the study. This is done by first described and justifying the selected research methods from a theoretical perspective, and by explaining how the specific research procedure was established. During the last section of this chapter, the actual research process will be described more thoroughly from a practical perspective with a reflection of its suitability and success after the data collection had been performed.

4.1 Case company introduction

The research conducted in this thesis is focused on an industrial case company and its supplier network. The company operates globally by offering lifecycle product and software solutions for customers within marine and energy sectors. The case company uses many different strategies to perform its supply management operations, including design-to-order for turnkey projects with high complexity and customer specific design, manufacture-to-order for industrial equipment that can be tailored based on customer requirements, and buy-to-order or buy-to-stock for transactional spare parts operations.

While the case company implements multiple different strategies to serve its customers, its supply operations can be mainly characterized as vertically non-integrated. This means that majority of manufacturing activities are performed by external suppliers, while the case company focuses mainly on research and development, assembly, and delivery processes. As a result of different business lines, the case company has multiple different purchasing organizations that operate

relatively independently from each other, but at the same time share common supplier base. Due to this setup, suppliers are often requested to adopt into various ways for collaboration.

While the case company utilizes many different electronic supply chain management software solutions to perform different procurement scenarios, this thesis will be limited to procurement of direct materials. This means that software solutions used for indirect procurement like services, travel or office equipment are excluded from the scope. As a result of this limitation, focus area of this research will be reduced to three different IOIS solutions which are currently used by the case company: online supplier portal, business to business EDI and online logistics portal.

The current situation regarding IOIS utilization in the case company and its supplier base is versatile. EDI has been implemented with approximately 30 suppliers that are characterized by high transactional volumes and close integration with case company. Currently used EDI integrations are mainly limited to straightforward communication of order creation and confirmation. In addition, suppliers can send their invoices through EDI. Due to limited activities supported by EDI, basically all suppliers using EDI are also using online Supplier Portal for other collaboration activities.

Online logistics portal (LogWis) is used mainly by one of the internal business lines with their suppliers. This solution is especially dedicated for supporting project deliveries with logistics management perspective, from the supplier premises to different locations around the world.

With over 800 supplier accounts, online Supplier Portal is the most actively used IOIS by the case company and its suppliers. While the Supplier Portal originally covered mainly order management and invoicing related transactional activities, it has been developed further during the past years. Currently there are features to support for example forecast collaboration, RFQ process, management of quality notifications, inventory visibility, compliance document sharing and delivery of traceability information. In addition, there is a possibility to share drawings and other information through the portal.

One of the key measures for the supply chain digitalization in the case company is the level of electronically transferred purchase orders. While some of the major business units have been achieving coverage of 80-95 percentages during the past years, there are still many purchasing organizations where IOIS solution is not used to support purchasing activities. Similarly, there are still wide range of suppliers with whom IOIS hasn't been yet implemented.

For most of the functionalities included in online Supplier Portal, the case company hasn't established continuous measurement practices for utilization. On the other hand, utilization has been measured through ad hoc reporting and based on user experiences especially after the introduction of the new functionalities. With many of the new features, the introduction process hasn't been as straightforward that could have been hoped. This can be related to IOIS characteristics, but also to suppliers being hesitant to start using new solution especially when they are related to new business requirements that haven't existed earlier. For example, case company lately released new feature to facilitate collection of product compliance certificates, and during the tool roll-out, also the requirement to deliver new types of certificates was expressed first time to suppliers.

Case company recognizes how supply chain integration and digitalization can support in achieving operational efficiency. Therefore, its objective is that the IOIS solutions would be utilized with all its major suppliers. During the past years most of the new features have been developed based on the case company's own internal needs, with an objective to centralize previously non-integrated activities to IOIS. While this has expanded IOIS service offering and increase potential for integration, the approach hasn't been supplier centric.

To support digital transformation in supply management activities, the case company is looking for ways to improve its IOIS solutions so that they would create more value also for suppliers, and as a result, encourage suppliers to utilize system more actively. The Supplier Portal is considered by the case company to be the most potential tool from currently applied IOIS solutions when it comes to supply base coverage and ability to cover most of the main supply management processes. Therefore, focus of this study will be limited to usability and utilization of Supplier Portal, while other IOIS and alternative solutions will be scoped out from the questionnaire and analysis.

To enable case company to reach its objective of increasing Supplier Portal utilization, this research aims to understand what drives supplier acceptance and utilization decision and collect improvement ideas from existing supplier IOIS users. As a result, possible implementation barriers are not requested from suppliers that are not yet using Supplier Portal.

During the research, the focus will be placed on general features of Supplier Portal. More detailed feedback about usefulness and usability will be requested related to following individual functionalities that are available in Supplier Portal:

1. Certificate tool allows suppliers to provide certificates in electronic format instead of sending them through physical mail or email. The requirements for specific certification documents are communicated as part of purchase orders. This tool also allows case company to request additional documents like dimensional measurement reports.
2. Claims management enables case company to communicate about quality notifications towards suppliers. Suppliers can receive information about issues with relevant attachments. Suppliers are expected to provide information about corrective and preventive actions through portal. The process can be finalized by requesting credit note from supplier.
3. Customs declaration tool allows suppliers to deliver information that is needed for global trade. This includes for example classification code, information about origin and preferential statements.
4. Document collaboration covers features related to sharing of drawings or other electronic documents mainly towards suppliers. These documents can be delivered as attachment to purchase order or via separate messages that inform suppliers about new or updated design. System also stores links to provided documents, which allows suppliers to download them also later if needed, thus reducing risks of missing documentation. Supplier can comment and accept information delivered to them.
5. Forecast collaboration allows case company to share information about long-term demand and expected future deliveries. Suppliers can provide comments related to availability and thus inform about possible challenges proactively. Objective for the process is to reduce risk of non-availability.

6. Product compliance management is one of the newest functionalities in Supplier Portal. Purpose for this feature is to provide a channel for case company to request documents related to environmental regulations that require for example detailed information about substances included in materials. The tool provides structured templates for providing information related to some of the key directives, and free format document-based collaboration related to other directives. Requirements to provide certain documents can be communicated as part of purchase orders or separately from compliance management tool. Main difference to certificates tool is that the documents are utilized on material level instead of being purchase order specific.
7. Purchase order management could be considered as the most important of the Supplier Portal functionalities as it facilitates high volume transactional collaboration related to sending, confirming, and rescheduling purchase orders. In addition, the tool has been extended so that it allows suppliers to create pick-up requests and invoices related to purchase orders. While basically all suppliers who are using Supplier Portal, are also using purchase order management, only few of the biggest case company departments actively use for example pick-up requests with their suppliers.
8. RFQ functionality allows the case company to send request for quotations to suppliers, who can then respond by providing needed information, prices, and lead time. RFQ tool is integrated with document collaboration as the relevant design documents will be made automatically available for the suppliers when sending the RFQ.
9. Traceability tool facilitates suppliers to provide unique item identifiers for the materials that they are delivering. These codes are used for tracking the components during their lifecycle.
10. Supplier inventory tool allows suppliers to maintain information about material stock levels. When this information is provided, case company can offer these materials to its own customers with a shorter lead time. The objective for this process is to enable more sales through better availability and increase stock turnover by activating the supplier inventories.

In addition to above mentioned functionalities, Supplier Portal also provides suppliers information about their performance through basic level KPI reports. Supplier users are also able to access support through help section and receive email notifications about new documents that require actions.

When evaluating the results about perceived usefulness and usability, it is good to understand that majority of the suppliers are using only a few of the available features as many of them are dedicated to specific processes. Additionally, some features are only used by certain case company departments, which also limits the utilization rate. Some of the functionalities have also limited potential to create value from supplier perspective, while they could be considered important for the case company. Although it is not examined during this research, this could create a gap between perceived usefulness between the case company and its suppliers, and it could also partly explain results of this study.

4.2 Research approach

Empirical research conducted as part of this thesis is qualitative and descriptive. According to Ghauri and Grønhaug (2010: 56-57), descriptive research is suitable when the research problem is well understood and structured. As described earlier, the research will be conducted as a case study, which is suitable method for investigating currently existing phenomena in-depth and within its real-world context (Yin 2018: 15). In this thesis, the context can be naturally limited to IOIS solution currently provided by the case company, and the existing users of the solution. Similarly, the research problem can be determined around the context as the objective is to understand how supplier users perceive use of IOIS solution, and what kind of system development actions could be done to support IOIS utilization. Like typical case studies, this thesis takes advantage of previous theoretical work for designing the research process (Yin 2018: 15).

One important element for a descriptive study is to plan, follow and document procedures that are performed when conducting the research (Ghari et al. 2010: 56-57). This is important so that it can be ensured that the same research protocol is followed each time that observations are collected. Proper documentation also helps to ensure at least certain level of replicability, although according to Bell, Bryman and Harley (2019: 374), poor replicability can be generally considered as

a typical characteristic for a qualitative research, as its findings tend to be typically interpreted subjectively and are impacted by time and environment.

On the other hand, although the results of this study are dependent on the current research environment, case study setup limits the replicability, and while qualitative results will be interpreted through current business framework, proper documentation should be performed. This is because carefully documentation of the process and results will enable the case company to replicate similar research from a longitudinal perspective. Careful documentation and clear research procedures also help to distinct case study research from similar non-research approaches (Yin 2018: 20). In other words, case company could be interested to evaluate possible changes over time on how users perceive Supplier Portal use. This can be considered especially useful if the case company decides to develop Supplier Portal based on the recommendations provided in this thesis and wants to later evaluate whether the developments had positive impact. To address this requirement, research procedure followed during this thesis will be explained later in the chapter.

While some of the questionnaire results gathered during this research can be evaluated through quantitative methods, primary research strategy for this thesis is qualitative. This is related to the research problem which is to understand user perceptions about use of Supplier Portal. While these perceptions can be categorized into groups, and could be therefore also compared and quantified, they remain to be result of personal feelings and considerations rather than something that can be measured in numbers. Additionally, from the perspective of research objectives, there will be a strong emphasis also on the open comments provided by the questionnaire respondents. Emphasis on words and thoughts over numbers is typically characteristic for qualitative research when compared to quantitative research (Bell et al. 2019: 355).

When considering reliability and validity of qualitative research, Bell et al. (2019: 362) divides both dimensions of research quality into external and internal perspectives. External reliability is determined as a possibility of replicating the research afterwards. As explained earlier, the case study setup will limit the possibility to replicate the research especially in different environment. On the other

hand, good documentation of the research procedure can improve external reliability as the research can be replicated later in the same environment. Internal reliability is considered as the level of possible variation between observers who take part in the research process. For this research, variation will not exist as there is only one researcher. On the other, when analysing the results, reliability could be supported by keeping the interpretation on minimal level and by also reporting wide range of replies although they would notably differ from each other. (Bell et al. 2019: 362-363).

Internal validity is evaluated based on the empirical findings and how they are aligned with theoretical framework. While this research doesn't aim to validate theory against reality, or other way around, internal validity can be assessed especially through specific statements in the questionnaire that address topics highlighted in theory. On the other hand, it is good to recognize that the questionnaire itself has been developed based on topics highlighted in by earlier research. (Bell et al. 2019: 362-363)

External validity is considered as a degree on which the results can be generalized across different social settings (Bell et al. 2019: 362-363). Typically, case studies have been criticized as an individual research can be hard to generalize (Yin 2018: 20). According to Yin (2018: 37-38), case study findings can be generalized when they are compared against theoretical background and previous studies.

For this research external validity could be evaluated based on whether the implications can be followed by other organizations than the case company. Due to different kind of business environments and software solutions, most of the implications are not probably directly valid for other companies, but they can provide valuable insights about what is important on a more general level.

The method applied for data collection during this research is a questionnaire. This method was selected as it enables efficient data collection from a large target group of respondents and this way helps in understanding the overall perceptions of software users. This can be considered as a suitable approach as there is no previous information about the topic. If there would already be recent information

about user perspective in general, then more focused research could be performed to obtain more specific understanding with smaller target group and for example through semi-constructed interviews.

Data collection with a questionnaire can be considered as a good approach for descriptive research when the objective is to observe variance of certain phenomena within clearly defined research setup (Ghauri et al. 2010: 119). As an example, descriptive questionnaire can be used to understand customer attitudes towards certain product or services. In the context of this research, we want to understand the variation within the user perceptions of software usage on a clearly specified business environment.

Ghauri et al. (2010: 123-125) provides useful list of topics that should be considered when using questionnaires to collect data for research purpose. First, it is important to use language that is simple and easy to understand. Additionally, the questions should be formulated so that it doesn't require in-depth knowledge to answer them. One question should also be specific enough and address only one topic so that it remains simple to answer and that the response shouldn't be incorrectly interpreted. These topics are especially important for this questionnaire as the target groups includes people that have different native languages and who are having different background related to Supplier Portal usage. While Ghauri et al. (2010: 124) recommends that there shouldn't be escape routes from certain questions, in this questionnaire we are offering possibility to reply that certain features are not used by the organization as this is also reality. Finally, the authors recommend avoiding suggestive nature when setting the questions, formulate them politely, while keeping the questions straightforward.

Ghauri et al. (2010: 125) also highlight the importance of placing the questions in right order. For the questionnaire in this research, it means starting with relatively easy background questions that can be replied rather quickly. More complex open questions will be asked later with the expectation that earlier questions have already initiated some thought processes. Based on the recommendations, the questionnaire has been also presented to representatives of the case company, with an idea to validate it through external perspective.

While the full questionnaire is presented in appendix 1, the background and purpose of each questions is explained next to provide justification for using them and connect them with theory when applicable. The first five questions were designed so that their results can be used as a background information about the respondents and their organization. This was needed especially because the responses were recorded anonymously, and thus demographic information was not available. Although the questionnaire was sent to active Supplier Portal users, it was also decided to ask from the respondents if they feel themselves that they actively use Supplier Portal to perform needed activities related to case company. Background to this question was to identify users like key account managers who might log in occasionally without performing any actual activities from the everyday users.

Results related to questions 2, 3, 4 and 5 can be mainly used for categorization purposes. For example, questions 3 and 4 aimed to understand how frequently and how long the supplier has been using Supplier Portal. Questions 2 and 5 categorised respondents based on usage of other inter-organizational information systems either with the case company or their other customers.

Questions 6 and 7 were dedicated to perceived usefulness, which was adopted from TAM and UTAUT as one of the key focus areas for the study. In question 6, respondents are requested to evaluate usefulness of available Supplier Portal functionalities in five step Likert scale. As majority of suppliers are using only some of the functionalities, there was also possibility to answer that a certain functionality is not in use. Question 7 allowed respondents to provide open feedback about usefulness of Supplier Portal.

Questions 8 and 9 were constructed in the same way that 6 and 7, but with focus on perceived ease of use and usability. The background of these questions was similarly also in TAM and UTAUT models.

The purpose of question 10 was to allow users to provide feedback about future development ideas with the special focus on topics that would enable their organizations to utilize Supplier Portal more actively. While this question is not directly linked to any of the theoretical models, it is important when considering the research objectives for this thesis. Based on concrete development ideas related

to either existing or new functionalities, it will be easier for the case company to evaluate and prioritise future developments.

Question 11 included twelve statements that respondents had to either agree or disagree on five step Likert scale. These statements tried to focus more specifically to individual topics that were recognized while evaluating the theoretical framework. Statement related to pressure from case company as being the main reason for using Supplier Portal, is addressing the social influence related to technology acceptance. In a similar way, statements related to support, trainings and instructions addressed topics related to facilitating conditions. Statements about Supplier Portal use being beneficial and about reliability of data were pointing to topics that were highlighted by literature related to IOIS adoption.

Question 12 is a free text comment, and it allows respondents to describe how their collaboration with case company has changed after they have started to use Supplier Portal. Main objective for this question is to allow collection of both positive and negative experiences as the expectation at least is that Supplier Portal usage has had at least some kind of impact also from supplier perspective. Question 13 mimics traditional net promoter score by asking whether the respondent would recommend use of Supplier Portal to their colleagues or other suppliers. Final questions provide a possibility for the respondents to provide any kind of open feedback related to Supplier Portal utilization and usage. Having this kind of option aims to contribute to the overall objective for the study as users might have good ideas about development opportunities or usability issues that were not considered when replying to other questions.

Planning of the questionnaire was done by balancing between proper level of specificity needed to address the research questions, and a requirement to keep the questionnaire enough simple so that it wouldn't be too complex to answer. Especially the decision to target large group of Supplier Portal basic users impacted the questionnaire contents, as it was acknowledged that answering the questions can't require detailed technological understanding or knowledge about relationship between case company and supplier. In other words, questions needed to be straightforward and easy to understand. To ensure that respondents wouldn't be dropped during the process, only few questions were marked

mandatory thus allowing respondents to skip for example the open questions. Mandatory questions were 1, 5, 6, 8, 11 and 13.

The request to participate in survey through web-based questionnaire was delivered to all active Supplier Portal users based on the user log provided by the case company. Based on this data it was possible to find out that the overall number of user accounts exceeds 4000 individual users. To restrict questionnaire to active users, it was decided to send questionnaire only to those users that have logged into Supplier Portal during year 2021. In addition, users connected to deleted, internal or test supplier accounts were removed. Figure 8 shows the number of user accounts based on their last login date.

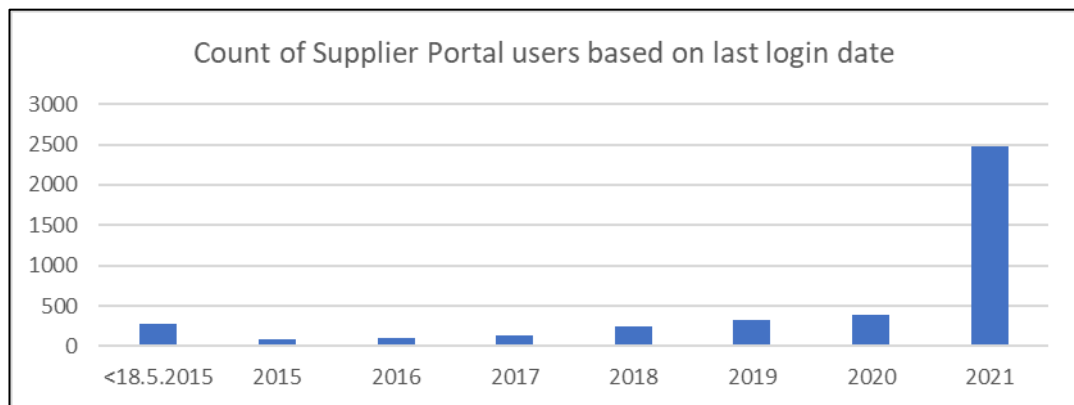


Figure 8. Distribution of user accounts based on last login date

After the inactive accounts were cleaned from the data, 2468 users remained. When examining the supplier accounts represented by user accounts, it was found that these users represented 862 unique suppliers. This means that on average a supplier account would have around three active users. More detailed analysis showed that while majority of the supplier accounts had only 1 or 2 users, there was also individual accounts having over 20 active users. This can be related to suppliers that are serving multiple different departments of the case company and to suppliers who are actively using wide range of Supplier Portal functionalities.

When determining the target audience to receive the questionnaire there was also consideration if the respondents should be limited more strictly with for example a focus to certain active suppliers. While this could potentially improve the average response quality, and lead to higher response rate, it would also be based on objective decision of which suppliers would be good respondents. As a

result, the outcome could be artificially distorted and not representative for the whole group of active users.

4.3 Evaluation of research method and data

The questionnaire was delivered to target audience in couple of waves. Main purpose of this approach was to mitigate possible technical risks related to functionality of web-based questionnaire tool and enable possibility to react if some issues would be identified after sending the questionnaire first time. When the first successful replies had been received without any observed issues, questionnaire was delivered in batches to remaining recipients. Delivery in batches was used so that sending would be easier and that it would be easier to manage possible automatic notifications about undelivered messages.

During the process, automated responses were recorded and categorized so that it would be possible to understand how many users were not successfully reached. When contacting the 2468 users for the first time, 322 automated replies were received. Out of these messages 195 could be interpreted as normal short-term out of office notifications, but 127 were related to failed delivery or longer absence of the recipient. As these 127 were not reached, they were also excluded from the reminder email. Similarly, these recipients were also excluded when evaluating the response rate.

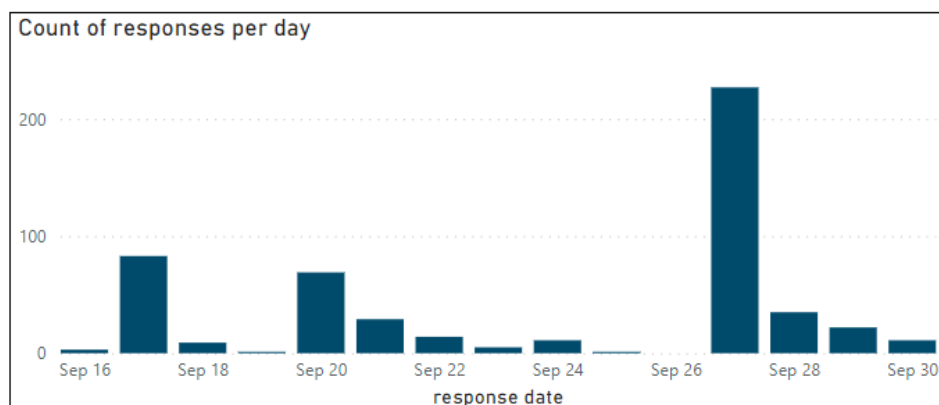


Figure 9. Daily responses over the response collection period

The reminder emails were sent 4 days before closing the questionnaire. Before sending the reminder, 230 replies had been received. This corresponds close to 9.8% response rate. After sending the reminder email, number of responses increased rapidly and during the day there was over 200 daily respondents. The

final number of respondents was 530 returning a response rate of 22.6%. Figure 9 shows the distribution of respondents per day.

As many of the suppliers are using also other IOIS solutions with the case company, there was a background question to understand which systems suppliers were using. Based on responses received for this question, it was also noticed that some of the respondents were not familiar with Supplier Portal although they were considered active according to the user information. To improve relevancy of the study, 22 replies were excluded from further analysis as the respondents didn't report about Supplier Portal use. Excluded respondents are shown orange in Figure 10.

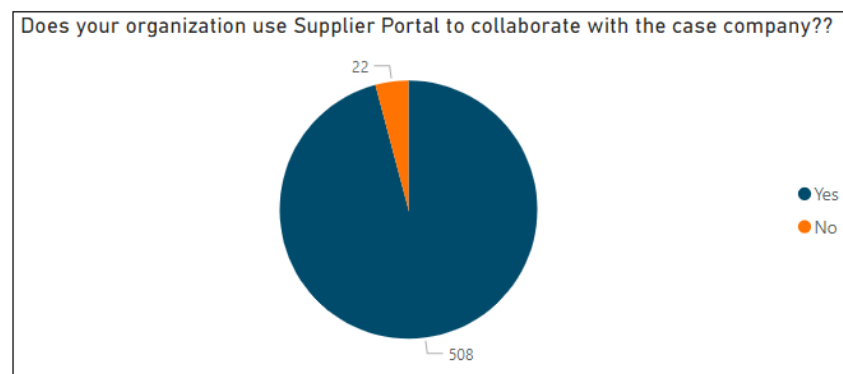


Figure 10. Use of Supplier Portal within respondents

To further understand background of replies, there was also a question if a certain respondent personally considers that they actively use Supplier Portal to perform needed activities related to operating with case company. The objective of this question was to categorize respondents into active users that might have relevant ideas for example about usability, and administrative users that could consider usefulness for example from relationship perspective. Out of 508 respondents

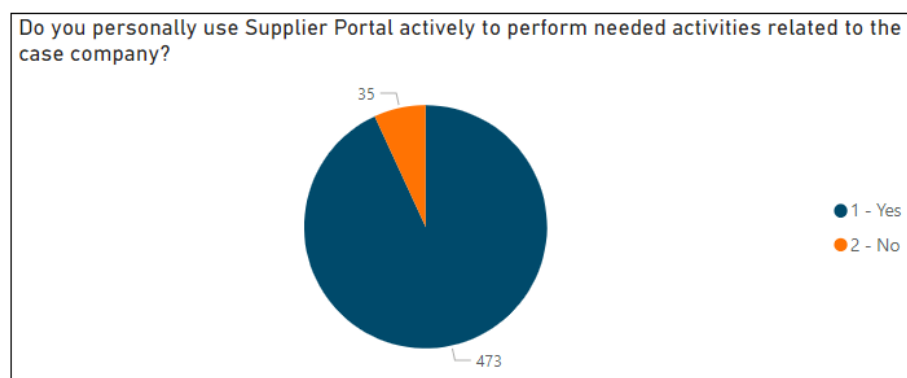


Figure 11. Active Supplier Portal users

using Supplier Portal, 473 considered themselves being active as shown in Figure 11. Categorization to active users and others will be considered also in figures related to usability.

The questionnaire was structured so that it included both mandatory and voluntary questions. While the questions that demanded respondents to evaluate usefulness and usability of different features, or statements related to Supplier Portal usage were mandatory, all the open questions were based on voluntary input and respondents could skip them. This was to ensure that effort for participation would remain low enough for all respondents. Out of whole 530 respondents, 316 didn't provide any non-mandatory feedback. On the other hand, many of those who provided open feedback commented more than one of the questions.

When evaluating the outcome of the empirical research process afterwards, the overall response rate can be considered good in contrast to similar web-based surveys. In addition, many of the suppliers have multiple user accounts related to them and although respondent information was not collected, it is likely that in some organizations there was alignment to reply only once. Relatively good overall number of respondents gives confidence that questionnaire was able to reach its audience and collect wide range of users with different kind of requirements and perspectives.

On the other hand, when evaluating the response rate critically, it should be acknowledged that majority of the contacted users remained passive and didn't take the opportunity to share their thoughts. As the group of non-respondents can't be considered random, high share of inactive users reduces possibility to generalize the results. Another challenge with the results interpretation is the relatively high number of neutral responses that were received for specific questions. While the neutral response as such is valid and can show that the topic itself don't raise specific interest or thoughts, it also reduces possibilities to make valuable conclusions and proposals about actions that could be effective.

5. USER PERSPECTIVES ABOUT SUPPLIER PORTAL USE

The objective for this chapter is to present research findings after cleaning the data according to the practices described in previous chapter. During this chapter research findings are presented neutrally thus leaving the interpretation and discussion to the next chapter. Especially the responses related to usefulness and usability will be also supported by relevant open feedback and development ideas from respondents.

When reviewing the open feedback related to Supplier Portal usability and user experience, it can be clearly noticed that some responses are overlapping between technical topics and process related factors. While this thesis mainly aims to understand the technical IOIS related development needs, also the process related concerns will be considered as they impact how users perceive Supplier Portal. Some of the process related issues could be also addressed with technical developments.

5.1 Background information

Purpose of background questions was to understand respondent demographics in a more detailed way. Additionally, it is expected that some background topic characteristics could impact the way how respondents perceive use, usefulness, and usability of Supplier Portal. Results related to questions 1 and 2 were already represented in previous section as they were also considered relevant for the evaluation of research data.

Results of question three is displayed in Figure 12. Based on the responses, almost 80% of the respondents have been using Supplier Portal longer than two years but less than five. When considering that the Supplier Portal has been implemented in 2014, the share of users that have used the system over five years can be also considered quite high. Small share of users that are new to Supplier Portal were also visible in responses for open questions as the respondents were highlighting that they haven't been able cumulate enough knowledge and experiences to evaluate usefulness and usability.

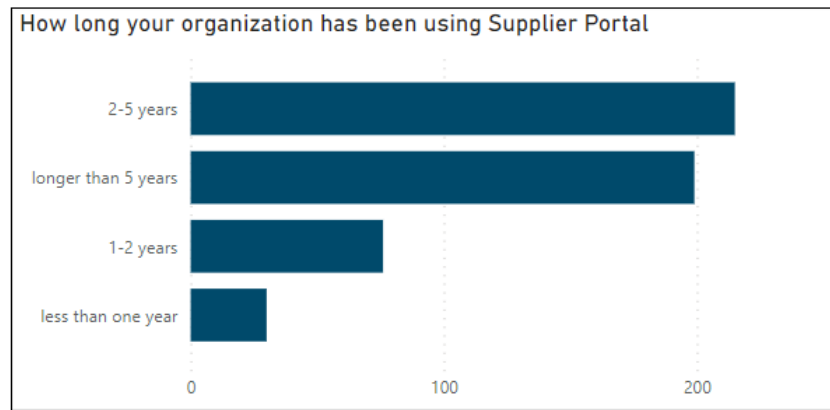


Figure 12. Supplier Portal usage in years

Question 4 mapped how frequently the respondents are using Supplier Portal (Figure 13). This question is relevant when evaluating the usefulness of Supplier Portal as perceived and potential benefits of IOIS has been typically dependent of transactional business volumes between the partners. While the question doesn't directly consider transaction volumes, usage frequency is likely to correlate with volumes. Based on the responses, it can be concluded that most of the respondents use Supplier Portal either daily or weekly. Results of this question will be utilized when analysing the perceived usefulness of each individual functionality.

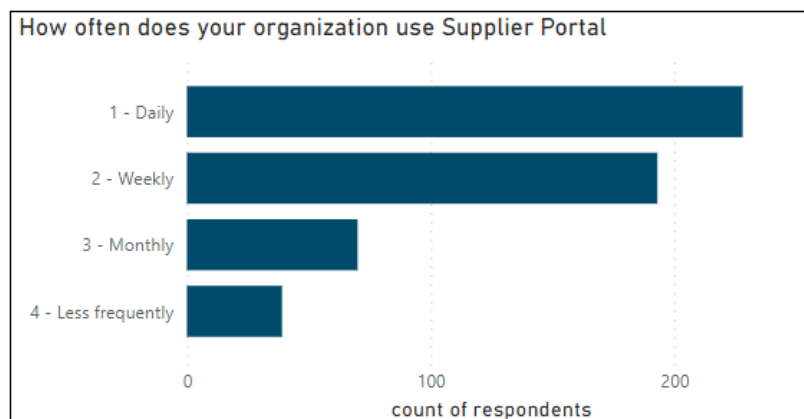


Figure 13. Supplier Portal usage frequency

Last of the background questions examined if the responded organizations are using similar web based IOIS solutions with their other customers (Figure 14). Based on the results, almost 70% of respondents were using similar solutions with other customers. This was also visible in some of the open question responses as the respondents were comparing the Supplier Portal against solutions provided by other suppliers.

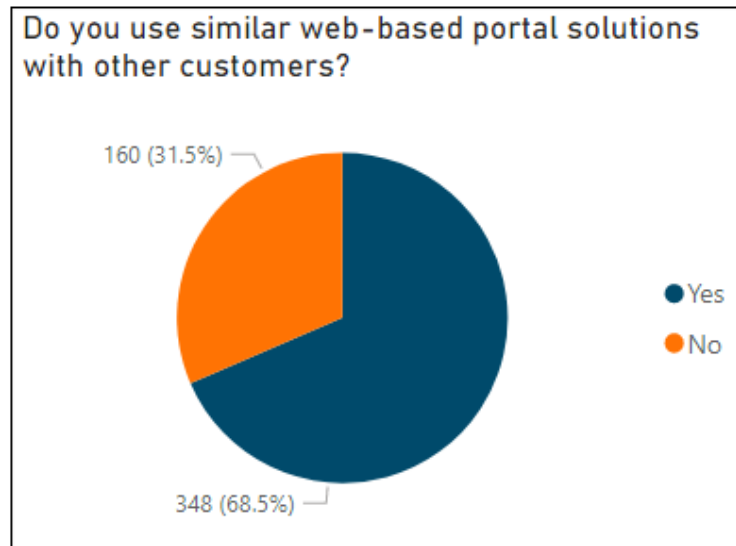


Figure 14. Use of similar web-based portal solutions

5.2 Usefulness and usability

One of the main objectives for the thesis is to understand how suppliers perceive usefulness and usability of Supplier Portal and its different functionalities. When comparing to the theoretical framework, usefulness aims to address topics related to performance expectations, while usability focuses on topics related to effort expectations. Due to relevancy of this topic, questionnaire results will be represented during this section in a detailed level and for each functionality separately. To understand both topics more specifically, responses have been also grouped based on different explanatory factors that were considered relevant. Perceived usefulness is grouped based on how frequently respondent is using certain tool, and perceived usability is grouped into two categories based on whether respondents personally utilize Supplier Portal to actively collaborate with case company. In this section perceived usefulness and usability for each feature will be visually presented. More detailed results can be found from appendix 2.

Before analysing results related to any individual functionality, it is good to understand how active the use of different functionalities is. Figure 15 shows the use rates related different tools. This usage rate is calculated based on the respondents who replied that a certain functionality is not utilized by their organization.

Certificates - use rate	Claims management tool - use rate	Customs declarations - use rate	Document collaboration tool - use rate	Forecast tool - use rate	Product compliance tool - use rate	Purchase order management tool - use rate	RFQ tool - use rate	Supplier inventory tool - use rate	Traceability tool - use rate
53.0%	70.3%	41.1%	41.3%	46.1%	45.7%	88.0%	40.4%	29.5%	38.4%

Figure 15. Utilization rates of Supplier Portal functionalities

Based on the responses, the most actively used functionality is purchase order management tool, which also includes features related to invoice creation and pick-up requests. This was expected result, because purchase order management is also considered to be the functionality through which the implementation of Supplier Portal initially takes place. Suppliers who use S2S can use other functionalities, while they are not using purchase order management. The second most used functionality is claims management, which was actively implemented few years back to all suppliers who had already previously used Supplier Portal of order management.

Two of the least used functionalities are traceability tool and supplier inventory tool. Both functionalities are serving special requirements, and they are used only by specific case company departments, which also limits their usage potential. Remaining six functionalities have user rates varying between 40 and 53 percentages. From the case company perspective, it can be interesting to notice that two of the latest new developments, forecast tool and product compliance tool have reached similar utilization rates than many of the older functionalities. Due to questionnaire setup, it is impossible to evaluate how active use of certain functionalities is and it could be useful for the case company to establish valid measurement practices for usage.

Perceived usefulness and usability for certificates tool is represented in Figure 16. Based on the figure it can be noticed that while majority of the users feel that the tool is useful, there are still many users who don't either agree or disagree with the statement. When evaluating the usefulness based on usage frequency, it can be noticed that especially daily users consider the tool to be useful. On the other hand, some daily users feel that the tool is not useful at all. In overall, usability of the certificates tool can be considered to be on a fairly good level, as the

number of respondents having negative feelings is notably smaller than the ones who either perceive its usability as neutral or positive.

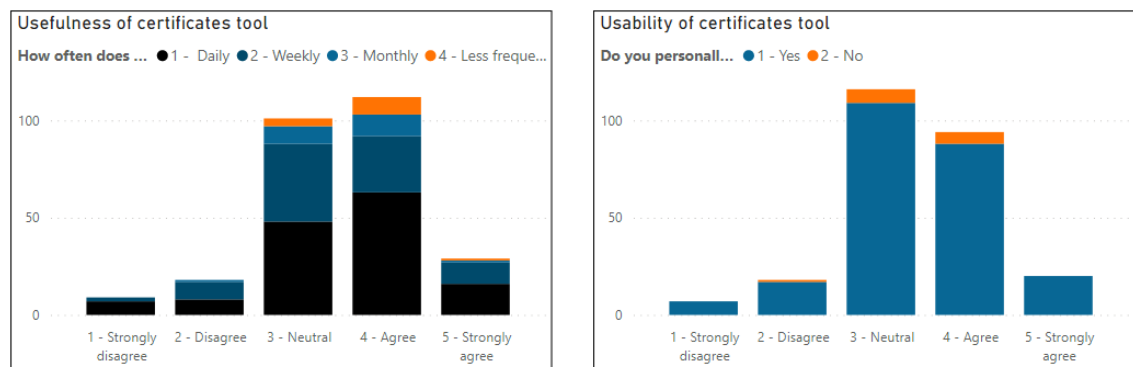


Figure 16. Perceived usefulness and usability of certificates tool

Only few respondents provided specific open feedback related to usefulness and usability of certificates tool. Still there were few users who highlighted that certificates tool could be developed so that suppliers would be able to upload more than one document at once and have better visibility towards what they have already provided. This requirement is related to situations where more than one document would be needed to fulfil case company requirements related to certain certificate. While being able to upload multiple documents at once, suppliers would be able to save time and avoid repetitive actions. When reviewing feedback provided by respondents who disagreed with usefulness or usability of certificates tool, there was no clear or specified feedback about the functionality. Instead, their feedback was more related to Supplier Portal in general and feeling that it creates additional workload.

While the claims management tool is one of the most actively used Supplier Portal functionalities, it is also considered to be relatively useful and easy to use when compared to other functionalities. Perceived usefulness and usability related to claims management are shown in Figure 17. From the figure it can be noticed that most of the respondents feel that claims management tool is useful, while only a few people consider it not useful. When considering the usability, the difference between neutral and agreeing respondents is smaller than with usefulness. This could be considered as an indication of potential for usability related developments.

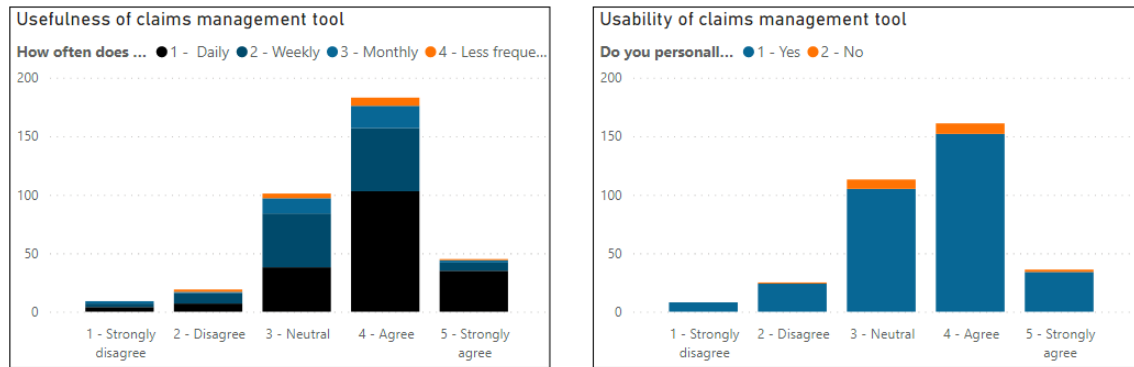


Figure 17. Perceived usefulness and usability of claims management tool

The open feedback related to claims management provides wide range of different topics to be considered. One of the most frequent comment is related to communication process between case company and supplier, as the respondents feel that additional communication must take place outside of Supplier Portal to clarify all the possible comments that might arise. To address this kind of communication requirements, some respondents propose that Supplier Portal would be extended with discussion or chat features. Specific feedback from suppliers also include concern that internal employees from case company don't have needed skills to interact via Supplier Portal and that suppliers are lacking feedback about the claim outcome.

Technical topics addressed by respondents include a proposal that claims related information could be extracted to machine readable format so that it can be inserted to supplier's own quality management tool. In addition, respondents would like to have better visibility towards the claims process by having visibility to when a claim has been previously updated and what kind of changes were done. From process perspective, respondents comment that challenges related to claim attachments are quite common and that claims are often lacking relevant content that would help supplier in taking proper actions.

Usefulness and usability of customs declaration tool is aligned with other Supplier Portal functionalities with similar usage rates (Figure 18). The results for these questions were slightly surprising when compared to practical expectations, as the customs declaration tool has not been that widely implemented. Open feedback related to customs declaration tool was also limited and mainly included experiences about error handling related to large scope of items and possibilities to inform whether a certain material is considered dangerous goods.

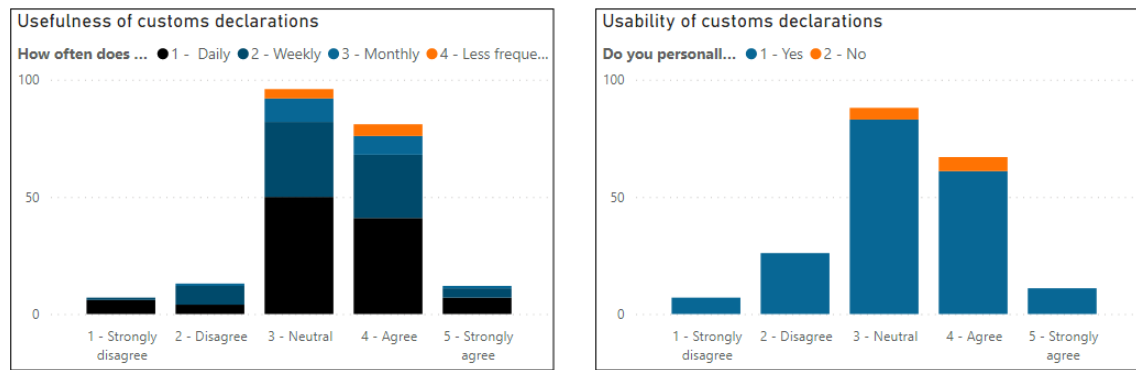


Figure 18. Perceived usefulness and usability of customs declarations tool

Document collaboration tool comprises features that are related to sharing documents, but also to communication as the tool also has chat feature. Having a possibility to discuss about issues directly in Supplier Portal is one of the most commonly requested developments based on the open feedback provided by suppliers. While the Figure 19 shows that usability and usefulness of document collaboration tool is aligned with other Supplier Portal features, respondents request that it could be used more actively.

From technical perspective there are also comments that drawings related to purchase orders or change notices cannot be occasionally opened. This could be related to limitations in product data management system used by the case company as especially older legacy documents have not been migrated into current system which is integrated with Supplier Portal. Additionally, one respondent also notes that the tool could facilitate sharing of also other than .pdf file formats.

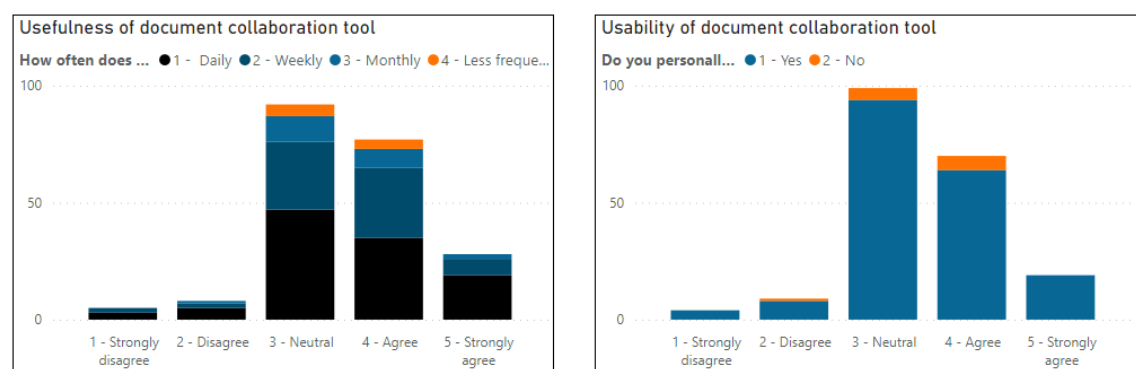


Figure 19. Perceived usefulness and usability of document collaboration tool

Forecast tool is one of the latest functionalities developed in Supplier Portal and it is currently used by the main manufacturing and spare parts purchasing departments within the case company. In addition, the case company does not forecast

to all their suppliers, which can be noticed in the open feedback as some respondents show their interest towards receiving forecasts.

Based on Figure 20, most suppliers feel that forecast tool is useful from supplier perspective. Majority of specific feedback related to forecast tool usefulness concentrates around possibility to start utilizing the tool or related to validity of forecast information which is shared by the case company. From usability perspective, some respondents feel that it is time consuming for them to provide feedback about the forecast and challenging to evaluate their own ability to deliver according to forecasted demand. Some respondents also feel that estimated future orders and already existing orders could be separated more clearly as this way system would be easier to understand.

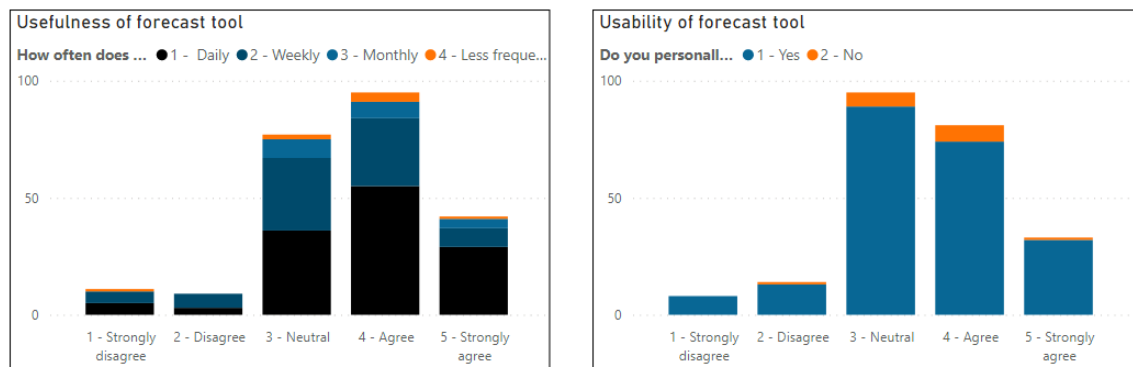


Figure 20. Perceived usefulness and usability of forecast tool

Product compliance tool allows suppliers to provide material or substance related declarations. Unlike the certificates tool, these documents are not connected to individual purchase orders, but instead it is enough that supplier provides document once for a material and after that document is valid for multiple deliveries. When compared to other Supplier Portal functionalities, usability of product compliance is relatively often perceived neutrally or even negatively as seen in Figure 21. This might be related to short implementations schedule and related backlog developments.

Based on the open feedback related to product compliance usability, respondents highlight that there can be plenty of old request for them to provide documents, and that the request status is not often clear for the users. As a result, users feel that they don't understand which specific document would be needed. In addition, some of the respondents indicate that the functionality is not intuitive and that they would require better instructions to support them. One of the respondents

specifically emphasize that the search and filtering options for product compliance tool don't enable them to perform needed activities efficiently. The unclarity related to statuses is especially highlighted when it comes to new product compliance requests.

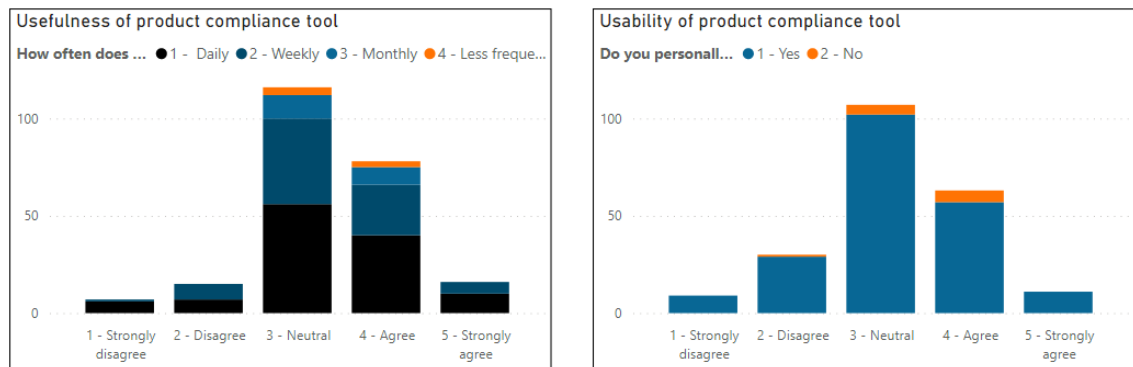


Figure 21. Perceived usefulness and usability of product compliance tool

Some of the responses could be categorized to be process or regulation related as there are strict rules on how the documents must be created and what they should include. At the same time, respondents provide feedback that their work would be easier if they could declare multiple items at the same time. As the tool already includes features that enable users to create one documents for multiple items that have similar characteristics, there could be room to improve the way how these features are communicated to suppliers. On the other hand, request about being able to export and import declaration details in excel format can be considered as one where technical improvement can support usability.

Purchase order management tool is the core and most used functionality of Supplier Portal. In addition to purchase order management, the tool also covers features like invoice and pick-up request creation. Figure 22 shows that usefulness and usability of purchase order management is perceived more positively than any of the other Supplier Portal functionalities. It is also the only tool that does not receive any of the most critical votes when it comes to usability.

On the other hand, purchase order management also receives lot of open feedback and while most of the respondents feel that the tool has improved quality and efficiency of purchase order management, there is also constructive feedback. Respondents would like to have for example more flexibility when it comes to confirmation of certain quantities and possibility to propose alternative delivery

schedules. In addition, the request to enable discussion through Supplier Portal is repeated with order management, as embedded chat functionality would potentially increase transparency and keep the conversation available in one interface instead of having to use email.

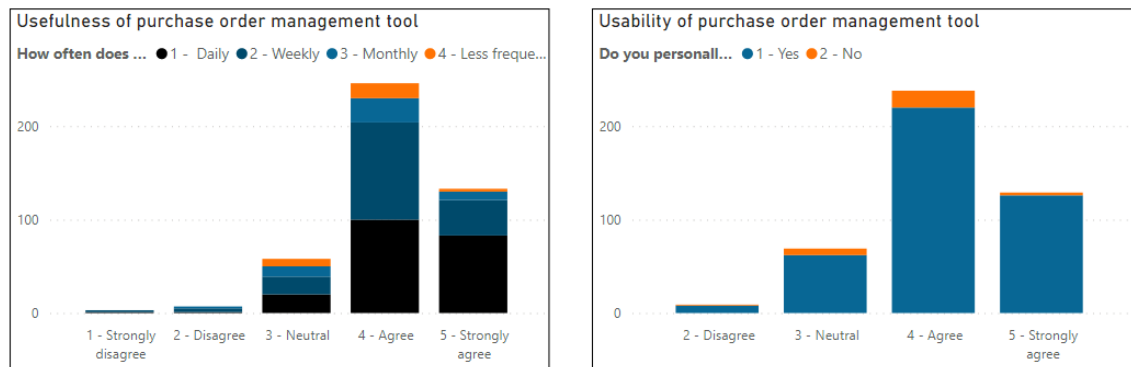


Figure 22. Perceived usefulness and usability of order management tool

One of the major concerns raised by respondents related to usability of order management is the way how the statuses behave. Many respondents highlight the feeling that orders often have incorrect status and representatives of the case company are not either active or skilled enough to process issues with statuses. The risk of incorrect statuses is that the delivery is delayed as the user is not able to proceed due to status related technical validation.

Another frequently raised feedback is related to purchase order email notifications. As some of the supplier organisations serve multiple case company departments and have also other customers using similar solutions, they would like to have more precise details in the emails that notify about new or changed orders. In addition, some respondents highlight that their effort would be reduced if a pdf-version of the order would be delivered already with the email notification. This way they would not have to separately fetch the document from Supplier Portal before understanding what it is about.

One part of order management is the pick-up request tool, which allows suppliers to inform case company and carriers that their shipment is ready for delivery. This feature received some dedicated feedback as it was considered complex and stiff for different delivery scenarios. One respondent specifically proposes that steps related to pick-up request tool could be consolidated to one screen.

Perceived usefulness and usability of RFQ tool (Figure 23) are aligned with the other functionalities that have similar utilization rates. This means that in general respondents feel that the tool can be useful, and its usability is on rather good level. While the tool didn't receive that much open feed, some specific comments were related to status management, ability to decline RFQ's and possibility to add one-time costs. Related to statuses, one respondent would like to have additional status indicating that supplier is in a process of preparing their quotation and expects to have additional information before the quotation can be finalized. The feedback related to having possibility to decline RFQ's can be categorized into communication topics as the tool already allows suppliers to refuse RFQ.

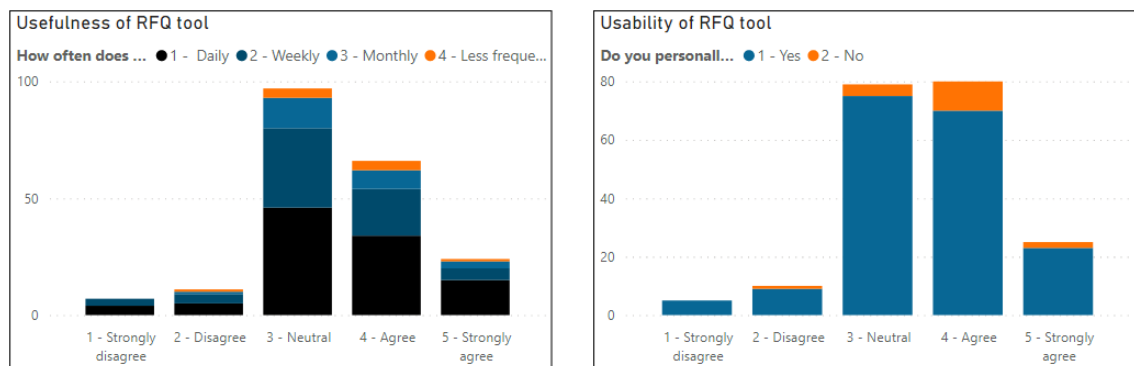


Figure 23. Perceived usefulness and usability of RFQ tool

The remaining two Supplier Portal functionalities, supplier inventory tool and traceability tool are also the least utilized functionalities. Perceived usefulness and usability for supplier inventory tool is shown in Figure 24 and for traceability tool in Figure 25. While the responses are again aligned with other functionalities, share of neutral responses can be considered high especially for the supplier inventory tool. While the traceability didn't receive any specific feedback, one respondent was highlighting that it would be great to have more transparency towards changes on inventory levels in supplier inventory tool without having to keep manual copies of historical values.

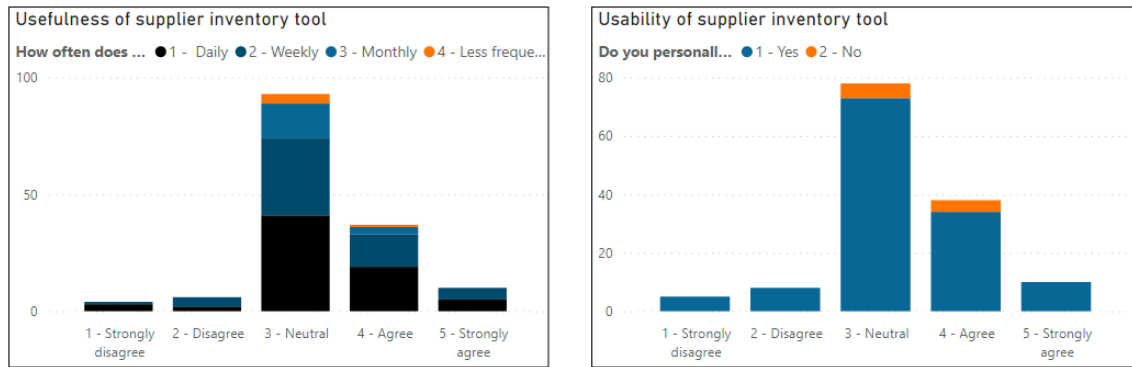


Figure 24. Perceived usefulness and usability of supplier inventory tool

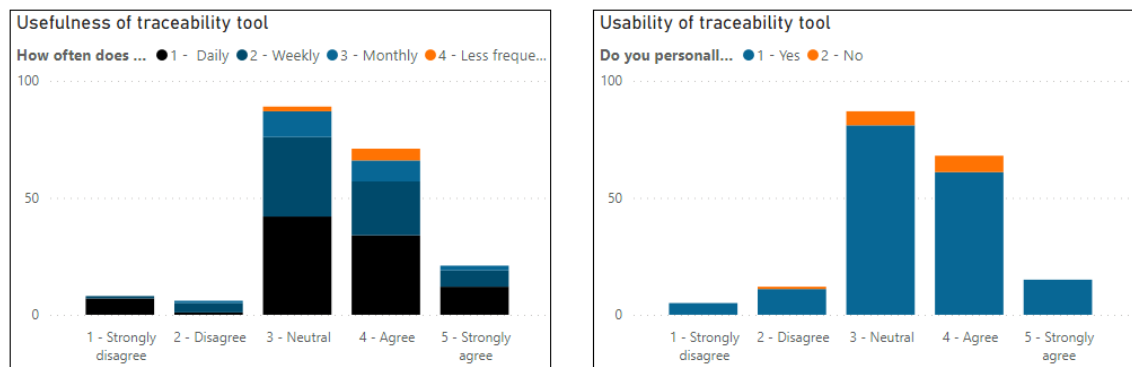


Figure 25. Perceived usefulness and usability of traceability tool

When considering the responses about perceived usefulness and usability in general, it is hard to find notable differences or patterns between the tools. While the overall performance can be considered good, more thorough analysis could be done especially for those functionalities that are not utilized. As it can be also noticed in the figures, the selected variables for usage frequency and personal Supplier Portal use don't have remarkable explanatory power when it comes to perceived usefulness and usability. When comparing detailed responses, a small variation for each functionality can be noticed in the "not in use" responses between usefulness and usability.

In addition to functionality specific feedback, many respondents provided open feedback that was hard to categorize for individual tool. Especially with this general feedback, it was possible to recognize variability in user experience and in perceptions about usefulness and usability. While Supplier Portal receives positive feedback about being easy to use and that it has improved efficiency of collaboration, there are similar comments that are stating the opposite. On the other hand, few comments compare Supplier Portal against similar web based IOIS

provided by other customers and typically Supplier Portal is considered to have better usability and usefulness.

When considering development opportunities, many respondents highlight the importance of having simple and easy to follow instructions available with minimal effort. Keeping the instructions updated and available is considered especially important when new functionalities are released. Some of the respondents also provide critique towards competence of internal employees of the case company, as they feel that case company employees often lack the skills required to collaborate through Supplier Portal and to handle problematic cases. Another frequent, yet specific, usability related request would be to extend Supplier Portal and instructions into different language versions.

When it comes to technical topics, respondents would consider that Supplier Portal usability could be improved by making their own article numbers visible in all the functionalities and that they should be also available for search and filtering. Currently supplier article number is visible only in selected views. Other technical topics mentioned by the respondents include contents for the email notifications and clarity of item statuses, like mentioned already for some of the functionalities. Additionally, some respondents propose that cleaning of old documents, like purchase orders, should be conducted more frequently as it would support system usability over time.

In general, the respondents also mentioned that their user experience would be improved if they could use only Supplier Portal to collaborate with the case company, instead of having multiple IOIS or non-IOIS processes. This would require commitment from all the case company purchasing departments to use Supplier Portal instead of implementing their own solutions. Similarly, commitment would be needed so that individual employees would concentrate their activities to Supplier Portal instead of deviating from the process by using emails or other communication tools.

5.3 Overall use of Supplier Portal

This section focuses on presenting the results for question 11. These statements aimed to understand different aspects related to Supplier Portal use and how users perceive them. From a theoretical perspective, each of the statements address one or multiple of the wide range of utilization and acceptance related dimension like social influence and facilitating conditions. On the other hand, some of the statements have more stronger business orientation as they aim to understand how respondents feel about specific topics. More detailed results for the question 11 can be found from appendix 2.

Also replies to question 13 are considered during the section. Question 13 aims to reveal how willing the responded would be to recommended Supplier Portal to their colleagues or other suppliers. Therefore, it is considered to provide good summary of respondents perception about the IOIS use. Therefore, it will be also used to explain some of the statements from question 11.

Figure 26 presents how respondents perceive pressure from case company and how it impacts their use of Supplier Portal. Purpose of this question is to understand impact of social influence to Supplier Portal acceptance, as pressure from stakeholders is considered important for IS usage and acceptance according to models like UTAUT, and it has been also recognized by literature. From the results it can be observed that over 40 percent of respondents agree or strongly agree about pressure from case company being the main reason why their organization uses Supplier Portal. The figure also shows how likeliness to recommend Supplier Portal is reduced among those respondents who considers the pressure being main reason for use. From the results, it can be noticed how respondents who have perceived high pressure from case company, would be the least likely to recommend Supplier Portal for their colleagues or other suppliers.

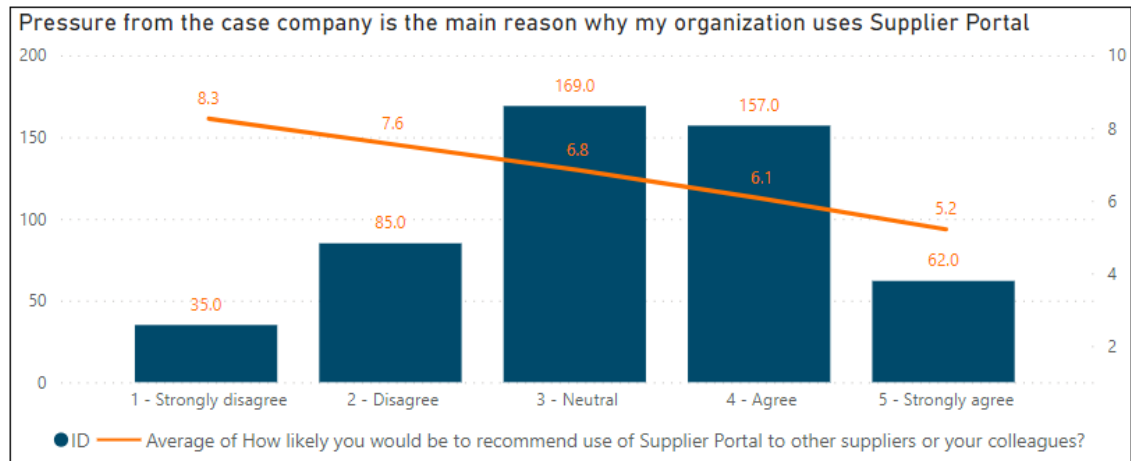


Figure 26. Impact of pressure to Supplier Portal use

Based on previous studies, performance expectations describe the positive outcomes related to improved performance that users expect to gain when using a new technology. Higher level of utilization and acceptance can be expected, when the users feel that certain technology will help them to improve their performance. Figure 27 shows how the respondents feel about Supplier Portal being beneficial for both organizations, suppliers, and the case company. From the case company perspective, the results can be considered positive as majority of respondents feel that Supplier Portal use is beneficial for both parties. Additionally, it can be noticed how positive feeling about Supplier Portal being beneficial also correlates with willingness to recommend Supplier Portal. Especially, the respondents who feel that Supplier Portal doesn't have benefits are unlikely to recommend its use to others.

Although many respondents consider that Supplier Portal use has helped them to perform more efficiently, there is a small difference compared to ones who felt that use is beneficial for both parties. The difference between these two questions could be explained, for example, by considering that Supplier Portal utilization can also have benefits that respondents consider important although they are not positively impacting efficiency. As an example, if respondent expect higher commitment from their customer as a return of Supplier Portal, use can be considered beneficial although it could decrease efficiency. This kind of expectations were visible in some of the open questions.

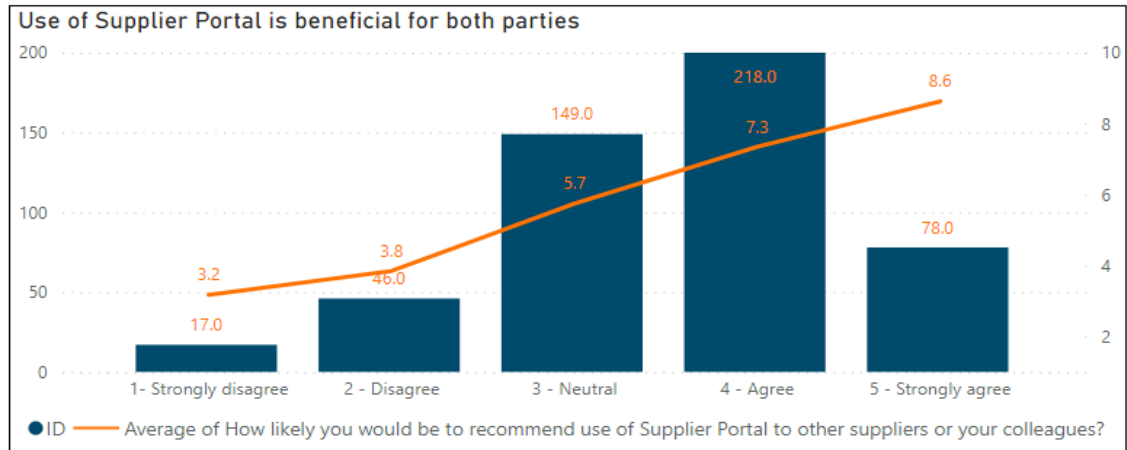


Figure 27. Use of Supplier Portal is beneficial for both parties

Figure 28 illustrates how respondents feel about Supplier Portal helping their organization in being more efficient. Positive correlation between perceived efficiency improvements and willingness to recommend Supplier Portal can be also noticed.

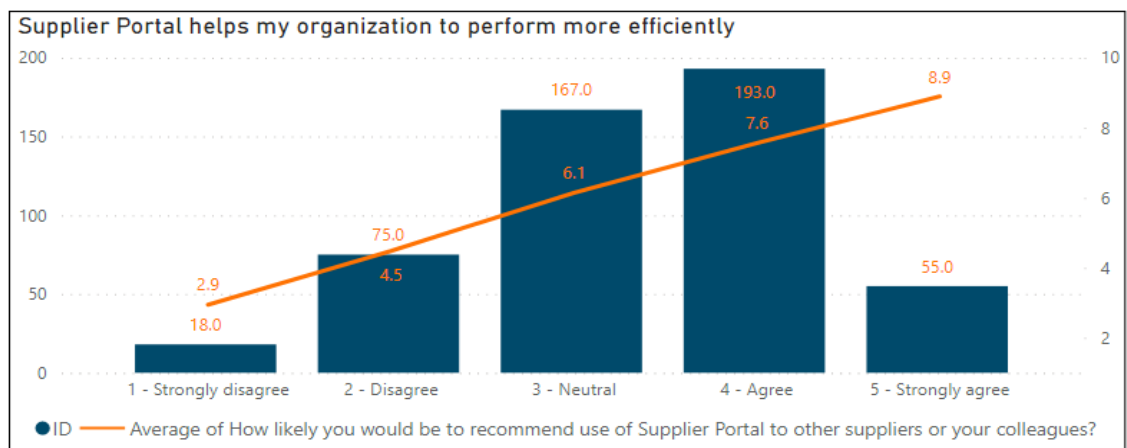


Figure 28. Supplier Portal and efficiency

According to UTAUT model, effort expectancy describes the amount of work that user believes is required from them when starting to use a new technology. This effort is considered smaller when the system is easy to use, and the users understand what is expected from them. Similarly, it can be also expected that users are more willing to accept new technologies when the effort needed for using them remains low.

While the effort expectations were already addressed with questions related to usability of each individual functionality, topics related to ease of use were also considered as part of question 11. Perceived ease of use was evaluated from two perspectives: how easy it was for the respondents to start using Supplier Portal

and how easy they consider that Supplier Portal is to use in general. Figure 29 addresses the perceived ease of use in the beginning, while Figure 30 doesn't have any specific time scope.

When comparing the two figures, notable differences cannot be observed. Related to both statements, only few respondents strongly disagree that starting to use or use of Supplier Portal would be easy. For both statements more than half of the respondents either agree or strongly agree with the statements.

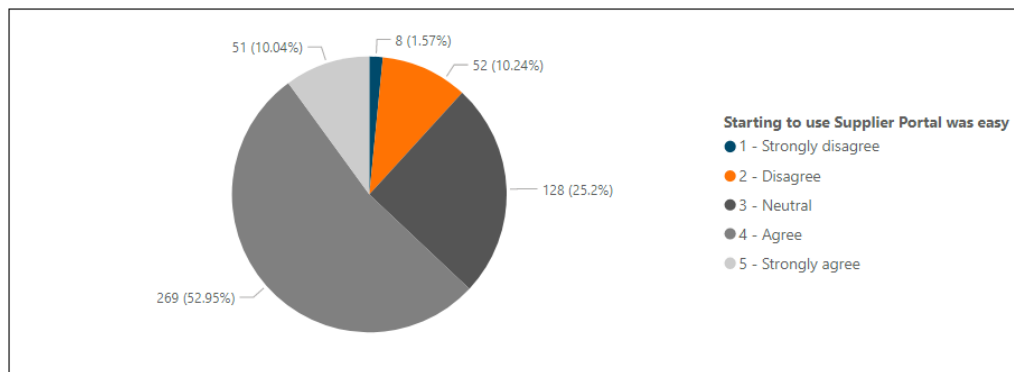


Figure 29. Perceived ease for starting Supplier Portal use

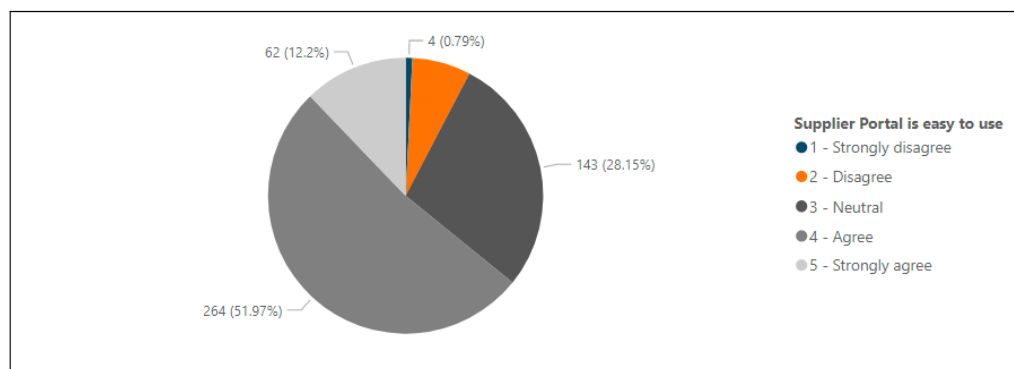


Figure 30. Perceived ease for Supplier Portal use

Statement about how well respondents know what is expected from them when using Supplier Portal aims to also address perceived effort. This is because it can be considered that clear requirements and expectations reduce need for users to investigate what they need to do. The results for this statement are shown in Figure 31 and they are aligned with previous results related to ease of use as majority of respondents agree or strongly agree with the statement.

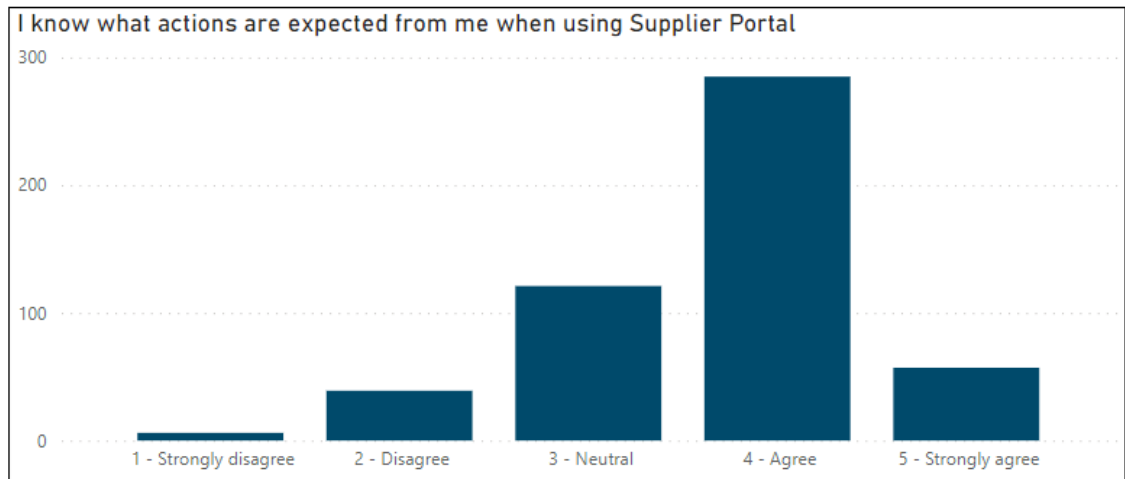


Figure 31. Clarity of expected actions

Some of the respondents addressed the effort related to use of Supplier Portal in their responses to open questions. Due to large number of respondents, it is also quite natural that the comments related to perceived effort varied notably. While some of the respondents report that Supplier Portal usage has made their work more complicated, and it requires more time than before, there are also comments about how Supplier Portal has clarified the collaboration and made information exchange faster, and improved availability and transparency of needed documents.

In their open comments, some respondents highlight that additional effort is needed when data must be transferred from Supplier Portal into their own ERP system and back. The replies also include comments about how the effort could be reduced if the data from Supplier Portal can be easily extracted and inserted in standardized format. The interest towards integrating Supplier Portal with respondents own ERP systems was separately mapped with a separate statement. Replies related to this statement are presented in Figure 32.

While some of the respondents had highlighted their interest towards more integrated solution, overall responses would indicate that most of the suppliers do not have specific need or willingness to increase level of system integration. Suppliers who had interest towards increasing system to system integration, had also provided some open comments related to the topic. While the statement considered system to system integrations, it is good to recognise that some respondents

highlighted that already possibility to export data related to orders and other documents into excel would help them to work more efficiently when transaction volumes increase.

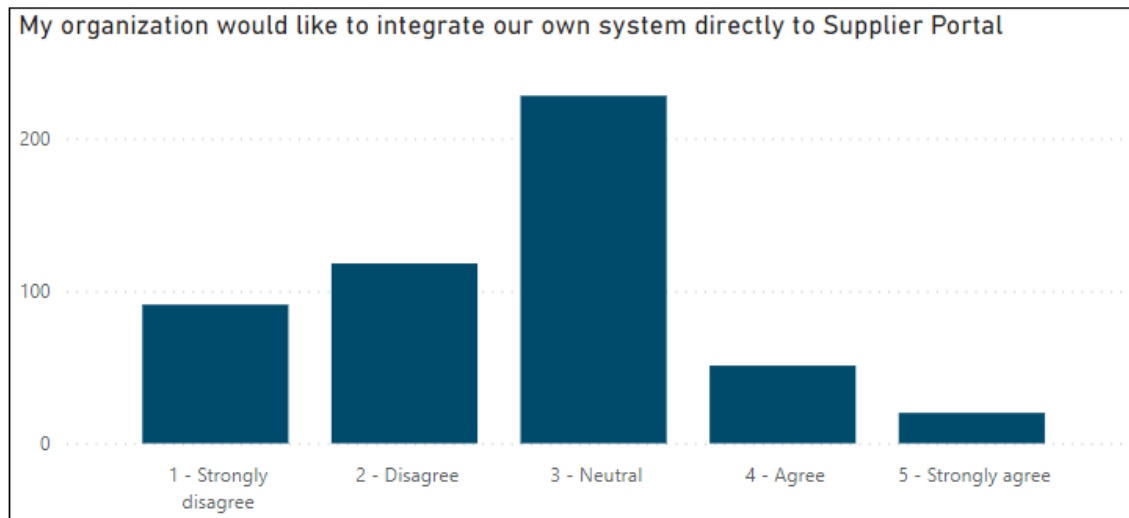


Figure 32. Supplier Portal and integrations to respondents internal system

According to UTAUT model, facilitating conditions include elements that support system usage and implementation. Typically, this covers elements like availability of training, instructions, and support. Topics related to facilitating conditions were addressed with three statements that cover these topics.

Figure 33 shows how respondents feel about the need for contacting someone from the case company to solve issues related to Supplier Portal. Based on the results, majority of respondents disagree with the statement, which can be interpreted as a positive signal about system functionalities and needed support. In other words, suppliers are mainly able to solve problems themselves or they are not having problems that frequently.

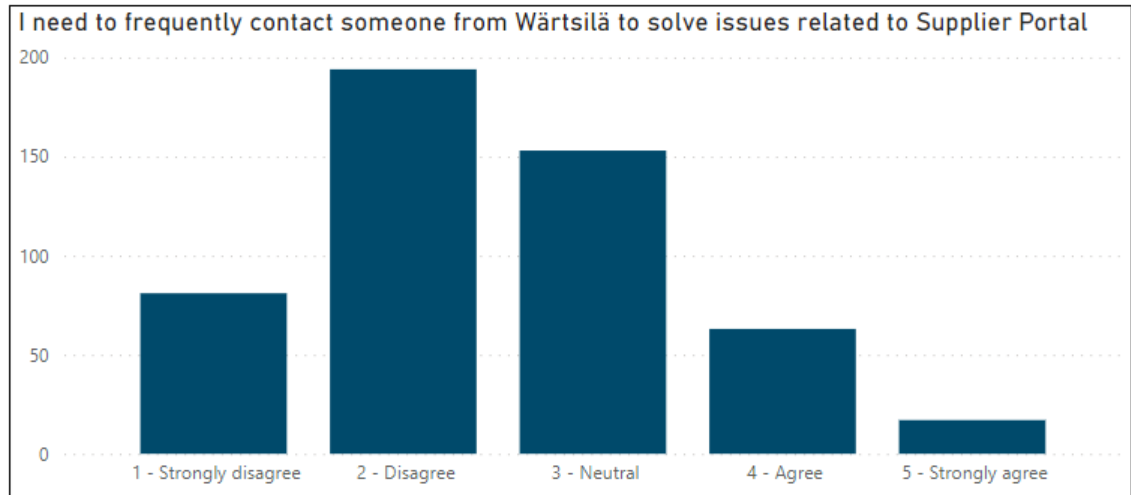


Figure 33. Need for frequent support from case company to solve issues

Another statement approached the same topic by asking if the respondents know who they can contact from the case company when they have problems. Results for this statement are shown in Figure 34. Based on the results it can be observed that most respondent feel that they are aware how they can get assistance and who to contact when help is needed. In addition to these results, there was some respondents who proposed that generic help chat or ticketing solution could help when they are needing assistance or have questions.

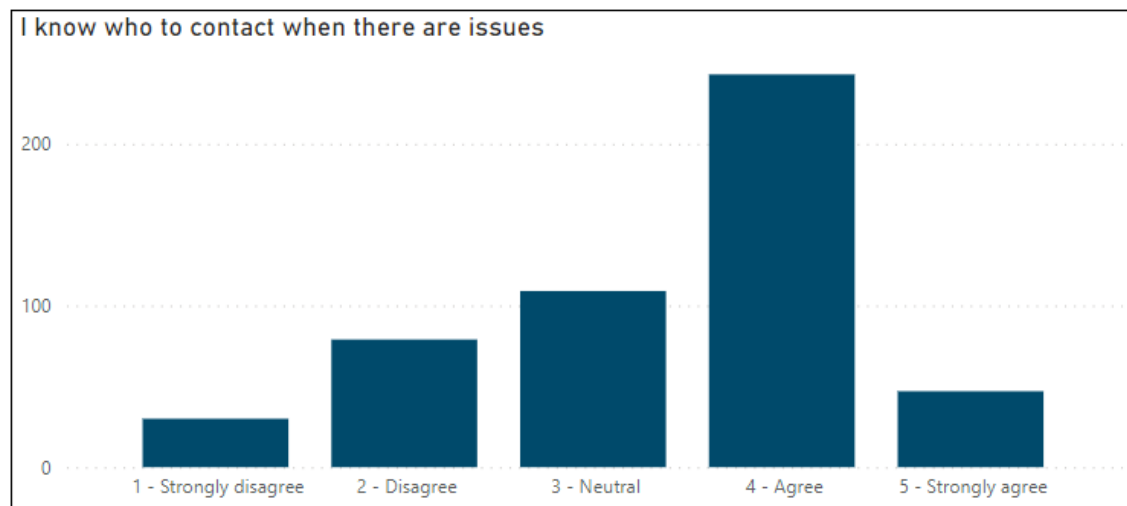


Figure 34. I know who to contact when there are issues

The last statement related to facilitating conditions is related to access for training materials, instructions, and guidance. While most respondents feel that they have needed access for supportive materials (Figure 35), there was relatively large amount of open feedback and comments about instructions, as was mentioned

in an earlier section related to general usability. To summarize, while the respondents feel that instructions are mainly well available, they also highlight the complexity of current instructions document and would hope for more simple instructions that would be easier to follow. Additionally, there was also a comment about how the instructions could be easier to access directly from the user interface instead of a need to separately navigate into help section. Similarly, it was also addressed that the case company should prepare the supportive documentation prior to implementing new functionalities, instead of publishing the materials afterwards.

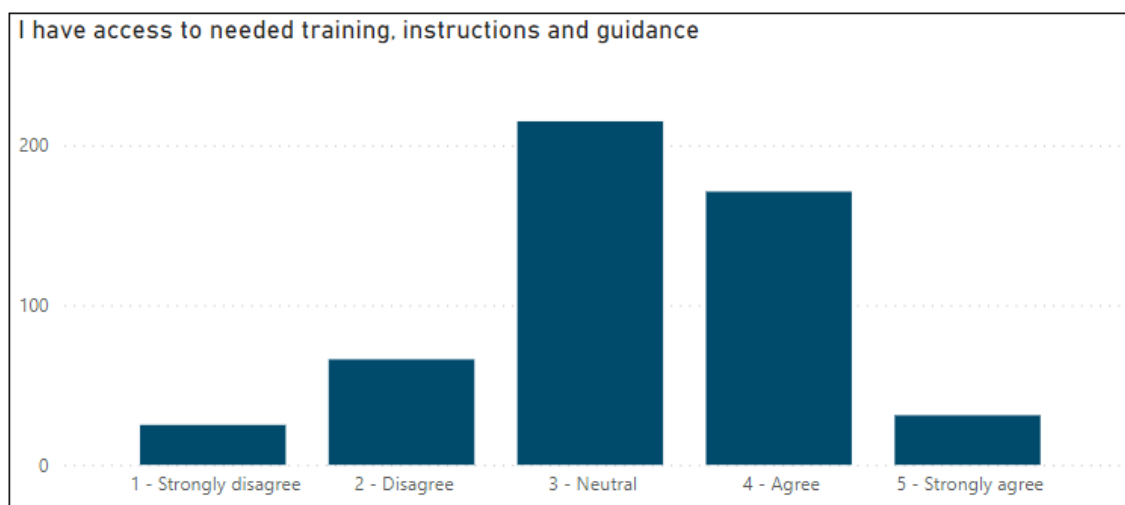


Figure 35. Perceived access to training, instructions, and guidance

Being able to rely on information shared through an information system has been recognized by literature as one of the main contributors for utilization and acceptance. In other words, poor level of information reliability often leads to situation where system will not be actively used. The reliability of data shared through Supplier Portal was addressed in one of the statements and the results for it are shown in Figure 36. According to the responses, typical respondent indicates that they can trust information which is shared through Supplier Portal.

Some open responses addressed topics related to data quality and more precisely availability of correct information. For example, some respondents highlight that efficiency of Supplier Portal is highly dependent on the data quality and lot of focus needs to be placed for ensuring that information is kept up to date. One of the respondents also mention that risk related to poor data quality is always relevant when information must be manually inserted to and from their own ERP

system. Regarding the availability of needed information, the most concrete examples are related to supplier article number as mentioned in previous section, and to availability of case company contact details, when suppliers would like to have direct contact for clarifying something related to their deliveries.

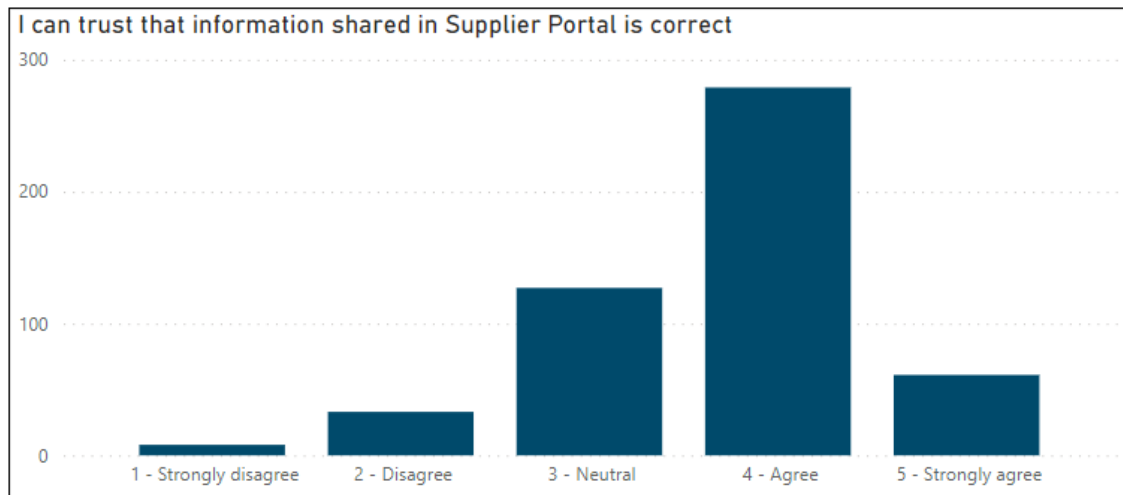


Figure 36. Reliability of Supplier Portal information

The last remaining statement is related to respondent organizations willingness to participate in Supplier Portal development work. This question can be considered important, as having the possibility to influence on system features has been typically considered as an element which increases acceptance and commitment for utilization. Also, from the case company perspective, there was a feeling that actual system users could be listened more actively. Figure 37 shows that majority of respondents are having neutral thoughts about the topic, while some are also giving positive signals about willingness to participate more actively. As a result, case company could try to identify those suppliers who are willing to take part in development and utilize their views more actively.

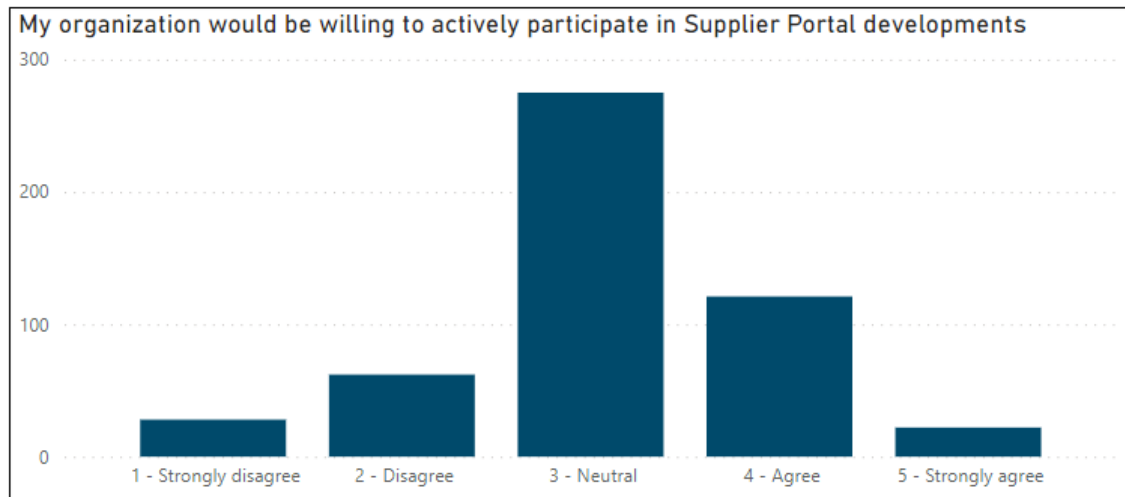


Figure 37. Willingness to participate in Supplier Portal development

5.4 Future developments

To meet the research objectives, respondents were also requested to provide their thoughts about future development opportunities related to existing or missing Supplier Portal functionalities. From a general perspective, this part of the questionnaire gained only limited attention and most respondents did not provide any proposals. On the other hand, some of the responses related to development opportunities can be considered concrete proposals that address improvement opportunities related to processes and the system itself. Also, individual comment about interface being outdated were provided, but unfortunately without any additional specifications.

For example, respondents highlight challenges related to statuses, email notifications and search functionalities, as was mentioned already in previous sections. The respondents who are working in a larger organization would like that email notification includes more precise information about case company and its specific departments. This way they could focus on the messages that are relevant specifically for them. Having the pdf attachment already included with the email notifications would reduce the need for going into Supplier Portal just to fetch the needed information in first place.

One specific comment highlight about issue related to notifications coming to users with limited user rights. These users can only book deliveries and are not

even able to adjust their own notifications settings. Still, they are constantly receiving email notifications about new documents that they cannot access or see. Related to statuses, better clarity and correctness would help respondents to understand what they are expected to do. To support objective of having clearer overview of open topics, process for cleaning already processed orders could be established. Regarding search functionalities, some respondents would like to have more alternatives to limit results for example based on project related information and similar criteria.

One bigger topic that was highlighted by the respondents, is the commitment of the case company to utilize their own Supplier Portal. Many respondents feel that it is challenging to work when different case company departments want to use their own solutions to collaborate with suppliers. When the suppliers are working with many different departments, request to use multiple tools is considered challenging. In addition, some internal case company users are not considered committed enough on personal level to collaborate via Supplier Portal and have relatively low threshold to deviate from integrated process and agreed tools. Similarly, respondents wish that operative contact persons from the case company would be more responsive in addressing their questions when problems arise.

Respondents would like to also increase level of communication that can be performed through the Supplier Portal. This covers more active utilization of document collaboration tool and its chat functionality, but also improvement to how purchase orders are confirmed. More specifically respondents would like to be able to provide open comments related to their confirmation, and a possibility to provide alternative delivery schedules based on availability and possibilities to deliver. Also, a possibility to inform case company about incorrect information or statuses is requested.

Related to management of supplier user accounts, one respondent highlights need for having a better visibility on which user accounts exist and have access to represent suppliers. In addition, the respondent proposes that there could be a possibility for supplier users to make changes to their own user accounts. This kind of development could help suppliers to maintain user accounts more effec-

tively themselves, and thus it would reduce need for internal maintenance activities from the case company. In addition to user management, there was also proposal on how the user experience could be improved by adding more alternatives for user level customization related to topics like landing page and email notifications.

To conclude discussion related to future developments, it is good to recognize that many respondents stated that Supplier Portal shouldn't be extended to cover new topics. Meaning that the respondents are happy with current functionalities, while new extensions would require additional work effort related to implementation.

5.5 General feedback

This section presents those comments and feedback that were highlighted by the respondents but haven't been covered during the previous sections. For example, many respondents highlighted how the use of Supplier Portal has removed personal collaboration between the parties. Based on the open comments this is mainly perceived negatively as respondents would like to build relationships more actively as they consider that many of the most challenging topics would be solved more easily through direct contacts and personal relationships. While this feedback is related to social elements and can reduce acceptance or perceived usefulness of Supplier Portal, it is not included to topics which are traditionally considered as part of social influence according to UTAUT model.

While it was not specifically covered in the questionnaire, respondents were also mentioning the reporting solution that has been made available through Supplier Portal. Most of the comments feel that having updated KPI figures easily available increases transparency and improves performance awareness. Therefore, respondents would like to see that the reporting would cover also additional topics related to quality performance for example. Critique towards reporting dashboard was mainly related to unclarity of specific measures as the respondents felt that they are not always certain what is the purpose of a specific report.

Through the open comments, it is possible to notice that some unclarity exists when it comes to system capabilities and purpose of specific tools. For example, some respondents request for possibility to create and send invoices through

Supplier Portal, while order management functionality has covered this feature for many years. Same applies for possibilities to reschedule and reconfirm purchase orders without email communication. Similarly, some responses related to need for using product compliance tool, indicate that suppliers do not understand that requirement for providing such information is mandatory. In other words, reason for having the business process itself is unclear.

While the situation related to system capabilities and purpose of functionalities could be addressed through communication and guidance, respondents also give feedback about lack of systems competence when it comes to their contact persons within the case company. This means that respondents feel that employees in the case company do not have needed skills to fully utilize the tool up to its potential or experience to solve problems when they arise. Therefore, communication and competence development should be also evaluated from internal perspective.

The fact that Supplier Portal is used to collaborate with a very wide range of suppliers in terms of technical maturity, organization size, relationship type and for example geographical location, can be observed in the comments. As a concrete example there are many comments where the respondents express their wish to have more language version available for the Supplier Portal interface itself or at least for the instructions. Similarly, some responses conflict against each other and most probably these comments are related to totally different collaboration environment and relationship.

Variability in how respondents perceive Supplier Portal, is also clearly visible in the comments on how they feel that it has changed their collaboration with the case company. While some of the respondents mainly raise negative feedback about collaboration now being more complex and requiring more effort, majority of feedback indicates acceptance and even specifically mentions system clarity as one of the major positive elements. While it can be hard to make conclusions about individual topics due to the variability, it is at least important to recognize that Supplier Portal users can't be considered as one group that would share common perspectives, ways or needs for using the system and to collaborate with the case company.

6. DISCUSSION

This chapter is to summarize the empirical findings that were presented in the previous chapter. In addition, the results will be compared against theoretical framework and possible reasons behind certain comments and recommendations will be considered. The discussion will be divided into sections according to main dimensions for utilization and acceptance based on UTAUT model and supported by considerations from the perspective of task-technology fit. The final section of this chapter aims to answer the research questions that were set during the first chapter.

6.1 Performance expectations

Performance expectations describe the performance improvements that the user expects to gain from using specific information system. In this questionnaire, topics related to performance expectations were addressed through questions related to usefulness of different functionalities and with statements about how Supplier Portal has impacted suppliers efficiency and if the Supplier Portal is considered beneficial for both parties. In addition, many respondents also considered performance related topics as part of their open feedback.

When reviewing the usability results for different functionalities, it can be noticed how the order management and claims management tools positively stand out when compared to other functionalities. This is aligned with the high usability rate of the tools. The fact that these tools are perceived as most useful can't be considered surprising as they are forming the core activities that are basically relevant for all suppliers who collaborate through Supplier Portal. Order management is also the activity that involves the highest number of transactional communication when purchase orders need to be sent, received, confirmed, and possibly also reconfirmed. According to previous studies, benefits for using IOIS have been perceived most evident when the transactional volumes are high.

On the other hand, the respondents indicate high perceived usefulness and interest also towards forecast collaboration tool, although this process has low transactional volumes due to forecasting frequency typically being monthly. For

the forecast process the high perceived usefulness most probably is not related to having forecast visible in the Supplier Portal, but about forecasting in first place and receiving information about forthcoming demand. This can be also noticed based on the open replies where suppliers shared their interest towards possibility of starting to use forecast tool. At the same time, those respondents who were already using forecast tool, felt that requirement for the suppliers to provide feedback about their capability to deliver according to forecast, did not improve their performance and was considered unneeded. As suppliers are not always able to recognize value of their own feedback towards case company, there should be more clear communication about importance of this information for the case company. This could potentially improve the justification for the requirement.

Based on the questionnaire results, majority of respondents felt that Supplier Portal has improved their efficiency. Open comments indicate that this improvement is mainly related to having one dedicated channel for communication that also consolidates information into one place and allows multiple different users to participate in the process and access information at the same time. On the other hand, the respondents feel that the process becomes inefficient when there are deviations or non-standard requirements, and if communication outside of Supplier Portal is needed. Therefore, process performance could be supported by improving Supplier Portal as a communication channel that also facilitates more flexible dialogue. This improvement would be also beneficial from the case company perspective as the volume of email communication and lack of transparency has been frequently highlighted as a problem in collaboration.

Positive perceptions regarding mutual benefits from using Supplier Portal is notable based on the responses. Together with the earlier results, this can be considered as an indication of acceptance from the users, especially when it comes to Supplier ability to reach performance improvements by using Supplier Portal. Good performance perception is important as it was highlighted in literature as the most important individual element that impacts acceptance.

Majority of performance related negative comments that were addressed by the respondents, was related to the need for processing the information many times. This means that supplier must first collect the information from Supplier Portal, insert it to their own system, and then also update the same information back to

Supplier Portal. This process needs to be performed again each time that there are changes or updates. The possibilities to reduce negative performance impact of double work are mainly related to possibility of increasing integration through S2S solutions. These are addressed also in the next chapter of effort expectations, as the double work also increases the effort expected from the users.

While the need for double work is most impactful for suppliers who have high transactional volumes, the responses also indicated that negative performance impact also occurs with suppliers who consider themselves as low volume users. In such situation negative performance impact seems to be mainly related to difficulty for accessing the system irregularly and being up to date on what is expected. These kind of low volume users would like to continue manual way of working.

Otherwise, the amount of performance related feedback from the respondents was limited and there were no major issues highlighted by the respondents. Instead, some of those users who had experience from similar Supplier Portal solutions with other customers, felt that the solution provided by the case company compares well against similar solutions when it comes to usability. This comparison should be considered as a positive indication and as a proof that no major changes to current system would be needed.

6.2 Effort expectations

Effort expectations describe the level of expected effort that users consider to be required when they start using certain technology. As the perspective of this thesis was restricted to already existing users, effort related topics have been approached through usability and ease of use. Additionally, also the statement about how well suppliers understand what is expected from them when using Supplier Portal, contributes to perceived effort as unclarity can increase the needed effort related to system usage.

Based on the responses related to ease of use, majority of users perceive that Supplier Portal is easy to use, and its implementation was not too hard. Some open responses highlighted that there was a learning curve related to system use, as it felt complex in the beginning. Similarly, majority of users considered

that they understand what is expected from them when they are working with the Supplier Portal.

Positive feedback about ease of use can be considered as an approving indication about how the current tool has been designed. Although the results don't indicate major issues related to ease of use, similar simplicity and focus on usability should be considered when planning future developments. Also, it would be important that common trends related to usability development are actively followed as these trends can impact user perception. While considering usability, it is good to notice that many of the latest developments have been related to processes where collaboration is more complex due to nature of requirements. When working with these kinds of topics, it is important that the simplicity is not achieved through missing features or poor technical performance.

Some open feedback highlighted the increased effort which is related to need for using Supplier Portal in addition of their own ERP systems. On the other hand, only few respondents indicated their willingness to integrate their own systems to Supplier Portal. This could be related to for example required effort and cost related to S2S integrations. At the same time respondents indicated wish to have easier ways for extracting information from Supplier Portal, and for inserting required information back. From a development perspective, case company could consider standardized file formats in which users can download information to spreadsheet or other machine-readable files. Similarly, also possibility to insert information back to Supplier Portal should be enabled.

Regarding usability, user perceptions related to different functionalities were mostly aligned when compared against each other. On the other hand, claims management and purchase order management tools showed up positively compared to other tools. Positive feeling about their usability is also aligned with positive experiences related to usefulness of these tools and their high utilization rate.

Negative feedback related to usability and required effort was provided especially for the product compliance tool. This feedback included for example comments about complexity of the process and difficulty to understand the request statuses that require suppliers to take actions. In addition, respondents highlighted the

need for being able to provide compliance declarations more efficiently for multiple articles at the same time.

The origin for these comments related to product compliance tool can be considered from couple of different perspectives, including communications and technical features. Related to communication, case company should consider how the suppliers were contacted and introduced to the new topic, and how the new requirements related to product compliance were explained to them. Similarly, also the communication related to tool features and capabilities could be reviewed, as some of the questions indicate how suppliers do not fully understand what is expected from them and how to use tool more efficiently. From a technical perspective, case company could also evaluate whether to have data export and import features available for product compliance tool and if the interface design can be more self-explanatory.

Challenges related to status management and email notifications were mentioned in the responses many times and complexity related to statuses was also highlighted as part of feedback related to product compliance. Respondents feel that difficulties to interpret statuses correctly, increase their effort and makes it more difficult for them to understand what is expected from them. Occasionally respondents also feel that they are not able to perform needed activities as the orders or other documents are stuck on incorrect statuses.

To improve challenges related to status management, improvement activities could include technical developments, more transparent communication and detailed supportive materials that explain purpose of each status. As a technical development opportunity, couple of topics should be considered. First, there could be processes to identify items that have wrong statuses and that could cause delays. This is especially related to those items that are waiting for actions from the employee of the case company. If the responsible person doesn't take actions in a desired time, additional notifications should be implemented to urge corrective actions.

The existing statuses should be also reviewed from a technical perspective so that they are not causing additional administrative work. This means for example cases where supplier first confirms change in the order and then internal user

approves the change, but due to status issues supplier still needs to reconfirm their original changes so that they are able to proceed in the process. Finally, a mechanism to clean and remove old and closed items would improve clarity of the system.

Otherwise, clarity of the statuses can be improved by communicating towards users more clearly about what each individual status means and what kind of actions are required from them. While these explanations can be included in the instructions documents, there should be also a description on how the statuses are updated and what kind of activities impact them. This kind of information could be made also available as tooltip directly in the user interface.

Regarding email notifications, respondents highlight that their effort could be reduced by increasing the level of information included in the notifications. Suppliers who are working with multiple different case company departments would like to have more detailed information about which department has created or changed the document, so that only the responsible person from their side could take the needed actions. Some respondents also propose that the relevant documentation could be already shared as a file attached to the email, so that they wouldn't need to log in just to fetch the document. Both of these technical developments could be considered as potential improvement opportunities that could reduce the effort related to Supplier Portal usage.

When it comes to making it more clear for the users what is expected from them, small improvements could be achieved through technical improvements, while emphasis should be on how the functionalities are described in supportive materials. Technical developments could include info boxes that inform what is expected from the user. More importantly, the supportive documentation should include description on what is expected from the users and why certain actions need to be performed accordingly. This is especially important when suppliers are requested to perform activities in Supplier Portal that haven't been previously required at all. If the background for these requirements is not properly clarified, it will be harder to navigate through the required steps.

6.3 Social influence

In the context of this thesis and related to Supplier Portal utilization, social influence is mainly about the pressure that suppliers receive from the case company to start using Supplier Portal and for utilizing it actively. Based on previous studies, pressure from the customer is relatively difficult factor to consider as it can have both positive and negative influence on the actual utilization and acceptance. As it was reported in previous chapter, notable share of Supplier Portal users who provided responses, feel that pressure from the case company is the main reason why they are using Supplier Portal. Similarly, the users who feel that pressure is the main reason for their use, are least likely to recommend Supplier Portal use for their colleagues or other suppliers. On the other hand, it slightly contradicting with the result of many suppliers feeling that Supplier Portal use is beneficial for both parties.

Although the questionnaire was performed by asking perspectives from already existing users, information about pressure being an important contributor for usage can be valuable as it could alter the possible communication strategies and influence on what kind of future developments are considered. For example, clear clarity about role of Supplier Portal as a tool to increase supplier integration could help suppliers to understand how they can benefit from Supplier Portal use. This activity could also include training of internal case company employees so that they can more fluently communicate to supplier about advantages of Supplier Portal usage and support in finding best setup when it comes to useful functionalities. Similarly, there could be communication about alternatives like S2S integrations with a clear guidance what implementation of more integrated solutions would also require from the suppliers themselves.

On the other hand, it can be expected that if most suppliers need to use Supplier Portal in addition to their own internal ERP systems, pressure from case company is likely needed to support implementation. Use of pressure to impact supplier implementation and utilization behaviour could be better justified when case company is more transparent about the benefits and motivation of using Supplier Portal. This could be done by clearly explaining the advantages for suppliers who use Supplier Portal, compared to ones who are not willing to use it.

It was interesting to see how some respondents highlighted how the reduction of personal collaboration has been one of the negative things related to Supplier Portal use. Although it has not been especially considered as part of social influence related topics, it is good to know that fear of losing personal relationship can negatively impact willingness to implement Supplier Portal. In addition, lack of personal collaboration can reduce commitment from the suppliers and decrease ability to solve challenging problems. This could be especially damaging for those departments who are already working in teams instead of having individuals as contacts for the suppliers. This aspect of using Supplier Portal could be mitigated for example by making it more visible for the suppliers about who they are communicating with and how they are able to contact this person in case of issues.

When considering the objectives for this thesis and comparing them to findings from the questionnaire, the impact of social influence can be considered rather low. The results were aligned also with the expectations as active work for implementing Supplier Portal has been needed, and especially implementation of new functionalities to already existing supplier users has been relatively difficult.

6.4 Facilitating conditions

According to UTAUT model, facilitating conditions cover factors that support implementation and usage of new technologies like information systems. Also, individuals expectations about having the support available when needed, is part of facilitating conditions as the expectations will impact willingness to start using specific technology. As the scope of this thesis is limited to existing users and how they perceive Supplier Portal, also the facilitating conditions were evaluated from the perspective of the current support that users consider is available for them.

Perceptions about facilitating conditions were specifically collected through three different statements that covered questions related to availability of support, frequency of cases when support is needed, and access of training, instructions, and guidance. While majority of respondents perceived positively topics covered in facilitating conditions, there was also quite many comments related to these topics as part of the open replies. While some of the users struggled in finding the instructions in the Supplier Portal, most of the instructions related feedback

was more about to the format and complexity of the instructions document. Due to complexity of instructions, some respondents considered that the effort needed to review specific topic is too high.

The availability of relevant support materials could be improved through technical solutions and design of the interface. In the current solution, user must navigate from a specific screen where they are performing activity to a separate help-page from where they can download instructions. By adding help-icons directly into different sections in user interface, access to instructions could become more visible, although the required number of clicks would remain the same. On the other hand, if the help-icons would open a pop-up view with instructions that are specific for that screen, the issue related to format and complexity could be addressed at the same time and the support would become more accessible and easier to understand.

The main support document for Supplier Portal is currently the user guide which covers all the different functionalities and basic use scenarios related to them. In addition, there are couple of documents that address specific functionalities separately and also video instructions for a few of the functionalities. Majority of these separate documents originate from projects that were responsible for developing and introducing the related functionality. Therefore, these documents are typically concise, but separated from each other when it comes to contents, looks and logical structure of explaining the processes. If some later improvements have been done for a functionality, it is also likely that especially the video instructions remain to be not updated.

By reviewing the current documents and dividing them into smaller packages, the usability of supportive materials could be improved notably. When the effort for using instructions would be decreased, the utilization level could increase. This, on the other hand, would have potential to reduce the need for additional support. One way to improve supportive materials could be to create more interactive material like short videos for specific topics.

As most of the current materials have been created by business process experts who have participated in development projects, different parts of the instructions

are not always aligned with each other. This situation could be improved by reviewing the whole instructions setup and reassuring that the documents are aligned. This work should be preferably done by a communications professional who would have experience about technical writing.

Based on the responses, it can be also noticed that some of the users are not aware of how to utilize all the features in Supplier Portal. This is for example visible in the feedback where respondent provides feedback about potential future development and those features actually already exist. Similarly, there was also comments about users not able to perform an activity in a certain way, although that should be possible. Especially for these kinds of topics related to best practices and how to use Supplier Portal in the most efficient way, short instructions in video format could be useful especially as they allow flexible way for showing alternative ways for performing some of the steps.

While most respondents felt positively about the support that they are able to access, some negative feedback was provided especially related to competence of internal users to work with Supplier Portal. As the smooth process flow requires that users on both sides know what they need to do, case company should place more emphasis on the competence of their own employees to collaborate over Supplier Portal. Improved competence and awareness of internal employees would also allow them to support suppliers in their questions and to be more responsive and thus personal collaboration would be more frequent.

6.5 Task-Technology Fit

Theoretical background of Task-Technology Fit can be considered rather straightforward as it aims to evaluate how well certain technology meets the requirements for a given activity, and how well it supports users to meet their performance expectations. From the perspective of this thesis, TTF can be considered as a summarizing concept that helps to evaluate whether Supplier Portal is successful in the objective for supporting the business and in helping to capture benefits of supplier integration.

When considering the responses, many suppliers emphasize the importance that they feel about having more structured collaboration and connection with the case company. Especially those suppliers who have started to use Supplier Portal only

recently, seem to consider that Supplier Portal strengthens also their position compared to prior situation and against competitors who are not using Supplier Portal. Objective to improve relationship with case company is also visible in some of the responses where suppliers show interest towards using wider scope of Supplier Portal functionalities.

Many suppliers also recognize the value of transparency and information sharing that is facilitated by Supplier Portal. As these elements are critical factors included in the scope of supply chain integration, it can be concluded that Supplier Portal helps to integrate suppliers closer to case company. As supply chain integration is at least in the interest of the case company, it can be therefore concluded that Supplier Portal is a suitable technology for the task of integrating suppliers. For those suppliers who want to have more closer relationship with case company, Supplier Portal proves to be a working solution.

When considering the Task-Technology fit from supplier perspective, it will be impossible to provide an answer that would be valid with all the suppliers. This is related to wide range of different suppliers and ways of collaboration between them and case company. Some of the suppliers are also working with high transactional volumes, while others receive new orders only irregularly. Based on the feedback, most of the critical views about usefulness were related to Supplier Portal being inefficient with high volumes or too complex when users need to use it rarely. Based on this, it could be concluded that Supplier Portal TTF is lowest for the suppliers who represent one of the extremities in supplier base. On the other hand, this indicates that Supplier Portal is working according to expectations for majority of supplier base.

As the case company can offer S2S solutions for most high-volume suppliers and for high volume transactions, Supplier Portal TTF related to high volume suppliers, could be also evaluated from the perspective that how well Supplier Portal supports other IOIS solutions. In this setup, Supplier Portal aims provide support with those activities that are not yet in the scope of S2S integration. For example, suppliers who are using EDI for purchase orders, are typically using claims management functionality for quality topics. Therefore, it can be also concluded that Supplier Portal provides working solution that can support when other S2S solutions are implemented.

Based on the responses, biggest shortfall of Supplier Portal is that it doesn't facilitate proper communication channel for general topics. As a result, users need to use traditional communication like emails when there is a need for addressing topics related to individual orders, issues related to deliveries, quality notifications, or there is some other need for collaboration. In other words, email usage is frequently needed to support usage of system that should reduce or even eliminate the need for emails. From the responses, it can be also noticed how suppliers have positive experiences related to commonly used instant messaging services, and they would like to have similar solution also embedded into Supplier Portal as it makes collaboration more effortless.

6.6 Improvement opportunities

The objective for this thesis was to understand how case company could develop its internal IOIS so that its implementation to new suppliers would be easier and to identify what kind of improvements should be done so that suppliers would utilize it more actively. As explained in the fourth chapter, the focus for this thesis has been limited to Supplier Portal, which is the most actively used IOIS in the case company and within its suppliers. By focusing only on one tool, instead of multiple alternatives, the objective was to understand more concrete improvement opportunities. During this chapter, research questions will be addressed.

RQ1: *How the case company should develop its current inter-organizational information system, so that it would require less effort to implement it with new suppliers?*

Based on the questionnaire results, majority of the respondents felt that it was easy to start using Supplier Portal. On the other hand, many indicated that the supportive materials, like instructions, are complex and it can be hard to find an answer for detailed problem. Some of the users also reported how they are not always sure what is expected from them, while other comments indicate that supplier users don't always know how to use the tool in most efficient way. Some suppliers were also giving critique to the requirement to use Supplier Portal in general.

As a result of above comments, it can be concluded that biggest improvement opportunities related to supporting implementation of Supplier Portal, are about

instructions and the way how topics related to Supplier Portal are communicated towards suppliers. For example, instructions should be simplified so that it would be easier for users to get help for an individual problem case. This can be done by dividing the current instruction package into smaller pieces based on different functionalities. This way, users wouldn't have to go through and search from the whole contents, especially when it is typical that they start using only limited scope in the beginning. Also, the use cases described in the written instructions should be very simple and concise, so that users with different kind of backgrounds and language skills would be able to understand what is required from them. More complex use cases and processes could be then described with short video examples where picture and spoken narrative can be used together.

Some users also emphasized that occasionally it requires too much effort to access instructions document and find the needed information, while trying to complete certain activity in the tool at the same time. This problem could be addressed by adding more supportive contents into the tool itself. For example, most important input boxes should contain more informative tool tips, and at least some of the current error and warning message would need to be more descriptive and informative, so that it would be easier for the user to make required corrections. After user has performed an activity, there could be also short message that explains what happens next and if some actions are expected from the user. This kind of feature could reduce the perceived unclarity related to statuses, which was specifically addressed by the respondents.

When evaluating implementation process in general, the case company should clarify and align the way how it communicates about Supplier Portal to potential supplier users. When performing the communication, case company should focus on clarifying its message in a way that the purpose and objectives for the tool would become clear already before suppliers start using it. This way, also the users would understand better, why they are requested to do certain activities through Supplier Portal instead of email or through some other channel. Higher transparency and trust can be also reached through communication if the case company would be able to present Supplier Portal benefits in measurable format, such as improved efficiency in collaboration and operations. Clear and measurable benefits would also increase supplier motivation for using IOIS, which has

been recognized in literature as an important success driver for IOIS implementation.

RQ2: *What kind of improvements should be done to current inter-organizational information system, so that it would create more value to the suppliers and thus it would be utilized more actively?*

Improvements related to RQ1 are also applicable when considering the Supplier Portal utilization also after the implementation. This is related to continuous need for having supportive documentation available while using the system. Also, it would be important that case company continues actively to communicate about benefits of Supplier Portal use towards supplier users, and thus ensures that suppliers are able to recognize the value while being aligned with common objectives.

In addition, there are some technical improvements that case company should evaluate so that Supplier Portal would create more value to suppliers and consequently more active utilization would be encouraged. To support ease of use, case company should improve how different statuses are managed in the tool and make it more transparent for the users when they are expected to take actions. Especially related to purchase orders, it would help if old data would be systematically cleaned from the tool, so that the risk for confusing active and old items would be reduced.

Similarly, user experience could be improved by developing the contents of email notifications that are sent from the system. For example, current notifications could contain more precise information so that it would be easier for the recipient to understand if some actions are required from them. Similarly, more information could be delivered as an attachment for the notification, so that users wouldn't need to login only to collect the same information.

Related to notifications, there were also examples where users received notifications about documents that they didn't have even access to process. Due to limited user accesses, the users were not able to deactivate the notifications, and as a result, they continue to receive irrelevant emails related to Supplier Portal. Case company should identify these kinds of system configuration issues and resolve them by modifying the notification settings directly.

When considering missing features or actual system development requirements, biggest interest would be towards enabling communication through a chat functionality. As the current tool already has chat functionality as part of document collaboration, it would make sense that the case company reviews more in detail existing barriers for using the collaboration tool. This investigation should cover both internal and external user perspectives. By implementing the chat functionality more efficiently, case company would be able to facilitate more flexible and transparent communication, which was also valued and requested by suppliers.

To improve efficiency of Supplier Portal usage, users would like to have more possibilities to export and import information in standardized machine-readable formats. This would allow users to transfer data more easily between their own systems and Supplier Portal. In addition, users would be able to use spreadsheets or similar when modifying the data. This would improve the user experience especially for those suppliers who are having high transactional volumes, and who often need to adjust the document details.

When considering other system developments, case company should recognize that suppliers didn't indicate any notable needs from their own perspective. Instead, some suppliers highlight that they would be happy to continue with current tools without any new functionalities. From this perspective, case company should critically evaluate all new development ideas, and proactively validate feasibility of new features also with some key suppliers.

In addition to system developments, there are also some other improvement opportunities that the case company should evaluate when trying to help suppliers in achieving more value. First, many suppliers are currently requested to use multiple different IOIS solutions with different case company departments. As the suppliers would like to use only one tool, case company should evaluate ways to consolidate current tools into one. As second, suppliers are requesting that different case company departments would be committed to use IOIS whenever possible, so that manual processes could be eliminated. This requires better alignment and commitment from the case company supply management departments.

Finally, the case company should invest more resources to ensure that its own employees are skilled enough to collaborate over Supplier Portal. While improved competence would also increase commitment for usage, it could also support efficiency when more users would be able to address problem cases directly with suppliers.

7. CONCLUSIONS

The purpose of this chapter is to conclude and provide summary about the thesis. This is performed by providing managerial implications through a summary of central findings from the empirical research. These are followed with a recap of limitations of the research and with considerations about future research opportunities.

As the research questions were already addressed during the previous discussions chapter, they are not addressed again during this chapter. Still, by reviewing the conclusions chapter, the reader should get an understanding about the key outcomes and contribution of the research.

7.1 Managerial implications

Based on the empirical research conducted during this thesis, Supplier Portal development opportunities were identified for the case company. While the research didn't recognise any major development opportunities or missing functionalities from supplier perspective, it provides input for both technical and non-technical developments that have potential to increase usability and efficiency of Supplier Portal, and thus also supports objectives for improved utilization.

Technical development identified during the research include requests to implement a chat functionality, that would allow more transparent communication through Supplier Portal and this way reduces need for using emails. As the chat functionality already exists, it is recommended for the case company to assess how it should be developed further so it could be better utilized by both internal and external users. Other technical improvements include alignment and clarification of document and process statuses so that they would be easier to understand, and improvements to email notifications that the system is sending to users. Finally, suppliers with high transactional volumes would benefit from a possibility to export and import information in machine-readable formats.

Non-technical development opportunities are related mainly to supportive materials, way of communication, and to improved internal competence and commitment. By simplifying the instructions and making them more easily available, the

effort needed by the users could be reduced as they would be able to solve problems directly themselves and without further delays in the process. Through clear and more transparent communication, case company would be able to build mutual understanding with suppliers about objectives and benefits of using Supplier Portal. Finally, the case company would need to be more committed for using Supplier Portal actively itself and to increase competence of its internal users to collaborate through Supplier Portal more fluently. Higher commitment and competence will also indicate to suppliers that both parties are working towards same goal of improving efficiency and performance through supply chain integration.

As a result of this thesis, it is recommended for the case company supply management decision makers that they thoroughly assess the feedback provided by their suppliers and evaluate implementation of identified development opportunities. As the identified development opportunities differ from their technical complexity, there should be possibilities to implement small improvements rather quickly. When determining these developments more in detail, it is recommended that the case company would involve some of its core suppliers to provide feedback and ideas from user perspective. When considering technical developments, it is recommended that case company focuses on functionalities that have highest utilization rate. This will help in reaching best return from investment.

7.2 Limitations and future research opportunities

During this research, user perceptions related to IOIS usage were investigated in a case company environment. Due to this research setting, the study is limited to only one focal company and its existing suppliers who have been already using Supplier Portal as an IOIS solution.

As a result of the research setting and limitations of scope, findings of this research can't be considered directly applicable outside of the specific research context. This covers companies, suppliers, and the features of IOIS solutions. Also, it is good to recognize that while the response rate of the empirical research can be considered relatively good, non-responding users can't be considered as a random group, which reduces applicability also within the research setting. Re-

Regardless of these known limitations, findings from this thesis can provide interesting ideas for companies who evaluate implementation of IOIS or want to develop their current solution so that it would create more value also to suppliers.

The research objectives for this thesis aimed to contribute more towards practice than theory. As a result, the empirical study mainly draws inspiration from the existing academic framework without trying to validate its relevancy. Therefore, contribution of the thesis towards academic framework remains very limited.

Although this research was performed as a case study, there could be future research opportunity by extending the scope. This would mean a research that aims to identify what kind of requirements suppliers within certain industry have towards IOIS. Such research would contribute mainly to companies who wish to commercialize IOIS solutions and need to understand requirements and expectations in a wider perspective. Alternatively, the research could be valid for supply networks that consider implementation of industry level portal solution. By adjusting the research objective slightly, future research could also contribute more on theoretical framework by evaluating whether models like UTAUT or TTF are valid when explaining IOIS acceptance and utilization.

REFERENCES

- Adams, D. A., Nelson, R. R. & Todd, P. A. (1992). Perceived Usefulness, Ease of Use, and Usage of Information Technology: A Replication. *MIS Quartely*. 16:2. p. 227-247.
- Adebanjo, D. & Laosirinhongthong, T. (2014). Adoption of web-based order-processing systems: experiences from tier-1 suppliers in automotive supply chain. *Production Planning & Control*. 25:15. p. 1287-1301.
- Asamoah, D., Agyei-Owusu, B., Andoh-Baidoo, F.K. & Ayaburi, E. (2021). Inter-organizational systems use and supply chain performance: Mediating role of supply chain management capabilities. *International Journal of Information Management*. 58.
- Bag, S., Wood, L. C., Mangla, S. K. & Luthra, S. (2020). Procurement 4.0 and its implications on business process performance in a circular economy. *Resources, Conservation & Recycling*. 152. p. 1-14.
- Bell, E., Bryman, A. & Harley, B. (2019). *Business Research Methods*. 5th edition. United Kingdom: Oxford University Press. ISBN 978-0-19-880987-6.
- Bienhaus, F. & Haddud, A. (2018). Procurement 4.0: factors influencing the digitisation of procurement and supply chains. *Business Process Management Journal*. 24:4. p. 965-984.
- Brandon-Jones, A. & Kauppi, K. (2018). Examining the antecedents of the technology acceptance model within e-procurement. *International Journal of Operations & Production Management*. 38:1. p. 22-42-
- Cámara, S. B., Fuentes, J. M. & Maqueira Marín, J. M. (2015). Cloud computing, Web 2.0, and operational performance: The mediating role of supply chain integration. *The International Journal of Logistics Management*. 26:3. p. 426-458.
- Chan, F. T. S., Chong, A. Y-L. & Zhou, L. (2012). An empirical investigation of factors affecting e-collaboration diffusion in SMEs. *International Journal of Production Economics*. 138. p. 329-344.

- Chang, W., Ellinger, A. E., Kim, K. & Franke, G. R. (2016). Supply chain integration and firm financial performance: A meta-analysis of positional advantage mediation and moderating factors. *European Management Journal*. 34:3. p. 282-295.
- Cho, B., Ryoo, S. Y. & Kim, K. K. (2017). Interorganizational dependence, information transparency in interorganizational information systems, and supply chain performance. *European Journal of Information Systems*. 26:2. p. 185-205.
- Chong, A. Y-L., Ooi, K-B, Lin, B. & Tang, S. Y. (2009). Influence of interorganizational relationships on SMEs' e-business adoption. *Internet Research*. 19:3. p. 313-331.
- Davis, F. D., Bagozzi, R. P. & Warshaw, P.R. (1989). User Acceptance of Computer Technology: A Comparison of Two Theoretical Models. *Management Science*. 35:8. p. 982-1003.
- Davis, Fred D. (1989b). Perceived Usefulness, Perceived Ease of Use, and User Acceptance of Information Technology. *MIS Quarterly*. 13:3. p. 319-340.
- de Mattos, C. A. & Barbin Laurindo, F. J. (2017). Information technology adoption and assimilation: Focus on the suppliers portal. *Computers in Industry*. 85. p. 48-57.
- Dishaw, M. T. & Strong, D. M. (1999). Extending the technology acceptance model with task-technology fit constructs. *Information & Management*. 36. p. 9-21.
- Dwivedi, Y. K., Rana, N. P., Jeyaraj, A., Clement, M. D. & Williams, M. D. (2019). Re-examining the Unified Theory of Acceptance and Use of Technology (UTAUT): Towards a Revised Theoretical Model. *Information Systems Frontiers*. 21:3. p. 719-734.
- Flynn, B. B., Huo, B. & Zhao, X. (2010). The impact of supply chain integration on performance: A contingency and configuration approach. *Journal of Operations Management*. 28. p. 58-71.
- Garcia, F., Grabot, B. & Paché, G. (2019). Adoption mechanism of a supplier portal: A case study in the European aerospace industry. *Computers & Industrial Engineering*.

- Ghauri, P. & Grønhaug, K. (2010). *Research Methods in Business Studies*. 4th edition. England: Pearson Education Ltd. ISBN: 978-0-273-71204-6.
- Goodhue, D. L. & Thompson R. L. (1995). Task-Technology Fit and Individual Performance. *MIS Quarterly*. 19:2. p. 213-236.
- Gunasekaran, A. & Ngai, E. W. T. (2004). Information systems in supply chain integration and management. *European Journal of Operational Research*. 159. p. 269-295.
- Harris, M. E., Mills, R. J., Fawson, C. & Johnson, J. J. (2018). Examining the Impact of Training in the Unified Theory of Acceptance and Use of Technology. *Journal of Computer Information Systems*. 58:3. p. 221-233.
- Hartano, E., Li, X., Na, K-S. & Simpson, J. T. (2010). The role of quality of share information in interorganizational systems use. *International Journal of Information Management*. 30. p. 399-407.
- Im, Ghiyoung (2014). Effects of cognitive and social factors on system utilization and performance outcomes. *Information & Management*. 51:1. p. 129-137.
- Kauremaa, J. & Tanskanen, K. (2016). Designing interorganizational information systems of supply chain integration: a framework. *The International Journal of Logistics Management*. 27:1. p. 71-94.
- Kakhi, M. D. & Gargeya, V. B. (2019). Information systems for supply chain management: a systematic literature analysis. *International Journal of Production Research*. 57: 15-16. p. 5318-5339.
- Kärkkäinen, M., Laukkanen, S., Sarpola, S. & Kemppainen, K. (2006). Roles of interfirm information systems in supply chain management. *International Journal of Physical Distribution and Logistics Management*. 37:4. p. 264-286.
- Lancioni, R. A., Smith, M., F. & Oliva, T. A. (2000). The Role of the Internet in Supply Chain Management. *Industrial Marketing Management*. 29:1. p. 45-56.
- Laukkanen, S., Sarpola, S. & Kemppainen, K. (2007). Dual role of extranet portals in buyer-supplier information exchange. *Business Process Management Journal*. 13:4. p. 503-521.

- Legris, P., Ingham, J. & Colletette, P. (2003). Why do people use information technology? A critical review of the technology acceptance model. *Information & Management*. 40. p. 191-204.
- Leuschner, R., Rogers, D. S. & Charvet, F. F. (2013). A Meta-analysis of supply chain integration and firm performance. *The Journal of Supply Chain Management*. 49:2. p. 34-57.
- Lee, H., Kim, M. S. & Kim, K. K. (2014). Interorganizational information systems visibility and supply chain performance. *International Journal of Information Management*. 34:2. p. 285-295.
- Li, Y., Liu, H. & Wei, S. (2021). When Do IT Capabilities Create Value for Buyer Performance? The Moderating Effect of Social Capital on Supply Chain Information Integration. *Information Systems Management*. p. 1-21.
- Liu, H., Ke, W., Wei, K. K., Gu, J. & Chen, H. (2010a). Adoption of Internet-enabled Supply Chain Integration: Institutional and Cultural Perspectives. *Pacific Asia Journal of the Association for Information Systems*. 2:4. p. 29-50.
- Liu, H., Ke, W., Wei, K. K., Gu, J. & Chen, H. (2010b). The role of institutional pressures and organizational culture in the firm's intention to adopt internet-enabled supply chain management systems. *Journal of Operations Management*. 28. p. 372-384.
- Liu, H., Wei, S., Ke, W., Wei, K. K. & Hua, Z. (2016). The configuration between supply chain integration and information technology competency: A resource orchestration perspective. *Journal of Operations Management*. 44. p. 13-29.
- Lyytinen, K. & Damsgaard, J. (2011). Inter-organizational information systems adoption – a configuration analysis approach. *European Journal of Information Systems*. 20. p. 496-509.
- Mangan, J., Lalwani, C., Butcher, T. & Javadpour, R. (2012). *Global Logistics and Supply Chain Management*. 2nd edition. Great Britain: John Wiley & Sons Ltd. ISBN: 978-1-119-99884-6.
- Marangunic, N. & Granic, A. (2015). Technology acceptance model: a literature review from 1986 to 2013. *Universal access in the information society*. 14:1. p. 81-95.

- Pattanayak, D. & Punyatoya, P. (2020). Effect of supply chain technology internalization and e-procurement on supply chain performance. *Business Process Management Journal*. 26:6. p. 1425-1442.
- Pu, X., Chan, F. T. S., Tsigas, Z. & Niu, B. (2018). Adoption of internet-enabled supply chain management systems: Differences between buyer and supplier perspectives. *Industrial Management & Data Systems*. 118: 8. p. 1695-1710.
- Pu, X., Chong, A. Y. L., Cai, Z., Lim, M. K. & Tan, K. H. (2019). Leveraging open-standard interorganizational information systems for process adaptability and alignment: An empirical analysis. *International Journal of Operations & Production Management*. 39: 6/7/8. p. 962-992.
- Pu, X., Wang, Z. & Chan, F. T. S. (2020). Adoption of electronic supply chain management systems: the mediating role of information sharing. *Industrial Management & Data Systems*. 120:11. p. 1977-1999.
- Ratna, S., Utami, H. N., Astuti, E. S., Wilopo and Muflih, M. (2020). The technology tasks fit, its impact on the use of information system, performance and users' satisfaction. *VINE Journal of Information and Knowledge Management Systems*. 50:3.
- Rajaguru, R. & Matanda, M. J. (2013). Effects of inter-organizational compatibility on supply chain capabilities: exploring the mediating role of inter-organizational information systems (IOIS) integration. *Industrial Marketing Management*. 42:4. p. 620-632.
- Salam, Mohammad Asif (2021). Analyzing manufacturing strategies and Industry 4.0 supplier performance relationships from a resource-based perspective. *Benchmarking: An international Journal*. 28: 5. p. 1967-1716.
- Salo, J., Tan, T. M. & Makkonen, H. (2020). Digitalization of the buyer-seller relationship in the steel industry. *Journal of Business & Industrial Marketing*.
- Schrier, T., Erdem, M. & Brewer, P. (2010). Merging task-technology fit and technology acceptance models to assess guest empowerment technology usage in hotels. *Journal of Hospitality and Tourism Technology*. 1:3. p. 201-217.

- Sezen, Bülent (2008). Relative effects of design, integration and information sharing on supply chain performance. *Supply Chain Management: An International Journal*. 13: 3. p.233-240.
- Singhry, H. B. & Rahman, A. A. (2019). Enhancing supply chain performance through collaborative planning, forecasting, and replenishment. *Business Process Management Journal*. 25:4. p. 625-646.
- Telukdarie, A., Buhulaiga, E., Bag, S., Gupta, S. & Luo, Z. (2018). Industry 4.0 implementation for multinationals. *Process Safety and Environmental Protection*. 118. p.316-329.
- Teng, T. & Tsinopoulos, C. (2021). Understanding the link between IS capabilities and cost performance in services: the mediating role of supplier integration. *Journal of Enterprise Information Management*.
- Thoben, K-D., Wiesner, S. & Wuest, T. (2017). "Industrie 4.0" and Smart Manufacturing- A Review of Research Issues and Application Examples. *International Journal of Automation Technology*. 11: 1. p. 4-16.
- Tiwari, Saurabh (2021). Supply chain integration and Industry 4.0: a systematic literature review. *Benchmarking: An international Journal*. 28: 3. p. 990-1130.
- Vanpoucke, E., Vereecke, A. & Muylle, S. (2017). Leveraging the impact of supply chain integration through information technology. *International Journal of Operations & Production Management*. 37:4. p. 510-530.
- van Weele, Arjan J. (2010). *Purchasing and Supply Chain Management*. 5th ed. Hampshire: Cengage Learning EMEA. ISBN: 978-0-230-20052-4.
- Venkatesh, V. & Davis, F. D. (1996). A model of the Antecedents of Perceived Ease of Use: Development and Test. *Decision Sciences*.27:3. p. 451-481.
- Venkatesh, V. & Davis, F. D. (2000). A Theoretical Extension of the Technology Acceptance Model: Four Longitudinal Field Studies. *Management Science*. 46:2. p. 186-204.
- Venkatesh, V., Morris, M. G, Davis, G. B. & Davis, F. D. (2003). User Acceptance of Information Technology: Toward a Unified View. *MIS Quarterly*. 27:3. p. 425-478.

- Wang, J., Sun, L. & Zhang, X. (2018). An Empirical Study of Key Factors Influencing on IOIS Diffusion. *2018 4th IEEE International Conference on Information Management*.
- Wiengarten, F., Humphreys, P., McKittrick, A. & Fynes, B. (2013). Investigating the impact of e-business applications on the supply chain collaboration in the German automotive industry. *International Journal of Operations & Production Management*. 33:1. p. 25-48.
- Williams, M. D., Rana, N. P. & Dwivedi, Y. K. (2015). The unified theory of acceptance and use of technology (UTAUT): a literature review. *Journal of Enterprise Information Management*. 28:3. p. 443-488.
- Yin, Robert, K. (2018). *Case Study Research and Applications: Design and Methods*. 6th ed. Los Angeles: SAGE. ISBN: 978-1-506-33616-9.
- Yousafzai, S. Y., Foxall, G. R. & Pallister, J. G. (2007). Technology acceptance: a meta-analysis of the TAM: Part 2. *Journal of Modelling in Management*. 2:3. p. 281-304.
- Zhang, C., Gunasekaran, A., Yu, W. & Wang, C. (2015). A comprehensive model for supply chain integration. *Benchmarking: An international Journal*. 22:6 p.1141-1157.
- Zhang, M., Lettice, F., Chan, H. K. & Nguyen, H. T. (2018). Supplier integration and firm performance: the moderating effects of internal integration and trust. *Production Planning & Control*. 29:10. p.802-813.

APPENDICES

Appendix 1: Questionnaire

Utilization of Supplier Portal

The survey will take approximately 8 minutes to complete.

Objective for this survey is to understand utilization and use of Supplier Portal from the supplier perspective. Based on your valuable feedback, we want to learn how we could support utilization of different Supplier Portal functionalities and what kind of new features could be considered in future.

While the objective for this survey is business driven, the results will be also utilized as part of Master's Thesis work. Data collection and processing will be executed anonymously.

* Required

1. Do you personally use Supplier Portal actively to perform needed activities related to the case company *

Yes

No

2. Which inter-organizational information systems your organization uses to collaborate with the case company

EDI (Electronic Data Interchange)

LogWis

Supplier Portal

3. How long your organization has been using Supplier Portal

- less than one year
- 1-2 years
- 2-5 years
- longer than 5 years

4. How often does your organization use Supplier Portal

- Daily
- Weekly
- Monthly
- less frequently

5. Do you use similar web-based portal solutions with other customers? *

- Yes
- No

6. Statement: below Supplier Portal functionalities are useful for my organization *

Please evaluate how you perceive usefulness of below Supplier Portal functionalities.

If you are not familiar with specific tool, please select not in use.

Order management covers PO processing, forwarding instructions and invoicing.

	Not in use	Strongly disagree	Disagree	Neutral	Agree	Strongly agree
Purchase Order management -tool	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
RFQ -tool	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Forecast -tool	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Claims management - tool	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Certificates -tool	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Traceability -tool	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Customs Declarations - tool	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Product compliance - tool	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Document collaboration -tool (drawing distribution)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Supplier inventory -tool	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

7. Open feedback: additional comments about Supplier Portal usefulness

Please provide feedback and possible ideas about Supplier Portal usefulness. It is also valuable feedback if you feel that something currently prevents your organization from utilizing some of the features.

8. Statement: below Supplier Portal functionalities are easy to use *

Please evaluate how you perceive effort needed to use below Supplier Portal functionalities.

If you are not familiar with specific tool, please select not in use.

Order management covers PO processing, forwarding instructions and invoicing.

	Not in use	Strongly disagree	Disagree	Neutral	Agree	Strongly agree
Purchase Order management -tool	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
RFQ -tool	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Forecast -tool	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Claims management -tool	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Certificates -tool	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Traceability -tool	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Customs Declarations -tool	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Product compliance -tool	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Document collaboration -tool (drawing distribution)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Supplier inventory -tool	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

9. Open feedback: additional comments about Supplier Portal usability

Please provide feedback and possible development ideas regarding Supplier Portal usability.

10. **Future improvements:** What kind of features would help your organization to utilize Supplier Portal more actively?

Would you like to see some new features or should the existing ones be developed somehow?



11. **Statements:** general use of Supplier Portal *

Below statements are related to Supplier Portal use in general.

	Strongly disagree	Disagree	Neutral	Agree	Strongly agree
Pressure from the case company is the main reason why my organization uses Supplier Portal	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Supplier Portal helps my organization to perform more efficiently	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I have access to needed training, instructions and guidance	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Starting to use Supplier Portal was easy	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I know who to contact when there are issues	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Use of Supplier Portal is beneficial for both parties	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I need to frequently contact someone from the case company to solve issues related to Supplier Portal	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
My organization would be willing to actively participate in Supplier Portal developments	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Supplier Portal is easy to use	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I know what actions are expected from me when using Supplier Portal	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Strongly disagree Disagree Neutral Agree Strongly agree

I can trust that information shared in Supplier Portal is correct

My organization would like to integrate our own system directly to Supplier Portal

12. Please describe how Supplier Portal use has impacted collaboration between your organization and the case company

Please mention examples regardless of them being positive or negative.

13. How likely you would be to recommend use of Supplier Portal to other suppliers or your colleagues? *

0	1	2	3	4	5	6	7	8	9	10
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Not at all likely

Extremely likely

14. Please provide feedback about any possible development proposals or challenges related to Supplier Portal

Appendix 2: Summary of questionnaire results

Question 6: Perceived usefulness (count of replies):

	Not in use	Strongly disagree	Disagree	Neutral	Agree	Strongly agree
Purchase Order management tool	61	3	7	58	246	133
RFQ tool	303	7	11	97	66	24
Forecast tool	274	11	9	77	95	42
Claims management tool	151	9	19	101	183	45
Certificates tool	239	9	18	101	112	29
Traceability tool	313	8	6	89	71	21
Customs Declaration tool	299	7	13	96	81	12
Product compliance tool	276	7	15	116	78	16
Document collaboration tool	298	5	8	92	77	28
Supplier inventory tool	358	4	6	93	37	10

Question 8: Perceived usability (count of replies):

	Not in use	Strongly disagree	Disagree	Neutral	Agree	Strongly agree
Purchase Order management tool	63		9	69	238	129
RFQ tool	309	5	10	79	80	25
Forecast tool	277	8	14	95	81	33
Claims management tool	165	8	25	113	161	36
Certificates tool	253	7	18	116	94	20
Traceability tool	321	5	12	86	68	15
Customs Declaration tool	309	7	26	88	67	11
Product compliance tool	288	9	30	107	63	11
Document collaboration tool	307	4	9	99	70	19
Supplier inventory tool	369	5	8	78	38	10

Question 11: statements about general use

	Strongly disagree	Disagree	Neutral	Agree	Strongly agree
Pressure from the case company is the main reason why my organization uses Supplier Portal	35	85	169	157	52
Supplier Portal helps my organization to perform more efficiently	18	75	167	193	55
I have access to needed training, instructions and guidance	25	66	215	171	31
Starting to use Supplier Portal was easy	8	52	128	269	51
I know who to contact when there are issues	30	79	109	243	47
Use of Supplier Portal is beneficial for both parties	17	46	149	218	78
I need to frequently contact someone from the case company to solve issues related to Supplier Portal	81	194	153	63	17
My organization would be willing to actively participate in Supplier Portal developments	28	62	275	121	22
Supplier Portal is easy to use	4	35	143	264	62
I know what actions are expected from me when using Supplier Portal	6	39	121	285	57
I can trust that information shared in Supplier Portal is correct	8	33	127	279	61
My organization would like to integrate our own system directly to Supplier Portal	91	118	228	51	20

Question 13: How likely you would be to recommend use of Supplier Portal to other suppliers or your colleagues?

0 = not all likely

10 = extremely likely

Rate	1	2	3	4	5	6	7	8	9	10
Count of responses	5	13	27	18	86	56	96	115	69	34