Market Intelligence within Software Procurement

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Abstract

With the dawn of the digital era, software solutions are becoming of increasingly strategic importance for corporations, and due to the complexity of the products and the huge lock-in effects which they often give rise to, software-procurement is growing into a critical activity. However, due to the phenomena of information overload, finding and making use of the right information when making strategic decisions is becoming increasingly difficult, resulting in the need for organizations to overlook their information processing capacities in order to ensure the quality of such selections. For this purpose, Ingka Group Procurement Digital & Tech: Software Category has identified a need for a Market Intelligence function within the division, and this thesis aim is to explore what activities that function should entail.

For this purpose, the thesis aims to identify what the main challenges are related to procuring in software markets, what information needs software-purchasers have and lastly, how this information should best be communicated in organizations related to the information's inherent complexity. This was investigated through a literature review, followed by interviews with both software market-experts and software-purchasers at Ingka Holding. This resulted in an analysis of the software markets and compilation of the identified information requirements, which were then analyzed from an Information Processing Perspective. Recommendations on how to communicate the information were thereafter developed together with a suggestion on what the main Market Intelligence-activities should entail. Lastly, a roadmap for how to implement said function at Ingka is presented.

Keywords: Market Intelligence, Software Markets, Software Procurement, Information Processing Theory, Information Requirements.

Sammanfattning

Med den digitala erans framfart blir mjukvarulösningar av allt större strategisk vikt för företag, och på grund av produkternas komplexitet och de omfattande lock-in-effekterna som de ofta orsakar, så håller inköp av mjukvara på att utvecklas till en alltmer kritisk aktivitet. På grund av fenomenet "informationsöverflöd" (information overload), blir det allt svårare att finna och använda rätt information vid strategiska beslut, vilket leder till ett ökat behov för organisationer att se över sin förmåga att processera information för att säkerställa kvalitén på sagda beslut. I detta syfte har Ingka Group Procurement Digital & Tech: Software Category identifierat behovet av en Market Intelligence-funktion inom avdelningen, vars innebörd denna uppsats ämnar utforska.

I detta syfte avser uppsatsen att identifiera vilka de främsta utmaningarna är relaterat till inköp inom mjukvarumarknader, vilka informationsbehov mjukvaruinköpare har, och slutligen, hur denna information bäst bör kommuniceras inom organisationer relaterat till informationens upplevda komplexitet. Detta undersöks genom en litteraturstudie, följt av intervjuer med både experter inom mjukvarumarknader samt inköpare på Ingka Holding. Detta resulterar i en analys av mjukvarumarknaderna och en sammanställning av de identifierade informationsbehoven, vilka sedan analyseras ur ett informationsprocesseringsteori-perspektiv. Rekommendationer om hur informationen bör kommuniceras presenteras sedan, följt av ett förslag avseende vad en Market Intelligence-funktion bör innebära utifrån sagda analys. Till sist redogörs en guide för hur Ingka bör gå till väga för att implementera denna funktion.

Nyckelord: Market Intelligence, mjukvarumarknader, mjukvaruinköp, informationsprocessteori, informationsbehov.

Acknowledgements

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1 Introduction

In the introduction, the identified problem and its background are presented along with a description of the company Ingka Holding. Thereafter, a more thorough description of the targeted problem, the thesis research questions with its focus and delimitations and targeted audience. Lastly, a thesis outline is provided with chapter's focus.

1.1.1 Information overload

With the dawn of the digital age and the endless stream of information it has made available through its holy grail, the internet, the challenge referred to as "information overload" has become the new epidemic facing managers. This phenomena, as coined by Gross (1964), "... occurs when the amount of input to a system exceeds its processing capacity. Decision makers have fairly limited cognitive processing capacity. Consequently, when information overload occurs, it is likely that a reduction in decision quality will occur." (The Interaction Design Foundation, 2021).

Some of the most common reasons behind information overload today can be related to the massive volumes of information created every minute and the increasing weight of historical data available (Pollfish Resources, 2022). Furthermore, it is also aggravated by the increasing number of channels that make this information available like white papers, market reports, trade journals, newspapers or websites. Furthermore, over four billion pieces of content are being created each day (World Economic Forum, 2022) with an increasing trend that predicts that, with the help of fastgrowing technologies like machine learning and AI, it is estimated that the amount of data that will be created over the next three years will be more than "all the data created over the past 30 years, and the world will create more than three times the data over the next five years than it did in the previous five." (Bansal, 2021).

This problem intensifies with the rising concern over "bad data", a phenomenon which describes how the quality of the data underlying strategic decisions is decreasing as the amount of data available increases (Bansal, 2021). This has been

estimated by IBM to already cost the US businesses three trillion USDs annually, with an important impact being how it robs business leaders of productivity by having low-quality data throughout the organization's systems (Bansal, 2021). As a consequence, the immensity of the task of trying to sort through it and take in the "big picture" has begun to exceed our capabilities (World Economic Forum, 2022).

With technological advancements and a more globalized world, to be able to understand the big picture has become even more essential for managers as strategic choices are shifting from the binary world to one more complex, where multiple choices can be intertwined and where the gray areas are becoming all the more nuanced (Deloitte Insight, 2022). The great danger with information overload combined with the difficulty of finding the right information that may lead to the most valuable insights, is that managers may become more reliant on assumptions. This is something strategists must be vigilant of, as "it is the assumptions that kill you, not your competitors" (Deloitte Insight, 2022). However, this risk is reduced by understanding what the right questions to be asked are, and thereafter building up capabilities within the organization to keep track of events and data in the fields that may influence this answer, but that also know how to sort and communicate them to the manager in a manner that does not result in information-overload.

1.1.2 Market Intelligence

A considerable challenge for organizations regarding their information processes therefore arises in the distinction between what information lacks value completely, what could be nice to know and what a manager actually needs to know to be able to make the best strategic decisions, as more information may cloud their decisions rather than enhance their outcome. Three important characteristics of strategically important information is its transformative potential, its applicability and how actionable it is (World Economic Forum, 2022). The aim with all gathered information has to be its ability to be transformed into clear strategic plans, as knowledge in itself can have value but it is the people translating it into insights that give it its power (Jenster & Søilen, 2009).

However, a challenge with building this organizational capability, that often goes under the name of Market Intelligence or Business Intelligence, is that managers rising from different functions in the organization may gain their insights from different kinds of information. Some sales managers have been described to base their analysis on e.g. tracked competitors prices, marketing from cost positioning-benchmarking and R&D from descriptions of technological paths rising in their surroundings (Jenster & Søilen, 2009). If a manager therefore wants to get the "whole picture" or the "valuable insights", the primary thing is to first define their point of departure, where some of the most important things to define initially are their decisional altitude, their decisional scope, the market scope, the product and

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technological scope, the network definition and the temporal dimension that is considered to be relevant (Jenster & Søilen, 2009). The Market Intelligence function can thereafter use different frameworks that are relevant for each case to define what may be of value to the strategist and how to translate the data into actions, like e.g. SWOT, Five Forces and PESTEL. However specialized the function becomes in regards to the data it gathers and disseminates, there are some activities that are central to all marketing intelligence work, as defined by the Intelligence Cycle that can be found in Figure 1 (Jenster & Søilen, 2009).
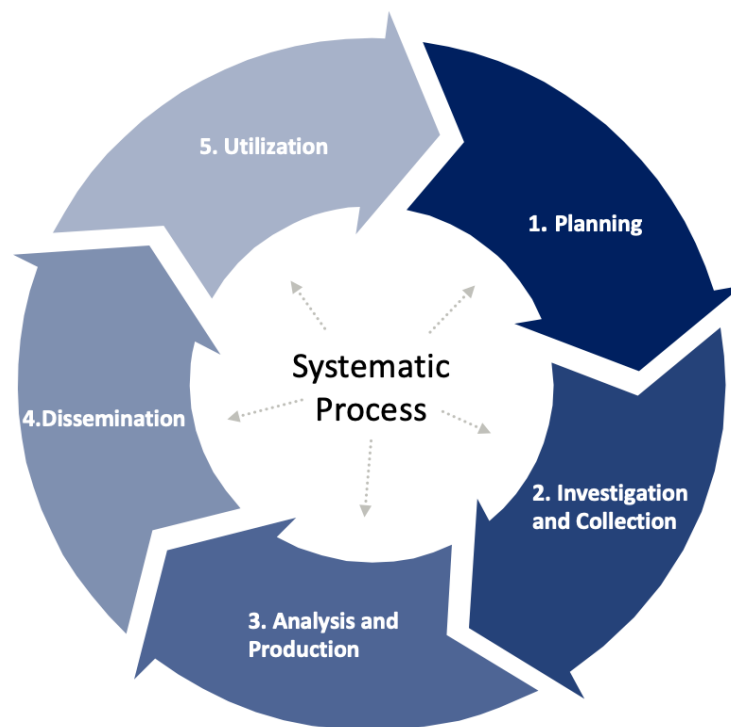
Figure 1. The Intelligence Cycle with its five phases, based on the framework presented by Jenster & Søilen (2009).

The Intelligence Cycle helps define the five elements that, conducted in a sequential manner, lead to a "systematic and ethical process of gathering, classification, analysis and dissemination of operable knowledge, focused towards decision makers, so that they can take preventive or corrective measures with the highest possible level of rationality" (Resendez, 2013). The first step of the process aims to converge into an understanding of the current status and objectives of the company, and the definition of Essential Information Elements needed by decision-makers, which are the pieces of data that are deemed to be crucial to reach decisional conclusions or judgements of value (Resendez, 2013). Thereafter, the Collection-phase refers to the step where the essential data is gathered, an area that gets more

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digitized by the day thanks to new information technologies that allow for more detail and depth than human practitioners. The Analysis and Production-phase varies greatly depending on the outcome that's been defined in the beginning of the process, but can be outlined by techniques like transmission, accumulation and/or aggregation of data, or an analysis of the data where the main purpose is to seek and measure patterns and relations. Finally, in the dissemination phase these "intelligence products" should be provided to the right user, with the right amount of detail at the right moment to avoid the confusion that can be caused by information-overload or by having the data delivered to users which find it irrelevant (Resendez, 2013).

1.2 Ingka Holding

The furniture retailing company IKEA was founded by Ingvar Kamprad in 1943 in the southern parts of Sweden, and has grown to become a multinational enterprise with 463 stores in 63 different markets with 225 000 employees worldwide (Ingka 2021). The vision of IKEA is to "create a better everyday life for the many people" with their business model building on the idea of "offering a wide range of well designed, functional home furnishing products at prices so low that as many people as possible will be able to afford them" (Ingka 2019).

IKEA is a franchise business, structured so that a great number of businesses and stakeholders work under the one IKEA brand through a separation into different strategic and operational companies and divisions. Ingka Holding B.V., further on referred to as Ingka, is the largest of twelve franchisees of the IKEA brand with almost 175 000 employees. Ingka is operating three separate main businesses, IKEA Retail, Ingka Centers and Ingka Investments, with each sub-division occupying different strategic business areas while at the same time providing synergies between these three departments and other strategic divisions of the IKEA franchise. The biggest of the Ingka Group business divisions is IKEA Retail, which operates the IKEA stores. IKEA Retail also aims to develop omnichannel solutions for IKEA to satisfy the whole value chain, from external suppliers and stakeholders, to users within the company as well as customers (Ingka, 2021). Ingka Centers is a division which establishes and operates the organization's shopping malls, always characterized by the fundamental IKEA store. The third area of business, Ingka Investments, deals with investments separated from the actual IKEA stores, such as investments into renewable energy, logistics and real estate, with the overall aim being to ensure long term sustainable financial growth within the IKEA brand.The three core businesses are supported by both a supervisory board and a management board, as well as several group functions, in which five different strategic areas are specified; digital, finance, people, real estate and sustainability.

Group Procurement is one of Ingka's twelve Group Functions that aim to operate as a scaffold to support Ingka's organizational set up. Group Procurement is responsible for all purchases within Ingka, and the group consists of five different "category areas", i.e. marketing, real estate, professional services, service business and digital & tech. All five procurement category areas operate the entire procurement process, from sourcing until the signing of the contract, as well as supportive activities such as supplier and contract management.

Group Procurement Digital & Tech is the category division within procurement responsible for the purchasing of three categories, software, hardware and cloud services, for the whole Ingka organization, and the division is further divided into those three main categories. The procurement department gets its purchasing-requests from Group Digital, which is another of Ingka's twelve Group Functions. Group Digital is the division responsible for the Ingka IT-infrastructure and the responsible group for direct contact with the end-users of the purchased solutions.

1.3 Problem description

Software procurement is taking an increasingly strategic role as the digital age and its technologies dive deeper and broader into almost every function of modern organizations. Choosing the right supplier is furthermore becoming all the more crucial due to the high lock-in effects the solutions entail, and the high risks related to the downtime that would be required for changes in the company software-architecture, if a change would be deemed needed. Therefore, a large amount of intelligence is needed before choosing a supplier, but also afterwards, as the trend points towards the companies investing in making strategic partnerships with the suppliers. These partnerships mainly aim to ensure that the roadmaps align, to nudge the suppliers technological innovations towards such which are considered beneficial for the organization and finally, to decrease the risks related to being locked in to a stakeholder whose culture and values do not match the company's own.

To be able to have these conversations and be considered a valuable partner with valuable opinions, purchasers need to have updated information about relevant trends, news and announcements which might affect the suppliers competitiveness in the market. However, due to the high dynamism related to the market, the complexity of the products and innovations and the legislative uncertainty related to the young age of the industry, it can be hard to define which information is of actual relevance and how not to succumb to the phenomena of information overload.

For this purpose, Ingka has decided to invest in a market intelligence-function, which is to aid software purchasers in their information processing activities. Challenges have been identified in the identification of what information is of value, who is to be responsible for its processing and how it is to be spread between departments and within the purchasing organization.

1.4 Purpose and research questions

The purpose of this thesis is to aid the creation of a Market Intelligence function within Ingka's category of software procurement within Group Procurement Digital and Tech. This function will aim at reducing the information overload which currently arises when purchasers investigate suppliers' competitive environments on a continuous basis, as part of their contract management activities. The aim for this thesis is therefore to identify ways of streamlining and structuring these information processing activities to accomplish general knowledge-standards among the purchasers, increasing the general intelligence in the department. This would consequently result in a decrease in the need for ad hoc investigations, as a good structure regarding a delegation of information processing activities between parties and the set up of good communication media would ensure that purchasers can search for the best information sources and intelligence in the organization themselves. The general goal is therefore to set up structures that allow for the Market Intelligence function to eventually take on more proactive or specialized investigations that might aid the purchasing department as a whole.

To reach a final conclusion regarding how the information processing flows can be organized to support the Market Intelligence function, the following three research questions have been articulated;

RQ1: What are the challenges specific to software markets from a procurement perspective?

RQ2: What information needs do software purchasers have?

RQ3: How should these information needs be processed and communicated in an organization?

1.5 Focus and delimitations

This thesis focuses on the activities of the intelligence cycle in Section 1.1.2 that relate to the first step, the definition of Essential Information Elements needed by

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decision-makers, and the fourth step, the dissemination of said information and insights. However, how the information is collected and processed into insights is not analyzed nor discussed.

Furthermore, the thesis aims at defining the information which software purchasers deem of importance to have updates on regarding their suppliers and their markets during the contract management phase, which means that all the information gathering and processes leading up to a purchase in the procurement-process are left outside the thesis scope. The purpose is to get a general view of the Information Requirements that the procurement department as a whole deem necessary, and Information Requirements of ad hoc investigations are therefore also not included in the thesis scope.

The procurement department which will be analyzed has also been delimited to the software procurement category within the department of Group Procurement Digital & Tech. This is due to the software markets being assumed to have special qualities which might imply different Information Requirements and challenges than other departments within the division. Lastly, the thesis tries to specifically get a general look at what characteristics the software markets have in common within the industry, rather than to dive into peculiarities with certain markets, as the identified challenges and Information Requirements aim to be as general for all software purchasers as possible.

1.6 Target audience

The target audience for this thesis are stakeholders who want to understand the challenges with software procurement, intelligence activities related to them and how intelligence-functions can be built up and adapted to their own organization. Furthermore, it may also be of interest for researchers, academics and university students who want to gain knowledge about topics such as information processing theory and how it can be adapted to the structuring of intelligence-functions and the role of software purchasers.

1.7 Thesis outline

Table 1. Outline of the thesis

Chapter	*Focus*

1 Introduction	In the introduction the problem description and its background are presented, as well as Ingka Holding as a company. Thereafter the purpose of the thesis is stated with research questions, focus and delimitations and its target audience.
2 Method	In this chapter the research strategy and its chosen methods are presented, as well as how it has been ensured that research ethics have been followed and that research quality has been confirmed.
3 Theory	The theory encompasses areas such as procurement practices, information processing theory, different kinds of competitive analysis frameworks, and lastly, an introduction to the software industry.
4 Analysis of Software Markets	In this chapter a more detailed Industry Analysis of the software markets which has been based on expert interviews is presented, focused on the hardships of procuring such solutions.
5 Case Study and Results	In the case study Ingka is further described along with challenges regarding communication within the procurement department. This is then followed by the resulting Information Requirements from the interviews with the purchasers.
6 Analysis	In the analysis, the resulting Information Requirements are submitted to an analysis based on information processing theory and divided into categories based upon what kind of media they require to be processed properly in the organization. This chapter concludes with an analysis of what the Market Intelligence function should entail.
7 Discussion	In this chapter it is discussed how the Market Intelligence function should be implemented at Ingka with regards to the previously presented results and analysis. Thereafter the applicability of these results and recommendations is analyzed, followed by a discussion about the future of the software procurement-role. This chapter is then finalized with suggestions for further research and a discussion about the thesis limitations.
8 Conclusions	In this chapter, the conclusions of the thesis are presented.

2 Methodology

In this chapter, the overall research strategy and process is presented. This is followed by the research methods which have been used, the literature study, case study and interviews of experts. Thereafter research ethics are discussed, followed by the quality aspects which have been pondered upon during the process.

2.1 Research strategy and process

The definition of a research strategy is a structured plan that aims to achieve the ambitions of the thesis, by defining and outlining the necessary actions and steps (Denscombe, 2017). To beneficially decide on a structured research process, several features had to be considered, such as compatibility with articulated research questions, accessibility to convenient sources of information and thereafter the different strategic alternatives had to be compared (Denscombe, 2013).

An iterative approach was applied to the research with the intention of adapting flexibility and minimizing risks associated with a traditional linear practice. This was done with the purpose of enabling reversibility of possible dead-ends encountered during the process, to ensure value contribution to both Ingka and academia. The practicality of the iterative approach implied that when gathered data led to the discovery of new aspects, new relevant theories were studied and the research questions were updated during the course of the work.

The nature of this thesis can be considered both exploratory and problem solving, as defined by Höst, Regnell & Runeson (2006). The exploratory aspect of the research relates to the part of the process where the aim was to in depth explore how Information Requirements and difficulties were structured within the department of software procurement at Ingka. Furthermore, the problem solving aspect consisted of the component of which the objective was to find a solution on how to develop a process to minimize said difficulties and ensure that the identified information needs could be satisfied.
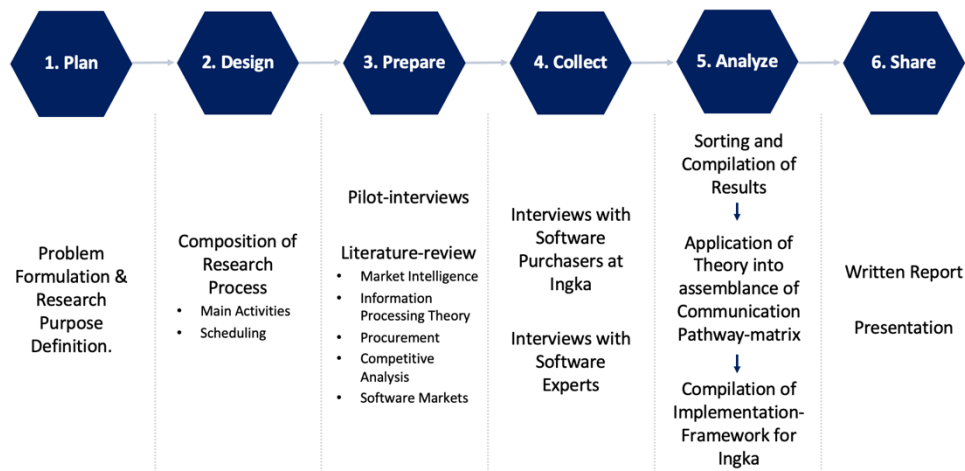
Figure 2. Research strategy of the thesis, based on Yin (2009).

Yin (2009) describes a research strategy as a process consisting of five steps, plan, design, prepare, collect and analyze, which has been adapted to this thesis according to Figure 2. The first step, Plan, consisted of defining a goal for the thesis by formulating the problem description and constructing the aim of the thesis. This included reading up on the subject in order to identify what could actually be targeted with the thesis and set clear delimitations. Planning was followed by the second step of the research process, Design, where the whole research method was designed. This was made by a breakdown of research activities, followed by scheduling of named activities into a Gantt chart to be able to visualize estimated time required for each phase and making sure the timeline added up. The third step, Prepare, consisted of a literature study, where data was collected about Market Intelligence, Information Processing Theory, competitive analysis, software markets and procurement. This was followed up by the next step, Collect, aimed to gather more up to date and insightful information about software markets from an expert point-of-view, and to understand the targeted group's, purchasers at Ingka Group Procurement Digital & Tech's, Information Requirements. After the collection, the next step, Analyze, was initiated. This step consisted of analyzing the answers from the interviews, both trying to find common patterns within the different focus groups (experts and purchasers) by compiling the results and comparing the answers from experts and purchasers to see their correlations. In this step the theory from the Preparation phase was also applied, to be able to see how these results correlated and could make use of theoretical practices in order to develop a solution for the identified problem. This phase then concluded with the development of a roadmap for Ingka, and a discussion over the applicability of the results to other organizations. The sixth and final step of the research process, Share, consisted of the compilation of the thesis combined with the composing of an oral presentation supported by visualization tools, with the aim of giving stakeholders,

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such as Ingka and the university, an opportunity to provide feedback before the final publishing of the thesis.

2.2 Research methods

The research applied qualitative data with a flexible design, allowing for iterativity during the process. Due to the combination of exploratory and problem solving nature of the research, different methods had to be used to achieve the purpose of the thesis.

2.2.1 Literature study

During the process, a literature study was carried out with the aim of establishing general knowledge and to acquire essential insights on the fundamental topics of the thesis (Höst et al., 2006). The final literature which was studied took the shape of academic papers, journals and conferences, as well as books written by acknowledged authors within the relevant subjects of the thesis.

The search for relevant literature followed the process described by Höst et al. (2006) initiated by a broad search, defined by searching for a broad variety of sources out of which literature was chosen based on their abstract. This was followed by a narrow search, where abstracts and keywords from the broader search led to more specific literature to search for, based on terminology relevant for the thesis. The search of literature was mainly conducted through searches on LUBsearch, Lund University's own portal for academic literature, Lund University libraries and Google Scholar, by combining a range of keywords. Following recommendations, reliability, validity and representativity (Höst et al., 2006) combined with the aspect of readily availability (Deane, 2010) of the literature were examined to identify potential useful sources of information.

The reliability of the literature was ensured by searching for literature written by authors with the right credentials and peer reviewed sources. This reliability of the information was judged by asking questions such as if the information was confirmed somewhere else, if the author qualified for the subject and if the source was intended for academic use (Deane, 2010). The validity of the literature was emphasized further later in the research process when applying other methods, the case study and the expert-interviews, to analyze the relevant topics. The relevance of the literature was ensured by comparing the scope of the thesis with the abstract of the potential literature. Lastly, to make sure the literature was Readily available, it was made sure that it was accessible online, through LUBsearch or Google Scholar, or physically at the university library.

2.2.2 Case study

The nature of this research can be described as both exploratory and problem solving while examining a contemporary phenomenon without controlling it, for which a case study is a preferable research method (Yin, 1984), especially when difficult to set apart from its surrounding environment (Yin, 1984). Höst et al. (2006) further emphasize the benefits of case studies to explore and gain in depth knowledge within a subject. A relevant case study should refer to a representative case, meaning that it is a good representation typical for the analyzed environment (Yin, 2009). To be able to gain deeper insights of a specific phenomena, a single-case study is beneficial and was therefore decided on (Yin 2018).

A case study of Ingka Group Procurement Digital & Tech: Software Category was conducted with the aim of mapping their purchasers' specific identified information needs, as well as to identify possible challenges with the dissemination of this information throughout the organization. This was made through interviews to gather data with a semi-structured design and a pre-decided set of open-ended questions, combined with flexibility regarding order and formulations (Höst et al., 2006). The purpose of this design was to enable a problem solving approach of the thesis, but still keep the interviews compendiary in order to both guide the interviewees in order to not miss relevant areas related to possible information needs, but still give room for the interviewees to accentuate what they thought of importance.

The selection of interviewees, due to the qualitative nature of the research, aimed to cover the variation existing in the studied population (Höst et al., 2006). The total population at Ingka Group Procurement Digital & Tech: Software Category reaches a number of twelve individuals, and it was therefore feasible to include the whole of the relevant population for the Ingka case study. These twelve interviews were fortified with two interviews with individuals from Ingka Group Digital with the purpose to triangulate certain identified challenges related to interdepartmental communication. The complete list of interviewees from the department of Group Procurement Digital & Tech: Software Category can be found in Appendix A. Interview questions were adopted along the process to mirror the iterative approach adapted to the process and therefore also adopt newer significant findings.

The interviews were, after giving consent, recorded and later on transcribed to make sure no information got lost along the way. To analyze the Information Requirements from the case study, a grouping of the findings was applied, to categorize and further deepen the analysis (Höst et al., 2006). A content analysis of the transcribed interviews was thereafter conducted. Nyberg (2012) describes content analysis as analyzing individual answers from the executed interviews, followed by a systematic grouping of these answers. This implied a size reduction

of the gathered material into the information which was deemed relevant for the thesis.

2.2.3 Expert interviews

A total of seven stakeholders from the industry and academia were interviewed to gather wider knowledge on the topic of software markets by mapping their experiences of the most relevant software market qualities from a purchaser perspective. The experts were chosen with the aim to cover the many perspectives from which the software markets can be seen, and were conducted until a perceived saturation was reached. The aim was therefore to reach out to experts which had been active in a range of different software markets and preferably in various international contexts, which had different niches and differing academic and industrial backgrounds. This was reinforced by two hard criterias:

- More than 10 years of professional experience.
- Experience from both academia and industry for a more holistic overview and realistic perspective

An overview of the interviewees can be seen in Table 2 below.

Table 2. Overview of software experts

Interviewee	*Role overview*
Jan Bosch	Professor at Chalmers University of Technology and Director of Software Center Organisation.
Elouise Epstein	Partner at Kearney, specialized in digital procurement and supply chain strategies.
Tony Gorschek	Professor within Software Engineering at Blekinge Institute of Technology.
Marcus Matteby	CIO and CDO of Sundsvalls kommunkoncern, Sweden.
Björn Regnell	Professor within Software Engineering at Lund University and member of the editorial board of the Requirements Engineering Journal (Springer).
Richard Torkar	Professor within Software Engineering at Chalmers University of Technology.
Paul Townend	Computer scientist at Umeå University and steering committee member IEEE ISORC, IEEE JCC and IEEE BigDataService.

The complete description of the interviewed experts can be found in Appendix A.2.

The expert interviews were conducted in an openly structured manner, defined as the interviewee being able to steer the conversation but still securing the relevance of the interview by the usage of control questions and supervision of responses from the interviewers (Höst et al., 2006). It was an explorative approach, as the aim was to identify what the experts found to be most relevant, with the interviews therefore adjusting along the way as more knowledge was gained about the software markets. The expert interviews were recorded and transcribed, following oral consent from the interviewees.

2.3 Research ethics

Two main ethics considerations, bias and integrity, have been discussed and examined for this thesis (Höst et al., 2006).

Yin (2009) explains that it is of highest importance for researchers to be unbiased, which can be achieved through regular external revisions and continual discussions of the findings. For this thesis, bias was shunned by continuous recurring meetings with supervisors from both Ingka and Lund University, combined with the leverage of a weekly status report, offering supervisors the opportunity to follow along the continuous development of the thesis.

Integrity is the second ethic consideration emphasized by Yin (2009). Höst et al. (2006) describe three fundamental principles to assure integrity is defended. Firstly, a cornerstone is to ensure that participation in the study is voluntary, which makes informed consent from participants a must. The second importance is to ensure the privacy and confidentiality of all participants, as well as matching their requested anonymity. The third and last fundamentality to guarantee integrity is to ensure authors honesty, especially regarding gathered data. For this thesis, integrity was ensured by handling gathered data according to current data legislation and reassuring all data was exclusively handled by the authors.

2.4 Research quality

To reassure research quality, by examining its validity and reliability, logical tests proposed by Yin (1984) were conducted, in combination with an analysis of the transferability of the thesis' result.

Reliability is the concept of demonstrating that the process of research, for example data gathering, can be repeated and then achieve equal results (Yin, 1984). For the

work of this thesis, reliability was assured by continuously conducting meetings with the supervisors, which also supported triangulation of the thesis.

Validity is the aim of establishing a domain to which the result of an analysis can be generalized (Yin, 1984) in order to make sure the phenomena which is being evaluated is not sourced from anything else than the dimension scrutinized in the research.. To reach validity, a wide range of sources and methods were selected carefully and their relevance ensured for the purpose of this thesis (Deane, 2010). When gathering information from both the literature and the case study, it was further validated by expert interviews, until saturation was perceived. The application of different methods for the data collection and further on the analysis of the result from these different sources and perspectives, made it possible to achieve a more holistic overview of the studied phenomenon and therefore fulfill the aim of generalization (Höst et al., 2006).

The *transferability* of the thesis aims to describe to which extent the results can be applied to a wider context, further from the specific case studied. By conducting the analysis on Ingka, which is one of the worlds biggest retailers, the representativity to retailer companies of similar size is deemed to be high as it is believed that purchasing software does not differ enormously between them. Furthermore, several of the interviewed purchasers had previous experience of software purchasing in other organizations, sometimes in industries other than retail, which is deemed to have given them a more holistic view of purchasing activities and insights to take into consideration which were not solely applicable to Ingka. However, it is not believed that the results could be directly transferred to any company or purchasing activity.

To validate the quality of the thesis further, five areas described by Robson (2002) were considered; logging, feedback, third party review, triangulation and long-term studies, as can be seen in Figure 3.

Logging	The process has been documented regularly in the beginning and the end of every week, more specifically through structured weekly status reports. The process has furthermore especially been logged regarding the collection of data and process of the analysis to be able to continuously visualize and check the path towards a conclusion.
Feedback	After conducting the interviews and compiling the results, respondents from Ingka have been able to give feedback and comments on the perceived conclusions.
Third Party Review	Supervisors from both university and Ingka continuously reviewed the work to make sure it was of quality and unbiased.
Triangulation	The triangulation of this thesis was based on a combination of three methods, where a literature and case studies as well as the expert interviews aimed to triangulate each other, allowing the phenomena of software procurement to be analysed from different perspectives.
Long-Term Studies	For this thesis, long-term studies were a limiting factor, due to the previously determined time frame which could not be impinged.

Figure 3. Quality validiation of theses, inspired by Robson (2002).

3 Theory

The following theory-chapters consists of background information as well as descriptions of theories and frameworks which will be applied later on in the thesis. "Purchasing and Supply Management" describes what procurement as a function typically does within an organization and what activities it might entail. "Information Processing Theory" looks at how information differs in both its complexity and its processing requirements, and how it should be processed within an organization. Furthermore, the chapter called "Competitive Analysis" gives an introduction to which kinds of information could be of interest for a purchaser when looking at a supplier market from a competitive perspective. Finally, a small introduction to the software markets is provided.

3.1 Procurement and Supply Management

Procurement and Supply Management (PSM) is a part of Supply Chain Management (SCM). Banbury (1975) established the term SCM to describe how different supply-related functions and activities conjoined intra- and inter-organizationally and how these could be managed. This process design is based on four fundamental functions, procurement, production, logistics and sales.

Hoskisson et al. (1999) further describes the functional aspects of strategic management to include drafting, implementing and evaluating cross-functional decisions, which ensures the organization strives towards their goals. The objective of applying SCM theory is to enhance an organization's performance and its creation of value towards their different stakeholders, both vertically and horizontally, by ensuring processes are done by those in the chain who are most efficient at it leading to the most value creation as a system (Sirmon, Hitt, & Ireland, 2007; van Weele & van Raaij, 2014).

3.1.1 Definition of procurement

PSM, is commonly explained as the discipline of managing external resources of the organization, such as goods, services, capabilities and knowledge resources, that

are essential for its daily maintenance and which might aid superior performance (Ellram et al., 2020; van Weele & van Raaij, 2014). Purchasers therefore function as the interface and communication facilitator between providers of external resources, suppliers, and the units within the organization which will make use of these resources in their processes.

From a historical view, the 1970s economic downturn combined with disruptions of the then traditional supply chains, made management of external relations and resources a priority for organizations. This formed the practice of PSM to have traditionally had a strong emphasis on cost reduction tactics, such as knowledge within negotiation, competitive analyses and strategic contracting (van Weele & van Raaij, 2014). Original PSM procedures, from the 1960s and 1970s, are based on the establishment of achieving the five "rights" for the company: right quality, right quantity, right delivery, right price and right service (Ellram et al., 2020). The conventional focus on cost reduction within PSM has led to established tactics of international and aggressive sourcing practices (van Weele, 2010).

The role of PSM can be encapsulated as the responsibility of interactions with the upstream supply chain, with the aim to fulfill the organizations underlying needs, interests and demands, either of internal functions or of downstream customers (van Weele & van Raaij, 2014). The main skills of PSM as a business unit is therefore for example to have knowledge of supplier markets, supply chains and gather information about essential resources (van Weele & van Raaij, 2014). Furthermore, stating PSM as a discipline of business administration, organizations must always embrace managerial insinuations (Ellram et al., 2020). Meanwhile, Klobučar & Erjavec (2019) argue that the traditional administrative role of PSM has begun to change during the last 20 years, as a constantly augmenting need for joint development between supplier and customer implies the role of PSM as an increasingly important strategic function within the organization (Klobučar & Erjavec, 2019; van Weele & van Raaij, 2014). PSM is heavily affected by trends within outsourcing, due to the acceleration of globalization and technology-innovation and specialization, as it results in a need for organizations to become more integrated with both suppliers and customers (Ellram et al., 2020). The need is reflected in the increasing importance of strategic management in the PSM function, such as corporate planning, competitive strategy and stakeholder strategies, such as network theory and resource management (van Weele & van Raaij, 2014).

3.1.2 Procurement activities

3.1.2.1 The procurement process
To illustrate the practice of PSM, its functions can be divided into two main business-related processes, namely the pre-order-process, where new suppliers are

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selected to fulfill an identified need, and the post-order-process, where suppliers are managed over time. The exact individual steps in these processes may however vary from organization to organization. (Scott, Lundgren & Thompson, 2018)
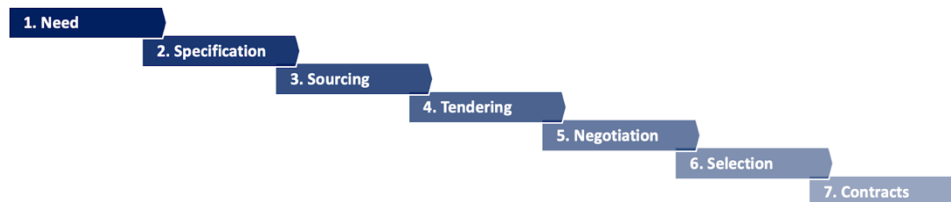
Figure 4. A schematic overview of the pre-order process. (Scott, Lundgren & Thompson, 2018)

A schematic overview of the pre-order process, presented in Figure 4, shows seven general steps of the PSM process from the moment the first identified need within the organization has been identified until the contract which ensures an external solution is signed. The pre-order process begins with an identified need within the company, that with certain specifications is passed on to the PSM function, where a procurement perspective is appended. The PSM function will then source potential suppliers, looking at both existing suppliers and new suppliers. Based on the specification a tendering is initiated, where PSM will compile a list of the possible suppliers which seem most suitable to fulfill the originally identified need. Tendering is followed by negotiations between the organization and one or several potential suppliers. Once the negotiations are conducted and an agreement(s) has been made for one or multiple suppliers, the contract(s) is set up, including the final specifications and the agreements made during the negotiations. The final step of the pre-order process is for both parties to sign the contract. (Scott et al., 2018)
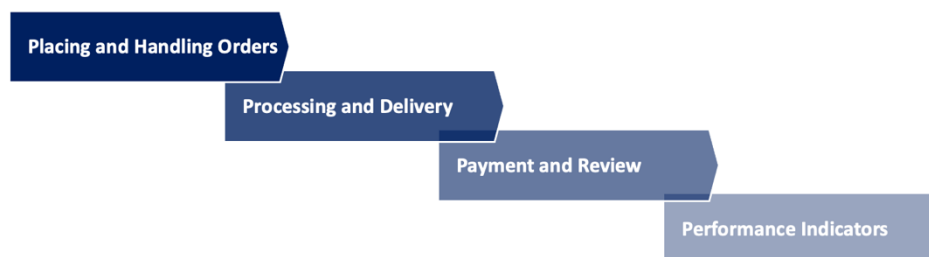
Figure 5. A schematic overview of the post-order process. (Scott et al., 2018)

The post-order process begins once the contract is signed, and is structured into four major traditional steps: placing and handling orders, progressing and delivery, payment and review, and lastly performance indicators, as seen in Figure 5. The post-order steps begin with the placing and handling of orders from the customer to

the supplier. This is followed by the customer's need to monitor both progress and delivery of the solution from the supplier, which can be done both operationally and ad hoc. The next step is the payment and possible handling of invoices from the customer towards the supplier. The delivery is then followed by continuous review of the supplier from the customer to make sure the stated specifications in the agreement are delivered as promised. The continuous reviews give the organization an opportunity to deal with possible supplier related issues, as well as giving the supplier potential feedback regarding their agreement (Scott et al., 2018). Most of the steps in the post-order process are more administratively heavy and are becoming more automated by the day (van Weele, 2010), leaving more room for PSM-functions to focus on the more strategic activities related to the pre-order process and partnership establishments.

Other theories visualize the purchasing process as rather cyclical, since the customer needs and therefore the customer scope, might change with time and development of the organization. Instead of emphasizing the pre- and post-order process as separate, a holistic overview is then applied (Scott et al., 2018; Rushton & Walker, 2007).

3.1.2.2 Main strategies

Strategically, the desired product as well as potential suppliers should be analyzed based on two dimensions. The first dimension is the purchases' impact on the organizations profitability, and the second parameter should be the supply risk which can be associated with the purchase (van Weele, 2010). Further on, partnerships and competitive bidding should be seen as part of the company's complementary strategies (van Weele, 2010), as well as the decision of whether to satisfy an identified need with insourcing or outsourcing, commonly known as the "make-or-buy" decision (Kauffman & Tsai, 2009).

Furthermore, another strategic choice can be applying a unified or multi-vendor procurement-strategy (Kauffman & Tsai, 2009). Unified procurement can be described as an organization's decision to purchase all possible compatible products needed from one single supplier (Kauffman & Tsai, 2009). Multi-vendor procurement strategy, on the other hand, focuses on the organization keeping contact with a wide range of suppliers from which to choose from (Kauffman & Tsai, 2009). Adoption of unified procurement might lead to decreased costs of coordination, but on the other hand, risks are identified in the loss of competition between said suppliers, which can result in issues associated with a supplier lock-in effect (Kauffman & Tsai, 2009). These issues can be mitigated if the purchasing organization becomes an allied partner, since distrust between supplier and buyer, seen from a long term perspective, can lead to increasing costs due to guarding measures (van Weele, 2010).

Depending on the level of the analyzed market's maturity, organizations should aim for different strategies. The mature industry is characterized by well-defined industry standards and is well-confined, and therefore not very agile (Kauffman & Tsai, 2009). The young industry, on the other hand, tends to be characterized by the absence of industry standards, unconfined capabilities, as well as limited IT spending (Kauffman & Tsai, 2009). Generic solutions with basic requirements tend to have a relatively predictable demand, combined with a long product life cycle fit for global sourcing. More innovative markets instead tend to be represented by short and dynamic life cycles combined with a well structured supplier network, often local (van Weele, 2010). This explains the requirement of both global and local strategies within organizations for PSM to optimize the supplier relationship, as more local strategies often can overcome challenges with innovative markets whilst global strategies are usually better suited for mature industries (van Weele, 2010). If the role of PSM is pursued globally, the organization is challenged with the issue to understand and manage both complexities and risks associated with a global environment. Strategies must be developed to allow the PSM role to accommodate systems and processes to the different important environmental irregularities (van Weele, 2010). If the organization acts on both global and local basis, strategies need to be developed to overcome barriers, such as language, cultural differences and diverse business situations (van Weele, 2010).

Scott et al. (2018) describe how the nature of the needed product can define the procurement processes further, such as its industry or its life cycle maturity. Furthermore, products established within the organization might have already ratified sources, while new product procurement might require more effort and time to reach an optimum agreement (Scott et al., 2018). PSM can therefore operate as an enabler for bringing both current and new suppliers into alignment with the existing organizational functions, to improve quality and reduce costs (Ellram et al., 2020).

3.1.2.3 Supplier Relationship Management

To manage relationships with an organization's suppliers efficiently, there is a need to establish procedures and routines for the partnership activities (Forkmann, Henneberg, Naudé & Mitrega, 2016). Supplier Relationship Management, SRM, can be defined as the part of PSM that is monitoring the linkage between an organization and a supplier proactively (Scott et al., 2018). SRM aims to benefit the buyer and the supplier mutually and therefore enhance the improvement of the PSM process in its whole (Scott et al., 2018). Scott et al. (2018) describe several beneficial implications of SRM, such as the possible breakdown of functional barriers between organizations. By applying a resource based view of an organization the dependency on external stakeholders is highlighted, of which a supplier is one (Ellram et al., 2020), and stakeholder theory strengthens this perspective by enhancing the purchaser's need of taking the different stakeholder perspectives into account when making decisions (van Weele & van Raaij, 2014).

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The classic SRM approach, referred to as the bow-tie model, is based upon one specific point of contact between buyer and supplier, as seen in Figure 6, often defined as the "buyer" and the "seller". This basic model has benefits in its straightforward paths of communication between the two parties. Difficulties with the bow-tie model revolve around identifying a need within the organization, as well as progress and KPI monitoring, mainly due to the heavy dependence on the two individuals responsible at each end of the buyer-supplier relationship (Scott et al., 2018).
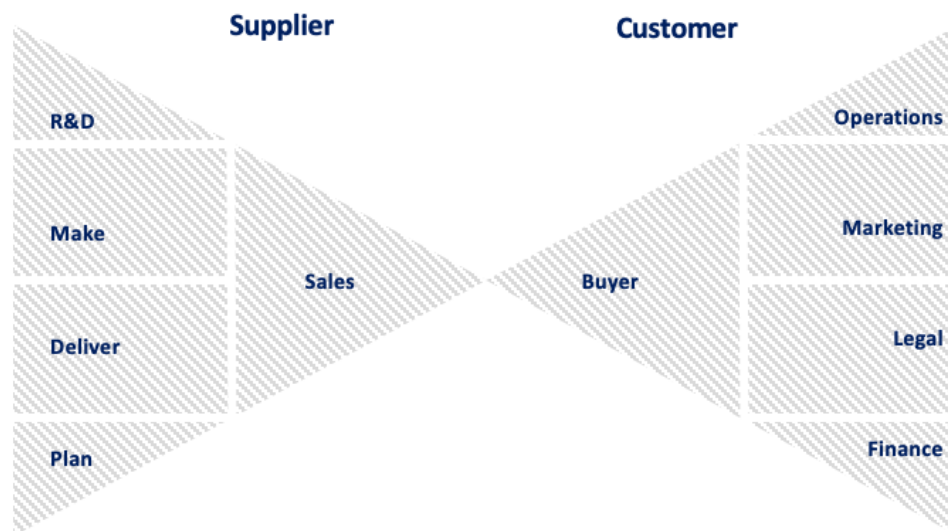
Figure 6. The bow-tie model of supplier-buyer relation. (Scott et al., 2018)

As a flip-side approach on how to manage supplier relations within the organization, there is the interdependent relationship model, see Figure 7, which is shaped corresponding to a diamond. Instead of one single node, the points of contact are multiple. This model requires the separate teams within the buying organization to closely manage their individual relation to their interrelated supplier team, to beneficially align roadmaps between the companies (Scott et al., 2018).
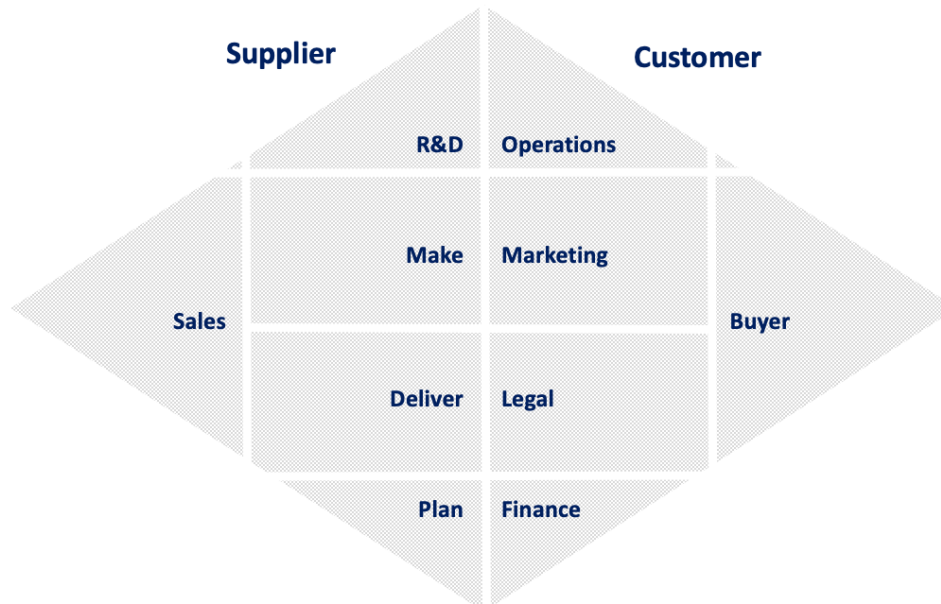
Figure 7. The Interdependent relationship model. (Scott et al., 2018)

SRM can be based on several different models of interactions between the organization and its supplier (Scott et al., 2018). It is shown that high SRM capabilities correlate to a positive impact on the supplier quality, as well as the buyer influence (Klobučar & Erjavec, 2019). Van Weele (2010) enhances the importance of increasing six important characteristics within the relationship before a cooperation can reach its true potential. These capabilities are: trust and commitment, cooperative norms, interdependence, compatibility, manager's awareness of environmental uncertainty, as well as an extendedness of a relationship (van Weele, 2010). Furthermore, to successfully implement a solid SRM system within an organization, a purchaser needs to possess a multi-dimensional mindset, considering the supplier-buyer relationship less transactional and with increasing advisory features. If the buyer and supplier from both ends adopt a holistic approach, by aligning roadmaps and goals as well as corporate cultural values, SRM can efficiently benefit both parties (Scott et al., 2018).

An essential part of PSM is the concept of supply and demand power, as its implications determine the strategies a purchaser should act on as well as influences both leverage over supplier behavior and the comprehensive profitability of an organization (Strohmer et al., 2020). Two main factors are identified as regulators of the buyer-supplier power. On the one hand, there is the supplier's capability to create and sustain a favorable solution meeting the buyer's needs, whilst on the other hand, there is the buying organizations capability of finding matching solutions for mentioned needs, hence challenging the supplier's uniqueness (Strohmer et al.,

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2020). An interesting trend is related to how suppliers are expanding their original offerings by providing services related to their core offering, e.g. maintenance services, operational services, and selling of gathered customer data and/or trends (Strohmer et al., 2020). This trend has shifted buyer-supplier power in favor of the supplier, due to the buyer's decreased ability to easily switch suppliers. This trend can be linked to the increased standardization of manufacturing, and implies an increasing value of services and data, both monetarily and for generating power (Strohmer et al., 2020).

Three strategic aims are described for a buyer trying to regain or stay in a beneficial position in the buyer-supplier relationship. The first strategy as a buyer is to remain approachable to substitute supplier-choices, the second is to deliberately care for the organization's intellectual property, IP, and finally to utilize innovative movements from the supplier (Strohmer et al., 2020). This can all be summarized in the fact that a buyer's relationship with suppliers is becoming increasingly strategic with the ambition of reaching desired value (van Weele, 2010). This emphasizes the importance of the development of specific PSM-related competencies. Bals, Schulze, Kelly & Stek (2019) define negotiation and communication, combined with the possession of professional specific knowledge related to the organization and its businesses, as the key skills from which the success of the buyer is derived (Bals et al., 2019).

Negotiation is described as both a key activity and a key competency for purchasers and salesmen, to efficiently reach a desired agreement (Bals et al., 2019; Scott et al., 2018). The fundamental concept of negotiation is the mechanism of compromising in favor for all parties involved (Scott et al., 2018), generally a buyer and a supplier. Compromising can be made not only regarding price but also to related procurement terms, such as service and delivery details (Scott et al., 2018). To achieve an overlapping agreement, compromise will have to be made by both parties. The last step of the negotiation is to deliver on the agreement (Scott et al., 2018).

3.1.3 Future of procurement

Strategic focus on innovation, combined with cognitive competence-based thinking, is the main driver of change when it comes to the development of PSM. There is a trend of organizations becoming more and more dependent on the management of supplier relationships and supplier performance (van Weele & van Raaij, 2014). Traditional PSM revolved around the immediate relation with suppliers, but due to the changing environment, PSM now needs to consider an increasing amount of intelligence related to e.g. the suppliers' supply chains, their network, the complexity of their products and the markets where they are active (Ellram et al., 2020). Challenges on the rise along the PSM processes which must be considered are e.g. the practices related to specifying a need, and in the prolonged scope the

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product-specific characteristics desired by the end-user. Bals et al. (2019) describe requirement-specification as "an art", and the capability is crucial for a purchaser to possess to be able fulfill the aim of converting assumed supply market value into reality product value for the end user (Bals et al., 2019). The environment where purchasers act is becoming all the more uncertain, with digitalization, automatization and the dependence on information becoming more and more prominent when it comes to acquiring economic leverage. The conclusion is that both individually and separately, these emerging technologies gruffly can rummage the function of PSM within organizations with an increasing demand for innovative and advanced managing and operating skills (van Weele & van Raaij, 2014).

3.2 Information Processing Theory

Information Processing Theory (IPT) has its basis on the distinction between the term "information" and "data", where information refers to data which is "relevant, accurate, timely and concise" (Tushman & Nadler, 1978). Information needs to effect a change in knowledge, and information processing is consequently defined as the "process of collecting and transforming data into information, as well as communicating and storing information" (Liu & Hyang, 2020). The processing of information filters and connects data into understandable concepts, which in organizations is mostly done to coordinate and accomplish diverse tasks through a reduction of underlying external or internal uncertainty (Daft & Lengel, 1986). It can be used to develop supportive attitudes toward innovations and change, by the transfer, dissemination and promotion of compatible norms, values and expectations (Dewett & Jones, 2001). This is done to facilitate cross-functional collaboration and aid adjustments to modified skills, roles or processes (Cooper & Wolfe, 2005).

Information Processing Theory was first coined by Galbraith in 1973, as a means to describe the way organizations can be designed to take into account the balance between their information processing needs and their capacity to do so, which is needed for optimal performance (Lorentz et al., 2020; Premkumar, Ramamurthy & Saunders, 2005). The information processing needs are defined as the requirements for the communication-pathways used for inter- or/and intra-organizational interactions, and includes the "collection of appropriate information, the movement of information in a timely fashion and its transmission without distortion" (Tushman & Nadler, 1978). Not having the capacity required could hence lead to delayed completion of tasks at higher costs for the organizations, and having too much of it would result in ineffective usage of company resources (Liu & Hyang, 2020).

3.2.1 Complexity factors

Uncertainty is a concept underlying Information Processing Theory since a decreased amount of uncertainty in organizations leads to lower information processing needs. Furthermore, an understanding of the complexity that uncertainty poses gives guidance on the information processing capacity needed within the organization (Lorentz et al., 2020). Early work in psychology (Garner 1962; Miller and Frick 1949; Shannon and Weayer 1949) set the ground for the common understanding of uncertainty as the absence of information, where an increase of information leads to its reduction and vice versa (Daft & Lengel, 1986). It was later identified by Duncan (1972) as a "key environmental characteristic of decision-making" underpinned by the main dimensions of complexity and dynamism, and Galbraith (1974) as the " difference between the amount of information required to perform the task and the amount of information already possessed by the organization". High uncertainty in organizations therefore imply a need to acquire more information to make the right assumptions for decision-making (Daft & Lengel, 1986)).

Additional to uncertainty, another factor underpinning the information processing needs of an organization was presented by Daft and Lengel (1986) when they expanded the framework to include the concept of equivocality. This factor relates to the complexity added by the interpretations and multiplicity of meanings that information can lead to within the organization (Lorentz et al., 2020). The two factors, uncertainty and equivocality, will be further described in the following sections.

3.2.1.1 Uncertainty

Uncertainty can arise from several sources during the processing of information, and the greater the uncertainty, the more information that will have to pass between decision makers during the task-execution in order to gain a certain level of performance (Galbraith, 1974). The level of uncertainty and therefore how well the task at hand is understood lays the basis for how well the task can be preplanned, as the acquisition of new information during the process can lead to changes in resource allocations, schedules and priorities (Galbraith, 1974). In information processing theory, these sources of uncertainty can usually be subdivided into uncertainties related to the environment in which the organization resides and takes inputs from, or from the task characteristics the organization or division tries to perform and their relative interdependence (Jia, Blome, Sun, Yang & Zhi 2020; Tushman & Nadler, 1978).

3.2.1.1.1 Environmental uncertainties

Areas outside of an organization or subunits control can be seen as a source of uncertainty due to the organizations partial or entire inability to control them, therefore making them potentially unstable (Tushman & Nadler, 1978). According

to researchers, this instability stems from two major dimensions: the complexity and dynamism of the environment. Complexity relates to the number of factors, and their interactions, that have to be taken into account to be able to process the information relevant for decision-making, whilst dynamism can be explained as the frequency by which these environmental variables change, and the ability to predict said changes (Premkumar et al. 2005). Among these uncertainties, the latter has been argued to have the bigger impact on the need for information processing capabilities, as it has been shown to be of particular importance for the uncertainty perceived by the organizational unit (Tushman & Nadler, 1978). Complexity in a stable environment can be more or less dealt with by the development of standards, rules and processes. However, if the environment is dynamic, these procedures will not be able to deal effectively with said uncertainty which will require higher information processing capabilities from the organization to monitor and react to changes (Tushman & Nadler, 1978).

Partnership uncertainty is a more specific environmental factor that affects the need for information processing capabilities. Interorganizational relationships may involve parties with different business objectives and can therefore lead to some parameters of the transaction being more or less optimal for each of the parties. This in turn may lay the ground for opportunistic behavior by withholding or distortion of information from either party (Premkumar et al. 2005). Another source of uncertainty is the risk posed by the partner underperforming on its contract (Premkumar et al. 2005). However, this uncertainty can be reduced by increasing the trust between the organizations, by e.g. relationship-specific investments, and by increasing the transaction specificity (Bensaou and Venkatraman, 1995).

3.2.1.1.2 Task uncertainty and interdependence

Each organization is built up and maintained by a variety of tasks which each depend upon differing quantities of information. Task uncertainty therefore refers to ''the difference between the amount of information required to perform the task and the amount of information already possessed by the organization''. The higher the uncertainty, the more variability and unpredictability can be expected relating to the exact processes that will be needed to finish the tasks, which in turn impacts the quality of the outcome. (Liu & Hyang, 2020)

However, task uncertainty also arises during the processes by which inputs are turned into outputs within the organization, namely due to the dimensions relating to the tasks variability, analyzability and input uncertainty (Sherman & Keller, 2011). Task variability refers to the frequency of unanticipated events that may arise during its conduction (Perrow, 1967), whilst analyzability relates to the ease by which the individuals can follow an objective or procedures needed for completing the task (Shamekhi, Scheepers & Ahmed, 2018). When the variety of the task procedures are low the individuals can predict the activities and challenges that may arise beforehand, which leads to a higher certainty of future activities. When the

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variety on the other hand is high, one can expect higher uncertainty and therefore a need for higher information processing capabilities (Daft & Macintosh, 1981). Furthermore, high analyzability of subunit tasks, when the nature of the work is certain, lead to lower information requirements as they may be able to conduct their tasks with the help of for example fixed standards, rules and formal operating procedures. This in turn decreases the need for input, monitoring, feedback and consequent adjustments. However, If the essence of the task is uncertain, there will be an increased need for an organized flow of information for the role occupants (Tushman & Nadler, 1978).

Another important factor that adds to a task's complexity, is its interdependencies to other subunits work, when "actions initiated by one individual or unit affect the actions or outcomes of another individual or unit" (Sherman & Keller, 2011). Complex tasks which implicate reciprocal interdependence, are harder to plan beforehand, add to the uncertainty and therefore affect the unit's inherent efficiency (Tushman & Nadler, 1978). This uncertainty leads to an increased need for cross-unit problem-solving and communication, and the subsequent coordination-requirements therefore enhances the amount of information that needs to be processed within the organization as this is tightly linked to the coordination performance (Daft & Lengel, 1983; Sherman & Keller, 2011; Tushman & Nadler, 1978). However, it is common with deviations between the perceived and latent interdependencies between the subunits tasks, which may be a "frequent source of integration deficiencies in organizations" (Westerman et al., 2006).

3.2.1.2 Equivocality

Equivocality makes information processing difficult in a completely different way than uncertainty, as more information does not necessarily result in a better understanding of the problem or task ahead (Daft & Lengel, 1986). Equivocality measures the degree to which data is ambiguous within the organization due to the existence of numerous and conflicting interpretations of the same information or situation (Cooper & Wolfe, 2005). This may lead to confusion and misunderstandings, as "participants are not certain about what questions to ask, and if questions are posed, the situation is ill-defined to the point where a clear answer will not be forthcoming" (Daft & Lengel, 1986). Information processing may therefore occur not just to reduce uncertainty, as Galbraith (1974) suggested, but also as a mechanism to reduce equivocality (Haussmann, Dwivedi, Venkitachalam & Williams 2011).

Equivocality can stem from the task being complex and the underlying input-output process not well understood, or the purpose of the task being ambiguous due to its compatibility with the organization's purpose and current strategy being dubious (Cooper & Wolfe, 2005). The degree of task equivocality can partly be measured due to the kind of specification that is sought after: it is low when the need is well defined as an input specification, medium for output specification and high when

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the need specification is open (Lorentz et al., 2020). If the task is interdepartmental or interdependent with another unit, another cause for equivocality can stem from the extent to which these units are differentiated in terms of "specialties, time horizons, goals, frames of reference, and jargon" (Lawrence & Lorsch, 1967; Shrivastava & Mitroff, 1984) . This differentiation can result in complexity, misunderstandings and overall difficulties to get common interpretations when communicating and can therefore be a substantial source of equivocality (Cooper & Wolfe, 2005).

3.2.1.2.1 Organisational implications related to information complexity.

The way to reduce uncertainty and equivocality is therefore different; the former is diminished by the acquisition of appropriate information through organized intelligence gathering and rational analyses, whilst the latter is reduced by the definition and production of unified answers (Cooper and Wolfe, 2005). New data may therefore not lead to better results or understandings when equivocality is high, as this is better tackled by meetings and discussions between managers, so they gradually can come to a common interpretation and frame of reference that can be used within the organization and underly future action (Daft & Lengel, 1983).

A summary of the previous chapter and as a tool to understand how combinations of different levels of uncertainty and equivocality can be interpreted, one can be guided by Figure 8 (Daft & Lengel, 1986).

High

Occasional ambiguous, unclear events, managers define questions, develop common grammar, gather opinions.

Many ambiguous, unclear events, managers define questions, also seek answers, gather objective data and exchange opinions.

Equivocality

Clear, well-defined situation, managers need few answers, gather routine objuective data.

Many, well-defined problems, managers ask many questions, seek explicit answers, gather new, quatitative data.

Low

Low   High

Uncertainty

Figure 8. Equivocality and unceratinty matrix. Based on Daft & Lengel (1986), reworked for this thesis.

3.2.2 Media Richness Theory

As discussed in the previous chapter, different means can be required to reduce uncertainty and equivocality when completing a task in an organizational setting. This chapter focuses on the importance of the media by which the required information is communicated, as different types of communication pathways are proven to be more or less efficient at reducing these complexity factors.

Information richness refers to the "ability of information to change understanding within a time interval' (Daft and Lengel, 1986), which is defined by the potential it has to carry data (Daft & Lengel, 1983). Consequently, information which has a high capacity of clarification of ambiguous issues is considered rich, whilst information that requires more time to enable understanding and is less effective at overcoming different perspectives ranks lower regarding this quality (Daft &

Lengel, 1986). Therefore, information richness is often referred to when clarifying how organizations could match the amount of information which is needed and how to lessen equivocality (Daft & Lengel, 1983).

Media richness theory extends Galbraith's (1974) theories by stating that information processes in organizations are meant to reduce uncertainty, but also equivocality (Cooper & Wolfe, 2005). The richness of a media is based upon its "capacity for immediate feedback, number of cues and channels used, personalisation and language variety" (Daft and Wiginton, 1979). Therefore, a distinction is made between lean and rich media, where the first refers to means of communication for more routine activities in the form of e.g. rules, forms, procedures and regulations whilst the latter consists of more personal contact like face-to-face interactions or group-meetings, as they enable direct checking of the recipient's interpretation and personalisation in the way that the information is communicated (Daft & Lengel, 1986). Rich media has greater ability to transmit tacit knowledge, which is essential for problem-solving and interorganizational learning (Prior, Hitihami Mudiyanselage & Hussain, 2021). It is therefore better at reducing equivocality between the parts to "reach an agreement about difficult, unanalyzable, emotional, and conflict-laden issues" (Daft & Lengel, 1983). Lean media on the other hand is more efficient at transmitting unequivocal messages (Daft & Lengel, 1983).
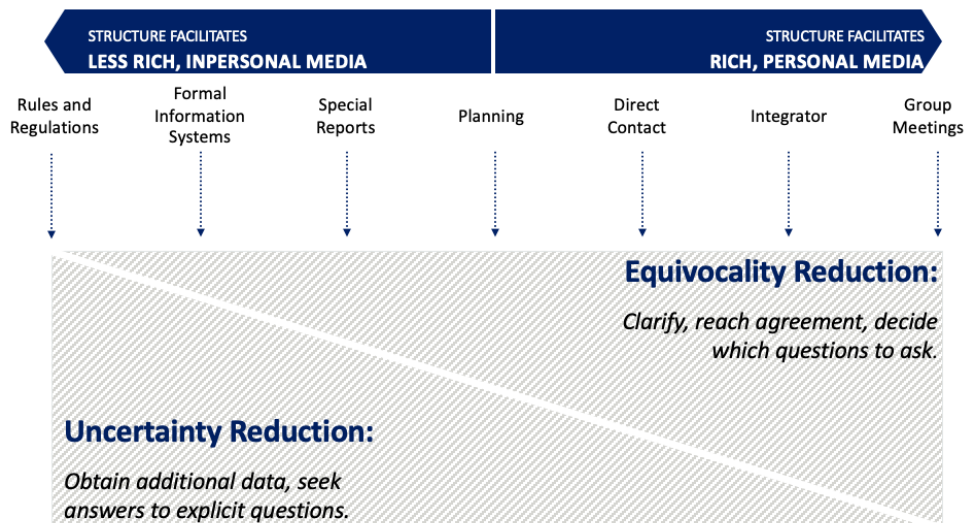

Figure 9. Information role of structural characteristics for reducing equivocality and uncertainty (Daft & Lengel, 1986). Reworked for this thesis.

There is a range of different media that can be used along the lean- and rich-spectra, as seen in Figure 9. Rules, regulations, standards and policies are seen as the weakest

information processing tool regarding its potential to reduce equivocality, but are useful at reducing uncertainty as they deliver a fixed, objective knowledge base that can be used when engaging in routine tasks. Formal information systems in the form of reports and more statistical information are moderately richer, whilst special reports in the form of one-time studies and surveys, further reduce equivocality. However, these kinds of media are still lean as the problem has already been stated, during which formulation most of the equivocality is reduced. Planning is set in the middle of the range due to its ability to reduce equivocality in the process of agreeing on targets and procedures, whilst scheduling and feedback systems reduce the task uncertainty. Direct contact refers to individual information flows between two parties both vertically or horizontally across the organization, and can take the form of e.g. meetings, informal chats or emails. This allows them to inform each other and exchange both subjective views and objective data, as well as discuss view-misalignments in order to reduce equivocality (Daft & Lengel, 1986). Integrators, "represent the assignment of an organizational position to a boundary spanning activity within the organization" (Daft & Lengel, 1986), and are roles mainly designed to reduce the potentially high equivocality among the different subunits about their purposes, courses of action or goals. Finally, group meetings include the subunits, task forces and overall stakeholders of different decisions and are mainly used as a means for coordination. There, different parties can share their opinions, views and judgements directly to each other, and therefore allowing for the greatest potential to reach common views or understandings (Daft & Lengel, 1986).

Managers within organizations should therefore use different media depending on the nature of the task and the uncertainty or equivocality related to it. When subunits are highly differentiated or interdependent, or the uncertainty and equivocality of the environment is high, rich media is called upon to reach agreements and common standpoints. Less rich media in the form of norms, rules or procedures can then follow from a common standpoint when the activities are more stable and analyzable. Rich media is typically used more extensively the higher up in an organization and/or the more coordinative activities that the manager holds, whilst less rich media can be used to provide clarity and certainty at lower levels of the organization to gain efficiency in routine activities. Having all levels in the organization trying to reduce equivocality would be inefficient, and top managers should therefore try to absorb it through richer media in order to establish common views and grammar and then translate the common view back through less rich media. (Daft & Lengel, 1983)

3.2.3 The "Fit" Concept

Information Processing Theory revolves around the so called "fit" concept, where a primary goal of an organization should be to try to achieve a fit between its information processing needs, and its information processing capabilities in order

to improve its performance and decision-making mechanisms (Premkumar et al. 2005; Shamekhi et al. 2018). Uncertainty is often linked to business risks, and organizations may therefore try to find this "fit" by adapting structures, task design and processes in order to simplify or and improve the information flows within the organization (Prior et al. 2021).

Galbraith (1974) therefore suggested mechanisms to manage this balance within organizations, which can be sorted into the broad categories of; 1) reducing the information processing requirements, which are directly related to the subunits tasks uncertainty and equivocality, and 2) increasing the information processing capacity of the organization (Lorentz et al., 2020). These can be visualized in Figure 10 below.
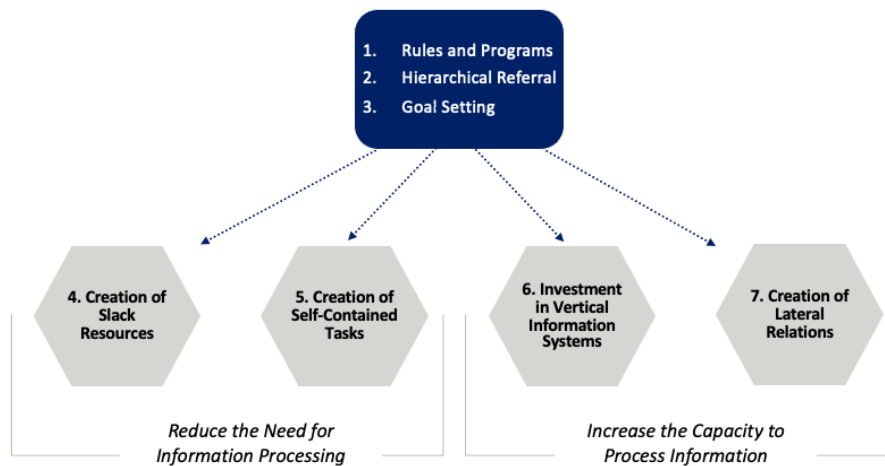
Figure 10. Different organizational strategies to both reduce information processing needs and increase Information Processing Capacity (Galbraith, 1974), reworked for this thesis.

The first design problem relates to the interdependence of subunits, as the behavior of a certain subunit will depend on the behavior of other units' performance, whilst communication between all interdependent roles is usually not possible. The first design-step is therefore to "create mechanisms that permit coordinated action across large numbers of interdependent roles" (Galbraith, 1974). The first of these mechanisms is the "Coordination by rules and programmes", which is most useful when the tasks are low in equivocality and can be planned in advance to thereafter be executed by each party without further inter-unit communication. The second mechanism, "Hierarchy", allows structure for when tasks are more uncertain and exemptions more common, by providing rules and mechanisms for the frequent problems but which can deal with exemptions by referring the decision to a level in the hierarchy which has an global overview of all the affected subunits. However,

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hierarchies can become overloaded when exemptions increase, in which situation "coordination by targets and goals" can be a more useful design-approach. This mechanism brings back the uncertainty-reduction to the subunits, by making them more self contained with clear targets and goals but also allowing them to be flexible in how they solve these. This decreases information processing needs by reducing the communication needed between units and hierarchical levels as long as the subunits are able to perform their tasks. However, if it does not, hierarchical structures can again be employed in order to deal with exemptions. Which of these three mechanisms is to be used is therefore dependent on the amount of exemptions expected from the task and the amount of information that can be processed by the hierarchy (Galbraith, 1974).

However, information processing needs and capabilities can and do arise within subunits as well, where the strategies to achieve an organizational "fit" can be divided into the two, broad categories listed below.

3.2.3.1 Reduction of infomration processing needs

The two main ways to reduce information processing needs relate to a reduction of the complexity and therefore needed amount of information for the completion of the task, which can be done in two main ways. The "Creation of slack resources" simply refers to making more resources available as the uncertainty of a task rises, as greater uncertainty means a greater need for inventory, lead time and/or budget to reduce an information overload. Giving task-performers greater access to e.g. good sources of information or already sorted and processed insights, keeps the "required amount of information within the capacity of the organization to process it" (Galbraith, 1974). The "Creation of self-contained tasks" is a strategy which involves a reorganization of the subunit so that units get organized from resource- to output-based, so that they each can group which resources they need to supply the output themselves. However, processes that can provide economies of scale, require specialization or are essential for control should continue being centralized for efficiency gains. (Galbraith, 1974)

3.2.3.2 Increase in information processing capacity

Increasing the units information processing capacity can be done along two dimensions of the subunit structure: through the organistic-mechanistic essence of it and the coordination and control mechanisms that tie units together (Tushman & Nadler, 1978). Organistic structures consist of highly connected networks where individuals can work efficiently by increasing feedback-opportunities, allow for faster error-corrections and can help synthesize more points of view (Tushman & Nadler, 1978). Such networks become less dependent on individuals and are therefore "less sensitive to information overload or saturation than more limited networks" (Jia et al., 2020). However, organistic structures are also harder to control from a managerial perspective, and may cost more due to increased response times and higher resource-needs (Lorentz et al., 2020).

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Galbraith (1974) suggests two main design strategies to increase the processing capacity, "investment in vertical information systems" and "creation of lateral relations". The first strategy takes into account the main variables of the frequency of the decision, the language-formalization degree and type of mechanisms that will be used when making said decisions. More specifically, it involves creating vertical information flow-standards, so that information can be more easily transmitted from its origin up to the relevant stakeholders and decision-makers. This resource is best used when data is formalized and quantifiable, but less effective when it is ambiguous and qualitative, where it might be a better strategy to make the decisions closer to its origins (Galbraith, 1974). The second strategy, "Creation of lateral relations", aims at bringing structure to the interactions between the interdependent units without reorganizing the units themselves, moving the level of decision making down vertically. This can be done by creating channels for direct contact, liaison roles, task forces, teams, integrating roles, managerial linking roles or by making a matrix organization (Galbraith, 1974). However, as communication volumes increase between different units through increases in direct contacts with a multitude of individuals communicating, the greater the coordination costs, and the choice of integration-mode should therefore not go beyond the information processing needs actually needed for optimal results (Sherman & Keller, 2011).

3.3 Competitive analysis

As stated in previous chapters, one of the most prominent challenges facing managers today is to sort through, select and monitor the information available in the complex environment that the internet- and Big Data-era has created (Jenster & Søilen, 2009). Having employees with high specialist knowledge and good market information available, which is often the case in procurement organizations, does not guarantee that executives and managers will actually put this knowledge to good use (Lobermeyer & Kotzab, 2010). Furthermore, knowing what is strategically important in an increasingly differentiated and dispersed market environment is a process, that can be improved and simplified by forming a strong analysis structure that "ensures that all relevant viewpoints of a market are taken into consideration and that the existing knowledge is facilitated and supplemented, and adjusted to changing market characteristics." (Lobermeyer & Kotzab, 2010).
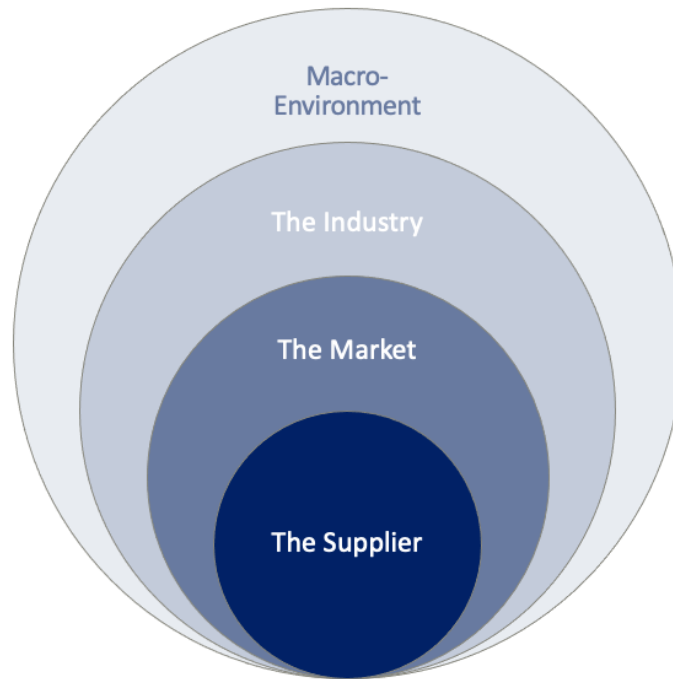
Figure 11. Macro and micro environmental forces affecting a company's competitive landscape, inspired by Lobermeyer & Kotzab (2010).

As seen in Figure 11, there are a whole range of different factors to be considered and which may affect if an individual firm will be able to merely survive or thrive in its environment. These can be divided into different, interconnected layers depending on how immediately they affect the company and its strategic and operational options. On one end, as seen by the outer layer in the figure, we can find factors that may affect several industries' landscapes and that are commonly described by tools like PESTEL, which will be further described in the following section. On the other other end, as seen in the center of the figure, we see the factors that define the analyzed companies position and possible strategies related to its innermost capabilities. These are commonly described by tools like SWOT, which gives a hunch on the strategic position to be taken by defining its Strengths, Weaknesses, Opportunities and Threats, or VRIO, which evaluate the organization's capabilities' long-term success (according to if they are valuable, rarity, imitability and organizational support).

However, this thesis will evolve around the factors which a purchaser might need to know about the supplier's competitive environment to be able to understand their future strategic roadmaps and ensure a good partnership can be upheld. The theories which will therefore be described in the following chapters are PESTEL, Porter's Five Forces and Supply Market Analysis.

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3.3.1 PESTEL

PESTEL is a framework which points out the importance of Political, Economical, Social, Technological, Environmental and Legal factors, and the specific industry life cycle-stage, as seen below in Figure 12. These can "directly or indirectly, cause or inhibit market growth over a particular time period", and therefore affect how hospitable or hostile the competitive environment is for the companies' in it as it defines the total shares to fight about and its inherent increasing or decreasing trend (Grundy, 2006).
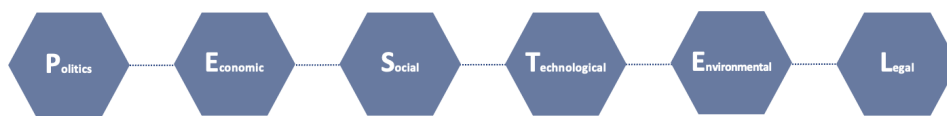
Figure 12. The six fectors in the PESTEL framework, inspired by Ren (2021).

The dimension of *political* factors analyzes each company's activities related to governmental issues and legal requirements, such as policies, political stability, tax policies or trade constraints (Ren, 2021; Sansa, Badreddine & Romdhane, 2021). These concerns are often geographically and/or nationally specific, and organizations must adapt their strategies to fit their current and expected government conditions (Ren, 2021).

The *economic* factors consider organizational matters related to costs that can affect performance (Thakur, 2021). These factors include macro environmental alterations such as overall economic growth, interest rate, exchange rate, unemployment rate, as well as income changes (Sansa et al., 2021). All these economic factors are important since all of them can affect purchasing power of consumers and therefore also the organization's profitability (Ren, 2021).

The *social* dimension takes all population-related issues into deliberation, such as current demographics, values and culture of the targeted population (Ren, 2021). Organizational specific cultural factors might also be considered, such as employees and their work-related qualifications and expectations (Ren, 2021). Furthemore, awareness and attitudes of customers regarding cultural values could impact the social dimension (Sansa et al., 2021).

The *technological* factors consist of operational practicalities and capabilities, such as technological development, research and change, as well as following awareness. The consequence of technological trends in the macro-environment, due to its possible impact on decisions regarding investment or product launches, can be a limitation of costs related to obsoletion. (Ren, 2021)

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Environmental factors raise awareness of current environmental issues, impacts and risks, often related to global issues such as global warming, pollution and resource scarcity (Ren, 2021). To be able to implement an environmental dimension and include sustainability propositions into an organization's strategic roadmap, there is a need for managers to facilitate the allocation of resources in a beneficial way, as well as quantifying the balance between financial and social value with environmental value (Sansa et al., 2021).The environmental dimension was not one of the four initial dimensions, but due to the rising environmental concern and awareness, this dimension has come to increase in importance (Ren, 2021).

The *legal* dimension has a certain overlap with the political concern but focuses more on laws regulating interests for all involved stakeholders. Examples of legislations affecting the legal dimension are employment laws, such as safety and health concerns, customer laws, such as privacy legislation, as well as copyright laws (Ren, 2021; Sansa et al., 2021). As an organization it is also of importance to consider the geographical legal discrepancies, since these can differ between region, country or city (Ren, 2021). To successfully operate on a market, ethically and economically, organizations must ensure total alignment with legislation, which can be arranged by regular organizational audits regarding potential changes in relevant laws and legislations (Ren, 2021).

3.3.2 Porter's Five Forces

In 1979 Michael Porter defined five forces which all affect the competitive landscape, and therefore also the overall profitability of the market (Isabelle, Horak, McKinnon & Palumbo 2020), in more or less significant ways depending on their so called "strength" and which revolutionized economic literature and the strategic thinking of managers (Porter, 1979). The forces were identified as the threat of new entrants, the bargaining power of buyers, the bargaining power of suppliers, the industry rivalry, and lastly, the threat of substitutes, as seen in Figure 13. This model has been thoroughly reviewed since its first appearance, with several frameworks having risen aiming to complement and/or substitute it in order to cover its arguable flaws, of which the most stated has been the difficulty to properly translate its insights into clear applicable and operational strategies (Dobbs, 2014). This may explain why there is still a relatively small awareness of the framework among mainstream managers today, compared to the awareness there is to the SWOT-analysis, which has a crude estimate of a 90-95 % awareness and 50 % active use (Grundy, 2006).
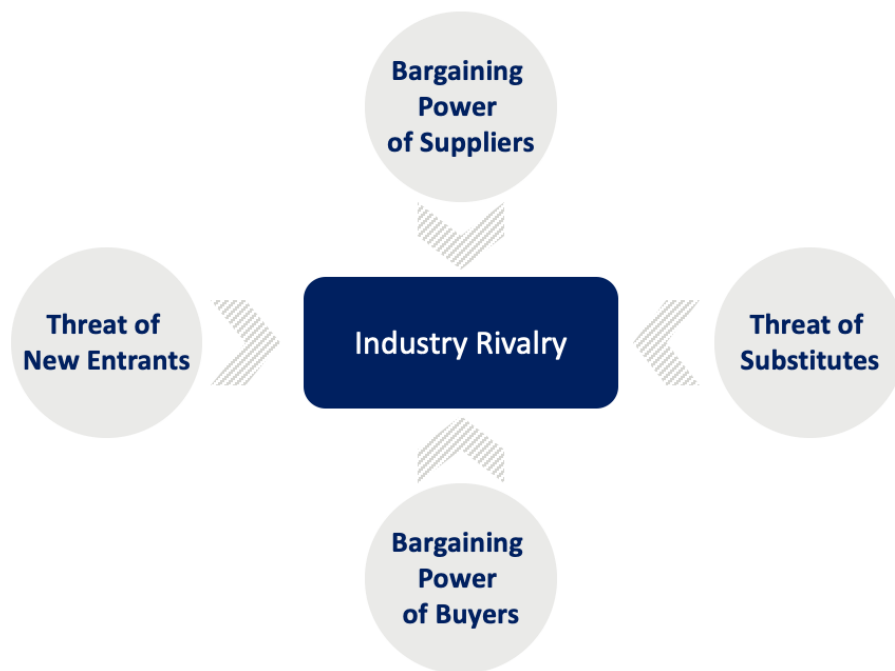
Figure 13. A schemativ overview of Porter's Five Forces, inspired by Porter (1979).

The first force, *Threat of new entrants*, is heavily dependent on the prominence of entry barriers, as well as the amount and size of existing competitors on the market (Dulčić, Gnjidić & Alfirević, 2012). The entry barriers can be distincted on whether potential new entrants expect reprisal and measures from already established players (Porter, 2008) and how hard it can be to actually enter a market due to lack of networks or the need for high initial investments. An important note is the fact that it is the perceived *threat* of entry, not the actual occurrence of entrances, that increases competition and decreases profitability (Porter, 2008). The force is commonly divided into seven different sub-groups of barriers of entry; customer switching costs, suppliers possibility to make use of economy of scale, buyers benefits of economy of scale, the amount of required capital, administrative advantages not correlating to company size, discouraging government legislation and finally disproportionate access to distribution pathways (Bruijl, 2018; Lee, Kim & Park, 2012).

The second force is the *Power of buyers,* which is deemed to be strong if the number of buyers is low, if each of the buyers buys significantly large-volume-orders in comparison to the single supplier and also if the products offered on the market are of a standardized nature, since buyers then have the possibility put the suppliers into competition against each other due to low switching costs (Porter, 2008). On the

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other hand, buyers' power is considered low when buyers have fewer options, switching costs are high and when the options of offered products are all the more dispersed (Bruijl, 2018).

Power of suppliers is the next of Porter's Five Forces and can be summarized into four sub-forces. The first sub-force relates to the amount of unique knowledge possessed by the suppliers as the higher the specific expertise, the higher the suppliers' competitiveness. Secondly, the size and number of suppliers existing on the market affects the force, since few very large suppliers will increase their power towards the companies. Resource scarcity is the third subforce of relevance for supplier power, where scarcity of resources will increase it, and lastly, the ease of forward integration is of high importance when analyzing the force of supplier power, which is described as the suppliers capability to integrate downstreams in the supply chain (Grundy, 2006).

The fourth competitive force is *Competitive rivalry,* as intense rivalry on a market between current competitors will lower profitability, due to competitive tactics such as discounting, increased service levels and increased spending on advertisement (Bruijl, 2018). Factors affecting competitive rivalry are best described divided into three categories; the company's commitment to the market, the amount of players existent on the market and the similarity between company strategies, which all increase rivalry (Grundy, 2006).

The final force is *Threat of substitutes*, which from a market perspective needs to be low to minimize the risk of buyers switching from the current market by using alternative solutions (Bruijl, 2018). The threat of substitutes can be deemed dependent on two major factors. The first refers to the price elasticity of buyers, as higher price elasticity raises the threat of substitutes, and secondly the switching cost, where higher switching costs decreases the force (Bruijl, 2018). Porter (2008) argues that substitutes always need to be considered and their extent is sometimes neglected as they do not always derive from the same industry.

3.3.3 Supply Market Analysis

The Supply Market Analysis-framework is heavily influenced by Porter's Five Forces, but aims at providing guidelines on how to conduct a competitive analysis on the suppliers market from a procurement perspective. Conducting such an analysis is essential in order to find the supplier in the market that is best suited to ensure the procuring agency's strategic aim and long-term objectives (Cockrell, 2018) and to understand the agency's bargaining position, as this can have a big impact on the success of the procurement division (Lobermeyer & Kotzab, 2010).

Figure 14.The Supply Market Analysis-framework as inspired by Government of Queensland (2018), with a highlight on the two forces which are more deeply discussed.

The supply market analysis-framework seen in Figure 14, highlights five key dimensions: market structure, competition, supply chains, substitute goods and services, as well as agency's value as a customer (Government of Queensland, 2018). The dimensions 1, 2 and 4 aim at giving an understanding of the trends underlying the market's development, the competitive position of different suppliers and the inherent threat of new technologies disrupting the balance of the market. These can be argued to be more closely related to the porter model and will therefore not be more closely analyzed. However, the supply market analysis-framework seems to differentiate more in the way it describes the importance of analyzing the whole of the supply chain the actual supplier is a part of, and the importance of the relationship between the supplier and the procurers company.

The dimension of "supply chains" aims to point at the risk of disruptions occurring further up in the supplier's supply chain, eventually disturbing its activities and leverage to the customer. The main aspects to be analyzed therefore include supply chain dependencies, the chain's sustainability and how to make the "make or buy"-

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decisions, i.e where to buy in the supply chain. It can be a challenge to fully recoup losses which are caused by supply chain failures as there might be a lack of agreements or contact with suppliers further up in the chain. This dimension of the analysis therefore points at the need to be aware of the risks imposed by such dependencies, and what strategies could be employed in the case of unsatisfactory performance. Relevant information to research for could therefore be the companies who make up the supply chain, what each contributes to in the final solution, how dependent the suppliers are on their suppliers and if there are any areas of vulnerability within the chain. (Government of Queensland, 2018)

"Agency's value as a customer", on the other hand, is a dimension which looks at how valuable the agency is within its market as a customer relative to the value of the supplier among other options. The more attractive the customer the bigger the increase in "the competition for its demand requirements" (Government of Queensland, 2018), which implies a more valuable contract for the agency can be pursued. Good parameters to research can therefore relate to market shares of both the supplier in their field and of the agency in the customer pool, as well as how much of the supplier's customer base the agency constitutes (Government of Queensland, 2018). In general, the aim with this dimension is to look at the supplier and agency's value in "relation to overall market characteristics and set into perspective against the own organization" (Lobermeyer & Kotzab, 2010).

3.4 Software businesses

Software businesses deliver knowledge-intensive goods (Suarez, Cusumano & Kahl, 2013), are unique due to their rapid technological advancement (Schief & Buxmann, 2012; Vanhala & Saarihallio, 2015) and their markets are among the most prominent industries in today's knowledge-based global economy (Westerlund & Svahn, 2008). This is reflected in the global software market spend that has been constantly increasing (Werder & Wang, 2016). The software industry arose in the 1970's in the shape of standardized solutions to meet the demand of the facilitation of communication between remotely based parties, gathering and processing of information, as well as realizing different types of transactions (Karagiannopoulos et al., 2005). Initially, these solutions were bothersome to access and operate, but this started to shift as the market got all the more established (Karagiannopoulos et al., 2005). The development of the software markets in the following decades led to a formation of a rather oligopolistic market, with a limited number of global megavendors making up the majority of the market (Saniuk, Saniuk & Caganova, 2019). Despite maturing since it was established in the 1970's, the software industry is still considered relatively immature in comparison to more established markets such as traditional manufacturing industries (Tyrväinen & Mazhelis, 2009).

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3.4.1 Characteristics

One of the unique characteristics of the software markets is the intangibility of their products and services, as these solutions can only be of value when perceived through some kind of user interface on hardware (Vanhala & Saarihallio, 2015). Another peculiarity of the software markets is their unique cost structure, which differs considerably from the one of traditional manufacturing industries (Vanhala & Saarihallio, 2015). This is mainly due to the expensive production of information, followed by a near-zero cost of reproduction of the same information (Cusumano, 2008; Karagiannopoulos et al., 2005; Suarez et al., 2018). The high gross margin cost structure is therefore based upon high fixed costs, such as labor, equipment and license, and low marginal costs, connected to the intangible products offered (Vanhala & Saarihallio, 2015).

Furthermore, the ever changing nature and the innovativeness of the software markets are two of the most prominent characteristics of the industry (Lee, Lee & Leem, 2008). Organizations that engage in software markets are constantly challenged with disruptive technological innovations (Kaltenecker, Hess & Huesig, 2015), which implies that innovative capabilities are an important factor affecting their competitive environment (Hernández & Vargas-Gonzalez, 2015). More specifically, the capability of keeping up with the disruptive environment has an indirect positive correlation with the performance of the organization (Hernández & Vargas-Gonzalez, 2015). The high rate of dynamism encountered on the software markets reflects the need of developing innovative qualities within the companies to meet an ever changing demand of cutting-edge technological solutions (Kaltenecker et al., 2015). Further on, Hernández & Vargas-Gonzalez (2015) argue that there is a risk of prominent companies getting outcompeted of their own markets, when not keeping up with the ever changing demands both horizontally and vertically on the markets supply chain (Lee et al., 2008).

As the competitive scheme is increasingly global, the ease of internationalization is emerging as a characteristic specific to software markets (Hernández & Vargas-Gonzalez, 2015). Generally, there are a couple of dominating organizations, so called megavendors, present on the software markets who offer their solutions to customers internationally, which to a large extent operate from few international clusters around the world (Lema, Pietrobelli, Rabellotti & Vezzani 2021). Further than conjoining in clusters, there are several types of partnerships these organizations can base these relationships upon, e.g. capital sharing, conjoined research efforts and cooperation of organizational set ups, as well as general agreements regarding solely information sharing (Kude, Dibbern & Heinzl, 2012). Moreover, organizational size is deemed to be an important attribute when analyzing how companies perceive and benefit from networks, as smaller companies more often tend to consider other companies potential partners rather than direct competitors (Vanhala & Saarihallio, 2015). Utilizing networks also seems to be of

a bigger relevance to small and medium-sized enterprises due to their scarce amount of resources (Westerlund & Svahn, 2008).

Furthermore, the software markets are differentiated by the dependence on tacit knowledge, derived from a compelling relationship to users (Lee et al., 2008). This implies that mentioned global value chains are heavily dependent on compounded relational interactions with different stakeholders, which in its turn can lead to heavy interdependence between stakeholders but also to an exceptional trade of information and insights (Lee et al., 2008). Interorganizational relationships can additionally be heavily dependent on personally promoted relations between individuals, which facilitate knowledge sharing in the all more dynamic software markets and possibilities to identify future trends within the industry (Westerlund & Svahn, 2008).

3.4.2 Business models

The main business model of knowledge intensive firms is to create value by approaching and solving a certain set of problems (Sheehan, 2005). In comparison, the traditional business model based on manufacturing organizations expects value creation out of converting inputs into outputs, as seen in the value chain-model in Figure 15. This different emphasis on value creation has come to be visualized as "the value shop", which differs from the traditional value chain, which can be seen in Figure 16. The main difference is the transition into a more cyclical and iterative chain of operation (Sheehan, 2005).
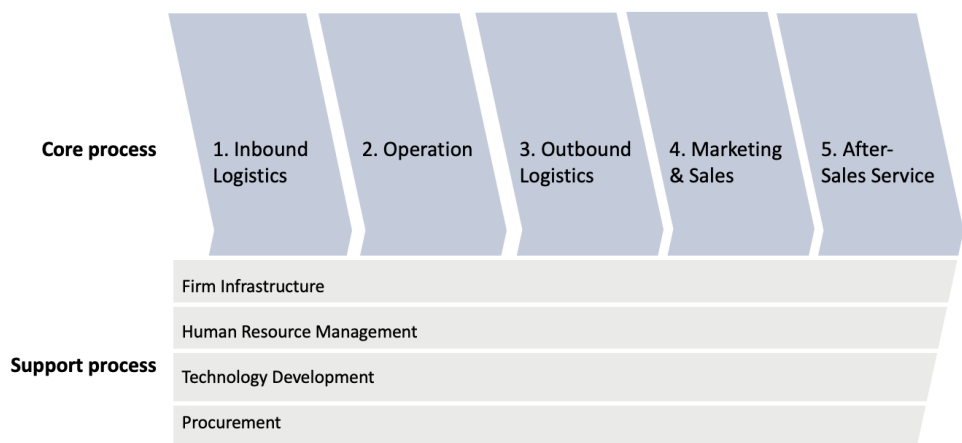
Figure 15. The traditional value chain (Sheehan, 2005), reworked for this thesis.
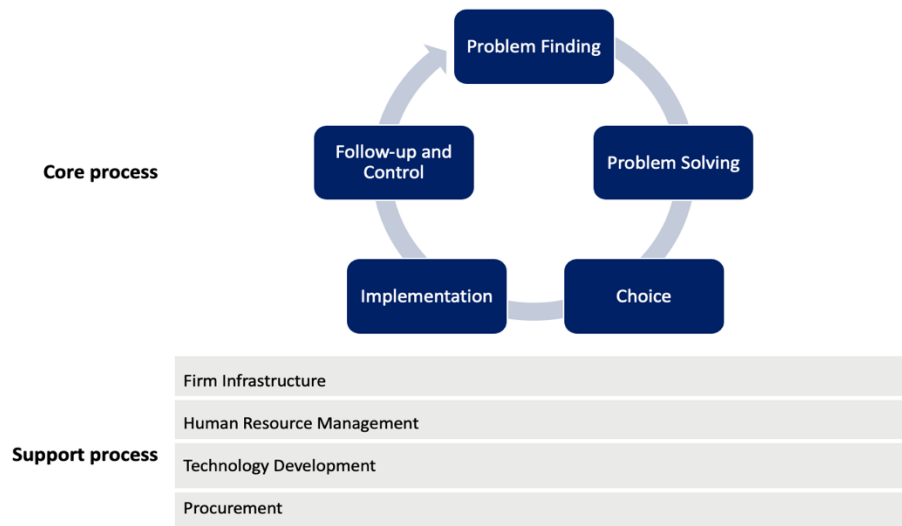
Figure 16: The value shop (Sheehan, 2005), reworked for this thesis.

Organizations present on software markets decide on whether to establish a generalist business model, with the aim of approaching a wide range of needs, or to mature into a niche organization and address a more narrow range of issues (Sheehan, 2005). Software offerings can generally be divided into two categories depending on their nature, namely tailor-made software, or general products not specialized for the specific customer (Werder & Wang, 2016).

Many companies adopt a service revenue stream reliance to continuously profit from customers (Suarez et al., 2018). This is a way of staying profitable when specific markets mature and revenue from the actual product decreases (Suarez et al., 2018). Services that can be included into the offer can range from help with installation, technical support, software-specific education, to regular activities such as maintenance (Suarez et al., 2018). There is an established term called "software as a service", which is where the software suppliers host the data and the software on their own premises and then outlicense the use of mentioned software to customers against a continuous fee (Werder & Wang, 2016). These customers basically buy a relationship based on service, where the cost of the software, maintenance and support often is clustered into a package, either tailor-made or general, paid for in one fee (Werder & Wang, 2016).

In recent years, sales of traditional on premise-solutions have declined for the enterprise-software organizations (Cusumano, 2008). Instead focus is shifting heavily towards software as a service (Cusumano, 2008). This shift can be described as a focus on delivering centralized solutions on-demand to be able to survive in the competitive environment (Kaltenecker et al., 2015). Furthermore, trends are

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implying a shift towards more modular business models for organizations to be able to deliver on requirements (Corbo, 2021). The modularity can with benefit be applied by using a platform model, where the platforms are becoming delivered by the beforementioned megavendors, for which modules can be added targeting different business related goals (Corbo, 2021). Other trends, such as the move towards software as a service, and cloud storage of data, is decreasing the software market entry barriers as well as enabling supplementary strategic decisions (Corbo, 2021).

4 Analysis of Software Markets

In this chapter an industry analysis of the software markets is presented, based on interviews with experts in the field with extensive knowledge on software solutions and implementations, and how companies usually evolve and behave. The findings have after an analysis been divided into three main subcategories which entail different challenges for the purchaser, "The Product", "The Market", and "Untouched Terrain", which are further discussed below.

4.1 The market

As stated in the introductory chapter, software markets have seen a huge growth and expansion during the last decades: as declared by one of our interviewees, "it is like the air we breathe. There is not a single organization today that is not deeply dependent on software, if nothing else because the society surrounding it is" (Regnell, 2022). Software has become an essential part of the infrastructure of companies and organizations today, as "everything is software-based today, every system, even the water in our taps would not flow if some software stopped working" (Gorschek, 2022). However, software is not only an expanding industry but also a highly dynamic one, with new players and disruptive technologies coming up continuously; " [in the last years] we have gone from 100 startups to 4000 startups within just in procurement, we have gone from a couple 100 millions in investment to over four billion in investment." (Epstein, 2022)

4.1.1 An innovative market

Software markets are highly innovative with characteristically low entry barriers, as most of the initial investments needed are related to the programming workforce, and the scale-up of a solution is made all the easier with e.g. the emergence of cloud-platforms. This has resulted in a strong ecosystem of small-sized companies leading to an increasing trend where companies are moving all the more from all-round solutions to modularized models, where companies can choose to fit all the more specialized and interconnectable solutions from different providers together (Epstein, 2022). Another increasing trend connected to these markets'

innovativeness and the increasing dominance of cloud-solutions, is that products are moving towards shorter production-cycles where software updates are continuously developed, integrated and pushed on a two or four week basis. This makes it easier to spot problems early on, but it is also one of the drivers behind the changing and augmenting difficulty regarding software-pricing models, where it is pushing buyers to go from license- to different kinds of subscription-models that eventually increase the so-called lock-in effects (Bosch, 2022).

4.1.2 Megavendors and niche-players

The competitive environment in these markets, with low entry barriers for companies with good ideas and skillful programmers, can not be described as anything else than fierce. However, In the last 50 years, "everything consolidated down to a handful of providers that are doing everything, 90 % being based on US soil" (Epstein, 2022) as "the only real success case we have in Europe is SAP" (Bosch, 2022). There is definitely a winner takes-it-all pattern, where a megavendor like e.g. Microsoft, Oracle or IBM can take about 80 % of the market shares and then leave the rest to middle or small-sized companies. Therefore, "the space for companies to grow in a digital world is small" (Bosch, 2022). These companies thereafter usually continue to grow by entering other software-markets where they can adapt and reuse former solutions to provide to their existing customers, resulting in the software markets being extremely interconnected, with megavendors customarily spanning across several industries.

However, a pattern with more or less monopolistic markets is that the megavendors and therefore, the market, over time becomes less innovative (Torkar, 2022). One way, often the main way, that the megavendors try to tackle this is by the acquisition of smaller, sometimes competing, companies, implementing their innovations into their existing products (Torkar, 2022). Nonetheless, "a big problem is that big companies are good at sabotaging good ideas" (Gorschek, 2022). This was said pointing at the fact that an acquisition often results in an integration of the team into the structure of the acquiring company, which may make them less creative moving forward, or to the commonly following dismantle of the company, as many acquisitions lead to the integration of the solution tailed by the decommissioning of the bought company (Regnell, 2022).

"As an example, look at when Microsoft was second-best at video-conferencing, and bought Skype. What happened to Skype then? [Microsoft] took their favorite elements [from Skype] into Teams and then said bye to Skype. When it comes to big companies there are very few who can continue to innovate at that level, so the most usual thing they do is to buy small startups to implement them into their organization." (Torkar, 2022)

An alternative approach that is becoming more common among the megavendors is that they slowly are evolving towards becoming platforms where systems are broken down into smaller subsystems interconnecting through common interfaces, eventually allowing for a modularity in the solutions they offer their customers. Among many of these they keep the modularity within the company, so that a buyer still can buy all the relevant solutions and modules from the same company without actually getting to know how the underlying system is constructed (Bosch, 2022). However, more of these companies are starting to develop network- and operational-standards to become platforms that other players can "plug into", such as we e.g. saw happened with the Apple-iTunes or Microsoft-Android in b2c markets a decade ago (Epstein, 2022). This is resulting in smaller companies being able to adapt to and build their solutions in a kind of partnership with the global megavendors without actually being acquired (Epstein, 2022). A problem many of these megavendors face has to do with the base of their solutions being built years or even decades ago, whilst the innovativeness of these industries is resulting in new ways of doing things that were not even possible when the global megavendors developed their solution, and which they might not be able to adapt to because of their legacy. As said by Epstein (2022), "[the megavendors] are slowly pivoting, but I would argue that the damage has already been done, they have hit the iceberg already, and it is just a matter of time until the boat sort of sinks or needs bailing out". Therefore, going towards the platform-strategy might be a way of staying relevant in their dynamic environment.

4.1.3 The global shortage of talent

A defining challenge related to these markets and faced by all its players, which was emphasized by all interviewees, was identified as the underlying global shortage of skilfull programmers and software developers. These competences are furthermore not only needed in dedicated software companies but by all, as digital technologies become all the more important in a vast range of sectors. As stated by one of our interviewees, "...if you look at a common Volvo (car), it has gone from [having] no software to having more than 100 million lines of code in 30 years" (Torkar, 2022). The phenomena was also described to be behind the high occurrence of mergers and acquisitions in the industry, as a good purchaser "is not interested in the management team, but in the individual that came up with the idea and the ones that are good at developing the technology" (Gorschek, 2022).

Furthermore, this shortage was articulated to be the main driver behind some of the biggest software trends we see today related to software development. One of these trends is how companies are coming up with ways to source competence from broader pools of talent through e.g. open source coding. It has been adopted quickly by start-ups as a way to scale-up quickly with small resources, and for global megavendors, contributing to the open-source expansion can also be a way for them

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to influence the development of the platforms that could come to be the future standard of the industry (Regnell, 2022). The second trend aims at amending the shortage by lowering the amount of education needed to write code through e.g. end-user-coding, or "low-code". This is something megavendors, such as Microsoft, are investing heavily on, which is seen in how they acquired Github, the world's leading open-source platform, in order to e.g. develop a "codepilot" by using the coding-pattern data in the platform to eventually make it easier and faster to code on the platform (Regnell, 2022).

4.1.4 The purchasing perspective

Purchasers of software are in a difficult position. One of the reasons is due to the small leeway they have when making a make-or-buy choice, because of the global shortage, with the second challenge rising from many markets being heavily consolidated with players who are hard to influence and negotiate with due to their sheer dominance. However, interviewees emphasized the purchaser role as one of the main actors who can influence the market towards standardization. The main way to reduce lock-in effects (further discussed in the following chapter), was stated to be forming purchaser communities among those who buy the same type of software (Bosch, 2022). Things the interviewees emphasized should be lobbied for were e.g. open source-code standards (Regnell, 2022), as well as for common interfaces and open APIs, which would allow for modularization and usage of different suppliers for specific tasks in a platform concept (Epstein, 2022; Matteby, 2022).

4.2 The product

One of the factors underlying the interconnectedness of software markets has to do with how hard it can be to define a software product in a way that is comparable to others. As a software purchaser, there are several dimensions to keep in mind which all influence the sought solutions in essential ways, and great technical and strategic skills are needed in order to understand the actual implications of a certain choice. To make it even harder, these markets are characterized by another difficulty, namely that final users of software often do not know how to initially articulate the need that purchasers aim to satisfy.

4.2.1 Software dimensions to evaluate when purchasing

Software products differ greatly from one another, where 4 main dimensions relevant for all were identified stemming from the interviews, presented in the Figure 17 below.
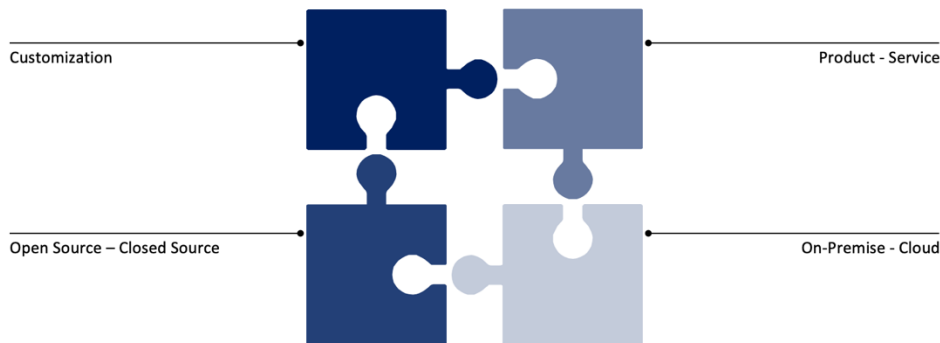
Figure 17: Different dimensions of software solutions (Authors' own design for this thesis, 2022).

One dimension relates to how adaptable they are, in the way that you can buy everything from a product that you simply install on your employees hardware and run updates on now and again, but do not really influence the characteristics or shape of, all the way to the purchase of a promise, where specialists come into your company and develop a whole new solution specially adapted to your company and which you have full control and ownership of (Gorschek, 2022).

Another aspect to be aware of is if you want it to be a one-time-buy of a product, where you get the installation and then run updates and up-keeping yourself, or a more or less license-based prenumeration, a service, where you pay for the supplier to develop the product continuously and which is becoming all the more popular riding on the cloud-trend (Regnell, 2022). Because of the high innovativeness of the industries, many times suppliers can be said to not be purchasing a service, but a promise that the solution they are buying will continue to be updated and able to keep up with new digital innovations (Regnell, 2022).

Another element to keep in mind relates to where the company data is going to flow. This is where the dimension going from the architecture residing on the company-premises versus on different cloud-solutions comes in. Essentially, this dimension looks at where the processing capacity, the code and the data resides, and there are several levels between these two extremes (Bosch, 2022). On the one hand, you can buy a solution that is completely implemented on the company premise, so that the data only gets to flow within the company walls. On the other end of the spectrum, if you buy a cloud-solution, you simply use the company computers as terminals

through which you can send data to be stored and processed on the supplier-controlled computers. As previously commented, there are many layers in between when deciding where different levels of the software-architecture is to be run, but essentially the choice comes down to which processes are going to be done where, and what data will flow through these interfaces. Choosing cloud-solutions can have several benefits for the buying company, e.g. allowing easier scale-ups and scale-downs according to timely needs (Regnell, 2022) and give companies access to data-processing-tools that they might not be able to develop as well internally. Furthermore, the trend is clearly moving towards companies choosing more cloud-based solutions where "almost everything will be on the cloud very quickly" (Townend, 2022). However, going cloud also poses risks for the company, as having company data flowing on supplier networks can bring data security risks, be impeded by legal aspects and even e.g. force customers to pay high egress-fees to regain control of their data, if future circumstances makes them want to switch the location of it (Townend, 2022).

Lastly, another dimension brought up by the interviewees accounts for how much insight and control you have over the bought solutions software core, often defined by how much of the code you have access to. Companies of a certain size have their own programming resources, so one of the first questions asked is usually if the solution or parts of it are going to be built in-house or outsourced and thereafter connected to the software infrastructure through interfaces. However, when you purchase/outsource a solution, there is a range between buying the functionality or actually getting insights into how the functionality is built up. Open source-code, also called "white or grey boxes", mean that you as a customer get to see and understand the whole or parts of the code, whilst closed-source, or a "black box", means that you get to use the function but don't get to see how it operates (Regnell, 2022). Interviewees argued for the importance of being able to peek into the code and have influence over the interfaces, so you can see what you are buying, what happens in the code and what you can change, and ultimately have better control over how your company's software is operated (Regnell, 2022).

4.2.2 Defining solution requirements

One of the hardships purchasers face when it comes to buying software-solutions, is that it is not often easy to understand the nature of the need and how it actually translates to technical requirements. As one of our interviewees commented, it is often the case that the end-users themselves are not specialized in software and therefore can not put down their needs in a conclusive way, leaving it to others, sometimes the software-provider, to try to guess what would best suit the user (Matteby, 2022).

As the purchased software often can be a more or less-customized solution, it is essential for developers to have clear guidelines on what is to be built, guidelines that can be divided into functional and non-functional requirements (Gorschek, 2022). Functional requirements often specify the bigger picture: what the actual solution is going to do, whilst non-functional requirements specify the way that it is going to be done and within what frames. However, a problem often arises due to many customers not having the ability to distinguish between the two, ending up basing their purchasing decision on price when weighing two options, which deliver the same function against each other, often not looking at the cost related to how effectively or ineffectively they do so (Gorschek, 2022).

"Take the patient journaling system [for healthcare] as an example, [the system] has a functional aspect in being able to log in. There is the login function, which is a functional requirement, and the time it takes the user to log in is non-functional, but having one or three minutes long login time can cost the government 30 million [Swedish] crowns per year, mainly from wasted working hours, since functional aspects were not considered, and this is what I perceive as the biggest mistake when procuring software. [Considering non-functional aspects] makes a huge difference. What is often missed out on specifying will be transferred further [down into the value chain]. The life expectancy of a system might be five to 25 years. A poorly designed system can dispatch the initial investment in only two years. The Public Procurement Act has inspired a whole generation of Swedish industry to compare suppliers against each other, where [purchasers] consider functional aspects, price and finally "this looks good"-tick marks. A perfect example of when this happened was when a Swedish County Council were going to procure new incontinence protection, they had a supplier that was doing it well before, but found a supplier that could tick off the same functional aspects, so they swapped suppliers. But after analyzing the results, it became clear that four times more products [of the new supplier] were used because of lower quality, which made it more costly anyway. So, the functional and non-functional aspects are equally important. [The purchaser] needs to consider the use [of the sought solution], and what the QUALITY of the use is." (Gorschek, 2022)

4.2.3 The purchasing perspective

4.2.3.1 Knowing the language
Understanding software needs and the solution-configuration of all the mentioned dimensions that may cover these needs best can therefore be a tedious and complicated mission from a purchaser perspective. The interviewees all stated that specifically software purchasers need to have an increasingly high degree of technical understanding as there quite often are no market-standards to rely on when choosing between options (Gorschek, 2022). Frequently, purchasers are not engineers themselves, which may result in hardships when it comes to actually

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weighing options against each other. Many companies can outright use technical words and say they do the same things, putting the purchaser in a position where they do not actually know what it means and if it is true until they actually dig into the different dimensions of the solution (Epstein, 2022). Without enough technical expertise it can be extremely hard to differentiate between buzzwords and actual innovations that bring value to the solution, and lead them to not being able to understand how suppliers provide their solution and how much more or less their approach is actually worth weighed against their competitors.

"If you are a purchaser and try to procure software, then roll up your sleeves and get dirty, you need to become much more digitally professional than ever before." (Epstein, 2022)

"[Different offerings] are very transparent, but [the exact value] is just very unclear, it is because everyone is confusing everyone else. Like, a big chunk of my job is just to explain what [a certain] company does for [another] company or that the big fish [megavendor] is not actually doing what the small fish is [doing], because the little fish is brand new, and is doing something totally different. (..) I spend a lot of my time explaining that to and negotiating it for clients." (Epstein, 2022)

Another challenge arises from the hardship when articulating end-user needs. Software is such an integrated part of almost all modern work today that needs can surge from anywhere in the organization. Therefore, end-users may not be technical experts themselves and know what specifications are needed from modern digital software, which often results in requirements related to other aspects than the technical ones. Having that many options and dimensions to weigh against each other in the software-market can therefore be incredibly challenging and require extremely close cooperation between different parts of the organization. (Matteby, 2022)

4.2.3.2 The pricing challenge
Understanding software-sellers pricing and weighing options against each other on this dimension has also been identified by our interviewees as one of the main challenges. Not all software markets are as complicated, as some markets have developed certain standards in a way that makes it possible to compare options quite easily. However, with the movement to cloud and rise of software-as-a-service, software companies are increasing the differentiation of their pricing standards. These challenges are further described in the quotes below:

"...[The classic license version is that] I pay a license, a one time installation fee and then an annual maintenance fee. Like, that is traditional. There is [the pricing model to] pay by the user, where it will cost you [the purchaser] 25 dollars a month

and then 25 dollars a month and so on, per user. [Users] can pay by the amount of volume transacted through [the software], so if a purchaser runs a sourcing event (...) then the company only pays for the one event, for example 500 dollars, if the company instead runs 20 events, they pay 2000 dollars. Then there is [the payment model of paying for] amount of dollars transacted, so if the company runs a one million dollar sourcing event or pays a million dollars to the system, a million dollars costs one fee and [if the company makes a transaction of] five million dollars [the company] pays another fee. Or [there is a payment model where the company] can use a system for free and charge the supplier, and the supplier pays if they get awarded business, or then [the company] can charge a supplier just to transact. Nobody has solved [the problematic environment of payment models] and I am not sure I understand or agree with today's solutions. Like, I am not really sure I know the right way [to design pricing models]. If you would ask me for a challenge in the software markets, the pricing models to me are the biggest challenge. How to price [software] effectively, because each pricing model has problems and the pricing models are not perfect". (Epstein, 2022)

"There are many different ways of deciding on pricing. Another thing is how I talked about how software is moving towards the rented subscription model, but there is a huge amount of complexity on the pricing schemes and the contracts. [The company] can rent per month in many cases, or per day. But, [the company] can also have [something similar to] a mobile phone contract, so [the company] says "[We as a company contract] this for three years and [the company] will pay this much money [to the supplier]". So, [the company] might use less than that, maybe only half of [the companies allowed amount of] data. So this is where all negotiation comes into play." (Townend, 2022)

"[What I consider to be the] main dimensions of pricing? It depends on the context, it depends on the software, so for example Microsoft, or no, let us consider Oracle, they are horrible [as suppliers]. (...) Oracle are, when they are doing licensing, charging per "cpu-core", so [Orarcle] are not even [charging the buying company] per machine, [Oracle charge] per the numbers of cores in [the companies] processors in [the companies'] data centers. Each processor might have between eight and 16 of these cores, depending on the processor. (...) So the pricing gets extremely complex and extremely technical, depending on the [supplying and buying] company. [Pricing] can be [based on] number of cores, egress-fees, process utilization, straight forward number of users, numbers of pc's and so on." (Townend, 2022)

4.2.3.3 Extensive lock-in effects

Furthermore, purchasers face another difficulty in the way that software purchases can lead to huge lock-in effects with high costs related to a potential change between suppliers. The more a company has had to adapt its infrastructure to the supplier-

solution, the more closed-source the code is and the more data and processing capacity that is controlled by them, the higher the lock-in effect becomes. A common way to reduce lock-in effects and minimize risk in purchasing is to have a secondary supplier ready in the case that the primary one does not deliver, but this is hard in the software industries due to the complexity of the solution and its adaptation to the purchasing companies interfaces (Bosch, 2022). Furthermore, if you already are in business with some providers, one of the interviewees commented how you can find yourself in the situation where "(...) you are so deep into business that you are probably paying [the supplier] anything, because the switching cost is always gonna be higher." (Epstein, 2022).

One of the lock-in drivers is that changing between suppliers would require some amount of downtime and an internal re-coding, and one driver of these switching costs is that software can run business critical operations where just a minute of outage can lead to enormous economic losses. Furthermore, when a company organizes one way to communicate with the rest of the value chain, it tends to spread throughout the whole IT system, so you would have to check everywhere in a change-situation. (Bosch, 2022)

"(..) every piece of software in a company has a different interface. So [researchers have] seen that the integration of the software is the key challenge companies have, every piece of software has different ways of connecting and integrating it in [to the companies' other software]. So what happens, which is the biggest lock-in, is that a company will buy some software, often cloud based because modern software is cloud based in some way, then they [the buying company] start integrating their management systems into that software and as time goes by [the company's other system and this bought system] get more and more integrated. That means that if the company wants to switch [to another solution] it would be very expensive and the company would have to throw away all that work and try to integrate an entire new system. So not only is it a lot of work with integrating systems, but it can go wrong, a company can bring a system down quite easily if the company is not careful. So the biggest lock-in really is once the company is heavily integrated, for example with Supplier X's products that they have integrated, then the company's developers develop software specifically compatible for Supplier X's cloud, and then suddenly the entire company is really connected with Supplier X. Now Supplier X doubles their prices. What do they do?" (Townend, 2022)

A company can try to prevent adapting too much to a software solution or making the internal architecture too heavily influenced by constructing decoupling layers, which essentially would result in only having to adapt the decoupling interface in case of a supplier-change (Bosch, 2022). The more open source-code you get access to the more likely you will be able to make these arrangements, which is why this is also a driver of the lock-in effect. However, this leads to additional costs that can be hard to argue for as the challenges often are interdisciplinary with both technical

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and business elements involved (Townend, 2022). The more of a cloud-solution a company chooses, the higher the lock-in effect has been described (Bosch, 2022), and this is actually mentioned as one of the most important deterrents for companies preventing them from moving to cloud-solutions (Townend, 2022). It is usually free to put company data into the cloud, but egress fees, fees for taking back your data from the cloud-providers servers, can be high and therefore a clear disincentive although they are becoming less common (Townend, 2022).

4.3 Untouched terrain

A factor driving complexity in software markets is that the implications and risks of its usage are not always clearly defined and hard to evaluate, so the risk the purchasing company is undertaking cannot always be measured when making certain choices; how can data or security risks related to certain solutions be given a monetary value, for a purchaser to take into account when balancing solutions against each other?

The more a company outsources to an external provider e.g. through cloud, the more it is essentially giving up control over its security, an important matter to look into when "... like 98 % of all software will be cloud by 2030." (Townend, 2022). The problem with software however is that a purchaser can never really be sure that it is bullet proof as it is "mathematically impossible to prove that there is nothing wrong [with the solution]." (Torkar, 2022). The absence of errors can perhaps be proven, but only because they can not be found does not mean that they are not there, which is why there will always be challenges related to quality-aspects of the solution (Torkar, 2022). Furthermore, if the software is located elsewhere on supplier servers and e.g. it gets hacked and the solution switched off, " (..) you might have a contract that might say you get compensation if that happens, but ultimately it is out of your control" (Townend, 2022). The time between the breach happening and the switch-off can be measured to almost no-time, making it incredibly hard for companies to guard themselves against such measures, making the supplier-choice essential.

Another source of unease related to these markets is that they are relatively new regarding legislation, meaning countries have vastly different legislation regarding e.g. data integrity. As an example, US companies are obliged to let the government look into all the data which flows through their servers, regardless of where the data is geographically. Furthermore, it is illegal for US companies to tell their customers when their data has been screened (Regnell, 2022), although "(...) [The US] do not just do it for terrorism protection, but they are famous for industrial spionage" (Bosch, 2022). With almost all industries getting more digitized riding on a strong cloud-trend, and with a small amount of US players dominating this market (Townend, 2022), we are seeing e.g. European legislation taking all the more action

to guard their data, e.g. through GDPR, inhibiting european companies from using some solutions from American companies (Townend, 2022). There is a trend with European countries turning towards european cloud-solutions (Regnell, 2022), but combining the slow nature of legislative action and strong lock-in effects, purchasers need to think strategically and have insights upon what might be or not be legal in the future, to not be stuck with a solution they suddenly are not allowed to use.

Conclusively, the high dependency companies have on their software suppliers and the changes that are bound to happen regarding how the market is even allowed to work and what suppliers that companies are allowed to choose, is leading to purchasers having to take an all more strategic role.

5 Ingka – Case Study

In this chapter the results from the conducted case study are presented. It starts with a more detailed introduction to the organization which has been analyzed, Ingka Group Procurement Digital & Tech, followed by the main identified barriers to the implementation of an intelligence-organization. Thereafter, the identified Information Requirements of the Ingka software-purchasers are compiled, presented and analyzed, answering the second research question of the thesis.

5.1 Group Procurement Digital & Tech – Software Division

Alongside Group Procurement, presented in Section 1.2, Group Digital is one of the strategic group functions supporting the multinational corporation, comparable to an IT department. Group Digital is divided into seven sub-categories; software, cloud, hardware, infrastructure, consultancy services, SI/AM services and application platforms. These sub-categories both align, overlap and differ from the sub-category areas defined within Group Procurement Digital & Tech. Business partners at Group Digital have direct contact and responsibility for suppliers and solutions, parallel to Group Procurement Digital & Tech, which calls for a close cooperation between purchasers from Group Procurement with their corresponding business partner(s) within Group Digital. Ingka states that the mission for Group Procurement Digital & Tech is to source high quality solutions together with Group Digital at the lowest cost, aiming at the greatest value generation.

5.1.1 The Ingka purchaser role

The interviewees all conform in the fact that the exact role of a software purchaser at Ingka is difficult to specify. The generic tasks can be divided into three main categories.

The first assignment is to continuously keep an overall brief track of Ingka's basic markets, including their relevant solutions and related suppliers. More specifically,

the purchasers should be well aware of Ingka's, and more particularly the department's, roadmap, to be able to take that perspective into consideration when procuring. The software purchaser at Ingka also has to construct and obtain a beneficial relationship with Group Digital, which includes communicating, information seeking and cooperating together to find the best solution for satisfying the end user need. Lastly, purchasers are expected to have a general knowledge about the company risks related to the procurement of software.

There is a Standardized Operating Process (SOP) for procurement within Digital & Tech, which aims to make sure all involved parties, first and foremost Group Procurement Digital & Tech and Group Digital, are aware of their responsibilities within the process and which ensures the correct procedures are followed. The scope of the SOP is defined as the process from sourcing to paying, which means the process is initiated by an identified need within the company, and is disclosed and transferred to the payment operations when the product is delivered. For a purchaser or a business partner to fully incorporate the SOP, a basic need of business intelligence is required, more specifically for the individual to be able to understand e.g. market trends and emerging technologies, aiming to improve their strategic thinking and help them prioritize among their tasks.

Lastly, another main activity of the purchaser is to establish and maintain relationships with Ingka's suppliers. In order to negotiate and uphold a good relation it is of essence to be continuously updated upon the supplier's latest activities and the market trends which might affect them or the partnership. In order to ensure future strategic alignment, a purchaser also needs to create a unified roadmap with the supplier and align corporate specific values between the two parties. The purchaser should also make use of personal networks and contacts to disclose how to become an appreciated customer or to anticipate future changes that might affect Ingka's position in the buyer-supplier relationship.

5.1.2 The procurement process

Sourcing is the initial phase of procurement, often referred to as "the path to a purchase" (Ingka, 2019), and Group Procurement Digital & Tech: Software Category should always be involved during the whole of this process. To begin the sourcing process, an initiation is required from a business partner at Group Digital. The need can derive from both within Group Digital or be passed along from another end user in the organization, and is announced to the corresponding purchaser via the business partner. The end user, no matter if it is Group Digital or another group function, is obligated to specify the requirements and standards of the needed solution, which should be forwarded in a standardized and detailed manner. When the business partner from Group Digital initiates the sourcing process, the corresponding purchaser is responsible to make sure that there are organizational

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possibilities to pursue the purchase. This includes for example the existence of an approved budget and a Business Impact Assessment, initiated by the end-user, and it also has to be ensured that the timeline is sufficient to pursue a full procurement process. After the initiation is accomplished, the business partner and the purchaser must define objective evaluation criterias together, to aim for a clear and transparent procurement process which will not impair fair competition. When tendering, Ingka as an organization strives to use existing suppliers to whom they already have relationships and which have been assured to align with Ingka's business and core values. When a supplier is decided upon and the sourcing process is to be finalized, the purchaser from Group Procurement Digital & Tech: Software Category is responsible for setting up the contract which has to be signed by all involved parties, generally business partners, purchasers and suppliers.

When it comes to supplier management, the purchaser from Group Procurement is responsible for adding the supplier into the Ingka supplier database, qualifying it for both one or several categories and domains. Along with the database registration a decision has to be made regarding the categorisation of the supplier, as it can be either as strategic, preferred, tactical or active, with decreasing importance accordingly. Depending on the category, more or less resources and effort will be commissioned to the relationship. The purchaser further monitors supplier performance and risk, and is to provide a monthly report on the purchase order compliance to their corresponding business partner at Group Digital. The supplier monitoring is based on four different dimensions, strategic fit, financials, service and product performance, as well as risk and compliance. Business relations require continuous monitoring to enable the organization to rapidly act on any arising red flags. This is done through a cooperation between the business partner and purchaser, where communication, both intra- and inter-organizational, needs to be properly managed to ensure efficiency. As a basis within Ingka Procurement, contracts should be reviewed in minimal every third year, but the higher the strategic importance of the contract, the more often the sourcing agent should be audited.

5.1.3 Stakeholders and Communication-pathways within the division

Software purchasers in the department of Group Procurement Digital & Tech have a range of different stakeholders from which they can gather and exchange information with. These include both internal sources at Ingka from other departments, and external sources to the company. The different stakeholders are visualized in Figure 18, and further described in the following sections.
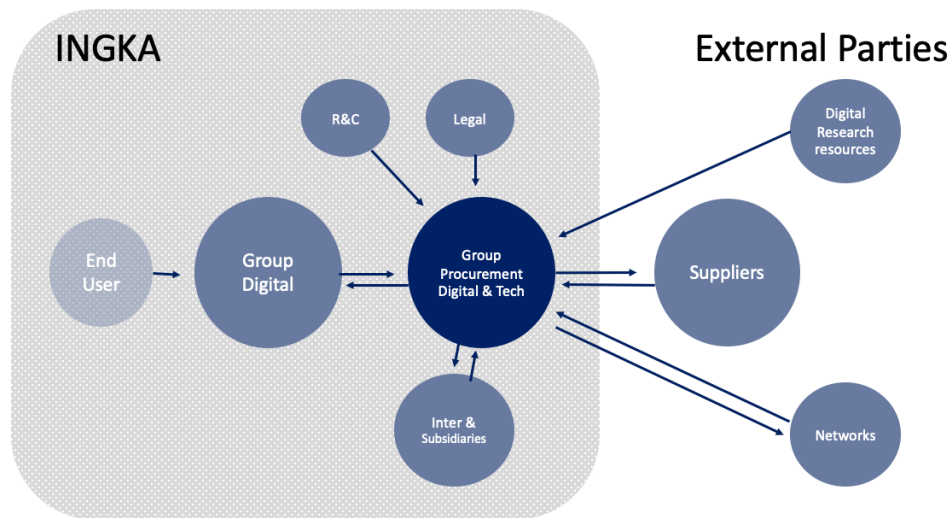
Figure 18. Ingka Group Procurment Digital & Tech communication overview (Authors' own design for this thesis 2022).

5.1.3.1 Internal communication

For a purchaser, one of the main sources of information consists of the communications within the department of Procurement Digital and Tech. These paths of communications are mostly based on ad hoc conversations between purchasers when dealing or interacting with a common supplier, where information about license models, contact persons and other areas of interest can be discussed. Furthermore, there are some recurrent arranged meetings within the category of software procurement called "What's cooking?". According to the purchasers, these meetings are more or less informal gatherings without a clear structure or agenda, and should be seen as more of a chance to briefly update the team on the category's current projects, discuss recent challenges and how to manage them.

Another important source of information comes from the communication the purchaser has with their relevant business partners at Group Digital, which are responsible for the overall software architecture and strategy, and whose duty it is to report the end user needs that are to be solved with the procured solution. It is therefore structured so that parties responsible for mutual domains and/or suppliers communicate regarding said domain and/or supplier. The purchaser and the business partner from Group Digital should serve as each other's assets with headspace to discuss strategic issues about potential solutions and future technological roadmaps. However, the interviewees expressed that this process and the amount of communication differs greatly between purchasers, business partners, domains, solutions and/or suppliers, as it is not a standardized activity after the purchase has been set and the collaboration enters the contract management-phase. The majority of the purchasers expressed that their business partner at Group Digital usually

possessed better continuous insights into the different solutions and markets. Although the cooperation between the two groups is to be based on a bilateral trust regarding possession of important information, this leads to the assumption that Group Digital usually has a better oversight over the solutions market. However, this was not entirely unanimous, as some purchasers said they were the parties who were expected to provide intelligence.

The last general source of information from within the company was expressed to be the departments of Risk and Compliance as well as Governance and Legal. According to the interviewees, there are no formal routines or communication pathways established between these departments and Group Procurement Digital & Tech: Software Category, more than the general trust they have regarding the departments disclosing important knowledge when needed. Mentioned examples of such information were e.g. severely increased geographic risks, updated cyber security legislations or export controls.

5.1.3.2 External communication

Regarding sources of information external from Ingka, the suppliers themselves can be argued to be the most important ones. They can deliver information directly during the procurement process and the contract management-phase in the form of e.g. financial numbers, both quarterly and yearly, their user-networks and product specific reports. Depending on the relationship with the supplier and their key account manager, information on e.g. solution-updates and trend-reports can be sent out directly to the managing purchaser. With strategic suppliers it was also mentioned to be common to have more or less continuous meetings, during which more strategic information could be discussed and roadmaps further aligned. If the relationship was not as established, information could further be gathered via the supplier's own channels, such as webpages or social media.

Apart from the supplier, purchasers within software can gather information through different kinds of networks with other suppliers, customers or software-purchasers employed in companies of the same size. These networks can be either personal connections, supplier-based user networks or other networks based on e.g. geographic proximity. The information shared through these networks was described as both hands on information, like chosen and implemented solutions, or more specific intel, such as issues and challenges with certain vendors or specific solutions. They can also be good platforms where identified trends regarding new technologies and innovations in the field can be discussed.

Further on, digital resources, tools and platforms such as Gartner, Forrester and Google, are main sources of information for the majority of the software purchasers. Google can provide all sorts of information through general searches of suppliers or solutions, such as news, press releases etc. Gartner and Forrester both specialize as procurement and supply management intelligence tools. They can provide

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information regarding operating suppliers on certain markets, but also conduct analyses comparing the different vendors.

5.1.3.3 Identified communication related issues

There were several issues identified during the interviews, related to the communication between parties and more specifically to a lack of alignment, which can be further divided into four different problems. The first one was the identified complexity and ambiguity related to the exact definition of the expected role of a purchaser. Depending on which purchaser was asked, different explanations were given with differing descriptions of their overall main tasks and responsibilities. Furthermore, there were contrary definitions of what their role as a "trusted business partner", which they are encouraged to be towards their business partners at Group Digital, actually entailed.

The second problematic area was declared to be the unclear segregation regarding who is ultimately responsible for knowing about or conducting the tasks which are divided between the purchaser and the business partner at Group Digital. An example was e.g. the blurred line regarding which department was responsible for some supplier contact- and relation-tasks in the after-sales and implementation-phase of the solution, such as tracking chosen KPIs and other continuous information on how the contracted solutions implementation was proceeding.

The next area of issues derived from a lack of alignment, was identified to be the unsystematized information gathering-activities within the procurement division, and more specifically within the category of software procurement. This was said to be due to the lack of defined questions to be asked, what information was considered to be important to be updated upon, and a lack of knowledge regarding when to search for information or where to find it. A lot of the information seeking was also declared to be done in an ad hoc manner, which meant purchasers were mostly reactive rather than proactive when it came to the information gathering activities, which led to general insecurity. However, the main problem which arose due to this inconsistency had to do with the consequent differences on what kind of and how much information each purchaser actually had and how much time they spent on intelligence activities, as huge differences were identified.

Lastly, there was another area of interest regarding information sharing processes in the organization, as interviewees commented that there was a general lack of structure regarding what information was within it and who had access to it. This was said to cause overlaps in information processing procedures, and the expressed lack of regular and continuous meetings interdepartmentally was also declared to lead to lock-ins of information within certain departments. Conclusively, this could lead to a general lack of alignment between departments and purchasers regarding how to achieve Ingka's long-term vision, as roadmaps could be laid out stemming from different information.

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5.2 Resulting Information Requirements

Other than to understand the main problems, needs, roles and communication pathways that are part of the Ingka purchasers work and environment today, the main purpose of the interviews was to understand what information the software purchasers would like to have updated on a regular basis in order to conduct their assignments efficiently. An interview guide was therefore constructed based on the areas highlighted in the different competitive analysis frameworks presented in Section 3.3, aiming at all angles which could be of relevance to be brought up and discussed. The conversations were thereafter held in a semi-structured fashion to give the interviewees both inspiration on the different areas that could be of relevance. This was done in order to not forget or miss out on any important information needs or insight-sources, but also to let them highlight what they felt was most important overall and across these sources of intelligence. This is why some parts of the frameworks in Section 3.3 might not be as represented as others, as the interviews specifically asked for what the purchasers found to be most important, and not just of general interest. Henceforth, the term "The Company" will be used when referring to Ingka when more general Information Requirements are explained in the following chapter.

An analysis of the transcriptions reveals the following pattern, where most information needs, also called Essential Information Elements as described in the intelligence cycle in Section 1.1.2, are identified to belong to either of the categories shown in Figure 19. "The Company" refers to the information needs purchasers have related to Ingka's overall strategy as well as the feedback and needs expressed or felt by the departments and people who will be implementing and/or using the purchased solutions. "The partnership" refers more to the overall relationship between The Company (Ingka) and the supplier, e.g. how the power balance looks between the companies, how much they can influence each other strategically in order to grow together and how compliant they are regarding the purchased product. In "The Supplier " category the information that purchasers want to have regarding the chosen supplier is identified, mainly related to how competitive they are in the market and how their prospected roadmaps relate to The Company's overall strategy. "The Market" category looks at the chosen suppliers' main competitors, other solutions employed by similar companies and overall trends in the industry which might affect future strategic decisions. Finally, "The Macro Environment" refers to information that is not industry-specific but which influences all software-industries, such as legislations and geographical risks related to having suppliers associated with certain locations, and which might affect future competitive-attributes.

Figure 19. Identified categories of information elements (Authors' own design for this thesis, 2022).

The final synthesized and categorized information needs can be found compiled in Appendix B. These are divided into the stated categories under the upcoming headings, together with a more in depth description of their nature and possible implications and insights which they might lead to. Furthermore, it is highlighted that the different columns in the tables do not represent differences in importance, but are to be seen as categorizing trees where all Information Requirements are categorized into an area and thereafter into a category within this area. In the cases where specific data-points or valuable information-types are identified within an information requirement, they are described under "specific data". Selected quotes from the interviews which highlight certain information and their consequent implications can be found under Appendix B.

5.2.1 The Company

Table 3. "The company" category of information elements.

Area	Category	Information Requirements
The Company	Strategic Direction	The Company's strategic direction
		Software architecture-strategy
	End User-Needs	
	Solution Experience	End-user experience
		Warning signs from IT-department
	The Solution's Lock-in-Effect	Expected replacement time of solution
		Warnings from enterprise architects of elevated lock-in-risk

As defined in the introduction, the needs found in this category are mostly related to the need of understanding what the final user of the solution is actually trying to get help with ("End-user need"), and what the overall company strategy and goals are moving forward ("The Company's strategic direction"). The summarized Ingka-

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related information needs can be seen in Table 3. "Software architecture strategy" is related to the need to know how the enterprise architectures at The Company look at the future resilience of the total software-architecture, by assessing how much is to be outsourced, what lock-in-levels can be accepted and how much they want to modularize or co-develop with different suppliers. This information should not be too extensive, but a broad update on the roadmap for the future of The Company's sourcing of software is deemed useful for purchasers to know in order to have an overall notion of what to look for in the market. The "solution experience"-information-need looks at how well the solution is fulfilling the initial needs, and to be able to identify early signs of discontent. Furthermore, there is an identified need to have a certain understanding and update on the current lock-in effect of the solution, identified by the enterprise architects, by monitoring for example "expected replacement time of solution" and "warnings from the enterprise architects of elevated lock-in risks".

5.2.2 The Partnership

Table 4. "The partnership" category of Information Requirements.

Area	*Category*	*Information Requirements*	*Specific data*
The Partnership	Delivery	Ease of collaboration	- Complaints regarding ease of collaboration - Problems or complaints about order -Invoice-inaccuriacies - Contract-specific KPI:s
	Power-Balance	Spend quotas	- The Company's total spend on supplier - The Company's share of supplier sales - Supplier share of total company software-procurement department spend -Megavendors: Suppliers fragmentation in sales organisation
	Strategic Cooperation	Contracts	-Historic and current contracts. -Regionally-fragmented contracts

		The Company's use of supplier in other domains	
		Strategic alignment	
		Points of contact	- Main supplier key account manager - Other contact-points with supplier.

In the partnership-category the focus shifts towards the interface between the supplier and the company. The Information Requirements, which can be seen in Table 4, therefore focus on collaborative aspects such as how the solution is fulfilling The Company's needs, the power-balance between the parts and the opportunity for strategic cooperation.

The delivery aspects focus more specifically on how well the implementation progress is developing and how easy the updates can be implemented, so that purchasers can get a better understanding early on regarding how contracts need to be updated in the near future. Other important data to keep track of in the delivery-category is associated with the ease of the collaboration, which points at how much "additional work" the supplier contributes to. More specifically, this can be measured by keeping track of for example how many complaints and the severity of them that purchasers receive from the users regarding the collaboration and the service/product, the amount of invoice-inaccuracies and other Key Performance Indicators (KPIs) related to the specific contract.

The amount of influence a purchaser has on the partnership is closely related to the power-balance between the buying company and the supplier, which is why several of the purchasers expressed tracking the spend-quotas between the actors as an important information need. This can be tracked by looking at how much of the supplier sales The Company accounts for, as well as how much of The Company's software-purchasing departments' spend is allocated to that specific supplier. Another interesting factor mentioned in the interviews that affects this power-balance regarded however the supplier had a fragmented sales-organization. Several of Ingka's strategic suppliers are megavendors, as described earlier in the thesis, where even a customer of the size of Ingka becomes "a drop in the ocean" among the rest of the customers. However, the interviewed purchasers express it being advantageous if these suppliers have a fragmented sales-department, as Ingka e.g. could be a small customer globally but end up having a good bargaining position relative to the nordic sales-departments. Therefore, it could be advantageous to get information regarding these organizational changes.

Additional information needs for this category relate to the overall scope of cooperation between the supplier and the purchasing department. Several

interviewees stress the importance of having an overview and systematic classification of the historical contracts with the supplier, as well as information about the contracts held with them regarding solutions in other markets or domains, which are often handled by a different purchaser. Ingkas software-purchasing department buys global solutions to be implemented coordinately world-wide, but a problem is identified in the fact that some regional divisions are known to contract suppliers without going through the central organization, creating some potential software-architectural problems. Some of these regional contracts are also with the same supplier, but with different pricing models due to previous longstanding contracts. It would therefore be of value for purchasers to have these contract-databases assembled and reviewed somewhat continuously to look for potential efficiency-measures. Due to suppliers overlapping into different markets it would also be of value to have an overview of all the solutions provided by them, not only the one related to the solution the specific purchaser is accountable for. Furthermore, the overall strategic alignment and cultural values of the supplier are accentuated as an important parameter to have a notion of. The last parameters to keep track of regarding this category relate to the importance of having information of the overall contact points between The Company's organization and the supplier, as it is described that there often are several more or less personal relationships between different hierarchical levels of certain companies. This is good to keep track of to be able to discuss supplier-matters at different levels depending on their strategic importance, but also to know who to involve in purchaser discussions to reach alignment on important decisions and show a unified front.

5.2.3 The Supplier

Table 5. "The Supplier" category of Information Requirements.

Area	Category	Information Requirement	Specific Data
The Supplier	Basic Data	Finance	Quarterly and yearly reports: -Revenue -Margins -Profits -Solidity - Nr of employees

			"Megavendors:
			   - Division of spend on different markets
			   - Division of profits from different markets
			   - Division of revenue from different markets"

		Geographic presence	-Headquarters location -Geographic disperson -Establishments in new geographical areas
	Innovation and Strategic Direction	Strategic roadmaps	
		Launches	-New technologies - Upgrades on current solutions -New products - New services
		Investment areas (megavendors)	- Employment trends (technological areas/markets) - Acquisitions - Investments - Sustainable investments
	Management and Networks	Networks (Niche)	- Strategic partnerships - Change of subcontractor
		Management	- Board - Shareholder structure/main shareholders - Executive-level managers
	Current Scope	Solution/product	- Life cycle-position - Modularity - Market shares - Pricing models
		Product/solution scope	- Product range on market - Product range across markets
		Customers	- Size - Geographical distribution - Industries - Different contract terms/models

		Compatibility with megavendors (Nich)	
	Scandals	Security breaches	
		Compliance records	
		Sustainibility scandals	
		Lawsuits	

The supplier category starts looking outside of The Company and onto parameters and attributes that relate to external factors that are more difficult to influence, and which may therefore give basis to other kinds of insights. The Information Requirements, which can be seen in Table 5, are further divided into five supplier-subcategories: "basic data", "innovation and strategic data", "management and networks", "current scope" and "scandals".

"Basic Data" assembles information regarding the finances and geographic presence of the company. The financial information is deemed of value to be updated on in order to control that the supplier is stable and will be able to continue delivering on its promises, whilst the information in the category "megavendors" aims to point out how looking at the overall margins and revenues of big market-transcending companies can be hard to get a grip of or insights from. However, several interviewees name it interesting to look at the spends, profits and revenues stemming from the different markets the megavendor is active in to try and get insights upon the company's future direction and actual strengths. Furthermore, having updates on changes regarding the company-headquarters locations, its dispersion and establishments in new geographical areas is regarded as valuable. This is due to the legislative implications location in different countries can have on the company's ability to e.g. secure data and provide service to end-customers.

It is reported that how innovative a supplier is play a huge role in however the company will be competitive in the future, especially regarding markets as innovative as the software-markets, and "innovation and strategic direction" aims at keeping track of how innovative they are and in what areas. To be able to form these insights, purchasers articulate a desire to be kept updated upon the company launches of such as new technologies, upgrades on current solutions, and new products and services. They also say it would be of value to take part of and discuss different suppliers' strategic roadmaps, as having insights upon its direction could be useful in order to plan coevolution and ensure future alignment. Furthermore, and most relevant regarding suppliers of a certain size, other sources of information that could lead to strategy insights included the suppliers investments, e.g. looking at their employment trends but most of all, by looking at mergers and/or acquisitions they might be involved in in specific technological areas or markets.

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Having updated information about the suppliers management and networks is stated as having different importance depending on the size of the specified company. Niche- and smaller suppliers' networks are deemed to be more critical being updated on, as new or concluded partnerships or subcontractors could influence their future solutions quality or technological roadmaps but also give hints on their future merge with a megavendor. All clues regarding future merges with other companies are actually emphasized to be of great importance to the interviewees, as such happenings could have huge implications regarding their future ability to deliver their services. Furthermore, the acquiring company's eventual strategic misalignment with Ingka could implicate a ripping of the contract. Clues regarding these aspects would therefore be very useful as they could let purchasers initiate the process of finding a suitable substitute earlier in order to avoid a lock-in to an inadequate supplier. Information about the management of the supplier, such as being informed about the members of the board, the main shareholders, the shareholding structure as well as the executive-level managers, could have implications mainly regarding conflicts of interest or altered strategic focuses and are therefore deemed useful to keep track of.

"Current Scope" refers to the information about the specific solutions the supplier offers, their scope across markets and their customer base. Interviewees conclude they would like to be kept informed on the life-cycle position of the chosen solution, mostly in order to know whether it was going to be phased out or substituted by another technology in the near future, so that new alternative contracts and solutions could begin to be investigated. Knowing the modularity of the solution refers to information or understanding of how easy it is to combine different features with other products or suppliers, which e.g. indicates higher or lower lock-in effects and therefore the usefulness of keeping updated on other supporting technologies. Due to the diffuse "scope" of the markets in the software-industries, many companies have offerings that transcend these borders and offer solutions that can combine many different needs. It is therefore seen as important to keep track of the product range of the supplier within and across markets, to have a better understanding of the potential to solidify the supplier-base. Furthermore, having an overview of the supplier customer base relating to their customers size, geographical distribution and industries can give a sense of the supplier capacity to fulfill The Company's needs of e.g. support, and are seen as more crucial to keep track of with small- and middle-size companies. Lastly, in the case of the global megavendors, interviewees speak of cases where new license-models and concepts are first tested and deployed by the supplier on other customers and thereafter spread across the customer base. Knowing these changes could give purchasers a clue to future negotiations and a chance to look for substitutes.

The Information Requirements about "scandals" are quite forward, stating that purchasers want to be informed when supplier's security, compliance or

sustainability approaches are questioned. They can give the basis for further investigation to see if the supplier actually complies to the contracts and e.g. has the same values as the purchasing company, as a potential mismatch can lead to contract termination, and is simply essential to keep track of so it does not stain the purchasing brand.

5.2.4 The Market

Table 6. "The Market" category of Information Requirements.

Area	Category	Information Requirements	Specific Data
The Market	End Customer-Needs	Changes in end-customer-needs	
		Other customers chosen solutions	
		Substitutes to the product/solution	
	Competitors	Main competitor's market shares	
		M&As	
		Competing products/solutions	- Price - Performance - Innovations
		Geographic proximity	
	The Solution and Trends	Pricing models	- Existing pricing models - Up and coming pricing models
		Market maturity	
		Innovations in the market	

In this category the Information Requirements related to the solutions' market and the suppliers' competitors, which can be seen in Table 6, as it is important to keep track of how the needs they are based on evolve, how different actors progress and how the solution matures. Specific Information Requirements therefore include changes in end-customers needs, as they may result in changed "market-scopes" or lay ground for new possible synergies between current suppliers' offers; other customers solutions, as these may indicate advantages or disadvantages with the purchasers chosen solution that they may have been unaware of before; and keeping an eye at substitutes to the product/solution. Important factors to keep track of relating to the suppliers' competitors relate mainly to their main competitor's market share and their competing products or solutions' prices, performance or innovative

capabilities. This information gives basis for competitive analysis that may lead to e.g. renegotiation of contract terms or initiate discussions with the current supplier about features that they may lack but that the customers may find valuable, to try to influence their innovative capabilities. Mergers and acquisitions occurring between competitors are also stressed as they may indicate a shift in the competitive environment, as e.g. the merger of two small middle-sized companies may suddenly pose a threat to an established megavendor within the sector. The geographic proximity of possible competitors may also be of value monitoring moving forward due to the increasing legal implications and risks related to locations, as a competitor being "closer" may give a bigger competitive advantage in the future, as discussed in Section 4.3. Lastly, interviewees mention the importance of being kept informed about the solutions evolution itself, by having updates regarding existing and up-and-coming pricing models in the market, having a sense of the market's maturity and about innovations or new ways of solving the needs the solution is based upon.

5.2.5 The Macro Environment

Table 7. "The Macro Environment" category of Information Requirements.

Area	Category	Information Requirement
The Macro Environment	Software-Related Trends	Software-technology trends
		Sustainibility trends within software-technologies
	Geographical Risks	Geographical risk on ownership structure
		Geographical risk of political instability
		Geographical risk of data breach/integrity
		Inflation
	Laws	Data integrity legislation
		Data security legislation
		Export legislation

This category, "The Macro Environment", specifies certain factors that most software-markets should have a certain notion of as they may influence and shape their more or less immediate future. A compilation of the Information Requirements can be seen in Table 7.

Firstly, information about macro software-technology trends, such as the evolution of buzz-word-trends such as AI, machine learning, cloud and blockchain technologies, should be highlighted so that purchasers themselves can form insights with their peers around how these may influence the future of the solution and need they try to fulfill, and be able to ask relevant questions about suppliers long-term roadmaps. More specifically, it is stated to be of great value to be updated on new

licensing and payment models, as these usually begin in one software market but then spread out. Being updated or aware has therefore been claimed to potentially lead to big payment increases or decreases depending on how you are able to foresee, manage and/or influence a supplier regarding these changes. Furthermore, sustainability being at the core of Ingka values, being informed about new technological trends within software specifically targeting sustainability could be of great value and give purchasers grounds to try and influence the suppliers innovative roadmap to include these technologies as much as possible.

Other Information Requirements related to shifting geographical risks, where interviewees deem it useful to be kept updated upon the geographical risks of ownership structures, their degree of political instability and their locational probabilities of having data or integrity breaches. Several interviewees mention an increased awareness and/or mistrust regarding suppliers with connections to certain markets or locations, and having regular reports on standing sanctions or possible implications of having suppliers with connections or activities in specific locations would therefore be of use when evaluating alternative suppliers or competitors. Having regular information about inflation rates is also mentioned as a valuable addition to this category, as these could affect pricing extensively and having news on rapid changes would therefore provide useful red flags.

Lastly, there are identified information needs related to the development of laws on the areas of software technology, data integrity, security and export legislations. As stated by the software experts in Section 4.3, the software-markets are relatively new and have not yet been as extensively legislated as they potentially could end up being. Incremental efforts such as Europe's GDPR legislations affect many supplier-relationships and the delivery of certain solutions, and future legislations could shift competitive structures further. As specifically software-contracts often extend over several years and have severe lock-in-effects, having regular updates on possible future changes legislations that could influence their delivery-capabilities would therefore be of use when developing strategic roadmaps.

6 Analysis

This chapter identifies how the Information Requirements discussed in the previous chapter should be gathered and spread throughout an organization to relevant parties in a structured manner that avoids information overload and optimizes insight-creation. Information processing theory is here used to first identify the complexity and equivocality of each information requirement, whereafter a framework related to how these different types of information should be diffused is presented. Lastly, an analysis and framework of what activities a Market Intelligence role should entail, in order to aid purchasers in their quest to fulfill their information needs, will be discussed.

6.1 The gathered Information Requirements from a complexity perspective

The first part of the analysis aims to identify what kind of information, and their related complexity, that the Information Requirements actually consist of. A result to be drawn from their description in the previous chapter is that there were a range of different types of information requested, with clear differences on e.g. specificity, the ease by which one could distinguish between relevant and less relevant information related to the requirement, as well as how easy the information itself would be to understand in an non-equivocal way among different parties.

In this chapter the information needs are sorted according to two criteria: if they can be deemed to be high or low in uncertainty and if they can be deemed high or low in equivocality, according to the descriptions of these attributes presented in Section 3.2. For the uncertainty attribute, the requirements are therefore sorted as either "high" or "low" according to the amount of information the purchaser would be deemed to need in order to understand the subject and fulfill their information need. This is according to theory presented in Section 3.2.1.1 highly related to how certain and dynamic the information gathered is and to how much background information the purchaser would need to possess in order to make relevant assumptions. For the equivocality attribute, the requirements are sorted as either "high" or "low" according to what degree of different assumptions purchasers could be deemed to

draw from the same information, resulting in numerous or ambiguous interpretations of the same situation within the organization and relevant stakeholders. As a guideline for how the combinations of these attributes can be interpreted, Figure 8 presented in Section 3.2.1.3, are used.

These requirements are solely based on the needs expressed by purchasers of software, and their related complexity is therefore often considered from the software-market perspective presented in Chapter 4, where the complexity of e.g. pricing, the process of defining software needs, as well as the highly technical-skills needed to understand solutions are discussed. Other considerations taken into account are the way by which interviewees express what insights could be drawn from the same information, outright statements about different needs (like "pricing") being complex to get a grip on, and the overall aggregated impression from the interviews regarding each piece of required information.

The requirements are also analyzed from the purchaser's perspective, where some information is assumed to be processed in other parts within or outside the organization and then delivered to the purchaser in a consistent way. One example is "the expected replacement time of the solution", which can be deemed highly uncertain and equivocal to arrive to, but which is a process assumed to be conducted from the company's digital department and solely delivered to the purchaser in a numerical manner. Overall, the Information Requirements are therefore seen from the perspective of how much the purchaser will have to process it, not necessarily how much processing it will need overall. The information which is considered should be processed elsewhere in the company, (e.g. in Group Digital or in the Legal or Risk & Compliance department), is therefore cursive in Figure 20. However, some of this information can still bring ambiguity within the department as it can lead to different insight, leading to some Information Requirements remaining high in equivocality.
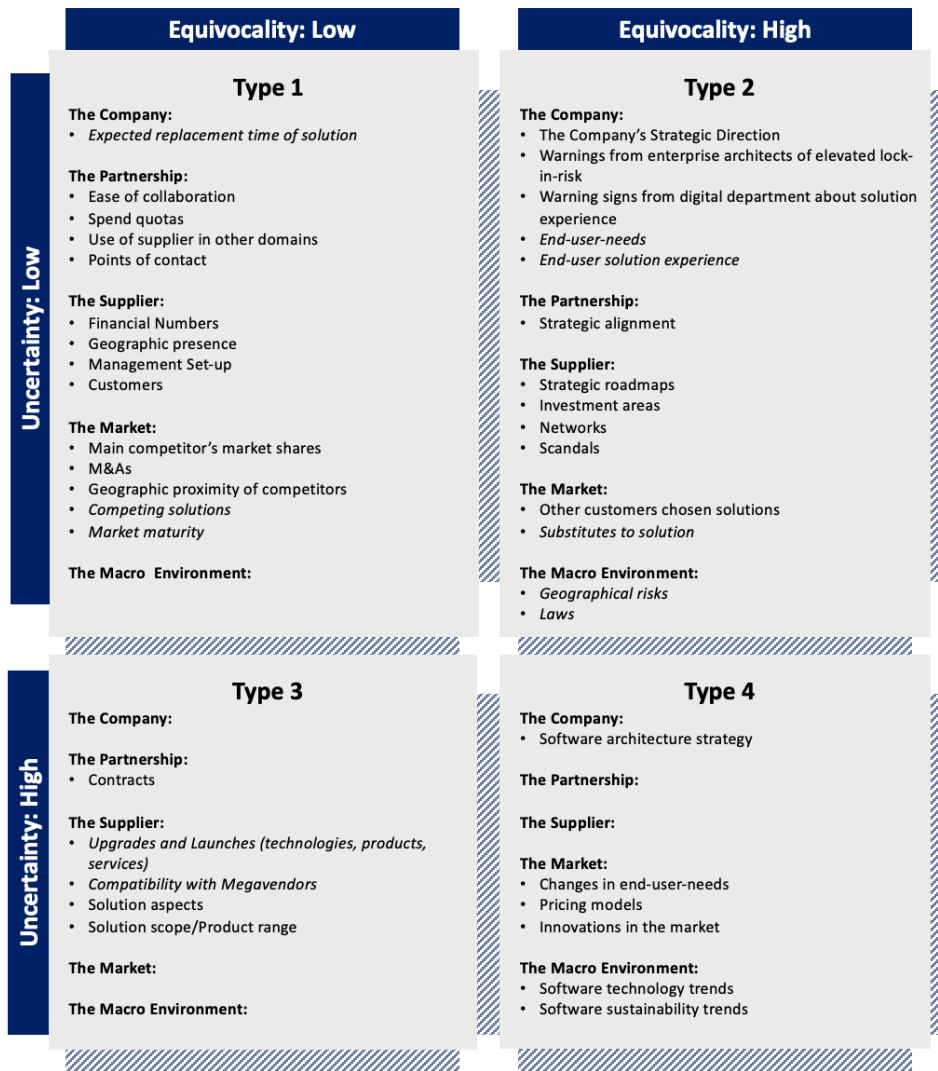
Equivocality: Low	Equivocality: High
Type 1	**Type 2**
The Company:	**The Company:**
• *Expected replacement time of solution*	• The Company's Strategic Direction
	• Warnings from enterprise architects of elevated lock-in-risk
The Partnership:	• Warning signs from digital department about solution experience
• Ease of collaboration	• *End-user-needs*
• Spend quotas	• *End-user solution experience*
• Use of supplier in other domains	
• Points of contact	
	The Partnership:
The Supplier:	• Strategic alignment
• Financial Numbers	
• Geographic presence	**The Supplier:**
• Management Set-up	• Strategic roadmaps
• Customers	• Investment areas
	• Networks
The Market:	• Scandals
• Main competitor's market shares	
• M&As	**The Market:**
• Geographic proximity of competitors	• Other customers chosen solutions
• *Competing solutions*	• *Substitutes to solution*
• *Market maturity*	
	The Macro Environment:
The Macro Environment:	• *Geographical risks*
	• *Laws*
Type 3	**Type 4**
The Company:	**The Company:**
	• Software architecture strategy
The Partnership:	
• Contracts	**The Partnership:**
The Supplier:	**The Supplier:**
• *Upgrades and Launches (technologies, products, services)*	
• *Compatibility with Megavendors*	**The Market:**
• Solution aspects	• Changes in end-user-needs
• Solution scope/Product range	• Pricing models
	• Innovations in the market
The Market:	
	The Macro Environment:
The Macro Environment:	• Software technology trends
	• Software sustainability trends

Figure 20. The Identified Information Requirements categorized based on level of uncertainty and equivocality, inspired by Daft & Lengel (1986).

The results of the analysis can be seen in Figure 20 above, where the different combinations result in the requirements being divided into four quadrants with differing implications, which will be further discussed below:

According to the definition stated in Figure 8 (Section 3.2.1.3) information found classified as "Type 1" with the attributes "Uncertainty; Low, Equivocality: Low", tends to be clear and can be routinely gathered as the situation is well defined and managers usually need few additional answers to process it (Daft & Lengel, 1986).

Requirements that can be found in this quadrant are therefore mostly information that can be relatively easily measured, usually lead to the same insights and are mostly delivered or found as "facts". Requirements such as financial information, management set-ups and spend quotas are therefore sorted into this category.

The information classified as "Type 2", "Uncertainty; Low, Equivocality; High", comes occasionally and is ambiguous, where the processing requires definition of new questions, the gathering of opinions and development of common grammar (Daft & Lengel, 1986). As seen in the figure, many of the strategic roadmaps are sorted into this category, as they usually do not require much information to be transmitted from the other party. However, they are prone to lead to ambiguity during the processing of the information into relevant action by the purchaser, a process where many questions may need to be asked and clarified in order to reach common understanding. Information about the situation regarding relevant geographical risks and changes in law are assumed to be provided by relevant stakeholders in a structured fashion, but may still lead to different follow-up questions and understandings regarding what it may imply for the purchaser's supplier-relationships, and are therefore sorted into this category.

The third type, "Uncertainty; High, Equivocality; Low", is information which is a sum of many, well-defined problems and which usually requires managers to ask many questions, seeking explicit answers and new quantitative data, is found (Daft & Lengel, 1986). The information sorted into this category is mostly related to supplies' solution-information, such as upgrades, new launches of technology and how far the supplier actually extends over different markets with their offers. These Information Requirements need much additional information to reach understanding of all the e.g. technology facets, but it is deemed hard to reach discerning views upon, as it is more connected to "facts" about how things work.

The information found in the last quadrant, "Type 4" "Uncertainty: High, Equivocality; High", require the processing of information from many, ambiguous events where managers need to define new questions and answers to those, as well as gather objective data and exchange opinions upon the data which is found (Daft & Lengel, 1986). Most of the Information Requirements sorted into this category relate to strategic information which might give insights upon where markets and technologies are moving. Because of the complexity of these markets and their inherent technologies, which were thoroughly discussed in Chapter 4, much information is usually needed to understand what they might mean for the purchasers own markets and Ingka's overall software-purchasing strategy. It is also assumed to be easy to reach different conclusions from the same data regarding future scenarios, which give the information high equivocality scores.

6.2 How should communication flows be organized?

Sorting the Information Requirements according to their complexity dimensions, in turn related to the attributes of uncertainty and equivocality, lays the foundation for the establishment of directions on how these different kinds of information should be communicated within the organization. With inspiration from Figure 9 in Section 3.2, regarding what kind of media and inherent richness should be used according to the information-complexity's nature, an adaptation has been made to show how the information in the different quadrants from the previous chapter should be communicated, shown in Figure 21 below. The analyzed recommendations are based on the assumption that an information-sharing platform is constructed, e.g. an intranet, where relevant information can be shared from the person responsible for its gathering to other parties in the procurement division who might take interest. Further recommendations are therefore more concerned with how different information should be spread through this intranet, and by how direct interactions between parties should take form depending on the information-complexity.
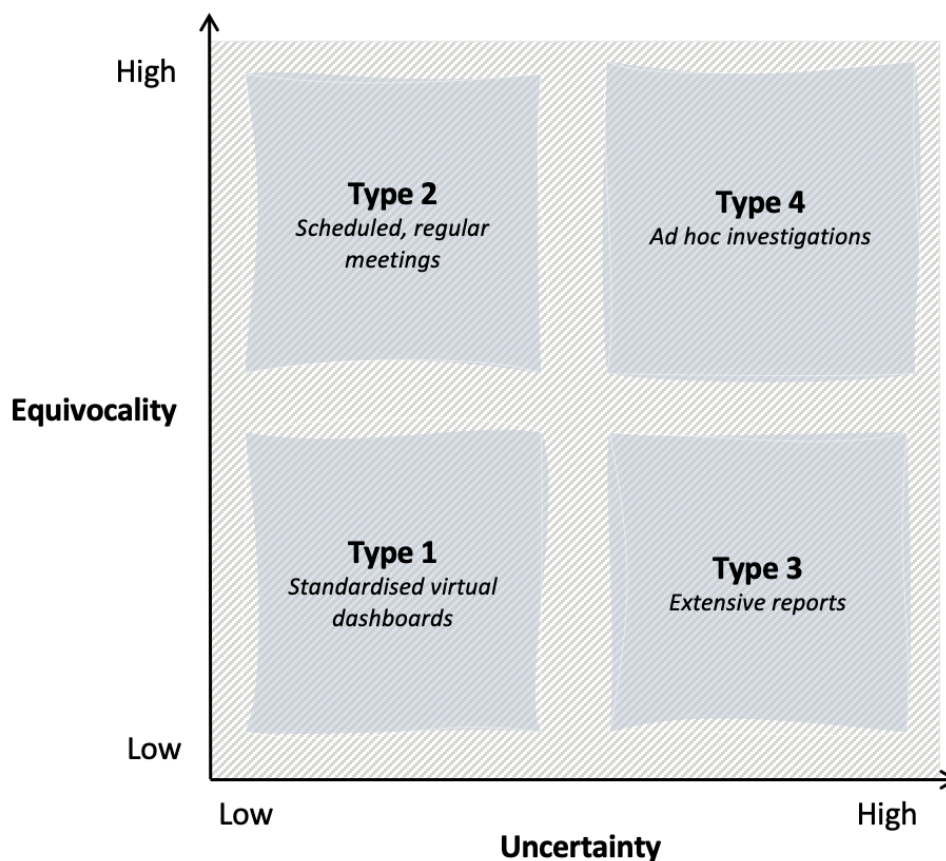
Figure 21. The different complexity categories of Information Requirements, inspired by Daft & Lengel (1986).

"Type 1"-information from the previous section ("Uncertainty; Low, Equivocality: Low") is easily identified, does not require additional information for the formation of insights and usually leads to the same insights independent of the person which gets the information. The analyzed recommendation is therefore to build identical virtual dashboards for each market showing exactly the same data-types, where this information can be uploaded by the person responsible for its gathering and which can be easily overviewed by all that take interest. This information can often be insightful to look at from a historical perspective, and beginning to gather it in this standardized way could lead to future additional trend-related-features where purchasers could look at supplier's and/or market's historical data. Other recommended features would be for the dashboards to have data-sorting features that would allow the identification of correlations between markets, to e.g. see where different suppliers are active across them to reveal their actual scope, a useful feature in software markets.

Information needs of "Type 2" ("Uncertainty; Low, Equivocality: High"), do not require much information but often take the form of processed insights coming from other parties within or outside the organization in the form of roadmaps or done recommendations. However, the processing happening in other departments and/or the actual essence of these information types, which are often strategic, can lead to ambiguity. The recommendation is therefore to set up scheduled, regular meetings for each requirement, choosing carefully which parties would be relevant to have in the room, and making someone responsible for the gathering of relevant information which will lay ground for the discussions. Thereafter, clear templates for the overall agendas should be set up, where the latest updates can be quickly run through, it is ensured that everyone has time to speak their mind and insights and time can be made for discussions about its implications. The agendas and insights could thereafter be stored in the platform to be easily accessed whenever needed and between the meetings, however the overall aim for all the information being brought up and processed during the actual meetings.

Requirements in "Type 3" ("Uncertainty; High, Equivocality; Low"), require a lot of information in order to be processed into insights but usually lead to the same conclusions. As an example, requirements in this category could relate to the need of understanding how the solution needs to work in a more technical manner, so that the purchaser knows what to look for in the market. Therefore and due to the complexity of these solutions as described in Chapter 4, extensive research might need to be conducted to understand all its facets. The important thing for these needs is to set up who will be responsible for the information gathering, and then to be able to store the information in a structured manner, in e.g. reports, so that anyone with an interest in the subject might look into it. The recommendation for these

requirements is therefore to set up templates on how these kinds of reports should be structured, with e.g. what overall headlines should be included, and guidelines on how the research could be made by the purchaser or project group.

Finally, the information needs identified as "Type 4" ("Uncertainty; High, Equivocality; high"), are the most complex to process, as they need extensive amounts of information whilst stakeholders in different parts of the organization might reach different conclusions from it. Furthermore, many of these needs relate to information of which essence and insights relate to all markets. Therefore, the recommendation is for special task forces to be assigned these in an ad hoc-manner, so that they can do the research and process its implications by compiling reports to be uploaded to the platform and which all purchasers could have access to. Thereafter, meetings should be set up where the task group can go through the research and relevant conclusions in a thorough manner, and leave room in the end for purchasers to discuss the implications for their markets either with the whole group or in workshops to reduce equivocality.

6.3 What should a Market Intelligence function entail?

To conclude, different Information Requirements need varying degrees of processing in order to become insights. The goal for the organization and for a Market Intelligence function should therefore be to set up necessary guidelines and structures for the information to flow in the way it needs to, fulfilling Step 4 in the Intelligence Cycle presented in Section 1.1.2, in order to be processed as efficiently as possible by relevant parties. In order to fulfill this purpose, three main tasks are identified as relevant Market Intelligence activities:

   a) *Identify main information stakeholders and define their information gathering responsibilities.*

The first activity regards defining who or which part of the organization should be responsible for actually gathering and processing each information requirement. Without clear guidelines defining who is to be the sender and/or the receiver of information as well as how, where and by whom it should be processed, information is likely to be processed more times than needed or not processed at all, resulting in inefficiencies or confusion. Furthermore, unclear requirements on what information a certain stakeholder should be responsible for gathering can easily lead to information overload in the sense that with no structure or responsibility, everything could essentially be deemed to be part of one's scope. Having a certain role "chargeable" for certain information would also decrease the probability of ending up with databases filled with so called "bad-data", as a greater sense of

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responsibility for the gathered information quality would be easier to be inspired. Mapping out which groups should be part of the information-centered structure, and what Information Requirements each should be responsible for assembling, is therefore an essential activity that arguably should be discussed with management and carried out by a Market Intelligence role.

b) *Set up and moderate information-sharing structures.*

The second activity relates to setting up structures for how information should flow between the identified stakeholders. These structures aim to clarify what information should flow between which shareholders and in what way, as well as to provide a platform where the information and insights can be stored for anyone who might take interest, or to open up for insights regarding historical data. This activity therefore also involves setting up the structures discussed in the previous chapter, such as the so-called "virtual dashboard" and forums where special reports and insights gathered from workshops and meetings can be uploaded in a structured manner. Furthermore, it entails setting up guidelines, standards, rules and procedures on how often different information should be updated. This activity aims at ensuring that each stakeholder gets access to the most relevant and right amount of information they need in the way that they are most likely to understand it, which increases their likelihood of actually taking the information in by reducing information-overload effects.

c) *Conduct ad hoc investigations.*

Lastly, the organization would gain benefits from having a central intelligence role or team responsible for the ad hoc research activities discussed in the previous section. The research should center around subjects which are industry but not market specific and which therefore can be hard to delegate to certain stakeholders, as a generalist view is more called for. The subject of these ad hoc investigations are recommended to evolve around topics such as technology- or software-purchasing trends, as well as describing and giving insights into what different strategic roadmaps actually mean for the software-purchaser role. Part of this activity would also be to organize informational workshops for software-purchasers regarding relevant subjects or problems that all are deemed to face, such as e.g. how to think about subjects discussed in Chapter 4 such as lock-in effects from a risk-perspective or what technology or contract-trends they are seeing in their markets, to make room for questions, insights and discussions which all purchasers might learn from.

To conclude, a Market Intelligence role or team would further need to moderate said roles, structures and topics regularly, in order to keep up to date with different organizational changes and adapt to and reflect what is happening from a purchasing-perspective in the software-markets.
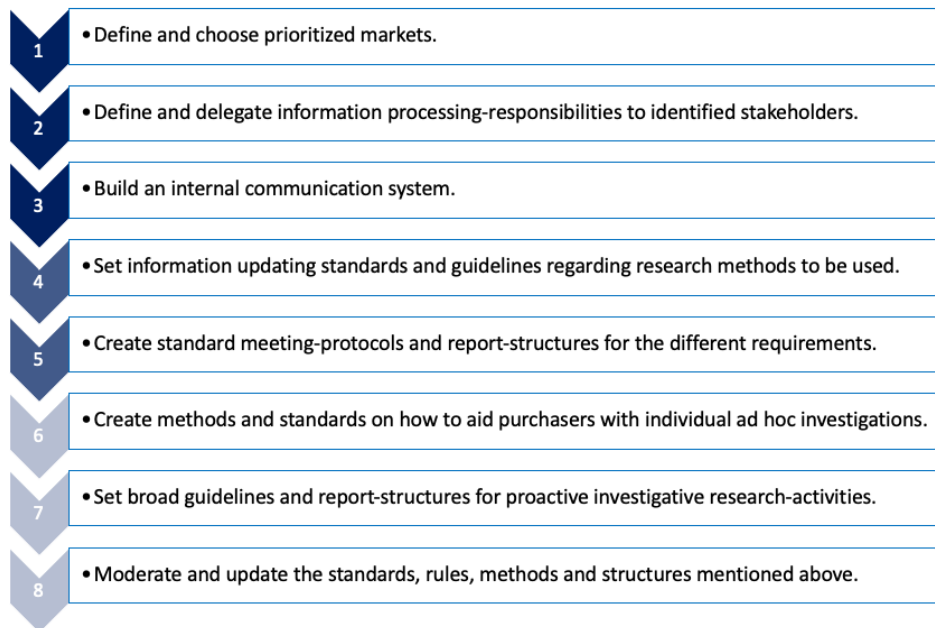
7 Discussion

This chapter is divided into five subcategories. In the first, an implementation process for the Market Intelligence function at Ingka Group Procurement Digital & Tech: Software Category is presented, based on the analysis of the previous chapter, and the identified challenges at Ingka communication-wise presented in the case. Thereafter, the applicability recommendations based on the results of this thesis for other organizations is discussed, followed by an examination of what the software procurement role will or should entail, based on the industry analysis of the software markets presented earlier in the thesis. Lastly, some suggestions for further research are presented and thereafter some identified limitations of this thesis.

7.1 The Market Intelligence function at Ingka

7.1.1 Setting up an Intelligence System

Ingka purchasers active in the software markets have, as discussed in previous chapters, a range of different information needs. These differ greatly from one another regarding how much information is required to gain the sought after insights and how equivocal the situation and information can be among different stakeholders in the organization, which leads to different kinds of media and structures being needed in order to gain efficiency. Building an intelligence department aiming at reducing the uncertainty and equivocality in the organization therefore becomes an intrinsic task, with difficulties regarding the definition of its subtasks and the order by which they should be undertaken. However, after an analysis of the company needs, the following eight-step roadmap seen in Figure 22 has been assembled.

1 • Define and choose prioritized markets.

2 • Define and delegate information processing-responsibilities to identified stakeholders.

3 • Build an internal communication system.

4 • Set information updating standards and guidelines regarding research methods to be used.

5 • Create standard meeting-protocols and report-structures for the different requirements.

6 • Create methods and standards on how to aid purchasers with individual ad hoc investigations.

7 • Set broad guidelines and report-structures for proactive investigative research-activities.

8 • Moderate and update the standards, rules, methods and structures mentioned above.

Figure 22. Recommended implementation process of a Market Intelligence function (Authors' own design for this thesis, 2022).

The roadmap consists of eight steps, and it is recommended that these steps are conducted in a sequential manner to get the processes up and running in the least amount of time. The first three steps aim at setting the basic intelligence communication structure, the following two at making the system more efficient and standardized and the last three set the basis for the activities which will be undertaken by the intelligence function when the system is operating. Each step is further described below.

1. Define and choose prioritized markets.

The first step of the process aims at deciding which markets should be prioritized when implementing the new information processing structure. Many purchasers accentuated the hardships of defining different markets due to the adaptability of the solutions to the customer, the many dimensions of it which make it hard to identify competing solutions and the many industry megavendors which span across markets. It is therefore important to analyze how the division wants to define a market, which are most relevant to target first and how the boundaries between them are going to be set, so that it becomes easier to know what information belongs where in the system when it is implemented.

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2. *Define and delegate information processing-responsibilities to identified stakeholders.*

As previously mentioned, purchasers need to have access to various kinds of information to conduct their activities, but as was presented in Section 5.1, there was no consensus regarding which of the departments were responsible for knowing certain kinds of information. Many of these information types regarded complex matters, such as which solutions could be deemed to compete with the currently chosen one or what suppliers were relevant on the market, and doubled information processing would therefore be costly for the organization. Furthermore, not having consensus regarding who should know what led to misalignment between the departments, unsystematized information gathering processes among the purchasers, confusion regarding their responsibilities and a general sense of insecurity, as they could not define what a "trusted business partner" actually meant.

The second step aims at minimizing the risk of two employees doing the same job or its opposite, purchasers missing out on important information, whilst ensuring that those who need the information and its findings know who to ask. A Market Intelligence position will not and should not take over all market research activities, as this would amount to a huge workload and would be ineffective. There are many cases where there would not be a need for anyone other than the actual purchaser to know certain things about his or her market, and a market spanning intelligence-division should focus on insights which can be of value to as many purchasers as possible. To this end, it is recommended that the responsibility for each Information Requirement is delegated to one of the following relevant stakeholders below:

a) The software purchasers themselves.
b) The Market Intelligence division.
c) Business partners at Group Digital.
d) The departments of Legal and the department of Risk & Compliance.

The responsibility would include gathering all relevant data regarding the information requirement and processing it into relevant conclusions, so that insights can be presented on the intranet (which will be discussed in step 3) or through other media to relevant parties. Depending on the information requirement at hand, this might demand having meetings with the other stakeholders mentioned in order to reach consensus, but then the stakeholder responsible for the information requirement should be ready to present their insights on the subject to be able to

answer other parties' questions to the highest degree possible. A suggestion for how the Information Requirements could be delegated can be found in Appendix C.

3. *Build an internal communication system.*

One of the main issues regarding the current information processes was concluded in Section 5.1 to be that information was shared in a range of different ways with no clear consensus regarding its storage, where it was sent and who the recipients should be. This was said to be a problem in the way that a lot of the information essentially got lost in group chats and was hard to retrieve when needed. Consequently, purchasers who would have found value in being informed upon certain supplier-specific matters would not know that the information was out there, somewhere on a colleague's computer.

The first thing to decide is what kind of media-types the Intelligence System should build upon to be as effective as possible, and how the intranet should support these media types. The recommendation is for the communication types to consist of:

a) Virtual dashboards.
b) Meetings and workshops.
c) Different kinds of reports.
d) A newsfeed-function for random/unsystematized written updates.

The second step of this process would be to decide which kind of information should be communicated in which way, where a recommendation on how this can be done and what media should be chosen can be found in the analysis in Chapter 6.

The last activity related to this step would be to set up an intranet which supports these functions. The intranet should therefore provide a virtual dashboard, a newsfeed function and a sorted storage for reports and meeting notes for each market. Furthermore, the Market Intelligence function should have control over and provide access to a more general newsfeed, a catalog for standardized guides and meeting protocols, and store the industry-reports which it will be responsible for assembling. Lastly, search-functions should be implemented to ease the research of each purchaser.

4. *Set information updating standards and guidelines regarding research-methods.*

The fourth step of the process regards setting up standards for how often different information should be updated. One of the issues mentioned by the interviewed purchasers was that they did not have guidelines regarding how often they should update themselves regarding different information, which led to an uneasy sense of the efforts often falling short. Setting standards for how often certain meetings should be held, updating research conducted and the virtual dashboards revised, would ensure that the information was always as updated as deemed *needed* and make it easier for purchasers to plan for when to do these activities.

Another feature regarding this step is related to the importance of knowing how to find this information, an essential part (Step 2) of the Intelligence Cycle presented in Section 1.1.2. Interviewees said they use plenty of different information sources with differing levels of success, and it is deemed that it would be of value to educate the purchasers and review how such research should be conducted. This would include looking at what information sources would be of relevance, how to evaluate sources and other information which would be deemed necessary to make the assembled information on the intranet trustworthy.

5. *Create standard meeting protocols and report structures for the different requirements.*

As stated in previous steps, meetings and reports will be a standard feature when assembling and disseminating information between stakeholders. The next step of the process would therefore be to assemble report structures and protocols for Information Requirements which are more or less alike across markets, to ensure that all relevant information is gathered and looked at as well as easy to find for interested parties. Having standardized ways of assembling these reports would sink the threshold for conducting the activity, as it would increasingly become routine and guide the information gatherer to ask the most important questions and not miss out on any basic dimensions which might be of relevance. Assembling meeting protocols for the communication which will happen on a more regular basis between stakeholders in e.g. different departments, where it is ensured that all important Information Requirements which need to be discussed have room in the schedule, would furthermore decrease the number of meetings to be hold, make them run more smoothly, allow all parties to have their say and also give structure for the meeting notes that would later be uploaded to the intranet.

As stated previously in the thesis, one of the main reasons for stakeholders not being informed is not knowing what questions to be asked, and making standardized reports or meeting protocols would ensure that some basic things are not missed. Of course, the subjects which will be discussed and researched will vary in their nature to a certain degree, which entails the structures and guidelines will have to be quite broad and allow for flexibility. However, it is still believed that just having some

general guidelines will create both structure in research activities, in meetings and eventually make it easier to find the sought after information in the intranet.

> 6. *Create methods and standards on how to aid purchasers with individual ad hoc investigations.*

When this step has been reached, relevant markets will have been defined and the intranet built, with stakeholders uploading and updating information regularly as well as discussing it with each other in a structured manner. In essence, most of the requirements of Type 1, 2 and 3 discussed in Chapter 6 would be supported by this structure and run more or less smoothly.

However, there are several Information Requirements which might arise in an ad hoc manner, where purchasers need help understanding how a certain phenomena works or what a trend might mean for their market and/or supplier-relation. These kinds of investigations would fall upon the Market Intelligence function to process. Nonetheless, it is deemed to be important to set some standards regarding what investigations are to be undertaken and not, as it was noted during the interviews that there was a general conception regarding a future Market Intelligence function helping and solving all of their ad hoc and complex investigative information needs. One of the crucial subjects to discuss in this step is therefore what investigations actually fall under the functions responsibilities and which should still be kept under the purchasers responsibilities.

When this is clarified, it is thereafter suggested that some standards and procedures are set up for how these investigations will be conducted and presented. These would have to stay very general to allow for the assumed flexibility which will be needed, as the sole purpose is for these investigations to regard some special information need not applicable to the existing structure. However, it is still deemed to be of value in order to make them run more smoothly and set the purchasers expectations to a certain level.

> 7. *Set broad guidelines and report-structures for proactive investigative research-activities.*

Another main activity which is recommended to be undertaken by a Market Intelligence function are the proactive investigations regarding technology- and market-trends which span across markets and therefore affect the whole purchasing division. These investigations would mainly aim to satisfy the information needs of Type 4 in Chapter 6, but might also give insights on other requirements depending on how universal and strategically important they are deemed to be. These

requirements are both highly complex and equivocal, and the range of different topics they might span across may make it hard to standardize. However, it is recommended to develop rules and standards regarding how these investigations will be conducted. Some dimensions which should be discussed are for example what range of topics are actually relevant, how many investigations should be conducted in a set timeframe and how many resources should be put into each investigation in order to not dive too deep into a subject when there might be several in line. General guidelines for the resulting reports, which would be uploaded into the intranet for the purchasers to access, would also be beneficial to develop.

Furthermore, it is recommended to develop guidelines for how these proactive investigations should be presented to the purchasing team. As these matters are highly equivocal and it might be hard to see how trends might affect specific markets, supplier relations and suppliers' strategic roadmaps, it is recommended that they are presented in the form of presentations, followed by workshops. The more purchasers involved the more beneficial input would be gathered, but finding time slots where all are available might present a challenge. Setting up regular meetings e.g. once every two months and developing clear workshop-guidelines on what is to be discussed would therefore probably make the attendance rate higher as well as shorten the amount of time needed.

8. *Moderate and update the standards, rules, methods and structures mentioned above.*

The last step in the process is to set standards for how often and in what way the intranet and all the procedures, structures, protocols and rules should be scrutinized and updated, as well as the Information Requirements which have been identified in this thesis. If the Market Intelligence function and all the communication-tools and processes are to stay relevant, there should be guidelines regarding how to ensure it. The best way to do this and safeguard it will happen, is deemed to be to decide upon these matters right at the establishment of the function, so it does not get forgotten when all the investigations start rolling in.

7.1.2 Market Intelligence as an ongoing division

After the intelligence organization has been set up according to the steps suggested in the previous chapter, the Market Intelligence function would step into a role with more standardized functions. Most of the information needs stated by the interviewees would get satisfied through the compilation of standards, regular and structured meetings with informed stakeholders and the intranet where the unified intelligence of the division could be tapped into. The ongoing activities that the

Market Intelligence function is suggested to undertake when the Intelligence System is set are therefore the following:

a) **Moderate the Intelligence System**: as stated in the previous chapter, a certain amount of moderation-activities will be needed when the system is up and running which is a task that is deemed to fall upon this division. Information Requirements should be updated every now and then as well as the protocols, standards and responsibilities of each stakeholder.

b) **Ad hoc investigations:** the second task will be to conduct ad hoc investigations and aid purchasers when specific intelligence needs arise.

c) **Proactive investigations:** lastly, the Market Intelligence function will conduct proactive research and educate the purchasers regarding subjects deemed to be relevant for the whole department of software procurement. This could include setting agendas for the "what is cooking?"-meetings already set up in the division, as mentioned in Section 5.1.
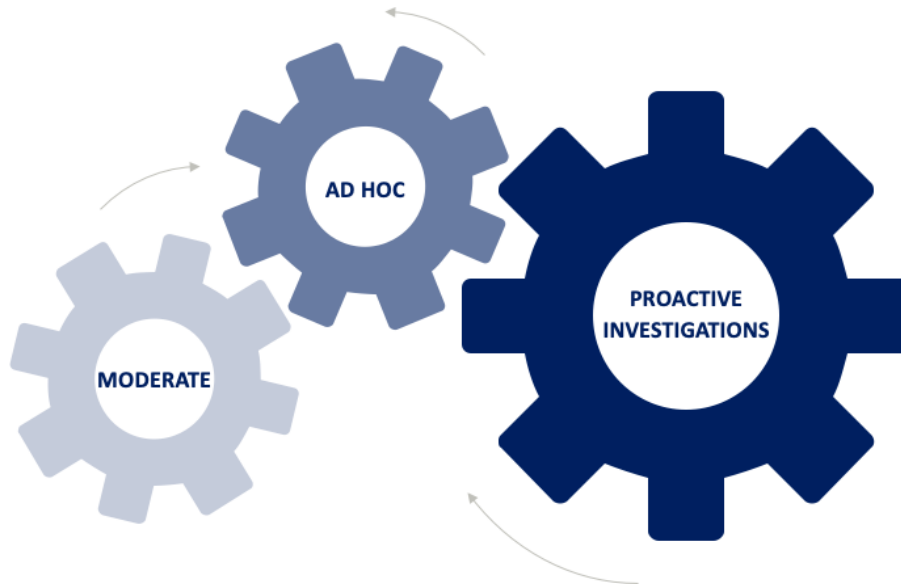

Figure 23. Activities of a Market Intelligence function (Authors' own design for this thesis, 2022).

These activities, shown in Figure 23, would recommendly be chosen, dived into as deep as agreed upon and conducted following the standards, rules and procedures decided upon during the set-up process.

7.2 Applicability to other procurement organizations

The identified Information Requirements, although relatively specific, are deemed to be relevant in other software-procurement organizations as well. Conducting the research regarding different frameworks for competitive analysis and the purchaser role gave a good basis for the interviews, as the different subjects and aspects which could be of relevance to be informed upon were systematically gone through to give room for the interviewees to discuss what they found of interest to know or not relatively to each other. The interviewees had various backgrounds coming from either a technological side, specialized on the software products and industries, or from a supply side, with a broader industry-knowledge and higher specialization on procurement-activities. When interviewed, it was noted that there was a slight difference regarding what the purchasers found of interest, which might be due to these differing backgrounds. However the Information Requirements coincided to a very high degree with consensus regarding which things were most important to look at.

Not all aspects of the different competitive analysis-frameworks presented in the Chapter 3 are represented in the final Information Requirements, but this can be assumed to be a result of the interviewers asking specifically for what the purchasers found to be important to be informed about, and therefore not everything they would like to but not necessarily need to know. As previously discussed and mentioned in the interviews, information overload is a problem as there are infinite aspects that could influence partnership outcomes, leading to these needs being the result of a general prioritization. However, the Information Requirements do show a good mix of needs, ranging from knowing the company needs and roadmaps, over to being informed about specific procurement activities related to supplier-relationships and the suppliers' competitive environment. Furthermore, the identified and emphasized needs of knowing industry-trends and stakeholder roadmaps showed the relatively high dynamic environment and strategic position that software-purchasers have relative to other purchasing organizations which procure in more standardized and mature industries, and reflects the insights about the industry discussed in Chapter 4. All in all and although only Ingka-purchasers where interviewed, it is therefore believed that these Information Requirements coincide to a high degree with the information needs of software-purchasers in other organizations.

Many of the resulting Information Requirements are broad and not particularly emphasized, but represent areas of information that the interviewees would like to

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be kept updated on. This is believed to be due to the needs being asked to be applicable to all software markets, which are as previously discussed highly dynamic and hard to delimitate. The Information Requirements could therefore likely be further specified within their categories if certain markets were more deeply examined, or if the industry chosen was more homogeneous. As previously stated, software is becoming increasingly essential to all companies, with software purchasers having all the more strategic positions. However, purchasing in more mature or generic industries can be more standardized and not include so many strategic decisions, which means that purchasers in those fields might find other Information Requirements to be of more importance than knowing for example what new technologies are on the rise. The Information Requirements which were prioritized by the interviewed population are therefore not believed to be applicable to purchasing organizations as a whole.

The complexity analysis of each Information Requirement has been conducted from a software market perspective, which means that it might not be applicable to other industries. How uncertain or equivocal each Information Requirement was deemed to be was highly influenced by the software market-experts and Ingka purchasers' descriptions of them. Most of the reasoning around these complexities were connected to the dimensions of software products described in Chapter 4, which might not be applicable at all when purchasing e.g. raw materials or other standardized products with clear distinctions between markets or easier classifications of which trends are relevant for their specific field or not. The recommendation would therefore be to update the classification of Information Requirements whenever the scope or field is changed, as it is deemed to be highly specific. However, Figure 21, which was evolved in this thesis and presented in Chapter 6, could be of value to all organizations which have identified and classified their Information Requirements regarding their complexity, and want to know how to process and communicate different kinds of information as it was mostly based on Information Processing Theory and not adapted to the actual case.

7.3 The evolving software procurement role

During the research- and interview-phase of the thesis the topic of what the purchaser role entailed and will evolve into became a recurrent theme of discussion, most concluding that it is becoming all the more strategic. As mentioned in Chapter 4, the role of a purchaser within software procurement is already determinately complex, as you "... essentially need a computer science background and a business background to understand what you are actually signing up for" (Townend, 2022). Furthermore, there are industry-specific challenges that are easily connoted to a purchaser regarding the hardship of understanding the need within the organization which is to be fulfilled, and choosing the right solution, with all its

dimensions, at the "right price". Due to the complexity of the products and the global shortage of competence, purchasers at all companies do not have the same mandates over the choice of suppliers, as they will not have the scale to adapt the solution to their own software and are often requested to go for the industry standards (Townend, 2022). Therefore, the software purchasing role in small companies can arguably be assumed to continue being more of a typical, although still technically complex, purchasing role, mostly choosing among the suppliers and negotiating to reach beneficial agreements.

However, software purchasers in big corporations have the possibility to have a bigger impact not only on their company's success but on society at large. As discussed in Chapter 4, software is taking an increasingly essential role in all companies with the world phenomena of digitalisation, with few global megavendors centralizing the global pool of computing and innovation competences. With the rise of new technologies such as AI and black-box computing, where it is extremely hard to look into how the algorithms come to certain conclusions, it falls onto the developer and the company developing it to ensure that these conclusions are based on certain moral standards and e.g. do not discriminate. As discussed earlier in Chapter 4, governments are still a bit behind when it comes to legislation and naturally cannot discriminate against a company for their stated company values, but as much coding builds on legacy, it is extremely important that these companies start getting held accountable by someone. However, purchasers do have the mandate to steer the money to go to companies which they believe follow certain values and codes of conduct, and influence the innovation activities of these companies by entering partnerships. They are the roles at companies which are to have the most insight into the supplier, the mandate to invest in one over another and have the utmost control over the influencing part of the partnership. They are therefore arguably the people which, if organized properly, have the means to actually ensure that digital technologies of the future follow certain moral standards.

In order to make choices regarding different suppliers that take all those factors into account, software purchasers need to be extremely informed, not only on the partnership, the supplier and the market but on the industry as a whole. Purchasers cannot be expected to make informed and strategic choices without having access to all the relevant information and insights over what different choices entail. Market Intelligence activities for these purchasers can therefore be argued to see an increase in importance in the foreseeable future when looking at software purchasers' future roles. Presumably, if the Market Intelligence function also tries to inform purchasers about sustainable and ethical coding trends that they can monitor in suppliers roadmaps, and take into account when procuring, it could lead to purchasers forming the digitalization wave into a more sustainable shape. It is therefore argued that an additional Information Requirement should be added to the list, namely looking at how inclusive coding evolves and how purchasers can help

shape suppliers roadmaps to develop technologies which emphasize inclusivity and equality.

7.4 Further Research

Some topics have been identified throughout the process which could be of interest to conduct further research on. These can be divided into research areas related to Market Intelligence, to Information Processing Theory and to software markets.

It was relatively hard to find specific or quantitative information regarding what benefits Market Intelligence can have for a division or organization, which we believe should be further researched upon. It can be easy to say that it would be good to have access to, but as this requires investments from the organization, it would be beneficial to research if there is an optimal spend, or way of using the Intelligence function, in order to gain the most of the efficiency-advantages. This could further aid in the prioritization of Intelligence activities, as research regarding what kind of activities rend the most insights or value per spend could help organizations choose what is to be done by such a function or delegated to other parties.

Further research could furthermore be conducted around Information Processing Theory, where it could be interesting to research upon what other implications or characteristics information which falls upon the ambiguity/uncertainty-matrix have. There was no clear consensus regarding how to e.g. communicate information which is both ambiguous and uncertain, which could also be interesting to investigate. All the media which was discussed by this theory was also quite analogue, but with the rise of new technologies such as artificial intelligence and personalized bots, we suggest that there should be research conducted regarding how they can aid with these types of communication. It would certainly be interesting to look at how they could tackle uncertainty and ambiguity and to what degree related to other kinds of media.

When conducting the interviews regarding the software industry analysis, several topics rose as valuable to research upon. The first one was related to pricing, as it was deemed that it could be useful for industry stakeholders to get a common standard regarding these strategies. It would therefore be of interest to map out what pricing strategies there are and how these could be standardized, which would make it easier to weigh solutions against each other for purchasers. Another topic of interest would be to examine how software markets could be classified or by which dimensions, as a general sense of confusion was identified during the interviews regarding these subjects.

7.5 Limitations

In this section, the limitations of the methods used for the research which led to the previously discussed conclusions, will be analyzed. The three areas the analysis will be based on regard the methods' validity, reliability and transferability, described in Section 2.4. Different methods have been used to answer the different research questions, and therefore the analysis of their limitations will be discussed accordingly.

The first research question, "What are the challenges specific to software markets from a procurement perspective?", was a broad research question to begin with, and was analyzed both through the expert interviews, mostly presented in Chapter 4, and the interviews with the purchasers. The reliability of the analysis and identified challenges could be questioned due to the low number of expert interviews. The nature of the interviews was exploratory and their backgrounds quite different, as the aim was to have as many different insights as possible in order to see what they agreed upon and by doing so, trying to find systematic challenges. Doing more interviews would have ensured that the identified challenges were more reliable, as it would have been easier to identify the challenges all experts agreed upon and sunken the amount of random variations. The validity of their answers and their transferability could be questioned due to the unsystematized interviews, and would have been better if we had developed a structured interview-guide afterwards from which to interview more experts and had triangulated it more systematically with additional software purchasers.

The results for the second research question, "What information need do software purchasers have?" which results are presented in Chapter 5, can be questioned when it comes to their representativity or transferability to other organizations, as only Ingka purchasers were interviewed in this research process. Ingka is for example a big international corporation, which means the transferability might be good for other companies of similar size, but maybe not as much to software purchasers in small and medium sized businesses with other organizational possibilities of influence. Furthermore, only interviewing software purchasers from one case-company makes the validity questionable as there might be systematic and cultural features in it that influence what purchasers deem important or not. Many of the interviewees had purchasing backgrounds in other industries as well, which might have influenced their answers into taking in perspectives which might not be as important for the software industries. Therefore, interviewing more organizations would have increased the validity, and interviewing organizations of smaller size would have increased the reliability of the results for more organizations.

The results for the final research question, "How should these information needs be processed and communicated in an organization?", could have been of better quality if the reasoning behind the classification of the Information Requirements had been more triangulated with the interviewed population. It was based upon theory, the expert interviews and the recorded answers of the software purchasers, but would have been even more reliable if the software purchasers had made their complexity classifications themselves so that variations could have been identified and taken into account. Their transferability could also have been further ensured by triangulation with software purchasers in other organizations.

8 Conclusions

In this final chapter, the previously presented results, findings and discussions the thesis has concluded into are summarized, and the future of the software procurement role, as well as its implications for the identified increasing need of a Market Intelligence function, are pondered on.

Digital technologies with all their potential efficiency gains and valuable innovations are becoming increasingly essential for companies to stay competitive. However, due to the complex nature of software and the global shortage of competence, the "make or buy"-decision that big organizations usually can ponder upon leaves little leeway. Furthermore, the many dimensions and adaptations that must be taken into account when looking at proper solutions to procure and the high lock-in effects related to its implementation, make it essential to choose the right supplier. It therefore becomes the purchasers duty to ensure that the roadmaps align and that a partnership is commenced, so that a lock-in does not become a costly achilles-heel they do not have any control over. Conclusively, software purchasers' roles are becoming all the more strategic at companies, which leads to an increasing need for intelligence which might aid them in their decisions.

However, understanding what information is to be processed to render relevant insights and how it is to be spread throughout an organization can prove to be challenging. In this thesis, Information Requirements from Ingka purchasers about what information they would deem important to have updated regularly have been investigated, analyzed and compiled into a final framework. It has shown that intelligence not only needs to focus on suppliers, their markets and the partnership between the parties, which are more typical procurement activities in all industries. Additionally, it also needs to look inwards at the company to understand what it really needs and what it values, as well as to the macro-environment and software industry as a whole to account for risk management and get inspired upon trends which could affect or help them shape the supplier roadmap for alignment.

These Information Requirements were found to differ greatly from an information processing perspective, as they all accounted for different levels of uncertainty and equivocality, leading to different kinds of media being needed for communication to ensure that it was spread efficiently through an organization. Furthermore, and

due to the complexity and differentiation of the markets, it was realized that a Market Intelligence function reasonably could not account for all intelligence activities in the organization, implying a delegation of intelligence activities is essential for all necessary information to be processed. It was therefore discovered that identifying relevant stakeholders and delegating the responsibility and standards for processing-activities for different information needs, as well as building communication pathways between those, with structures for the media to be used in them, can be seen as essential Market Intelligence activities. This has been argued would ensure that general information levels are kept at an acceptable level, and give leeway for the intelligence-function to focus on industry-wide ad hoc investigations which could aid most purchasers in their efforts to strategize and form sustainable, and advantageous, roadmaps with their suppliers.

Conclusively, the implementation of such an Market Intelligence function in software procurement organizations would aid purchasers steer the software-industry towards a more sustainable and inclusive future, and further research on the matter and a generalization of these functions would therefore be of interest to all.

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Appendix A Description of Interviewees

As a part of the thesis research-methodology, several interviews were conducted. For the analysis of the software markets, 7 interviews were held with experts in the field, whose area of expertise and experience is further described below. Furthermore, several interviews were conducted with purchasers of software within the department of Group Procurement Digital & Tech, who are further described in this appendix.

A.1 Interviewees from Group Procurment Digital & Tech: Software Category at Ingka

Table 8. Interviewees from Ingka Case Study

Name	*Role*	*Experience*
Jacob Welin	Category manager	Academic background within system sciences. More than 30 years of industrial experience, reaching from distribution, sales and business development to product management, all within software. Worked at Ingka since 2017, following roles at companies such as Sony, Tetra Pak and Scalado.
Andreas Johansson	Sourcing manager	Academic background within electrical engineering. 15 years of experience at Ericsson and Sony, which included roles such as product management, portfolio planning and competitive intelligence, followed by two years of experience of public procurement at Region Skåne. Started at Ingka in 2020.
Amandine Buathier	Sourcing manager	Academic background within logistics and procurement. More than 20 years of international experience from working with different parts of supply chain management, especially within indirect sourcing. Experience from companies such as Nokia, Microsoft and Caverion. She started her journey at Ingka in 2020.
Daniel Petermann	Sourcing manager	Studied economics and law while working within banking, followed by experience within sales marketing and digital procurement at global companies such as Hewlett-Packard and Sony. More than ten

		years of experience at Ingka since starting in 2011, mostly within procurement but also within retail.
Joel Polner	Purchaser	Academic background within accounting. More than twelve years of industrial experience in the US and 21 years of experience in Sweden within sales and telecom. Started at Ingka in 2007 as a purchaser.
Joanna Horwood	Purchaser	Five years experience within Ingka, as a purchaser, mainly focusing on contract management. Previous experience include focus on M&As and compliance at global companies such as Telia, Nordea and Citibank.
Adam Attar	Purchaser	Academic background within supply chain management and management control. International global purchasing experience within both direct and indirect purchasing. Begun his journey at Ingka in 2020, after purchasing roles at Sony and Trioplast.
Anneli Magnusson	Purchaser	Academic backround within data science. Has had various roles within product management and procurement before starting her journey at Ingka in 2003. Her role within Ingka has since the beginning had a focus on IT and it's procurement.
Johan Westerberg	Purchaser	Academic background within business administration. More than 20 years of experience within competitor-, market-, and customer analysis at software-heavy global companies, such as Ericsson, Sony and Hiab. Experience from public procurment at Region Skåne. Started at Ingka in 2020, specialized in cyber security-related software.
Stefan Ngo	Purchaser	Academic background within mechanical and industrial engineering. Experience of sales- and product management, as well as procurement, mainly towards software. Experienced within public procurement at Region Skåne. Begun working at Ingka in 2018, and has experience within both software- and application-management.
Anna Kling	Purchaser	Academic background within law, economics and politics. 30 years of experience working with software globally, of which 15 years as a license manager at Electrolux. Her journey at Ingka started in 2008.
Navita Choudhary	Purchaser	Academic background within political sciences. Started working at Ingka in 2020. No previous experience within procurement or software.

A.2 Software market experts

A.2.1 Jan Bosch

Professor Jan Bosch is a professor at Chalmers University of Technology and is the director of Software Center Organization, which is a cooperation of five universities and 17 companies including Volvo, Scania, Bosch and Siemens. He is on the board for several start-ups and acts as an investment angel. Furthermore, he has industrial experience within consulting for several Fortune 500 companies. Other industrial experiences of Prof. Bosch include positions as vice director at Intuit, USA, and other international experiences. His academic background consists of a PhD from Blekinge Institute of Technology, where he was active from the year of 1994 to 2000. His areas of expertise mainly include digitalization, R&D strategy, R&D management, data-driven innovation management, as well as ecosystems of software.

A.2.2 Elouise Epstein

Dr. Elouise Epstein, based in San Francisco, is currently a partner at Kearney, a company she has been with for 22 years. Her main focus areas are digital procurement and supply chain strategies, working closely with managers at some of the world's biggest companies. She has written the book "Trade Wars, Pandemics, and Chaos: How Digital Procurement Enables Business Success in a Disordered World" and co-written the book "Disruptive Procurement: Winning in a Digital World" and is currently authoring her next book about supply chains. Her academic background includes a PhD in history.

A.2.3 Tony Gorschek

Prof. Dr. Dr. Tony Gorschek is currently a Professor within Software Engineering at Blekinge Institute of Technology, Sweden. His role is as a research leader and a scientist, working side by side with industries. Dr. Gorschek's main areas of expertise include Requirement Engineering, Product Management, Agile and Lean product development, of which he has published over 90 scholarly articles.

He is managing over a dozen collaborative relations with developing start up companies. Parallel to his own research, Dr. Gorschek possesses over 15 years of industrial experience, occypuing roles such as CTO, senior consultant, engineer and product manager. He has established five startups within logistics and software and manages today his own consultancy company and serves on several boards.

A.2.4 Marcus Matteby

Marcus Matteby is currently CIO and CDO of Sundsvalls kommunkoncern in Sweden, a position he has had for four years. His industrial experience ranges from IT development at Försäkringskassan to consulting within software development and programming, and he has been praised for his work digitizing public authorities.

A.2.5 Björn Regnell

Dr. Björn Regnell i s currently a Professor in Software Engineering at Lund University, Sweden. His areas of expertise include requirements engineering, software quality, software product management and empirical research methods within software engineering. Dr. Regnell has had positions as Vice Dean of Research, Assistant Dean for Digitalization and Vice Head of Department for Education Strategy, all at Faculty of Engineering, LTH, at Lund university. Dr. Regnell's industrial experience include roles as a Senior Researcher at Sony Ericsson and working as software engineering expert consultant in the Swedish software industry, and possessing His academic contributions consist of more than 100 peer-reviewed research articles, editing of several special issues for journals, as well as co-authoring several books. Dr. Regnell was ranked among the top 13 software engineering-scholars globally by IEEE and has been awarded the Lund University Pedagogical Prize for outstanding achievements in teaching. Furthermore he is a reviewer for several high-impact journals and peer-reviewed conference program committees and a member of the editorial board of the Requirements Engineering Journal (Springer).

A.2.6 Richard Torkar

Professor Richard Torkar is currently active at Chalmers and University of Gothenburg as a professor of Software Engineering, where he also is a prefect at one of the institutions. He has spent his research studying software quality, both functional and non-functional aspects, which also is his expertise along with information theory and implementation of information theory. His academic contributions consist of the publication of 37 articles and papers, 46 conference and workshop proceedings, as well as three book chapters.

A.2.7 Paul Townend

Paul Townend is a computer scientist and has been conducting computer science research since 2000, first at Leeds University, UK. His current academic role is at Umeå University, where he started in 2020 as an associate professor. As a part of his role he is engaged in the Wallenberg AI, Autonomous Systems and Software Program (WASP) Graduate School Management Group which supports funding and research for over 400 PhD-students. Internationally, Townend is a steering committee member of several organizations; IEEE ISORC, IEEE JCC and IEEE BigDataService. Industrially he has experience from co-founding UK-start up Edgetic, centered around data center efficiency. Mr. Townend has authored over 70 internationally peer-reviewed articles and papers, mainly focusing on Distribution Systems, and more specifically Cloud and Edge Computing, Decision Support, Energy-efficient computing, and Dependability.

Appendix B Compilation of resulting Information Requirements

In this appendix, there is a compiled table wit all the resulting Information Requirements presented in Chapter 5. Thereafter, selected quotes from the interviews can be found which give more insight upon some of the Information Requirements and their identified complexity.

B.1 Information Requirements Compilation

Table 9. Compilation of the five categories of Information Requirements.

Area	Category	Information requirements	Specific data
The Company	Strategic Direction	The Company's strategic direction	
		Software architecture-strategy	
	End User-Needs		
	Solution Experience	End-user experience	
		Warning signs from IT-department	
	The Solution's Lock-in-Effect	Expected replacement time of solution	
		Warnings from enterprise architects of elevated lock-in-risk	
The Partnership	Delivery	Ease of collaboration	-Complaints regarding ease of collaboration -Problems or complaints about order -Invoice-inaccuriacies -Contract-specific KPI:s

	Power-Balance	Spend quotas	- The Company's total spend on supplier -The Company's share of supplier sales - Supplier share of total company software-procurement department spend -Megavendors: Suppliers fragmentation in sales organisation
	Strategic Cooperation	Contracts	- Historic and current contracts. -Regionally-fragmented contracts
		The Company's use of supplier in other domains	
		Strategic alignment	
		Points of contact	- Main supplier key account manager - Other contact-points with supplier.
The Supplier	Basic Data	Finance	Quarterly and yearly reports: -Revenue -Margins -Profits -Solidity -Nr of employees

			Megavendors: - Division of spend on different markets - Division of profits from different markets - Division of revenue from different markets
		Geographic presence	- Headquarters location - Geographic disperson - Establishments in new geographical areas
	Innovation and Strategic Direction	Strategic roadmaps	
		Launches	- New technologies - Upgrades on current solutions - New products - New services
		Investment areas (megavendors)	- Employment trends (technological areas/markets) - Acquisitions - Investments - Sustainable investments
	Management and Networks	Networks (Niche)	- Strategic partnerships/collaborations - Change of subcontractor
		Management	- Board - Shareholder structure/main shareholders - Executive-level managers
	Current Scope	Solution/product	- Life cycle-position - Modularity - Market shares - Pricing models
		Product/solution scope	- Product range on market

			- Product range across markets
		Customers	- Size - Geographical distribution - Industries - Different contract terms/models
		Compatibility with megavendors (Nich)	
	Scandals	Security breaches	
		Compliance records	
		Sustainibility scandals	
		Lawsuits	
The Market	End Customer-Needs	Changes in end-customer-needs	
		Other customers chosen solutions	
		Substitutes to the product/solution	
	Competitors	Main competitor's market shares	
		M&As	
		Competing products/solutions	- Price - Performance - Innovations
		Geographic proximity	
	The Solution and Trends	Pricing models	- Existing pricing models - Up and coming pricing models
		Market maturity	
		Innovations in the market	
The Macro Environment	Software-Related Trends	Software-technology trends	
		Sustainibility trends within software-technologies	
	Geographical Risks	Geographical risk on ownership structure	
		Geographical risk of political instability	
		Geographical risk of data breach/integrity	
		Inflation	

		Data integrity legislation	
	Laws	Data security legislation	
		Export legislation	

B.2 Selected quotes from interviews

B.2.1 The Company

"…in relation to how quickly you can switch suppliers. Consider "High Review", which is a video service, when I started administering them two years ago, Group Digital only wanted to make one-year-long agreements, while at the same time stating that replacing them would take more than two years. Why would Ingka then conduct one-year-agreements? It does not make sense. It is not like steel, that you have five suppliers of the same steel and steel is following international standards and so on." (Polner, 2022)

"We are considering, on one hand, company cultural values, but then we also have the architect that has the responsibility to see how [the solution] would fit in the IT landscape, so they could warn if [the lock-in effect] becomes too high. It becomes a technical lock-in, so [the architects] should observe that." (Welin, 2022)

B.2.2 The Partnership

"[We observe] what kind of matters we have, how issues with this supplier to Ingka and how they deal with these [problems]. For example, if we have about 100 problem inquiries per month, it might be critical and then probably something is wrong [with the solution]. If it is 100 minor inquiries, it can be overlooked, but if it is ten severe inquiries it is also problematic. Also how long the problems take to solve." (Magnusson, 2022)

"Also [we audit] their invoices, how many defaults we have on the invoices as well. Some suppliers have deceived us by sending invoices on stuff we have not even ordered" (Magnusson, 2022)

"I also monitor the size of the supplier compared to Ingka's sales, as well as how big a share of their sales Ingka forms, and how that can affect [supplier-buyer power]. If we are 50 percent of [the supplier's] sales Ingka's requests will have a

bigger impact, but if we are 0,01 percent, we are not really important even if the supplier says so." (Attar, 2022)

"If Finland makes an agreement with CGI, CGI will have a frame agreement in Finland while Group Procurement have a global one, and CGI is not going to want to put this local deal under the global, because they have a better price deal in Finland, since it was organically grown. If you ask [CGI] for sales reports, they will not necessarily give it to you." (Horwood, 2022)

"Group Procurement Digital & Tech should know the information about what the suppliers do in different domains" (Buathier, 2022)

"Purchasers try to find solutions preferably where we already have existing contracted suppliers, since it facilitates and [purchasers] do not need to conduct such a long procurement process." (Magnusson, 2022)

B.2.3 The Supplier

"(...) when we controlled [the potential supplier's] previous customers, it was a risk that they had not worked with a customer as big as IKEA before, so we unfortunately had to disqualify them. So, it is a must to ensure [the potential supplier] can support such a big organization as IKEA." (Attar, 2022)

"Even that the growth [of a company] is not enough, because Microsoft, for example, can drop [in revenue], but they can drop within the hardware, but grow within licences. So if SAP and HP decrease in on-prem solutions and increase in SaaS, it is not enough [when evaluating solutions] to tell if [the megavendors] go up or down. This is better [to analyze] with small companies. " (Buathier, 2022)

"[It is of interest] how the suppliers stand in the market, at what level they are standing, how much growth they are doing, if they really are growing. Of course we do not wanna be with a company going downward." (Choudhary).

"But if I see that the supplier is in trouble for a certain quarter, I can seal a fantastic deal with them before that quarter is over." (Petermann, 2022)

"(...) two people in a basement is irrational for global support" (Kling, 2022)

"If a [niched] supplier is going global, it is definitely important to keep an eye on them, because it says a lot about their business, that they are expanding. Purchasers know that the world works differently, so suppliers are gonna have different circumstances. If a supplier is going global there are a few things a purchaser needs

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to look up. Right now data requirements and GDPR are strong, we need to keep an eye there, someone even heard that IKEA paid money to buy back their own data from suppliers. (...) There is no rulebook for this, purchasers need to work with business to try to make the best and stay updated. If the supplier is doing something like that, my responsibility [as a purchaser] would be to look for add ons to the agreement that could protect Ingka." (Choudhary, 2022)

" When a supplier plans rapid growth it leads to increased prices, and in the end that either prices just raise or that the supplier separates modules, and that the supplier takes one module, divides it into three and sells it like three different products and earns more money because of that. So even if the per se does not only raise the original price, the solutions offered get more expensive." (Attar, 2022)

"If it is an already contracted supplier it is the road map that is relevant. So that is why [us purchasers] try to promote our existing suppliers to develop with and towards [Ingka's] needs.

"I want presentations [such as newsletters] of new developed technology. It is interesting to receive and to stay updated on, and also to show [the supplier] during meetings that [me as a purchaser] is in the known. And this knowledge might be just thanks to those ten minutes I spent reading that newsletter" (Petermann, 2022)

"One more thing, these [difficult] suppliers every second or third months keep adding services to the [contracted] solutions and then I have to go back to my business partner [at Group Digital] and ask if this [added service] is important, and then I need to go back and look at the market and see how much value [this new service] can add to IKEA. This is general for software. Other information [I receive] from suppliers are their general news and market trends on how their solution is growing." (Choudhary, 2022)

"It is damn difficult, because often you[as a purchaser] are just informed [from the supplier] that "we bought another company" or "another company bought us". We [purchasers] do not have that kind of tracking. Is there something huge, one will find it on for example Dagens Industri, such as if Microsoft would buy Salesforce, but these smaller [acquisitions] [us purchasers] only receive an email that they have been acquired [by another company]." (Ngo, 2022)

"With Apple for a while, health was really trending, then one could see that Apple was recruiting a lot within that health tech and related software development. Then you [as a purchaser] can easily figure out that they are developing something within that area. It is a piece of a puzzle. Then you have to look up other stuff." (Westerberg, 2022)

"Suddenly Salesforce acquired Slack, and suddenly [Salesforce] became a competitor to Microsoft, which Ingka is detecting as a backup for Microsoft Teams, and what happens if Microsoft stops working." (Welin, 2022)

"We need to understand what the supplier are doing for the climate and so on. It [environmental sustainability] is an upcoming thing I am discussing with suppliers." (Choudhary, 2022)

"Mostly acquisitions is not an issue, but there have been cases where suppliers have been acquired by companies that Ingka do not want to associate us with. (...) For example this payment company that acquired a company Ingka wanted to work with, but the acquiring payment company was operating within the porn industry and then Ingka had to make a statement [to not work with them]." (Petermann, 2022)

"If there are stakeholders interested in acquiring, (...) within the software markets [the companies] are to a high extent owned by investment companies that sell off these companies after five to ten years." (Kling, 2022)

"The supplier might be acquired by a company we do not wanna do business with. If we get the information [about the acquisition] too late we might not have the time to react and find a backup replacement. And sometimes it is like a silent consent, if we do not say anything it is the same as we approve [of the acquisition]. Before a procurement procedure we thoroughly audit financial numbers, but we rarely do it after [signing the contract]. So how we could audit financial numbers continuously would be interesting." (Ngo, 2022)

"I often analyze what [the supplier's] economy looks like. For example, there was this Irish supplier that ran their business solely based on state money." (Kling, 2022)

"(...) management changes, that is something a purchaser needs to monitor. If there suddenly is a whole new group of individuals in the management team coming from a competitor, [a purchaser needs to analyze] what is cooking for both the supplier and their competitor." (Kling, 2022)

"[It is important to monitor] where the stakeholders]come from, where [the supplier's] money is coming from, which companies the supplier]have made deals with lately. That gives a big picture of overlap of interests, it also gives a good picture of where [the supplier] are doing well and which company or investors might acquire them." (Horwood, 2022)

"If there are big changes in for example the [supplier's] board, it means something is cooking, there might be big disagreements between opinions on the board, or between the board and the operational." (Kling, 2022)

"During meetings, the supplier might say that they offer more functions that cooperate." (Johansson, 2022)

"Adobe is a good example. Suddenly they fired their whole salesforce. Then you [as a purchaser] are not prepared. Then you have other suppliers that change [sales management] to one customer at a time, for those situations, these customer networks can be gold worth and provide a basis for improved conditions [for Ingka]. Changes could be for example that the supplier stops selling on-prem license and only sells cloud, it can absolutely happen step by step and happen when renegotiating contracts. The supplier can make re-bundling of their licenses, [Ingka] often purchase bundles of licenses since it can be beneficial, but sometimes the supplier remakes these bundles, splits them into several and re-puzzle and then claims to offer added value. So here purchasers need to be awake to analyze what actually contributes with value for IKEA. It is extremely usual that suppliers separate bundles like this, and if someone else informs you earlier it is great, since you [as a purchaser] can be proactive." (Magnusson, 2022)

"What the spread of the customers [of the suppliers] look like is interesting, if [the customers] are from one country only. For example, companies only existing in The US are very difficult to work with because they only know The US." (Kling, 2022)

"We [within Group Procurement Digital & Tech] have an idea that we should not act as guinea pig for the supplier. The suppliers have spent a huge amount of money on developing a solution, and therefore quickly want to go to market. Then [when the product quickly goes to market] purchasers call the product a "beta-2" product, that was stressed to the market and is not fully developed. It is just the foundation of the house that is going to be the final solution." (Kling, 2022)

"It is the size [of the supplier] that matters, and also if they act on a global basis, some niche suppliers can be small but global. For example, I have a small Belgian supplier that wants to deliver [to Ingka] globally and then [Ingka] discovers limitations [with the supplier]." (Kling, 2022)

"For me it is about getting the smaller supplier to work with for example Microsoft if 75 percent of Ingka's solution is from Microsoft. That is how many of the small suppliers work today. " (Petermann, 2022)

B.2.4 The Market

"The biggest trend is the movement towards cloud and how to deal with that" (Magnusson, 2022)

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"For software, there are any number of payment models, which means there are as many payment models as there are suppliers and then you need to get behind [and really understand] this area of payment models. ANd when you figure the current market out, the market have always come one step further. (...) [Payment and licensing models] are incredibly important to monitor for [software purchasers] since it can bring huge costs if we do not keep track of updated license models. There are often a few suppliers who initiate the use of a certain [payment/license] model and then [the model] a spread throughout the value chain." (Magnusson, 2022)

"One of the most important areas are trends within metrics, more precisley how the trend are moving with changing payment model metric. Where are the trends going with different license models= Where do we see rapid increase? When do you change from user-based [payment/license model] to transaction-based, and then to bot-based? Then you have to be ready when contract are renegotiated and see if there is a possibility to request this new payment model from the supplier, and if they already have it." (Magnusson, 2022)

B.2.5 The Macro Environment

"It can be a big company in, for example, Russia, during normal circumstances, then [Ingka as a customer] already had issues before the [Russia-Ukraine] war that RUssia had plenty of sanctions towards them. The owner structure is important as well, so [the suppliers] are not long-range owned by Putin." (Kling, 2022)

"What risks are there within certain fields related to certain markets? Should [Ingka] avoid certain suppliers that are related to a certain market? For example the Chinese or Russian market, there [purchasers] need to do more extensive auditing and analyzes. In this case it is not the market itself but the geographical location. What risk do Ingka take on with a certain solution? Are there locations where [Ingka] are not allowed to use this product? If [Ingka] wants to launch a product in CHina or Russia, we need to have a data center in their countries." (Attar, 2022)

"One might think that "Well, Russia is always riskful", but when it comes to the US it might be as big of a risk as well due to [The US'] extensive surveillance." (Kling, 2022)

"If one looks at what has been happening regarding legal issues lately, GDPR has been most prominent within the EU, it is updated all the time. Then we have different parts [of the world], Germany that is within the EU has a lot more

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restrictive legislation [on data privacy than the rest of EU], and then there is The US with their demands, and then we have Asia [with their requirements]. [Ingka] as a company need to abide by these [legislations], it is a must, [us purchasers] are constantly receiving notifications from [the legal department] that [us purchasers] need to update [contracts]. Recently, [Ingka] had to update everything in The US and all data [Ingka] have there, it is also apparent that everything in The US revolves around The US, and they rarely consider what requirements other countries have. (...) This type of GDPR and similarities is permeating everything, there is no doubt about that, but then the [department of] Risk & Compliance can come and say that they have identified a risk, and that [Ingka] needs to "plug" this." (Magnusson, 2022)

"I mean, I would say that [purchasers] should monitor macro environmental factors, such as inflation and so on, because it affects [the suppliers competitive environment]. Inflation within a certain region of the world matter a lot, because if [Ingka] are going to implement a solution, [Ingka] often need external consults from another company, so if the inflation has increased it affects other parts of the markets, one country, several countries and salaries finally increases and [Ingka] needs to consider that." (Attar, 2022)

"[We as purchasers] always know which countries have specific requirements and that [purchasers] can always bring into negotiations and that is something you always know if you have been around [in the industry and as a purchaser] for a while. If [the department of] Legal gets information about updated legal requirements somewhere, they have to update us [purchasers]." (Magnusson, 2022)

"[Ingka] needs to have an export license if [Ingka] wants to export [the bought solution], even within [Ingka], and it applies to both software and hardware, even if [the data] is stored on cloud and so on. So, every [software] that is above a certain level of encryption, 56-byte encryption, need to have [export classification] codes and approval from the government that [Ingka] can export [the solution]. So now, with for example Russia that is sanctioned, companies can not use Microsoft [in Russia]. This is something [Ingka] have not worked around before, something that we are trying to learn." (Magnusson, 2022)

Appendix C Recommended distribution of responsibility for processing of Information Requirements

In this appendix, a recommended distribution of information processing responsibilities is presented. The main parties (further described in Chapter 5) are identified as Group Digital, the software purchasing individuals at Group Procurement Digital & Tech, the Market Intelligence function which will be implemented, and the departments of Legal and Risk & Compliance.

Table 10. Recommended distribution of information responsibilities.

	Group Digital	*Individual Purchasers*	*Market Intelligence function*	*Legal and R&C*
Ingka	- Expected replacement time of solution - End-user needs - End-user solution experience	- Warnings from enterprise architects of elevated lock-in risk - Warning signs from Group Digital about solution experience	- Ingka Strategic Direction - Software architecture strategy	
The partnership		- Ease of collaboration - Spend quotas - Points of contact - Contracts - Strategic alignment	- Use of supplier in other domains	

The Supplier	- Compatibility with "megavendors" - Upgrades and Launches (technologies, products, services)	- Financial Numbers - Geographic presence - Management Set-up - Customers - Upgrades and Launches (technologies, products, services) - Solution aspects - Solution scope/Product range - Strategic roadmaps - Investment areas - Networks - Scandals		
The Market	- Competing solutions - Market maturity - Substitutes to solution	- Main competitor's market shares - Geographic proximity of competitors - Other customers chosen solutions - M&As	- M&As (when "megavendors" are involved) - Changes in end-user-needs - Pricing models - Innovations in the market	
The Macro Environment			- Software technology trends - Software sustainability trends	- Geographical risks - Laws