



LAPPEENRANTA UNIVERSITY OF TECHNOLOGY
School of Business and Management
Faculty of Technology
Department of Industrial Management

MASTER'S THESIS
FULL SCOPE DELIVERY: CHALLENGES AND POSSIBILITIES IN PROJECT
BUSINESS

Instructor: Associate prof. Petri Niemi
Supervisor: MSc. Antti Rautio

Lahti 21.05.2018
Jari Suortti

ABSTRACT

<p>Student: Jari Mikael Suortti</p> <p>Title: Full Scope Delivery: Challenges And Possibilities In Project Business</p>
<p>Department: Faculty of Industrial Management</p>
<p>Year: 2018 Location: Lahti</p>
<p>Master's thesis. Lappeenranta University of Technology.</p> <p>98 pages, 18 figures, 18 tables, 5 charts and 9 appendices</p> <p>Instructor: Associate professor, Petri Niemi</p> <p>Supervisor: Purchasing manager Antti Rautio</p>
<p>Keywords: make or buy, make and buy, subcontracting, outsourcing, offshore outsourcing, offshoring, delivery project</p>
<p>The present procurement of equipment covers traditional subcontracting and outsourcing, with some cases including engineering. To proceed into next level of procurement, there must be done evaluation which equipment can be classified as offshore outsourced equipment.</p> <p>Objective of this study is to analyze a selection of products, how different purchasing methods effects their costs. This requires understanding of the outsourcing theory covering all purchasing methods, make and/or buy, outsourcing, offshoring, open book accounting, and analyze of how these theories are compatible with the practice.</p> <p>The study is carried out using literature for solving the theory part, and analyzing actual delivery projects comparing the results with estimations of outsourced products. The branch of industry and nature of project business with fairly small quantities of equipment gives challenges to find out relevant theories from literature as typically all studies, articles and books are for mass production or for cases where the production of product is planned to move from own production to vendor production.</p> <p>The analysis of product types related to purchasing methods did not give any conclusive result, due to not enough detailed data to achieve specific results which purchasing method would be the best for each product type according to project type. It was found, that the data used for analyzing should be very detailed and investigated into the lowest possible level. Though, despite the inadequate data, the guideline how the selection of purchasing method for each product type and project type is represented in this study.</p>

TIIVISTELMÄ

<p>Tekijä: Jari Mikael Suortti</p> <p>Työn nimi: Kokonaishankinta: Haasteet ja Mahdollisuudet Projektiliiketoiminnassa</p>
<p>Osasto: Tuotantotalous</p>
<p>Vuosi: 2018 Paikka: Lahti</p>
<p>Diplomityö. Lappeenrannan teknillinen yliopisto</p> <p>98 sivua, 18 kuvaa, 18 taulukkoa, 5 kaaviota ja 9 liitettä</p> <p>Tarkastaja: Tutkijaopettaja Petri Niemi</p> <p>Ohjaaja: Ostopäällikkö Antti Rautio</p>
<p>Hakusanat: alihankinta, ulkoistaminen, toimitusprojekti</p>
<p>Laitteiden hankinnat tehdään tänä päivänä alihankintana, niin kotimaassa kuin ulkomailla, ja osin myös sisältäen suunnittelun. Jotta hankinnassa voidaan edetä seuraavalle tasolle, eli ulkoistamisen tasolle, hankittavat laitteet täytyy arvioida ja tehdä päätös mikä tai mitkä niistä ovat mahdollisia ulkoistaa kokonaisuudessaan.</p> <p>Työn tavoitteena on analysoida miten eri hankintamenetelmät vaikuttavat laitteiden kustannuksiin. Tähän tarvitaan syvempää valmista-tai-osta ja ulkoistamisen teorian ymmärtämistä, ja analysointia onko teoria täysin sovellettavissa käytäntöön.</p> <p>Työ tehdään sekä kirjallisuustutkimuksena että analysoimalla toimitettuja projekteja verrattuna arvioituihin ulkoistamisiin. Tutkittavan teollisuudenalan ja projektiliiketoiminnan luonteesta johtuen hankittavat määrät ovat suhteellisen pieniä joka lisää haastetta löytää työhön sopivia teorioita, koska kirjallisuudessa käsitellään tyypillisesti massatuotantoa, tai tapauksia joissa oma tuotanto tai pelkästään joku tuote ulkoistetaan.</p> <p>Valittujen tuotteiden analysointi suhteessa hankintamenetelmiin ei tuottanut selkeää ohjetta, koska käytettävissä ollut tieto ei ollut riittävän yksityiskohtaista määrittämään mikä hankintamenetelmä olisi paras kullekin tuotetyypille ja projektityypille. Analysoinnin tuloksena voidaan todeta, että analysoitava tieto pitää olla tutkittu mahdollisimman tarkalle tasolle asti. Analysoinnissa käytetyn tiedon tarkkuuden riittämättömyydestä huolimatta, työssä esitetään ohjeellinen menetelmä hankintamenetelmän määrittämiseksi jokaiselle eri tuotetyypille ja projektityypille.</p>

PREFACE

This master's thesis is made for my employing company in 2018. The purpose of this study was to find out which purchasing method related to various project types and products is most suitable and profitable for each combination. The studied subject is a constant issue in the project business, and therefore very interesting to study. I would like to give special thanks to my employer for giving the opportunity to execute the study. This surely will help understand the complexity of procurement and maybe help in my career later on.

Supervisor of the work was my superior Antti Rautio. I want to express my gratitude to you for showing right direction, challenging and supporting during the very intense thesis process. Special thanks to all my colleagues and members of other teams sharing your valuable experience and knowledge to help me reach the goal.

To my instructor, Associate professor Petri Niemi, I am grateful as he has guided me through the process with great understanding and commitment. This journey was not the easiest one due to limited time, but with professional advice and help from Petri I did manage with the work. Finally, I would like to thank my family, especially my wife, for letting me to start studies in my "old days" in Lappeenranta University of Technology. It has been challenging, fascinating and rewarding for me to attend the TUDI2014-master program.

And thanks to all school mates of TUDI2014!

Thank you!

Lahti 21.05.2018

Jari Suortti

TABLE OF CONTENTS

ABSTRACT.....	ii
TIIVISTELMÄ	iii
PREFACE.....	iv
LIST OF CHARTS	vii
LIST OF FIGURES	vii
LIST OF TABLES.....	viii
LIST OF DEFINITIONS AND ABBREVIATIONS	viii
1. INTRODUCTION.....	10
1.1 Background	10
1.2 Research objectives	11
1.3 Research limitations	12
1.4 Structure of the thesis, research method	14
2. PROCUREMENT (in the literature)	15
2.1 Supply chain management	17
2.2 Purchasing concepts / methods	26
2.2.1 Subcontracting.....	27
2.2.2 Make or Buy.....	28
2.2.3 Outsourcing	35
2.2.4 Offshore outsourcing, Offshoring	38
2.2.5 Open book accounting.....	48
2.3 Supplier: evaluation and selection	49
2.4 SWOT-analyses of outsourcing	53
2.5 Potential risks in outsourcing	55
2.5.1 External risks to outsourcing.....	59
2.5.2 Internal risks to outsourcing.....	62
2.5.3 Risk management	64
3. ANALYSIS ON CHALLENGES AND POSSIBILITIES OF FULL SCOPE DELIVERY	68

3.1	Procurement in Company.....	68
3.2	Questionnaires of offshoring: global and local view	71
3.3	Purchasing methods and variants in the present procurement	76
3.4	Product definitions and cost drivers.....	78
3.5	Analysis of purchasing methods	82
3.6	Analysis of product specifications	88
3.7	Possible risks in outsourcing.....	91
4.	CONCLUSION	96
4.1	Outsourcing theory versus practice.....	96
4.2	Cost structures versus different purchasing methods.....	98
4.3	Suggestion for the basic guideline for outsourcing planning.....	99
4.4	Suggestions for future research.....	100

LIST OF CHARTS

Chart 1 Cost change in Product cost + engineering.....	86
Chart 2 Cost change in Product cost Outsourced	86
Chart 3 Cost change in Product cost Offshore outsourced	87
Chart 4 Cost change % of products costs in average	88
Chart 5 Cost change development %	88

LIST OF FIGURES

Figure 1 Limitations of the study on the process map (Company).....	13
Figure 2 Skill types required for procurement.....	16
Figure 3 Supply chain management antecedents and consequences (Mentzer et al., 2001, pp. 12).....	20
Figure 4 Supply chains as flow networks (Hopp, W., 2003, pp. 3).....	20
Figure 5 Relevant trends for research on purchasing organization	23
Figure 6 Relationship between supply chain risks.....	24
Figure 7 Risk and performance: sources and drivers.....	25
Figure 8 Theoretical framework of the study	27
Figure 9 Strategic sourcing model (Welch et al. 1992)	32
Figure 10 Framework of make or buy decisions (Cáñez et al. 2000).....	33
Figure 11 Simplified model of offshoring	39
Figure 12 Schematic of SWOT-analysis framework.....	54
Figure 13 SWOT-analyses.....	55
Figure 14 Proportion of total economic impact borne by different societal segments (San Diego County study).....	61
Figure 15 Nomenclature and conceptual framework.....	63
Figure 16 Project categorizing.....	70

LCC

Low-cost country sourcing

QA/QC

Quality Assurance / Quality Control

1. INTRODUCTION

1.1 Background

This study focus on procurement activities of large size international company (later called as “Group”), a division of a case company group (later called as “Company”), which operates in several business areas in field of project business globally. The competition in the business areas is global and very hard. There are multiple competitors, not all providing the same delivery scope, which are mainly middle size companies thus being able to give heavy competition in some certain narrower areas. The global operations and competition naturally drives procurement towards global operations as well, and in the same time towards new challenges and solutions to gain competitiveness against competitors.

The Group provides a comprehensive product portfolio for special industries all over the world operating in all inhabited continents. With its technologies and service solutions, the Group is the world leader in all its major business areas having sales approximately 6 billion euros and amount of the personal 25.000.

The procurement activities in the Group are typically in high level, and the procurement activities are covering much more than just the purchasing process itself. Project business requires the procurement is involved already from sales phase up to project execution phase and even to service phase. In the procurement of case company group, the subcontracting and outsourcing are well known purchasing methods to cut the costs and enlarge the manufacturing capacity, as well localizing the manufacturing in near areas of the project mill site. Procurement together with logistics have target to make savings on transportation costs especially on heavy and large structures, where location of the manufacturing has big impact. One of the major drivers is also total quality of the product: production quality, manufacturing quality and quality of managing the process.

Though subcontracting and outsourcing are widely used purchasing methods, there are still quite a lot of research to be done to achieve the best result, especially when focusing on

project business. As the procurement environment is constantly changing due to changes in global markets, the procurement must respond and try to be ahead of the changes to maximize competitiveness and profitability. The problem in Company is, that the quantity in number of different supplied equipment are typically very low, from 1 to 10 pieces per project, and variety of different kind of equipment. On the other hand the quantity in weight of the equipment can be very wide, from 1 ton to 500 tons, which defines certain characteristics needed to follow during purchasing, e.g. location of the supplier. One more factor giving impact, is the location of customer, different requirements of customers and regulations of countries are giving more complex task to procurement. These numerous factors, specific to project business where Company is operating, are creating more challenges to procurement managing the process profitably and successfully from sales to project execution, not to forget the risk management during procurement activities. The risk management does not concern only procurement, the full process must be evaluated as whole, with sub-processes evaluated in more detail.

1.2 Research objectives

The study aims to gain knowledge of total cost structures of different purchasing methods related to various products, meaning in the case study economical correlation between different purchasing methods and sourcing of different types of an equipment resulting knowledge of what purchasing method should be used for each type of an equipment, with relation to project requirements. The second objective is to study how outsourcing functions and is it real opportunity to Company to lower costs. In the study will be searched answers to following questions:

Main objective: To establish guideline defining the relations between product types, purchasing methods and project types, giving guideline for procurement planning in projects.

Research questions regarding products and purchasing methods in the Company:

- What purchasing variations can be defined?
- What are the cost structures of the products?
- Does cost structures effect to purchasing method?
- How purchasing methods apply to various products in various projects?

From Company's point of view the objective is to establish guideline, showing the relations between products, purchasing methods and project types, which can be used as a basic guideline when planning project purchases. Due to complexity of the products and projects, the guideline cannot be built as all-embracing within this thesis work.

1.3 Research limitations

The study is limited, concerning Company, to focus on ten different product types (Table 1) and how does different purchasing methods applies on different project types. The studied costs, risks and other activities are limited to comply delivery term FCA (Free Carrier) Incoterms 2010 (International Chamber of Commerce, 2010) to have comparable results. The study will research the impact in the processes the activities from product management to quality assurance (product management → sales → engineering → procurement → quality assurance), see Figure 1, following activities from logistic to service and maintenance are ruled out.

Table 1 Product types in projects (Company)

Product type	Typical quantity in project
1	5 - 20
2	2 - 5
3	2 - 5
4	2 - 5
5	1 - 3
6	2 - 8
7	1 - 2
8	3 - 10
9	5 - 15
10	3 - 9

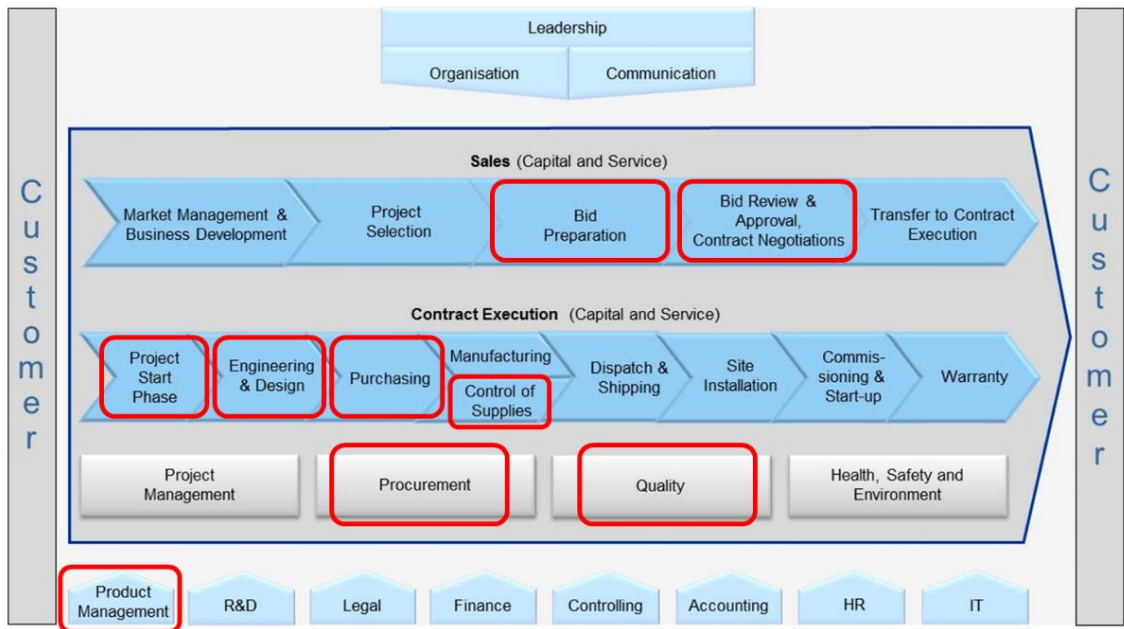


Figure 1 Limitations of the study on the process map (Company)

1.4 Structure of the thesis, research method

The structure of the study is constructed of four main sections in four chapters. The first chapter, Introduction, presents the overview of the study with research topic, what is the main target and how the study is conducted. The second chapter, Procurement, is the theoretical part of the study having the literature review giving knowledge of procurement in today's organization, as well the challenges it might face. The knowledge gained will be then realized in the case study for the best result of data acquiring and applying it. In the third chapter, Analysis on challenges and possibilities of full scope delivery, is executed research on cost structures of products and the relation to different purchasing methods and project types, as well concentrating on analyzing the results of case study and compare them to knowledge from second chapter. Target is to establish matrix showing the relations between purchasing methods, products and projects, to find out the best practices for more effective procurement. The fourth chapter, Conclusion, gathers all information and analyses from previous chapters giving the final advisory instructions which purchasing method should be used in different situations, and in general how theories of purchasing methods can be applied to actual project business procurement.

The literature review concentrates on purchasing theory, subcontracting, make or buy, outsourcing, offshoring, supply chain management, and risks in outsourcing.

The empirical study describes the operation of procurement in the Company today and how purchasing is done. Also, it contains product selection, analysis of the selected products, and risk review. Empirical study includes two internal questionnaires, for global procurement and local project operations. The global questionnaire is distributed globally to several Company's location, with target to find out the present offshore outsourcing situation in the Company group. Target of the local questionnaire is to define how offshore outsourcing effects to each process activities and vice versa.

2. PROCUREMENT (in the literature)

Procurement has been in constant change during its existence with growing rate and due its importance to companies it has been widely researched over past 50 years, although the need for further research of purchasing organizing (Schneider, L. & Wallenburg, C.M., 2013, pp. 144). Looking into 1960s the main purchasing objective was competitive bidding, leading situation where the price became main factor on contracts. Also training of procurement professionals helped regaining procurement departmental status, after downshifting from strategic to clerical role what happened during World Wars. Coming to 1980s, procurement practically established the most important factor that is still reality today: supplier management. The transition of procurement towards strategic sourcing started in 1990s, identifying suppliers as partners and encouraging long-term contracts, giving the direction to modern day procurement (Purchasing Related Articles & Insights, article 22 of 34, 2018).

The transition of procurement can be seen in literature, e.g. Krause, D.R., Pagell, M. & Curkovic, S. (2000, pp. 498) present that supporting the production and operations activities is the core of role in purchasing more in strategic manner. Ellram, L.M. & Carr, A. (1994, pp. 13) defines the movement of purchasing from passive or reactive towards strategic role. Mol, M.J. (2002, pp. 43-44) describes companies have broader competitive and corporate strategies, where as a part of it is operational strategy including operations such as purchasing, though he is arguing purchasing may not be a strategic activity.

The present world-class procurement professional has ability and multi-dimensional skills to operate successfully in changing procurement function and the environment. This though requires constant development of skills, as the field of procurement varies from procurement specific skills and abilities to organization wide business and management skills and abilities. They are presenting set, new taxonomy, of procurement skills which modern day procurement professionals needs to asses: technical skills (TS), Interpersonal skills (IS), internal enterprise skills (IE), External enterprise skills (EE) and strategic business skills (SB). This new skill set categorization is presented in the Figure 2, where the relation between skills and organizational functions is defined and showing the

differentiation of skills required by procurement and management, as the procurement specific skills are moving towards managerial skills. Procurement professional is mandatory to have procurement specific skills, as well number of generic managerial skills which are tailored for procurement purposes. (Tassabehji, R & Moorhouse, A., 2008, pp.57, 59-60).

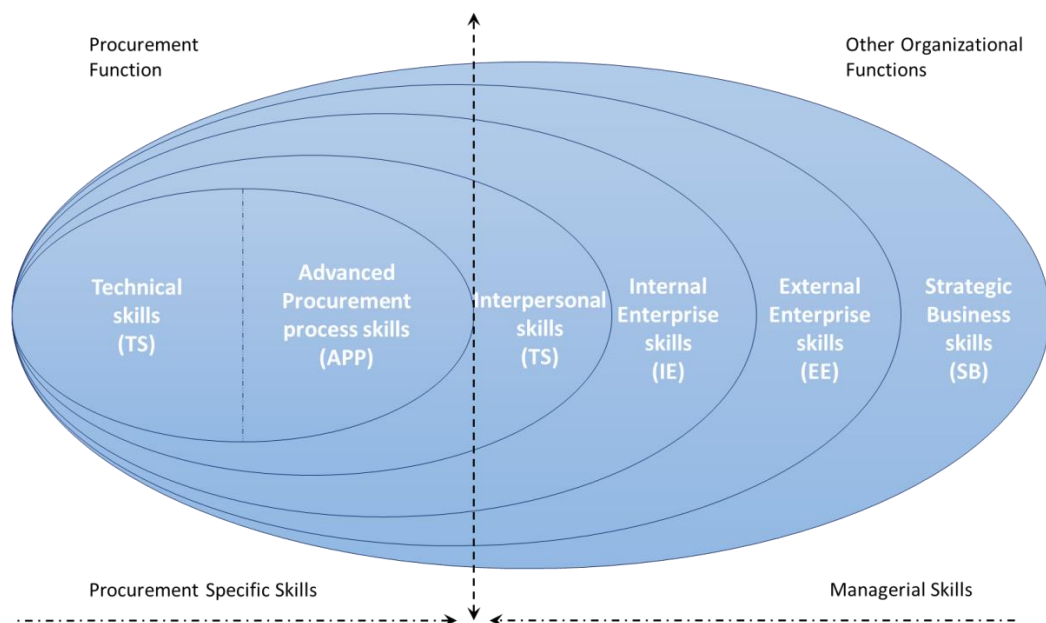


Figure 2 Skill types required for procurement

Primo, M.A.M. & Filho, J.R.F. (2012) describes procurement in project oriented business highly connected to supply chain management, project management and risk management in finalizing projects successfully. In the project business unlike in product manufacturing business, projects cannot be analyzed as individual cases as companies are typically supplying projects to same customers in somewhat continuously. So the projects must be analyzed as portfolio of projects, though customers tends to impact coming projects via ongoing projects. They also point out, that companies in project business are executing projects with limited resources, as projects in execution are not consecutive but overlapped.

Studies done in construction business shows project success is heavily depended on correct procurement strategy selection matching objectives of key stakeholders. The development of procurement from traditional non-integrated approach practically separating the project phases towards integrated approach, where coordination is more handed over to contractors. This new approach process includes design and build, turnkey and management-oriented approaches, where the integration is conducted by a third-party.

They also argue, that due to environment in projects with multiple stakeholders, numerous project governance elements such as ethics, transparency, accountability, trust between project parties and stakeholders, procurement is lead to make sourcing decisions meeting needs of project parties but not endangering stakeholders needs, and same time ensuring the value add with reasonable risk exposition.

2.1 Supply chain management

Supply chain management is well researched issue in the literature, mainly for mass production purposes but also for project oriented production. In project oriented production or business most found studies and articles relates to constructions business and some specific business areas like aerospace. Though industrial project business is in very big role in total, the projects are typically quite large up to very large, it is rather poorly studied area in the literature. No specific reason was not found in the literature, but most likely reason behind this phenomena is that companies in project business tend to execute their own confidential studies due to business competition and nature of project business having individual projects.

One definition of supply chain is “*a goal-oriented network of processes and stockpoints used to deliver goods and services to customers*” (Hopp, W., 2003, pp. 1.), where the processes are representing the individual activities which are related to producing and distributing goods and services. These individual activities can be design engineering operations, service operations, manufacturing operations or legal actions. One other traditional definition of a supply chain given is that of a “*loosely aligned, fragmented series of paired relationships among different firms, agents and parties, independent or not*”

that function within an agreed set of rules, contracts or contractual agreements” (Kogan, K. & Tapiero, C.S., 2003, pp. 5). They also say, the supply chain management is an alternative to approach of centralized and authoritarian-based management. This is based on their findings of numerous functions supply chain contains, consequently supply can emerge activities of companies and entities, which are not able to have or manage these activities, in operational and organizational form. Kogan et al. (2003, pp. 5-6) define, when viewed in an operational and narrower way, a supply chain and its management are consisting following activities: management of a network of facilities, communication exchange, distribution channels and the supply chain entities producing materials, transforming them into semi-finished and finished products, and distribute the finished products to customers. These multiple activities gives a supply chain new meaning amongst the companies which do not have sufficient capabilities in interest by design or economic, by integrating them in a manner of emerging operational and organizational form.

With all large number of research, it's though argued the most knowledge of supply chain management is focused on narrow functional silos, such as purchasing, logistics, IT and marketing. Therefore, at least partly as a result of this, research methodological and conceptual ground of supply chain management do not have full consensus, leading to the knowledge base of supply chain management having numerous gaps (Burgess, K., Singh, P.J. & Koroglu, R., 2006, pp. 703). Mentzer, J.T., DeWitt, W., Keebler, J.S., Min, A., Nix, N.W., Smith, C.D. & Zacharia, Z.G. (2001, pp.18) have defined supply chain management *‘as the systemic, strategic coordination of the traditional business functions and the tactics across these business functions within a particular company and across businesses within the supply chain, for the purposes of improving the long-term performance of the individual companies and the supply chain as a whole’*.

Examination of the strategic level of supply chain antecedents and consequences presented by Mentzer et al (2001, pp. 12) (Figure 3), argues supply chain orientation implementation is impeded or enhanced by antecedents to supply chain management. The main factor in this argue is that the trust, both direct and indirect, and commitment in relationship between parties are the essential to successful cooperation, with risk and reward sharing.

Before starting supply chain management project within the supply chain, the vision and key processes of planned supply chain management should be shared amongst the whole supply chain, where all the companies have top management support, by the leader company to reach the market-winning supply chain management (Mentzer et al., pp. 13-14). The consequences are in fact the motives for building up a supply chain system and a supply chain management, as they are increasing the competitive advantage e.g. cost leadership, differentiation, profitability, and customer value and satisfaction. (Mentzer et al., pp. 15).

Hopp, W. (2003, pp. 3) argues the research of supply chain is though limited primarily only on the flow of goods and services, with specifications to describe their effect on the flows but only with amount of as much as necessary. This leads to ability to adapt insights from one industry to another by applying models across a wide range of industrial settings enabled by the perspective given.

The stockpoint is also involved in definitions addition to processes, as the inventory locations in the supply chain must be taken into account. They are connected to processes by a network, which describes the various flows through supply chain (Figure 4).

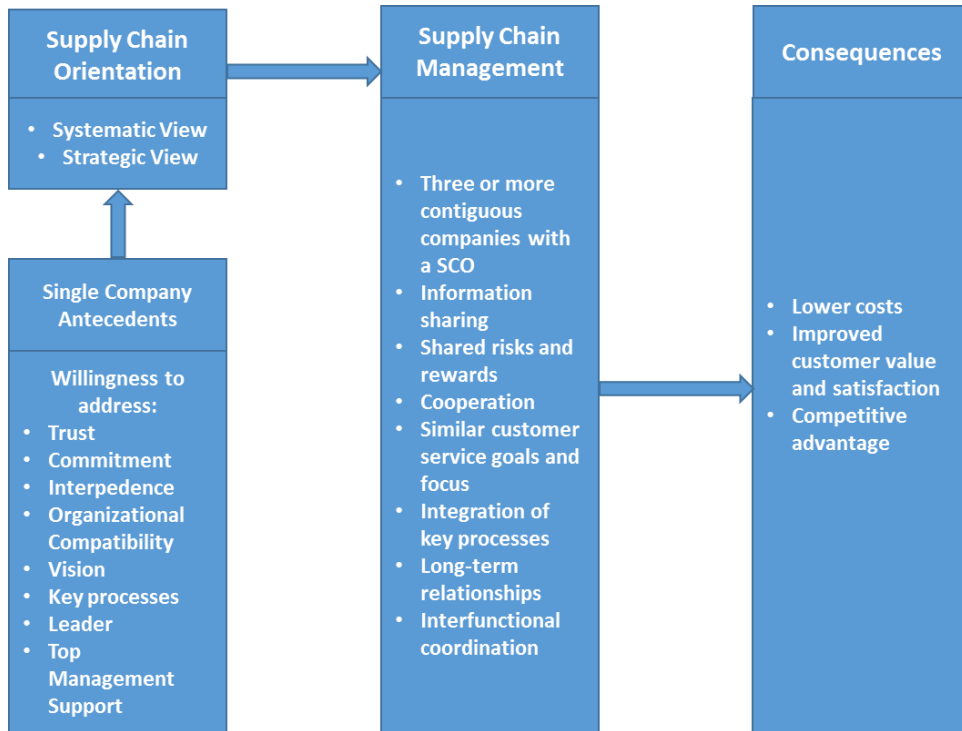


Figure 3 Supply chain management antecedents and consequences (Mentzer et al., 2001, pp. 12)

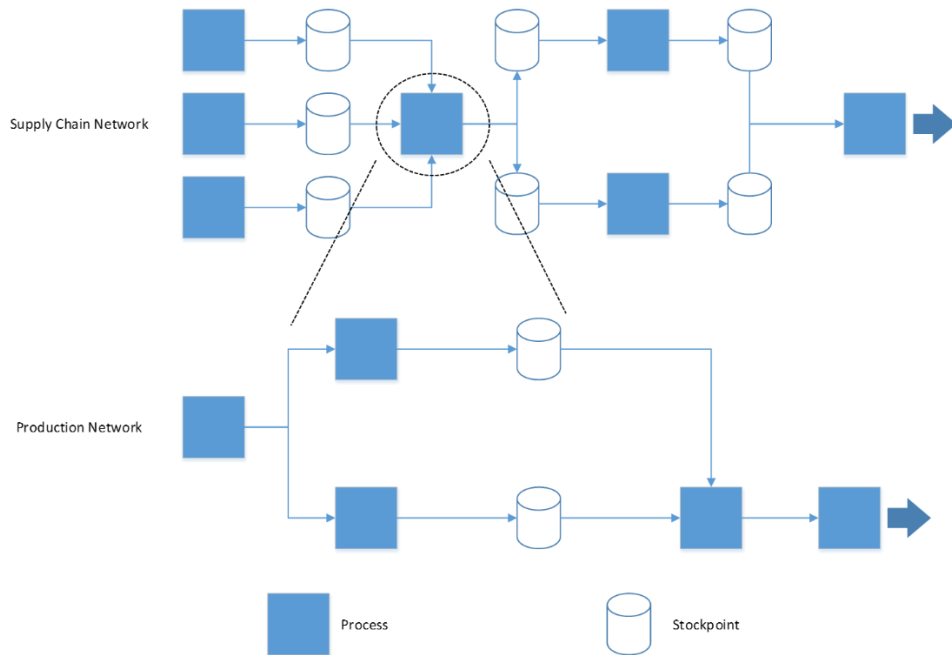


Figure 4 Supply chains as flow networks (Hopp, W., 2003, pp. 3)

When observing the Figure 4, we can see processes and stockpoints can be found from both supply chain and production networks, therefore they can be stated having similar structure. This similarity of structures enables the possibility to implement use of same framework of flow network, and gaining a basic understanding of both individual production systems and aggregations of these in supply chains. The supply chains are also in important role to support business activities and they must be evaluated with business terms, meaning basic objective of a supply chain is to be profitable in long term. Pickett, D. (2013, pp. 30) says there are many benefits to gain, improved margin, supporting expansion into new markets, reducing operating costs and enhancing the customer experience, by a well-designed supply chain network and not depending on the maturity of the company.

As the supply chains have been expanding it has been creating more complex operations and logistic problems, which then affect traditional operational management issues by altering them extensively more complex and growing strategic importance. In the same way the quantitative modelling experience, evaluating and using intelligent analyses have been growing giving better ability to manage operations, in their intertemporal as well as their strategic and risk settings. Operations management have been made feasible by such experience. (Kogan et al. 2007, pp. 3)

The role of a supply chain management as a “new beginner” in sourcing being emerged less than 30 years ago, has lead supply chain management rapidly become to companies an activity gaining competitive advantage and way how to serve the markets best, and on the other hand being act of loss when neglected (Christopher, M. & Holweg, M., 2011, pp. 63-64). Though the supply chain management is recognized as very important activity determining the success of a company (Cambra-Fierro, J. & Ruiz-Benites, R., 2011, pp. 148) there is no consensus on its research (Burgess et al., 2006, pp. 703) despite there has been tremendous interest for research towards it since 1980’s (Hwarng, H.B., Chong, C.S.P., Xie, N. & Burgess, T.F., 2004, pp. 2829).

Based on several value chain frameworks, in the global value chain management/business is identified three different models: integrated, semi-integrated and low. First model,

integrated, represents cases where a multinational enterprise controls the value throughout the product life cycle, including technology and intellectual property rights. Second model, semi-integrated, represents the cases where a multinational enterprise control design and markets of the product, and minimizing outsourcing and its control of intellectual property and technology rights which can be contractually outsourced as production processes are often offshored and outsourced. The last model, low cost, is in this case regional, not global. This model is very similar to semi-integrated, on this model the component supplier tend to own the intellectual property and other similar rights. (Seppälä, T. 2013a, pp. 60)

Due to rapid globalization of sourcing, the supply chains have become more complex since early days of supply chain management research (Hwarng, H.B. et al. 2004, pp. 2830), in the designing of a supply chain system, must be take into consideration several critical factors such as technology, strategic alliances, production and operations, distribution and logistics, reverse logistics, supply chain integration, green supply chains and customer service (Cambra-Fierro, J. et al. 2011, pp. 149). The supply chains are still evolving as markets, businesses and organizations are changing globally, and there can be recognized trends of supply chains for further research (Figure 5) (Schneider et al., 2013, pp. 151). These ten identified trends, corporate, supply chain trends and fundamental trend towards an online society, are claimed to influence purchasing organizations in the future, not only as individual trends but all together rather as bundled trends and their combined effects.

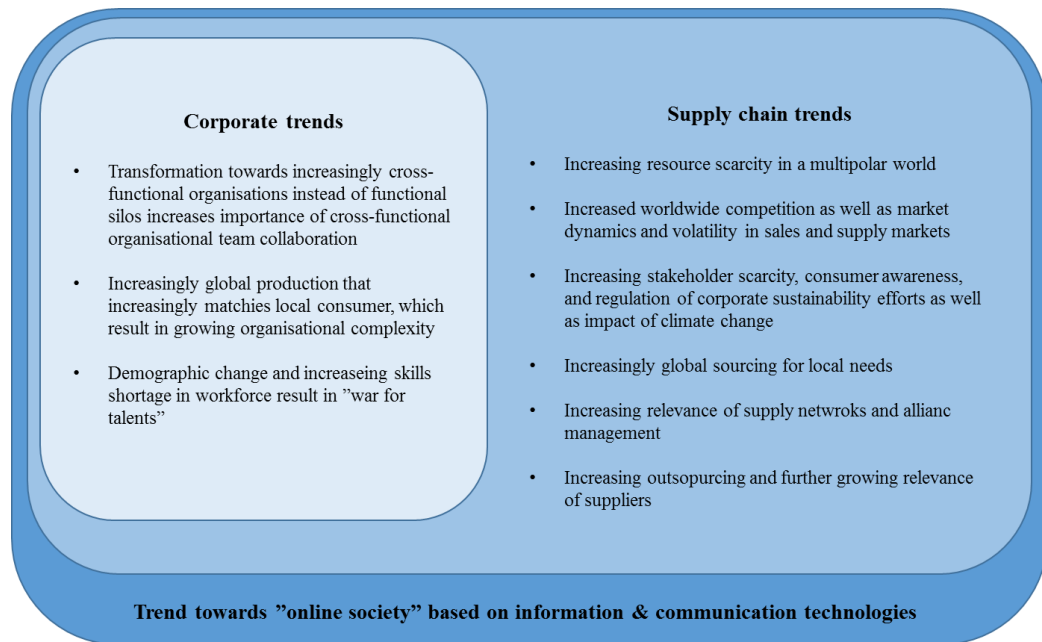


Figure 5 Relevant trends for research on purchasing organization

Source: Schneider, L. & Wallenburg, C.M., 2013, *Journal of Purchasing & Supply Management*, Vol. 19, p. 151

When operating in supply chains the companies always have risks, Christopher, M. & Mena, C. (2011, pp. 68) have identified five main supply chain risk categories: process risk, control risk, demand risk, supply risk and environmental risk (Figure 6). As supply chains are coming due to globalization and the complexity of supply chain grows, the parties in the supply chain are involved in number of networks simultaneously and sourcing is done typically in many countries, which exposes organizations to higher risks for a variety of reasons. Also the parties in the supply chain are facing greater risk of disruptions, bankruptcies, breakdowns, macroeconomic and political changes due to geographical coverage in multiple regions of global supply chains.

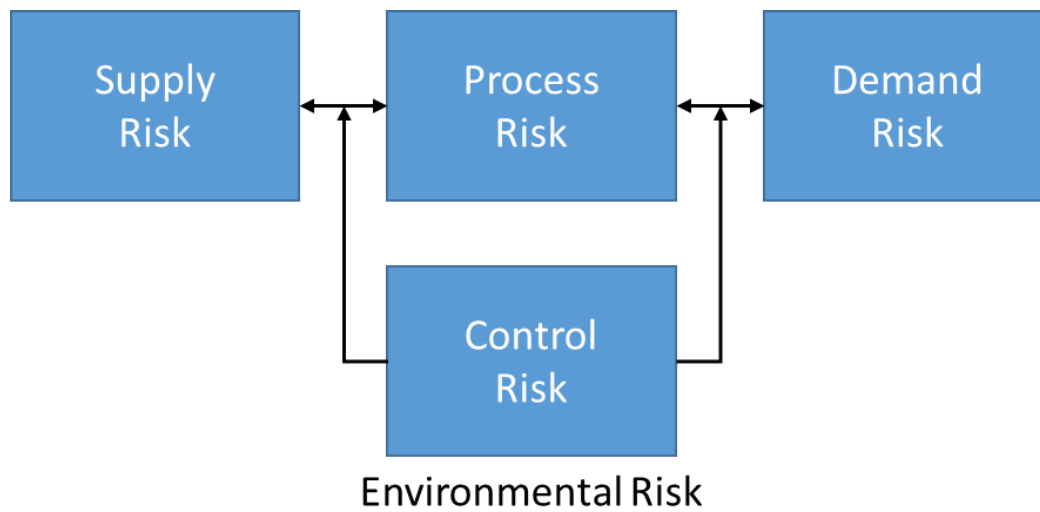


Figure 6 Relationship between supply chain risks

Source: Christopher et al., (2011, pp. 68) (originally based on Mason-Jones, R. and Towill, D.R. (1998), “Shrinking the supply chain uncertainty cycle”, *Control, The Institute of Operations Management*, Vol. 24, No. 7, pp. 17-22)

Ritchie, B. & Brindley, C. (2009, pp. 259) argue there are numerous amount of different sources and factors affecting to risks in supply chain. They have established categorization combining these sources and factors into seven groups (Figure 7).

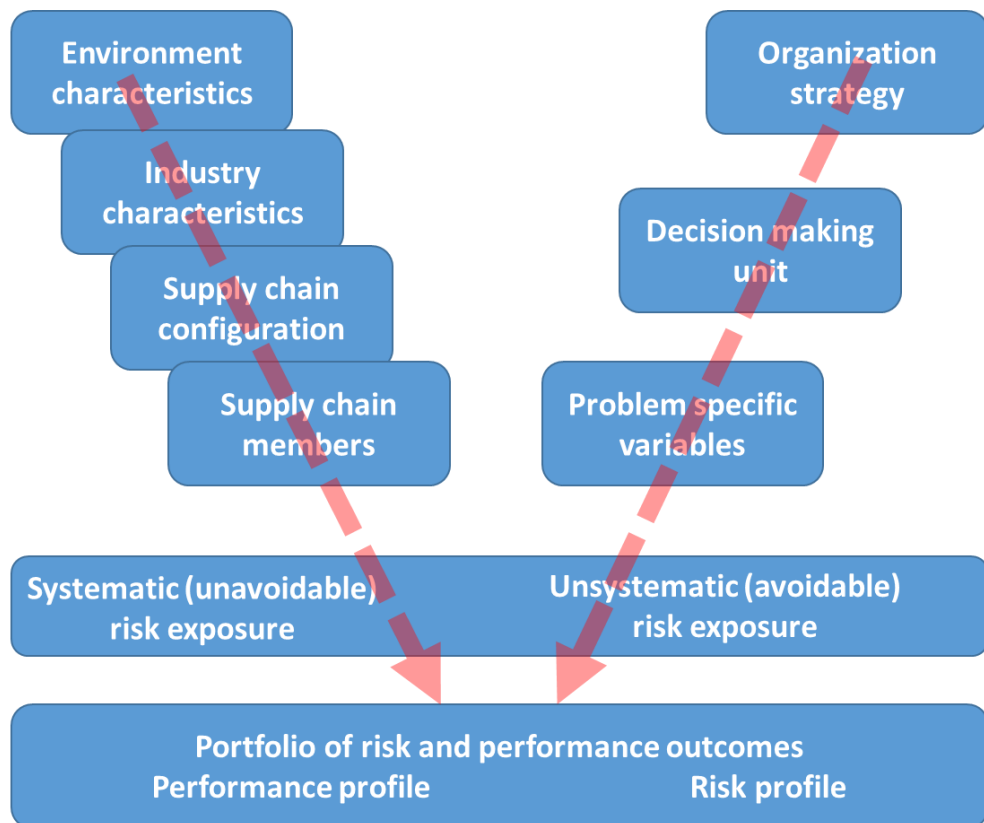


Figure 7 Risk and performance: sources and drivers

Ritchie et al. (2009, pp. 260) recognizes the performance and risk profiles, representing organization's investments and activities, in outcomes portfolio can be influenced by new risks, at any time and continuously, caused by any of the seven sources. The mentioned investments and activities are representing the total performance of the company, which of the management is concerned. They claim that business is exposed by nearly infinite number of factors creating undesirable consequences, which must be evaluated by company to critical and non-critical factors, and company need then accept there will be some consequences in high risk category.

Mitigation of risks remaining flexibility in supply chain is an important for companies. Network re-engineering of supply network should be considered especially when upstream network is not fully understood, by reviewing the criteria other than costs and customer service. One other mitigation tool is to enhance the collaboration between sourcing parties to share, recognize and minimize the risk. Also having agile supply network in both down-

and upstream network can help mitigating the risks due to rapid response to unpredictable changes. Further, risk management culture must be created in global sourcing by the top management of companies or by their support, and the risk profile of the business must be monitored and managed, with the awareness of the impact supply chain decisions have on the risk profile. (Christopher, M. et al. 2011, pp. 71).

Besides recognizing the supply chain risks, the supply chain risk management should not neglect risk monitoring, which is important and necessary process when companies have to mitigate appeared early warnings by giving time to react to changed circumstances (Hoffman, P., Schiele, H. & Krabbendam, K., 2013, pp. 202). As individual risks tend to be interconnected, it is difficult to manage the supply chain risks, mitigating one risk may end up to exacerbating another (Chopra, S. & Sodhi, M.S. 2004, pp. 54). They also have recognized the situation when a company takes actions in the supply chain, it may increase the risk for other companies in the supply chain.

2.2 Purchasing concepts / methods

The modern purchasing concepts are well known and they can be defined in five categories: subcontracting, make or buy, outsourcing, offshore outsourcing and open book accounting. What makes the literature review difficult, is that subcontracting, make or buy, outsourcing, offshore outsourcing are more or less overlapped and the same definitions, concepts and methods are presented in numerous researches and articles, which consequently may distract or confuse the study. Thus there are similar or even same issues mentioned and defined in all study sections of these subjects.

In the theoretical framework of this study (Figure 8) is presented a simplified model of purchasing decision making process within different equipment and purchasing methods in respect of project requirements with the main aspects: need for purchasing, defining which equipment needs to be purchased, which are project requirements, which purchasing method fulfills the requirements.

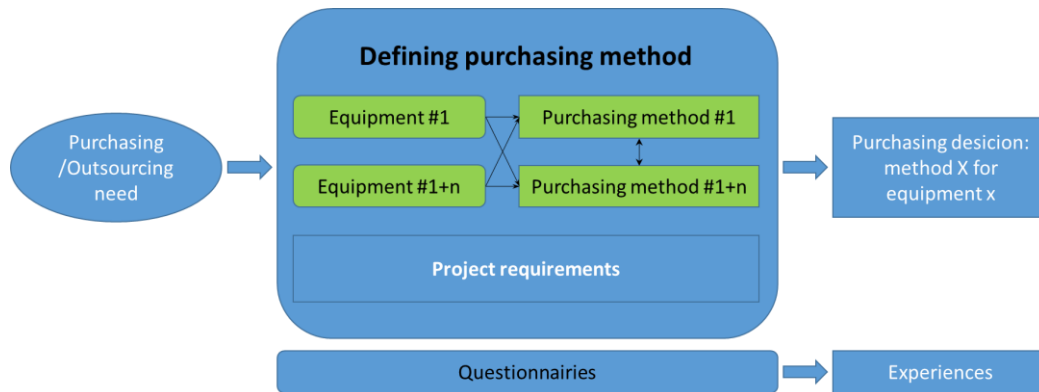


Figure 8 Theoretical framework of the study

2.2.1 Subcontracting

According to literature, production structure with vertical integration contains rigidity that can be avoided by using subcontracting as a strategy, which help companies to achieve flexible and lean production. Companies see advantages in subcontracting, as savings in cost and wages, as a protection against market demand fluctuations, and as a source of an ability to competitive edge operations (Holl, A., 2008, pp. 299). Holl is defining subcontracting as trade-off process, where the cost in-house is higher than cost perceived of using outsourcing market. One other definition of subcontracting is a purchasing process where a subcontractor is working for buyer, and a vendor with buyer (Dolgui, A. & Proth, J-M. 2009, pp. 78). They also recognize the difference between subcontracting and outsourcing, in subcontracting the trade between companies is simply handing over tasks or services from buying company to supplying company which has required skills for tasks or services and/or efficient resources.

The Merriam-Webster dictionary has defined subcontracting as follows: (Merriam-Webster, 2018).

1. General definition: "a contract between a party to an original contract and a third party; *especially* : one to provide all or a specified part of the work or materials required in the original contract"

2. Definition for English language learners: "a legal agreement by which you hire another person or company to do part of a job you have been hired to do"
3. Legal definition: "contract between a party to an original contract and a third party that assigns part of the performance (as building a house) of the original contract to the third party"

2.2.2 Make or Buy

Definition of make or buy

Wide consensus lies in the literature of make or buy theory as a strategic sourcing model, which will be proven in this chapter by following definitions. The make or buy action is a decision or act of making a choice whether to execute in-house activities, such as source a product, process or service internally or sourcing it externally (outside operation) (Moschuris 2014, pp. 2). According to Shorten, D., Pfitzmann, M. & Kaushal, A. (2006, pp. 1) make or buy decision depends on two main factors: product is made in-house due to its importance to company performance, it's timely related to supply or there are continuous changes in the design, and product or manufacturing process is bought as they are not considered as strategic for the company. Quinn, J.B. & Hilmer, F.G. (1994, pp. 1) recognize in the make or buy process two strategic approaches: core competence focus of company resources to produce value to customers by being superior to competitors, and outsourcing activities which do not have strategic position or do not need special capabilities. Moschuris (2014, pp. 2) says when manufacturing companies or organizations are in pursuit of improvement to profitability and productivity by rationalizing their supply chain, they will face one of the most important decision, whether to make or by. This decision of insourcing or outsourcing could release needed resources for company focusing on more important tasks, which likely are company's core businesses, and to have possibility to invest in more modern processes gaining higher return or new earlier not foreseen opportunities. Quinn et al. (1994, pp. 44) though raised the question are managers skills in appropriate level to identify what are the core competencies of the company, as there have been confusion among many executives.

In the literature the make or buy and outsourcing are not divided as two separate processes (Quinn et al, pp.43), more of they are combined together as purchasing process, and the make or buy and outsourcing are sub-processes. In many studies, researches and articles outsourcing is mentioned as the purchasing activity following the buy decision. Even though they are not managed as their own processes, in theory and in practice they are managed as mixed processes.

Though there are wide range of articles on literature of the make or buy perspective, it is not so widely researched issue (Krzeminska 2008, pp. 12). Two perspectives, or main streams, have been identified for further study: the first stream is aiming to answer the make or buy question from a cost viewpoint and the second stream is approaching the make or buy question from a strategic perspective where not only the cost but also other factors have been taken into account (Cáñez, L., Platts, K. & Probert, D. 2000, pp. 1313; Mahaorand, T. & Al-hakim, L. 2005 pp. 2). According to them there are other perspectives, due to multiple disciplines inside make or buy decision, as economics, purchasing, operations research, accounting and strategic management. There can be found many different definitions of make or buy in the literature; it can be described as a periodically done strategic decision due to various reasons, that may be new product launched, vendor performance, change in the policy of the company or in the demand dynamics (Vrat 2014, pp. 303). Shorten et al. (2006, pp. 1) says make or buy decision is based on the strategy, and buy decision can be set if the product or production process is not strategic for the company. The make or buy decision can also be done by decision of buy over make decision to avoid cost reduction because of short-term reasons (McIvor, R. & Humphreys, P. 2000, pp. 295). As the make or buy decision involves strategic implications, it often has a crucial effect on profitability, giving a significant contribution to the company's financial health (McIvor, R., Humphreys, P. & McAleer, W. 1997, pp. 169).

The make or buy is also known and used synonymously with other terms (Krzeminska 2008, pp. 12): make and buy, plural governance, plural sourcing, bi-sourcing, concurrent sourcing, plural form/mode of organization/management, tapered integration, taper integration or partial (vertical) integration, as well partial sourcing. The large number of

terms used makes the research of the make or buy theory more difficult and time consuming. Mahaorand et al. (2005, pp. 2) uses also term outsourcing option.

Sourcing modelling of make or buy decision

The importance of make or buy decisions are recognized as one of the most difficult tasks organizations will meet (Moses 2011, pp. 1042) and this creates complex choices for management how to decide between which operations, products or processes to keep in-house or to outsource. Also the importance of make or buy decisions has got increasing awareness amongst the companies (Mahaorand et al. 2005, pp. 1). However the make or buy decisions are rest too often on very limited or weak analysis, or due to existing capabilities or in-house capacity, or leaning on emotional aspects, leading to poor judgement of company's internal problems and performance, which results unexpected or undesired low outcome (Shorten et al, 2006, p.1). On the other hand, beside strategic issues, make or buy decision should also be evaluated by answering questions regarding cost analyzing such as: Are overhead costs properly determined? Is there any cost effect to other products kept in-house by outsourced products? (Welch, J.A. & Nayak, P.R. 1992, pp. 26).

There are several models supporting companies during the make or buy decision process, but typically they have two main general limitations (Moses, A. & Åhlström, P. 2008, pp. 231). The limitations do have counter definitions, as mentioned below.

1. Most of the models are deductively based, not depending on if they are orientated towards process or content. Outlining the required procedure for reaching make or buy decisions, is defined in process models, also process models defines decision data acquiring and evaluation process. The content models, when making a make or buy decision, defines the context needed to take into consideration, as well defines factors which need to be considered. As deduction is the main basis for these two models, it means they do not have much empirical support, but models are based on idealized scenarios. Also, models having empirical support, it is more or less only anecdotes. Thus the connection to actual make or buy decision processes is very

weak. On the other hand, Welch et al. (1992, pp. 26) emphasize the importance of true cost analysis as basis for make or buy decision in their strategic sourcing model, which argues with the mentioned characteristic of models.

2. Both models, process and content, are static and therefore the dynamic nature of companies and decision-making is not well enough defined. Similar effect is caused as numerous models are derived from static theories. The models do not consider, that the quite volatile environment surrounding the companies is giving strategic directions based on only one-time decisions. Such behavior of models leads to situation where strategy directions are forced to change at varying intervals. The strategic sourcing model presented by Welch et al. (1992, pp. 27) though have focus on determining the company's process technological position against competitors prior to possibility of make or buy decision.

Welch et al. (1994, pp. 26-27) have developed a Strategic Sourcing Model (SSM) which target is to give in-depth view of strategic and technological factors as a make or buy decision support for managers (Figure 9). This model features a concept of process technology, defined to cover broad range of processes from R&D to supply chain management. The matrix model describes how development of process technology compared to competitors in all industries reflects to make or buy decision making. Analyzing the process technology the measuring is done converting all activities into costs to have all activities comparable.

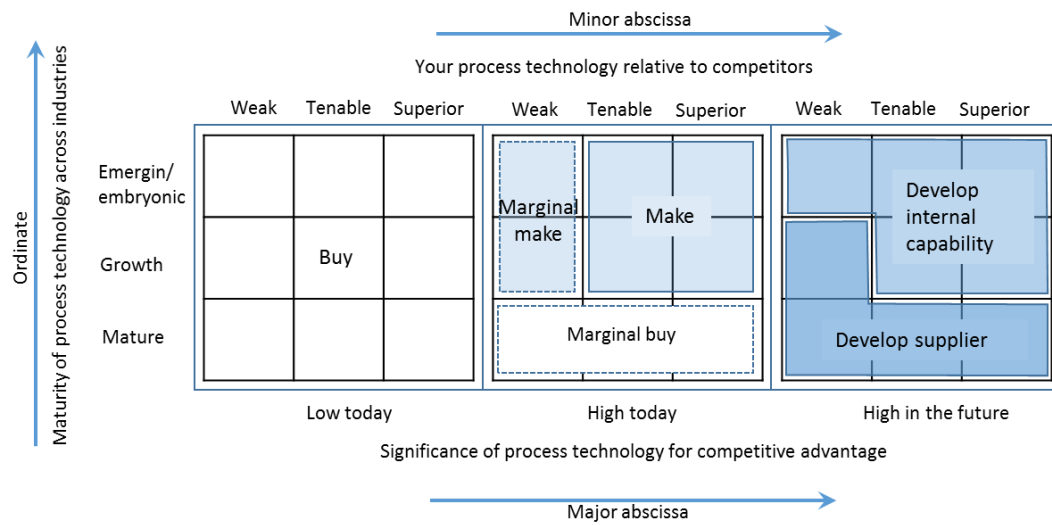


Figure 9 Strategic sourcing model (Welch et al. 1992)

The make or buy decision framework created by C  nez et al. (2000, p. 1322) presents the view for the question “why make or buy decisions are made”, and the relevant dimensions need to be studied in approaching make or buy decisions (Figure 10). Departing from the other approaches to make or buy, the presented framework provides a holistic view of the make or buy. This is achieved as the relevant factors are compiled in a structured way, enabling make or buy decisions of single item or group of items.

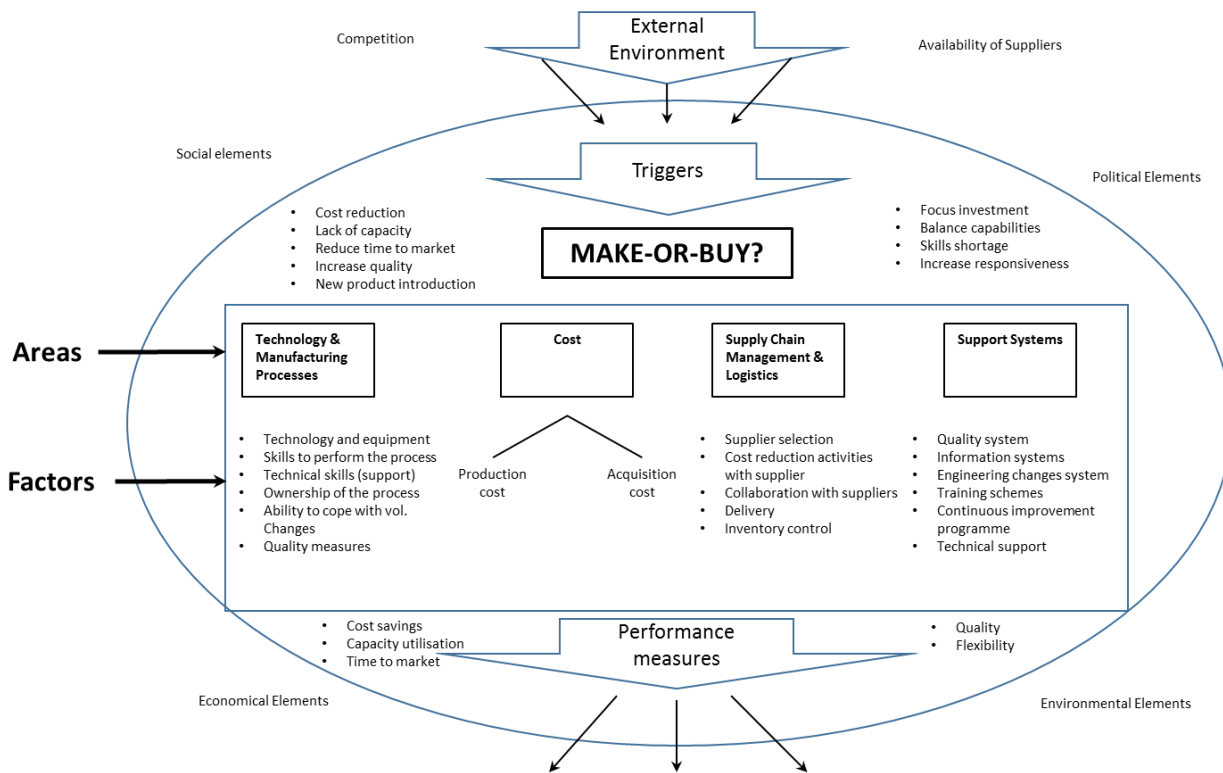


Figure 10 Framework of make or buy decisions (Cáñez et al. 2000)

The framework shows the path of make or buy question step by step from External environment to Triggers and to Performance measures and finally back to External environment, where the outcome measures are showing whether the make or buy question is valid or not, and is there a need to proceed to make or buy decision. According to Cáñez et al. (2000, p. 1321) the framework is suggesting four areas to frame a group of relevant factors for make or buy: technology and manufacturing processes, cost, supply chain management and logistics and support systems. The four sections, technology and manufacturing processes, cost, supply chain management and logistics, and support systems, are clustering the relevant factors for make or buy, suggested by the framework.

The performance measures are closely linked to the triggers, and the performance measures for the decisions done in these four areas are giving feedback to external environment and therefore possibly activating other triggers which then will raise the make or buy question again.

For example, if company meets heavy competition, it is external environment issue, and analyzing it as trigger it can be cost reduction due to insufficient capacity. To achieve cost reduction, company must consider the four areas and factors related to them. If company sees technology and equipment in-house are restricting cost reduction, then in next area it's related to either production cost or acquisition cost. If company wants to select production cost, meaning analyzing whether to modify in-house production or look for competitive production outside. In next area there are several possibilities to consider. If company analyzes shows the best way to proceed is collaboration with supplier, in the next area, there could solution of continuous improvement program to be established with selected supplier. The following performance measure is then capacity utilization, which in this case is the solution to cut down the costs, as there is now enough capacity to produce with no extra cost.

Difficulty of the make or buy decision

There are found few key problems companies have encountered during their studies of finding out formulation to an effective make or buy decision: firstly, no standardized method for decision evaluation, secondly, insufficient cost data available in the systems and thirdly, the competitive implications of the decision (McIvor et al. 2000, pp. 296). Though the make or buy issues are important, the decisions made are often only having short-term perspective, at a tactical level, and only by cost basis (Moschuris, S. 2014, pp. 3). Moschuris states many companies are forced to executed make or buy investigations under cost reducing demands and/or simultaneous improve the quality of supply. Also, they are saying that in many studies are findings of criteria which are influencing issues in tactical make or buy, although the effect of found criteria to companies is not studied, as well no studies if the effect changes on company basis or are the dependence due to variables. Cáneez et al. (2000, pp. 1313) claims the make or buy decisions is done more often on costs basis, than by strategic implications, though there have been practical structured guidance provided during last 10 years.

2.2.3 Outsourcing

In 1950s and 1960s US industry moved away towards outsourcing from the vogue of vertical integration created by Henry Ford, as companies found out many advantages of outsourcing. They discovered advantages, e.g. conversion from fixed cost to variable cost creating flexibility in an economic downturn, balancing demand in work force, lowering capital investment requirements, supplier's economies of scale and lower wage structure lowering costs, new product development could be accelerated, getting benefit from invention and innovation of suppliers, and possibility to focus resources on activities with high-value. (Welch et al. 1992, pp. 23).

Dolgui et al. (2010, pp. 77) have defined outsourcing as purchasing of services, semi-finished products and components, which were earlier traditionally provided in-house, by buyer (outsourcing company) from vendors (outside companies). Outsourcing action requires coordination and information exchange between the trade parties. Outsourcing is defined as purchase from a vendor in same country. When a vendor is abroad, term outsourcing changes to term offshore outsourcing. These two terms are related to moving a part of the production or service system to an external company. When full business process is located abroad, term turns into offshoring. As the processes outsourcing, offshore outsourcing and offshoring are close and partly very similar to each other, these terms are frequently confused (Dolgui et al. 2010, pp. 77-78).

According to Quinn et al. (1994, pp. 43) there are two strategic approaches in outsourcing which allow managers to overrule other strategies and gain competence with their company's skills and resources: providing unique value to customers and achieving definable superiority by concentrating on company's core competencies, and outsourcing activities, which are not strategic or essential to company, based on a strategic decision. The benefits are significant when these two approaches are combined with success. Four main benefits are defined in literature. First, return of concentrated input value is maximized. Second, competitors threat can be prevented by rigid barrier build up with well-developed core competencies. Third, the activities of supplier, investments, innovations and professional capabilities that may not be possible to execute in-house,

utilized in full giving the best leverage. And as final benefit, lowering risks, shorter cycle times, lower investments and better responsiveness to market need, due joint strategy in market-places and technological situations in rapidly changing business environment.

The core competency concept combined together with strategic outsourcing to create maximum effectiveness, is a challenge to managers, as they must carefully evaluate several difficult issues such as: What are actual core competencies? Should all core competencies kept in-house, which activities to outsource and which not? What value each core competence creates? What are the risks and how they are related to each situation? Does outsourcing create critical risks? (Quinn et al., 1994, pp. 44).

Following is suggested as effective core competencies (Quinn et al., 1994, pp. 45):

1. Sets of skill and knowledge instead of products or functions; where interaction of sets of skills cut across traditional functions, allowing an activity in organization to perform consistently better than functional competitors with continuous improvement of the activity as markets, technology and competition evolve.
2. Flexible, long-term platforms capable of adaptation or evolution; which defines distinctive features of successful core competency strategies: flexible skill sets and constant, conscious reassessment of trends.
3. Limited in number; meaning company must concentrate only on few, preferably from two to four, activities which presents the most critical future success factors in the value chain.
4. Unique sources of leverage in the value chain; the “empty” places in value chain like knowledge gaps or market imperfections that could be filled with company’s unique skills, and where intellectual resources are high leverage by investments.

5. Area where the company can dominate; chosen core competences of activity are continuously benchmarked and developed against potential suppliers to be able to overcome other suppliers.
6. Elements important to customers in the long run; understanding and serving customer must be covered at least with one core competence, aggressive analyzing of customer's value chain can identify the activities where customer can be served best by lower cost or more effectively.
7. Embedded in the organization's systems; core competencies should be build inside the company through its reputation or culture, if core competencies are e.g. creativity, personal dedication, or initiative, they could include recruiting, training, marketing, innovation or motivation systems.

Companies are defining core competencies as the main reason for the outsourcing decision, which creates complex task to find out clear understanding of difference between core activities and non-core activities. Quinn et al. (1994, pp. 47) says peripheral activities, which are intermittent, could be outsourced are often disregarded by managers as they are more concentrated on those activities which are executed constantly. Furthermore, it is fraught with many ambiguities defining organization's core competency, as core competence or core activity is not a product or some actions executed relatively well, but activity which company can perform out ruling other companies. Intellectually based service activity or system is such typical activity. The outsourced activity cannot be the core competence or core activity (Mahaorand et al. 2005, p. 3).

According to the resourced based view of content model for make or buy decision, concerns how the company's assets and resources can develop and affect performance and competitive position of the company. As well there is argument that keeping rare, valuable and difficult to imitate resources, is what company's survival depends on. In process models the question is how the different steps for gathering data and evaluation criteria for a make or buy decision are taken. Companies which don't implement a structured process in their strategies, may end up situation where the present is reflected from the past, with

decision done of vertical or horizontal orientation, and where the company's long-term strategy is not followed by short-term decisions. (Moses et al. 2008, pp. 232-233).

2.2.4 Offshore outsourcing, Offshoring

Global sourcing in literature has been suffering from lack of consistent terminology and definitions. Quintens, L., Pauwels, P. & Matthyssens, P. (2006, pp. 170) have found many terms describing global sourcing, e.g.: global sourcing, international purchasing, worldwide sourcing, import sourcing, offshore sourcing and international procurement. Bals, L., Kneis, K.C., Lemke, C. & Pedersen, T. (2013, pp. 170) have recognized following terminology in the literature: international outsourcing, offshore outsourcing, captive offshoring, international sub-contracting, far-shoring, near-shoring, which may advert to behavior of use of different terms and aspects but mainly to the same process where companies are setting up activities in foreign locations to support domestic or global operations.

The term offshoring is established in recent literature. Offshoring is also defined as relocating business processes, services, and work to overseas locations as a strategy, in locations where business is most rational to execute. This is carried out by capitalizing of global skill pool, possibilities in communication technologies, and the benefits of cost arbitrage (Bellow, E., 2013, pp. 274). Recently, in literature have been emerged a consensus of how to present offshoring in matrix form (Figure 11) showing the interdependence between location and ownership factors (Bals et al. 2013, pp. 12). There is a fine line between offshoring and outsourcing processes: offshoring refers to internal operations of a company in a location outside a home country, outsourcing is merely a contractual relationship between a company and a vendor providing services outside a home country, and therefore they are commonly and mistakenly mixed (Bellow, E., 2013, pp. 274).

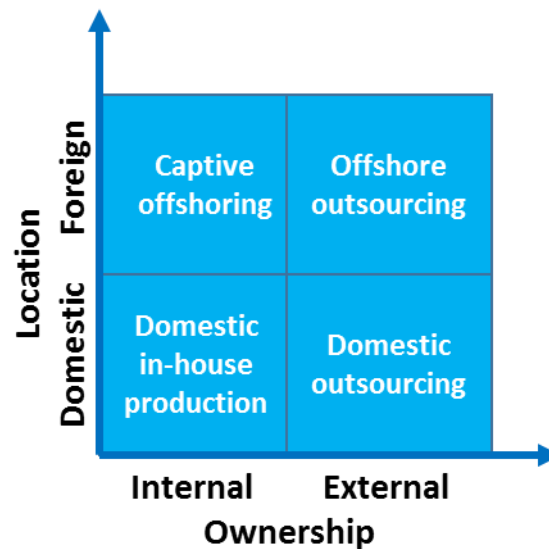


Figure 11 Simplified model of offshoring

Bals et al. (2013, pp. 3) have defined offshoring as follows:

“An International relocation of disaggregated firm value chain activities in captive, collaborative or outsourced governance modes”

The core of understanding of the definition is to recognize the outsourcing process as relocation of company activities from the origin country to a foreign location. Offshoring involves three main organization processes: the disaggregation of company value chains into activities possible to offshore, the relocation of these activities to foreign locations and the re-integration of the activities into a concerted organizational whole (Bals et al., 2013, pp. 3). Editorial of Journal of International Management (2009, pp. 122) describes how the strategic decision of a company is defining the offshoring, as competencies supporting competitive advantage are influencing the critical strategic global sourcing decisions. The primary objective in global sourcing strategy to create competitive advantage, is to combine internal (company’s) and external (supplier’s) competencies with the comparative advantages of various geographic locations. They present two ways how the intermediate products are sourced globally in organizational point of view. The first way is to source products from the mother company or from abroad subsidiaries by intercompany trade (insourcing). The second way is to source products on contract from independent suppliers

(outsourcing). On the other hand, when changing the viewpoint to a location, global companies can have domestic manufacturing (onshoring) or abroad manufacturing (offshoring), which enables to form matrix showing relations between in/outsourcing and in/offshoring (Table 2). This table is comparable to Figure 9, which viewpoint is from location and ownership.

Table 2 Strategic choice: location and control

		Geographic location strategy	
		Onshore	Offshore
Control strategy	Insourcing	Onshore in-house	Captive offshore
	Outsourcing	Onshore outsourced	Offshore outsourced

Source: Journal of International Management 15 (2009) p. 122 (editorial)

(Paz-Aparicio, C. & Ricart, J.E., 2013, pp. 25) presents two main types of offshoring: transfer of blue-collar work and transfer of white-collar work. Offshoring of blue-collar functions has mostly concerned manufacturing operations since 1960's and offshoring of white-collar functions service operations since early 1990's (Bals et al. 2013, pp. 4; Paz-Aparicio et al. 2013, pp. 25). This leads offshoring of services to situation where development of international economic tends to be the most critical issue, which can be recognized by implementation of the activities: manufacturing, as blue-collar workers, concerns relocating, and services, as white-collar workers, concerns displacing. Paz-Aparicio et al. (2013, pp. 25) also claims beside the traditional main driver to outsource and offshore, cost reductions, there are two new increasingly significant strategy motivators identified: knowledge assessing, and deeper understanding and exploiting of foreign markets, although the motives to realize offshore outsourcing will change from time to time. Bellow, E. (2013, pp. 273) says the offshoring is mainly used by companies which are looking for cost savings, more flexible manufacturing and an entering possibility to new markets. Since 1990's outsourcing has been turned into a common strategy and companies are seeking cost cuttings by using both outsourcing and offshoring as a business strategy (Bellow, E., 2013, pp. 274).

Offshoring development

Some researchers are claiming there have been three main waves of global sourcing. First occurred in mid-1980's primarily focused on manufacturing operations, which lead research to concentrate on manufacturing companies. The second wave was in early 1990's when operations relocated in foreign countries focused on in-house information technology operations, mainly due the substantial growth of IT-departments. The IT operations had already become commoditized, and the interest of companies to develop IT operations further was reducing to rapid acceleration growth of IT providers. The third wave, maybe the most important wave, realized in the early 2000's by offshoring movement of business service processes from accounting and human resources to finance and after-sales, which raised concern if the knowledge is transferring to suppliers and they will rise up in the value chain and start competing against the sourcing companies. (Editorial of Journal of International Management, 2013, pp. 122)

There are several factors recognized impacts global sourcing strategy of a company, many of them highlighting the strategy advantages. Firstly, improving performance, especially the cost effectiveness trough the global sourcing. Secondly, acquisition of knowledge and competence development concerns as sourcing driver. Thirdly, location concerned availability of some materials or components drives to global sourcing as necessity. Fourthly, gaining access to its customers and having production close to its customer markets to acquire knowledge, known important for product development, of the local markets. And finally, pooling of sourcing power of global demand by single point of sourcing achieving scale economies and bargaining power. (Editorial of Journal of International Management, 2013, pp. 122).

Knowledge transfer

According to Slepnirov, D., Waehrens, B.V. & Gubi, E. (2013, pp. 125) the discussion of offshoring of services in the literature focuses typically on traditionally recognized service sectors, software providers, call venters and business process outsourcing, whilst literature concentrating on manufacturing offshoring is mainly preoccupied with production

offshoring. They argue that to have deeper understanding of the offshoring phenomenon in high-value knowledge-intensive activities, the research must cross the line over this traditional split. Development in offshoring during near past has presented the phenomenon to offshore knowledge-intensive white-collar work. The offshoring is dominantly concerned blue-collar work in a view of a traditional understanding and white-collar offshoring compared to the blue-collar work is quite new phenomenon (Slepnirov et al. 2013, pp.126). The reasons for white-collar work late offshoring are: activities are kept in house and they are linked to other in-house operations often so tightly, white-collar work is far more harder to transfer to offshoring, and the rate of change of knowledge which has affect how the knowledge transfer should be executed (Slepnirov et al. 2013, pp.126).

They argue, that the mobility of value-chain activities has increased, due to “shrinking” world leading to situation where the locations with right technologies, skills and knowledge are found, it can create activities wherever the locations are The reason for world “shrinking” is convergence of three factors, major political events occurred during past twenty years, innovations and companies, which has led to new global situation of collaboration of international and inter-company by new conditions, methods and tools, simultaneously decreasing the relevance of geographical divisions. (Slepnirov et al. 2013, pp. 124).

The knowledge transfer in offshoring is important in both blue-collar and white-collar work offshoring. This knowledge transfer is defined as a process where causally ambiguous but complex set of routines are viewed in a new setting, recreated and maintained by the organization. It is also argued that in the context of knowledge management the knowledge transfer is able to be organized in three properties: properties of units, properties of the relationships between units, and properties of the knowledge itself. (Søberg, P.V. & Wæhrens, B.V., 2013, pp.157).

When looking deeper into each of these dimensions, we can find out the literature is saturated with discussions of the knowledge transfer processes disrupting and/or facilitating key elements. The knowledge transfer between different stakeholders (e.g.

headquarters, subsidiary, and supplier) can be defined into three categories: primary, secondary and reverse. The knowledge transfer from headquarter to the subsidiary is defined as primary knowledge transfer, transfer between subsidiaries is secondary knowledge transfer, and transfer from subsidiary back to the headquarters is defined as reverse knowledge transfer. (Søberg et al. 2013, pp. 156).

R&D offshoring

As part of the white-collar offshoring during recent years, the R&D offshoring have raised its importance amongst offshoring activities, but it is still inadequately researched and understanding what the implications are for companies is very limited. R&D offshoring has taken its place on the offshoring when offshoring has widened and knowledge-intensive value-added activities has been included, therefore it has become essential for companies to foresee possible implications. Though the R&D offshoring importance is growing, scholarly contributions are mainly focused on the motives to offshore R&D and location choosing, and the research of the consequences of R&D offshoring remains scarce. The productivity is defined as a benefit for R&D offshoring, but the relationship between them is rarely researched, as it is mentioned there is only one published research examining R&D offshoring and productivity, Tang, J. & do Livramento, H. 2010 in their publish *Offshoring and productivity: a micro data analysis*. (Nierto, M.J. & Rodrigues, A., 2013, pp. 175-176).

Offshoring criticism

Though offshoring has been a part of global business success, it has also raised criticism. The President of United States, Barack Obama and the President of France, Nicolas Sarkozy as well some commentators as Dobbs (2004) and analysts as Price Waterhouse Coopers of Canada (2004) have accused offshoring being a lead cause for loss of jobs and competitiveness in Western countries. It's also implied by Nobel Laureate Samuelsson that in certain circumstances it is possible offshoring can be detrimental to developed country economies. Such wide criticism has launched mainstream economic writers to response in many ways, which then were partly revoked by other writers. So the debate amongst critics

and defenders of offshoring has not ended but is more or less in a draw, with no winners or losers. (Rangan, U.S. & Schumacher., 2013, pp. 38-39).

Paz-Aparicio et al. (2013, pp. 33) findings support this phenomena of job losses, expanding plans of offshoring activities are still in level of 57% out of financial service companies during next 18 – 36 months, though during their research the recession was showing its first signs. Though the supply chains and control of global value of high-value product life cycle-phases and tasks, have been remaining in advanced market economies, a higher concern of them to be offshored is raised (Seppälä, T., 2013a, pp. 58). Also one major negative issue in offshoring is cultural differences between buyer and supplier, such as language (communication) and institutional environment (Editorial of Journal of International Management, 2013, pp. 122). In the Editorial is presented issues for and against outsourcing, see Table 3.

Also Dolgui et al., (2010, pp. 104-105) claims the offshore outsourcing can be harmful in many ways, jobs are moved from developed countries to emerged countries leading to unemployment, lowering wages or workers meanwhile shareholders are gaining profit. The redundant employees shifts to other locations or other trade or business, requiring new skills which makes adaptation difficult with the phenomenon rapidly growing. The transfer of technology, know-how, management including research and production, enables future competitors to have free resources in a wide range of information.

Table 3 Arguments for and against outsourcing (Editorial 2009, Journal of International Management , 2009, Vol. 15, pp. 123)

The case for outsourcing	The case against outsourcing
<p><i>Strategic focus/reduction of assets</i> Through outsourcing activities a firm can reduce its level of asset investment in manufacturing and related areas. Therefore, stock markets usually react favorably to outsourcing since more or less similar absolute profit levels can be obtained with lower fixed investments. Furthermore, outsourcing can help the management of a firm redirect its attention to its core competencies, instead of having to possess and update a wide range of competencies.</p>	<p><i>Interfaces/economies of scope</i> Firms may benefit from internalizing production through scope economies. Manufacturing firms, in their outsourcing decisions, ought to reflect on the interfaces among R&D, manufacturing, and marketing. If there are important interfaces between activities, decoupling them into separate activities performed by different suppliers will generate less than optimal results.</p>
<p><i>Strategic flexibility</i> Outsourcing may increase the firm's strategic flexibility. By using outside sources, it is much easier to switch from one supplier to another. If an external shock occurs, firms are able to react quickly by simply increasing or decreasing the volumes obtained from an external supplier. If the same item were produced inhouse, the firm would not only incur high restructuring costs but also a much longer response time to external events.</p>	<p><i>Hollowing out</i> Firms that outsource activities excessively are hollowing out their competitive base. Once activities have been outsourced, it tends to become difficult to differentiate a firm's products on the basis of these activities. Furthermore, a firm could lose bargaining power vis-à-vis its suppliers because its suppliers' capabilities may increase relative to those of the firm.</p>
<p><i>Avoiding bureaucratic costs</i> Rising production costs are associated with internal production, due to a lack of a price mechanism and economic incentives inside a firm. As a consequence, firm efficiency will suffer.</p>	<p><i>Opportunistic behavior</i> External suppliers may behave opportunistically as their incentive structure varies widely from that of the outsourcing firm. Opportunistic behavior allows a supplier to extract more rents from the relationship than it would normally do, for example: by supplying a lower than agreed-on product quality or withholding information on changes in production costs.</p>
<p><i>Relational rent</i> In recent years, many researchers have argued that certain relationships with external suppliers can help create a competitive advantage. By outsourcing items based on idiosyncratic and valuable relationships with suppliers, firms may be able to innovate, learn and reduce transaction costs.</p>	<p><i>Rising transaction and coordination costs</i> Excessive outsourcing may lead to high coordination costs. Firms are limited in their capacity to work with outside suppliers as partners and therefore have to prioritize outside partners. If they simultaneously invested time and attention to all outside suppliers, this would induce very high coordination costs.</p>
	<p><i>Limited learning and innovation</i> A form of learning that is deemed especially important for attaining tacit knowledge is learning-by-doing. The supplier may acquire tacit knowledge by performing the activity; consequently, the outsourcing firm cannot appropriate all benefits. Appropriation of innovation and rents is always a problem in buyer-supplier relationships because both parties will try to obtain as many private benefits as possible. Furthermore, it may become more difficult to innovate, due to the different</p>

Seppälä, T. (2013a, pp. 58) has recognized a phenomenon concerning global high-tech companies, acceleration of disaggregation of company's value and supply chains. One approach to this phenomenon is international trade theory perspective of disaggregation of company value and supply chain by separating trade in tasks from trade in goods, other approach identifies higher resolution level examination of unbundled value and supply chains. These approaches reflect the current working environments of any multinational enterprise, and represent the prevailing perspectives regarding global value and supply chains. The disaggregation phenomenon is represented as control of most valued product life cycle phases and tasks remaining in advanced economies, and less valued product life cycle phases and tasks moving to emerging economies. On the other hand, Rangan et al. (2013, pp. 38) argues the value-add slowly moves and migrates to low-wage countries, i.e. emerging economies.

Global sourcing strategy is commonly connected to the long term implications of outsourcing, and there are two schools opposed to each other on this matter. This view difference is concerned especially the situation, where companies are coming more and more depended on suppliers due to outsourcing, and this arguing is related company's core competence long-term sustainability. The first school argues, the supply chain constructed of alliances by cross-border joint ventures, subcontracting and licensing activities, provides flexible network system where each party can pursue its own specific competence. The second school argues negative long-term consequences may arise, though companies may achieve short-term advantages as their technical expertise and competence towards suppliers decreases in the long run into the point where company's value-add tends to be limited. In strategy wise, global sourcing may lead to a decline in company performance, if the global sourcing strategy is not applied in an appropriate context to company and specific characteristics of company's industry. (Editorial of Journal of International Management, 2013, pp. 123).

Entrepreneurial organization

Rangan et al. (2013, pp. 39) present entrepreneurial globalization which is defined by research of occurrence of entrepreneurial transformation to the companies facilitated by

offshoring. This can be implemented by establishing companies, or using existing companies to move and execute value activities in other companies. The entrepreneurial globalization is argued to include five inter-related steps:

- rethinking an existing business
- reconfiguring its value activities
- leveraging other companies resources
- creating new strategic options
- developing organizational innovations to create sustainable long-term value

Typically in traditional view, the globalization is presented as extending of the new company's monopolistic advantages to new locations, value activities in whole are replicated in many locations and countries to create there independent units. This leads company to rely on its own resources, and main channel for reliance to other companies is supplier-buyer relationship. In such view, the development and evolvement is typically slow, due to lack of market pressure the multinational company does not have much interest to recast in the locations marketplaces.

The entrepreneurial globalization is described, in the contrast to above mentioned view, so that companies shift abroad, not to clone the company, but to create some new advantages by appropriately distributing activities worldwide. Entrepreneurially globalizing companies, when necessary, are keen on rely on other company's resources, and using other company's resources as leverage is a resource and the best way to proceed ahead for a company. Also, entrepreneurial globalization favors innovations amongst the companies, as well companies are willing to grow by new strategic options. All these aim in the end, companies to reduce bureaucratic processes to achieve efficient global operations, in a constant and a frequent adaptation. See the contrasts between traditional and entrepreneurial globalizations listed in Table 4.

Table 4 Traditional versus entrepreneurial approaches to globalization

	Traditional globalization	Entrepreneurial globalization
View of globalization	Extension of monopolistic advantages to new countries	Rethink the existing business and do it differently globally
Value chain activities	Replication of all or most activities in-house in many countries	Reconfigure value activities and distribute them worldwide partly in-house and partly with other firms
Use of other firms	Maintain control over most activities and use other firms mainly as arm's length suppliers of inputs	Gain leverage through other firms resources through strategic partnerships
Future growth and strategic evolution	Driven from the center or headquarters and mostly incrementally	Create and exploit strategic options as they occur worldwide because of global configuration of value activities
Organizational processes and systems	Slow to change and the emphasis is mainly on managerial control	Change quickly to suit a more entrepreneurial firm where the emphasis is on customer level

2.2.5 Open book accounting

The open book accounting purchasing process was established to gain from extending the collaboration with suppliers into management accounting, where the internal cost and other related data is shared with the parties (Ellström, D. & Larsson, M.H., 2017, pp. 21). Hoffjan, A. & Kruse, H. (2006, pp. 40) are describing open book accounting as consistent opening up of cost information over corporate borders between individual legal entities. According to Caglio, A. & Ditillo, A. (2012, pp. 61) claims that open book accounting may consist management accounting, supporting inter-organizational action by exchange of

information between the parties. They also define as one key factor of open book accounting, degree of openness or level of transparency in disclosed information. Although Ellström et al. (2017, pp. 22) argues there are different kind of open book accounting relationships, based on assumption of various interview respondents and authors.

According to Ellström et al. (2017, pp. 22) there are two sublevels in open book accounting, one using static prices and other using dynamic prices. The static price contracts are based on price decisions which rest on indirectly used cost information, and the negotiation format is non-open book accounting business relationship as negotiated price basis on expected value. In the dynamic price contracts the price is based on the cost information. These two pricing mechanisms have a key difference, on dynamic pricing the cost change on supplier automatically changes the contract price, when on static pricing the cost change requires renegotiation.

Three factors on open book accounting are recognized describing the business relations and possible effects: degree of economic dependence, duration of contract, and number of contractual parties (Hoffjan et al, 2006, pp. 40).

2.3 Supplier: evaluation and selection

Supplier selection is part of the outsourcing process. Dolgui et al. (2010, pp. 80-81) presents the outsourcing process in their 7 step process:

First, company must select outsourced activities or services. These must be non-core competencies, for which is set strategy aiming to consolidation and improvement. From these activities is listed those activities which have the least core competence or in-house resources. Second step is to select the most suitable activities from the list. The selection process includes evaluation of each activity's importance related to company's general strategy and set objectives, condition definition for succeeded outsourcing, analyzing of outsourcing effect to management of the company and evaluation outsourcing benefits and foreseen costs.

In the third step is supplier identifying and selection, which is the most critical due to conflicting qualitative and quantitative criteria. There are many factors to be viewed in addition to normal criteria: Is supplier candidate committed to continuous improvement? How strong is the supplier candidate's will for long term cooperation? Are they committed to cost reduction? Are the quality issues in line with their other commitment? Are they able to reach demand with consistency? Is the operation agile and reactive? What is their ability to reduce lead times? We can see multiple factors, which are targeting to same goal, cost reduction, just by different means.

The fourth step concerns the negotiation with supplier. Negotiation must be done only after the criteria and ground rules are set and the negotiation should be following accordingly. It is important not to negotiate if the criteria is not unclear or not available. In the fifth step is evaluation of supplier in certain periods continuously to have possibility to evaluate how the agreed criteria is fulfilled. Next step, sixth, concerns periodic review with supplier to analyze how the outsourcing has been evolving in the case.

Seventh step is to examine the effect of supplier's location, especially when supplier is located abroad. The taxation, customs clearance, exchange rates and input price uncertainties needs particular attention, as they vary from country to country, and can influence the outsourcing decision.

Selecting supplier for a company targeting best performance, it is critical that vendor fulfills the criteria of a successful performance: competitive, high quality, lead time as required, able to meet delivery schedule, appropriate after-sales service and ability to manage emergency situations. Such vendors are typically enlightened, dependable and ethical (Vrat, P. 2014, pp. 317). The ethical factors are in today's business world very important issue. The Group has "Supplier Code", which includes a code of conduct and ethics for suppliers, setting the minimum requirements for supplier to conduct business with the Group as a supplier. The "Supplier Code" presents following topics to take into account:

- Organizational requirements and management responsibility
- Human rights and fair working conditions
- Environmental responsibility and sustainability
- Business integrity
- Export control
- Intellectual property rights, trade secrets, and data protection
- Supplier's commitment and contractual obligations
- Reporting, monitoring, and sanctioning
- Compliance contacts at Case Company

As this is important issue, the supplier must comply the “Supplier Code” to be able to do business with Group (The Blue Book, Group, 2015).

Vrat (2014, pp. 317) says searching for a vendor the buyer can facilitate its network, either other vendors or vendors other clients, and internet as proactive action. When doing business with the selected vendor, it is important to have clear and complete purchase orders to avoid possible later conflicts, also buyer being transparently fair and objective is important behavior, but same time touchstone, to reach good supplier relationship management.

In their research Quintens et al. (2006, pp. 171) are defining global sourcing to be company's worldwide activity of searching and obtain goods, services and other resources, which target is to fulfill company's needs and consolidate its position in the market. They are presenting three pillars to describe this definition. As first pillar the global sourcing is determined to be more than just physical sourcing, where strategic operations, such as supplier development and synergies in global sourcing, gains ground from operational tasks. The second pillar of the definition concede the global search activities should not automatically lead to offshore sourcing for offshore sourcing's sake, but sourcing must be based on the best cost principal, within the global sourcing strategy, which may also lead to local sourcing. In the third pillar the company's must also recognize the organizational alignment and implementation processes along the strategy formulation to be part of the global sourcing research.

Though above mentioned definition is not directly concerned to supplier evaluation or selection, it gives various basis for it. Quintens et al. (2006, pp. 173-174) have found in their research antecedents of global sourcing, which includes number of factors related to supplier evaluation and selection (Table 5).

Table 5 Proposed antecedents of global purchasing

	Drivers	Facilitators	Barriers
Product	Cost advantage (materials and components) Better delivery performance Higher-quality products Unique of differential products Obtain better technology	Product type Supplier certification Top management support Nationality of parent company	Limited production volume Different product standards Regular design changes Insufficient product modifications Delivery delays
Firm/management	Assure organizational flexibility Global attitude, orientation and experience Centralization of decision making Integration of worldwide activities	Knowledge on foreign businesses, exchange rates and global opportunities Planning for global purchasing Operational philosophy (lot sizes, number of suppliers, etc.) Development of communication skills	Parallel trade Lack of resources needed for global sourcing (staff, time, money, etc.) Cost of travel and accommodation Accurate demand forecasting Nationalistic purchasing behavior Increased paperwork
Network	Take advantage of existing logistics systems Diversification of the supplier base	Long-term relationship prospects Buying alliances	JIT sourcing requirements Finding qualified suppliers Foreign supplier image
Industry/competition	Competitive positioning Protect proprietary technology Gain a foothold in new markets Market size	Type of industry Technological orientation of industry	Diverse business practices Limited industry information Agents/brokers fees Intensity of foreign competition
Environment	Cost advantage (labor) Satisfy countertrade requirements Guard against currency fluctuations Stimulating foreign government policies Advantageous legal and economic environment	Development of trade zones Better foreign transport and communication Capable intermediates Cultural similarities	Import quotas Country of origin image Adverse political environment Adverse economical environment Customs regulations Different time zones Lack of government assistance Language/cultural differences

2.4 SWOT-analyses of outsourcing

Studying and evaluating the appropriate outsourcing activities can be used SWOT-analysis, coming from terms Strengths, Weaknesses, Opportunities, Threats, (Katarikar, R. & Pawar, K., 2011, pp. 925) to define the benefits and risks that outsourcing may consist. The SWOT-analysis tool is used to create overview or snapshot of the company's health and it is critical tool to determining which strategy best fits for the organization in its external operating environment point of view. The SWOT-analysis may be a powerful tool in identifying and matching core capabilities of the company.

Before the company has ability to start to use the SWOT-analysis, there must done step-by-step plan planning for outsourcing. Katarikar et al. (2011, pp. 927 - 929) have presented 8 step plan whereof the managers can proceed to ST-analysis. The step plan shown below includes some example questions and actions:

STEP 1: Describe the own situation - Helps to analyze the company with following questions

What are the objectives of the company?

What is the own company strategy?

STEP 2: What can the company outsource and what not?

What are the semi-finished and final products that the company manufactures?

Which are the production processes or parts of the key competencies and key activities that can be considered for outsourcing?

STEP 3: Which vendor?

Are there vendors who can supply the products or processes that the company has identified for outsourcing?

Are there specialized vendor? Subcontracting is part of activity of the potential vendor?

STEP 4: Ask for quotations from vendors

Prepare a very detailed request for quotations. Be the clearest as possible and use the check-list for and optimized co-operation.

STEP 5: The final decision: to manufacture or to outsource?

Calculate the costs to manufacture in-house and those for subcontracting and compare the two type's costs.

Are the financial and non-financial advantages higher than perceived risks?

STEP 6: Choose vendor or vendors

During this phase the decision and choice should be based not only on quotes, but as well on the characteristics and/or qualifications of the vendor.

STEP 7: In action for

Arrange an appointment and prepare a contract

Make the test order

Make the first order

STEP 8: Assessment of vendor for services

Comparing the supply against the contract to find any differences

Vendor should be immediately noted of deviations in the supply

Continuous follow-up and evaluation of the vendor

Katikan et al. (2011, pp. 927 - 929) presents also schematic framework of how SWOT-analysis works (Figure 12):

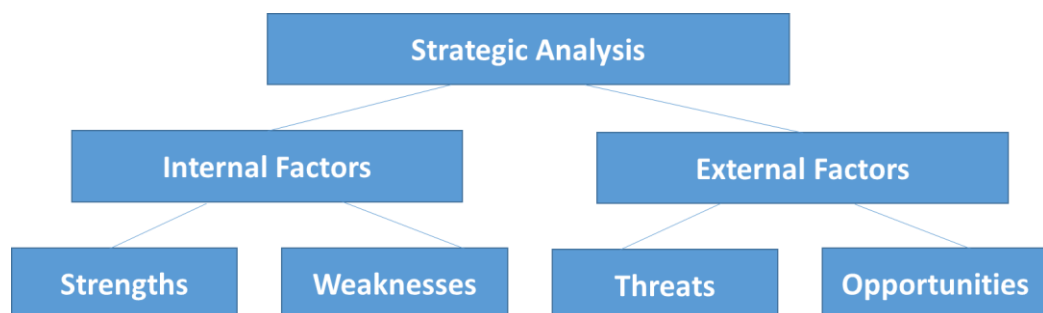


Figure 12 Schematic of SWOT-analysis framework

The SWOT-analysis must be filled with the criteria the company sees relevant to business area and to operation. In the Figure 13 is an example of SWOT-analysis.

Strengths	Weaknesses
<ul style="list-style-type: none"> - Strong research and development, cash flow, market share - Held patents - Weak customer or supplier power Good reputation 	<ul style="list-style-type: none"> - Weak research and development, cash flow, market share - Ending of patent protection - Strong customer or supplier power - High cost structure
<ul style="list-style-type: none"> - Reduction in trade barriers for foreign expansion - Competition - Market and economy situation - Shareholders expectations - Cost level in vendor country 	<ul style="list-style-type: none"> - Reduction in domestic barriers - Competition - Market and economy situation - Shareholders expectations - Cost level in vendor country
Opportunities	Threats

Figure 13 SWOT-analyses

The SWOT-analysis with found strengths, weaknesses, opportunities and threats, is then turned into more detailed questions how to reach and mitigate the found issues.

2.5 Potential risks in outsourcing

As mentioned in the paragraph 1.1, there are many risks involved in outsourcing. In this chapter the risks are described in more detailed way, to find out what are the most effecting risks to outsourcing. I will start with risks that are not related to outsourcing process itself, but which are more external risks.

There are also many other challenges and risks in the outsourcing. Olson.D.L & Wu, D. (2010, pp. 1) have studied enterprise risk management in supply chains and they are describing three main risk categories: Natural disasters, malicious activities and systematic failures of human systems. The risks concerned supply chain itself can be categorized in many terms, Zsidisin, G.A. & Ritchie, B. (2009, pp. 4) have recognized following terms:

“1. Disruptions to the supply of goods or services, including poor quality, which cause downtime and consequent failure to satisfy the customer’s requirements on time.

2. Volatility in terms of price may result in difficulties in passing on price changes to the customer and potentially have consequences in lost profit.
3. Poor quality products or service, either upstream or downstream, may impact on the level of satisfaction of the customer with consequences for future revenues and possibly more immediate claims for financial compensation.
4. The reputation of the firm, often generated by issues not directly related to the supply chain itself, may pose risks. Inadvertant comments by senior executives or the failure to endorse certain protocols may damage the reputation of the organization.”

Zsidisin et al. (2009, pp. 3) describes supply chain management to be more proactive than reactive as the parties in supply chain are together aiming, whilst managing more complex interaction of risks, to more competitive advantage, value adding, lean and agile operations, and profitability.

The challenges in outsourcing are also defined by complexities of offshoring (offshore outsourcing). The complexities are divided into six subcategories: task complexity, structural complexity, operational complexity, social complexity, spatial complexity and outcome complexity. The complexity of offshoring is today realized by companies that the managing as increasingly globally dispersed organization is more difficult and costly than expected in the planning phase. Many companies have been experiencing setbacks due to the “harsh reality of offshore outsourcing”, as they have not been able to choose right processes, estimate the operational and structural risks nor match organizational forms to cope with the initial expectations of the offshore outsourcing activities. (Pedersen, T., Bals, L. & Ørberg, J.P.D. & Larsen, M.M. (ets), 2013, pp. 5.).

Burtonshaw-Gunn, S.A., (2009, pp. 188) defines in his research the risks related to private initiative finance (PFI) projects. Although private initiative financing is used as procurement method when executing construction projects for central government, this also can be partly applied to EPC projects as well. In risk management of PFI-projects is defined term prime contracting:

“a systematic approach to the procurement and management of buildings, based on the role of a Prime Contractor in integrating all the activities of a pre-assembled supply chain. The approach also draws together a number of best practices, including through-life costing, value engineering and risk management, to achieve significant efficiency of the completed building”

Due to long payback period, typically agreements are made to cover period from 25 to 40 years, the pre-project risks requires careful assessment and management to enable the possibility for success of the project. Before any contacts or communication between PFI facilitator and prime contractor, there must be done an assessment outlining the project to evaluate the political and economic risks of country of destination. This assessment will be further broaden to cover more risk areas, see Table 6 for general areas to be considered, understood and addressed during pre-contract phase. (Burtonshaw-Gunn, S.A., 2009, pp. 193)

Burtonshaw-Gunn, S.A. (2009, pp. 194) also says the end customer must be connected to the project by getting their acceptance for the planned supply-chain, involving main sub-contractors, raw material supplier, special service providers, to gain better confidence between project facilitator and end customer. Strategic decision making of facilitator is strongly connected to the pre-contract assessment and risk management with importance.

Table 6 Pre-contract risk consideration

Risk area	Pre-contract considerations
Technical	Evolution and maturity of design Site investigations Source and availability of materials
Employment	Productivity of resources New or different methods of construction or operation Safety and security of employees and equipment Health, Safety and Environmental legislation Working patterns – hours, holidays
Financial	Inflation Fluctuation of foreign exchange Payment delays Local taxes Advisors fees
Political	Stability in terms of war or revolution, Constraints on availability or employment of expatriate staff The use of local companies and suppliers
Logistical	Availability of resources Customs procedures Import duties Embargo
Geographic and Social	Weather and seasonal implications Prohibitive weather patterns – typhoon, monsoon etc Cultural understanding including work practices season and religious beliefs

2.5.1 External risks to outsourcing

Climate change risk

Climate change as a risk factor is a relatively new issue in development of offshoring, defined as an uncertain risk with high likelihood of some degree of risk, and not fully understood or recognized what is the extent or impact. The risk of climate change may be accepted by judging and evaluating variety of factors: knowledge, judgement, trust, regulation, bias, the nature of risk, funding, political beliefs, aims, and supply and demand. Definition of risk management, following this definition of risk, is to attempt to reduce losses or volatility occurred by risks faced in the operating environment. (Bellow, E., 2013, pp. 276).

A definition of climate change by World Meteorological Organization (2018) is as follows:

“Climate change refers to a statistically significant variation in either the mean state of the climate or in its variability, persisting for an extended period (typically decades or longer). Climate change may be due to natural internal processes or external forcings, or to persistent anthropogenic changes in the composition of the atmosphere or in land use. Note that the Framework Convention on Climate Change (UNFCCC) in its Article 1, defines "climate change" as: "a change of climate which is attributed directly or indirectly to human activity that alters the composition of the global atmosphere and which is in addition to natural climate variability observed over comparable time periods". The UNFCCC thus makes a distinction between "climate change" attributable to human activities altering the atmospheric composition, and "climate variability" attributable to natural causes.”

The first studied external risks are natural disaster risks, such as earthquakes, floods, fires and hurricanes, which potentially can affect economic activities due to their characteristics of location, frequency and severity (Olson et al. 2010, pp. 59). The mismanaging and unmanaging of disaster risks reflecting current conditions and historical factors are factors leading to natural disaster losses. (Olson et al 2010, pp. 60). Wagner, S.M. & Bode, C.

(2009, pp. 271) says the increase in frequency of catastrophic events causes potential disruptions growing, as well increase their magnitude, giving event like hurricane Katrina as an example.

The second studied external risks, malicious activities risks, is related to criminal activities, terrorism and gray area activities in the business world. In the business world the gray area activities can be found in highly competitive marketing, success of supplier's product can often turn into slander of competitor products. The information technology is one area where the malicious activities have been arisen, like acts of identity theft or tampering with company records (Olson et al. 2010, pp. 1). The third category is maybe the most common source of crises, unexpected consequences arising from overly complex systems. There are very complex systems creating high risk: dam which may create disaster if it breaks, mine supplying precious materials but which may collapse, nuclear systems that are designed to be highly reliable but with many processes which needs checks and balances by human (Olson et al. 2010, pp. 2.).

The nature disaster events, emergencies and crisis, as floods, earthquakes, fires and hurricanes may cause large damage. The vast quantity of damages caused by nature disaster can be best viewed by examples.

The first example of nature disaster is forest fire, which have a variety of effects to environment and economies. As a positive effect there can be increase in community economic during fire suppression as well post-fire rebuilding. The positive experience effect is higher if the contracting for fire-suppression is done locally. Then on the negative effects there are burned timber, loss of tourism and recreation and affect to agriculture. More long term negative effects on state level are replacement of lost facilities and infrastructure, watershed and water quality mitigation, and restoration of sensitive species and habitat. (Diaz, J.M., SFE fact sheet 2012-7).

In 1998 Florida United States suffered from vast forest fires burning down over 200.000 hectares. The fires destroyed or damaged 337 homes and the final cost was over 880 million US dollars. The cost of lost timber was 605 million US dollars. In 2003 forest fires

burned over 152.000 hectares in San Diego, California in United States with overall cost of 2450 million US dollars. The cost for loss of home, business and property was nearly 1200 million US dollars.. For the economic impact of forest fires see Figure 14. (Diaz, J.M., SFE fact sheet 2012-7).

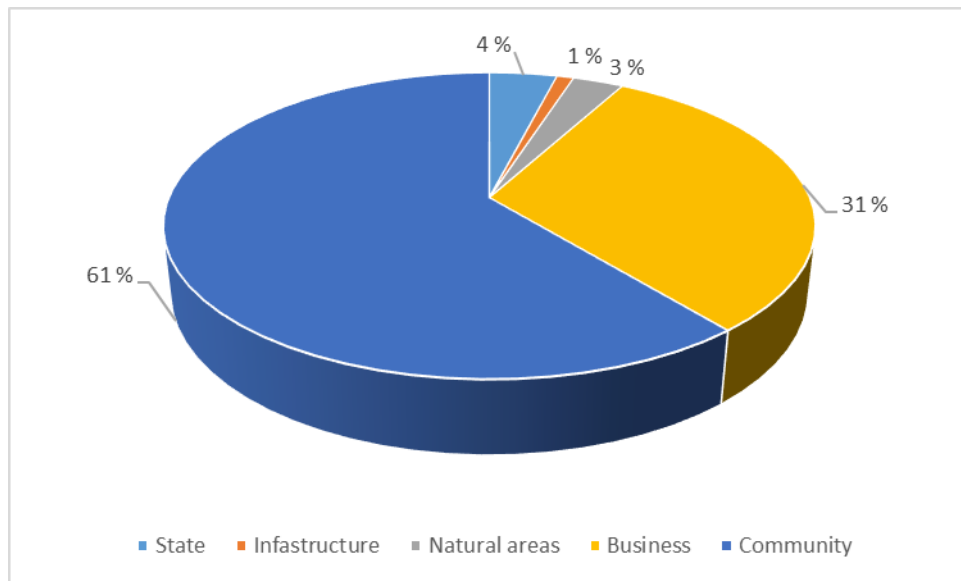


Figure 14 Proportion of total economic impact borne by different societal segments (San Diego County study)

The second example is volcano eruption in Iceland in 2010. The eruption of Eyjafjallajökull caused the largest European airspace shutdown since World War II. The airspace shutdown from April 14th to April 21st left over seven million passengers stranded effecting to trade, business and general production. The total loss of GDP, resulted by the prolonged inability to move people or goods, is estimated to be 4,7 billion US dollars. The eruption effected airline industry, destinations globally and international trade. (Ellersdottir, E.T., pp.129).

Country risk

The country risk issue is not deeply studied in this chapter, as it relates to many other chapters, and will be thoroughly viewed in the case study.

In research of (Burtonshaw-Gunn, S.A., 2009) on PFI-projects, country risks are directly linked to their assessment of pre-contract risk consideration (Table 6) on each risk areas. These risks are monitored by Euler Hermes, credit insurance company founded in 1893, providing quarterly information of worldwide country risk status involving economic, political, business environment and commercial and financing risks in 241 countries and territories. The outcome of this monitoring is company decision making support on non-payment risks. Euler Hermes provides reports such as country risk map (Appendix 1) and ratings (Appendix 2), in-depth economic country reports (Appendix 3), and business sector reports (Appendix 4) (Euler Helmer, 2018).

2.5.2 Internal risks to outsourcing

The risks in supply chain context, as internal risks, are caused by the modern complex supply chains, which are more vulnerable due to globalization and competitive pressure. This vulnerability is result of large outsourcing or offshoring of manufacturing activities, low-cost country sourcing, minimizing inventories, or more intensive collaboration with other parties in supply chain (Wagner et al.2009, pp. 272). They have defined four interrelated terms of risks in their research: supply chain risk, supply chain disruption, supply chain risk source, and supply chain vulnerability, see Figure 15 showing the relations between the identified terms.

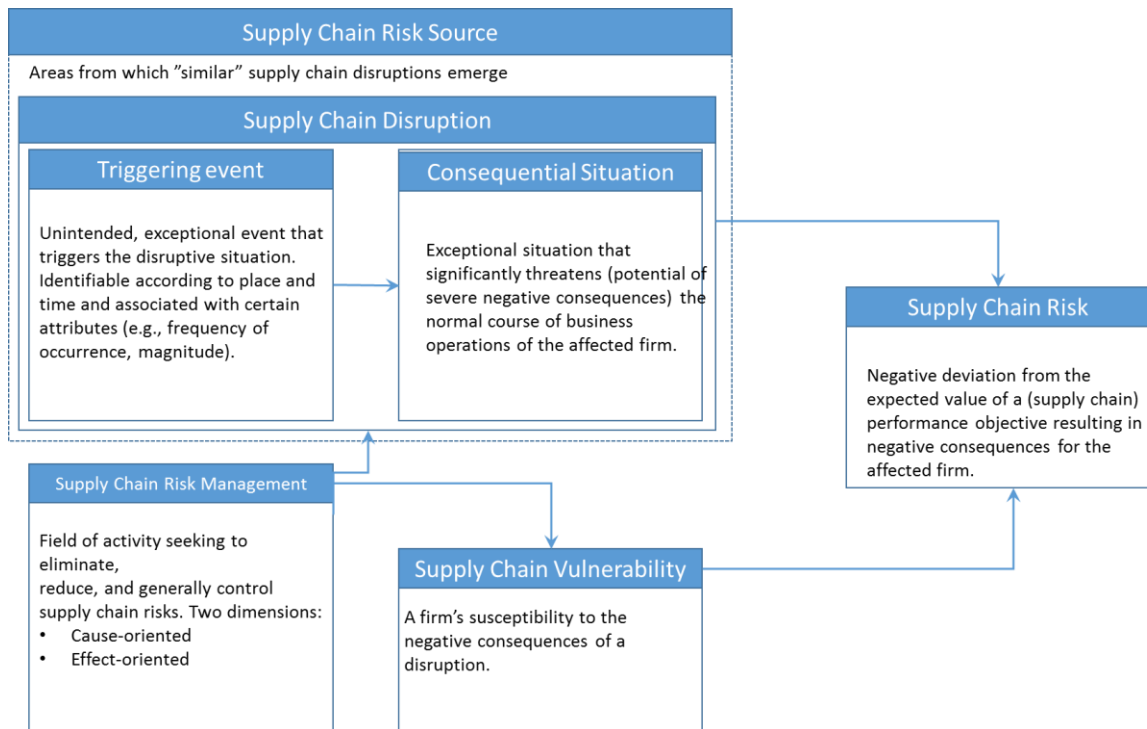


Figure 15 Nomenclature and conceptual framework

National and international law systems and trade contracts

One risk that is not so commonly recognized, is the difference between common law and civil law. Common law, based on law system used in England, is in use in 73 countries, but only in 6 major countries regarding outsourcing (Central Intelligence Agency, 2018). The main differences of common and civil law according to World Bank Group (2018) are defined in Table 7.

The basic issue with common law is that the court is basing its decisions on precedents or earlier court decisions, and civil law in legislation. This makes the contract making more difficult in common law, as there are many things needed covered contractually, whereas the same issues are covered by law in civil law contracts. Also some countries, such as United Kingdom, India and Hong Kong as the major traders, practicing common law, do not recognize the Contracts for the International Sale of Goods, which have been signed, ratified, accessioned, approved or succeeded by 89 countries (United Nations Commission on International Trade Law, 2018). When sourcing from named countries,

combination of common law and not applying CISG, is even more greater challenge for contract management.

Table 7 Common law vs civil law

Feature	Common Law	Civil Law
Written constitution	Not always	Always
Judicial decisions Binding	Binding	Not binding on 3rd parties; however, administrative and constitutional court decisions on laws and regulations binding on all
Writings of legal scholars	Little influence	Significant influence in some civil law jurisdictions
Freedom of contract	Extensive – only a few provisions implied by law into contractual relationship	More limited – a number of provisions implied by law into contractual relationship
Court system applicable to PPP projects	In most cases contractual relationship is subject to private law and courts that deal with these issues	Most PPP arrangements (e.g. concessions) are seen as relating to a public service and subject to public administrative law administered by administrative courts

2.5.3 Risk management

In Olson et al. (2010, pp. 3) research is presented framework with five major risk components: 1. Risk context and drivers, 2. Risk management influencers, 3. Decision makers, 4. Risk management responses, and 5. Performance outcomes.

The first component risk context and drivers is defined that in supply chains can be seen primary and secondary levels. In the primary level are the supply chains with major involvement in delivery of goods and services and in the secondary level are the participants with less direct involvement. Risk drivers are founded by external environment, in as industry, in specific supply chain and partner relationships, or in specific activities in the organization. (Olson et al. (2010, pp. 3)

The second component, risk management influencers, is an organization improving its risk position by taking actions. Attitude against risk in the organization affects its reward system, and therefore molding the will to react to events of the individuals in the organization. The third component is decision makers, where the risk profiles of individuals together with degree of group decision making in organization and level of organizations hierarchy shape the individual or group attitude towards risk. (Olson et al. (2010, pp. 3)

Risk management responses as fourth risk component describes the way to respond to risks. After identifying the risk, proper response must be selected, and organization according to its expertise and capabilities can know which risks it can cope with and what risks it should outsource with some cost. The last component, performance outcome, defines 8 disruption/risk management key drivers (Table 8).

Table 8 Key drivers of disruption/risk management

Corporate image	Regulatory compliance	Community relations	Liability
Employee health and safety	Customer relations	Cost reduction	Product improvement

In supply chains the risks are complex, due to streamlining the supply chain and companies building relationships with only the most competitive suppliers, revealing previously neglected risks which now have expanded because of several reasons e.g. supply chain entities dependencies, political, strategic and risks externalities creating their assessment and management to be more important. Therefore more risk management, supply chain integration, stakeholder management and network capacity is required. This leads, due to co-dependency and collaboration of supply chains, sustaining and managing of occurred risks in all possible ways keeping in mind that they must be able to be measured. As the risk management is based on both theory and practice in supply chain, it is multi-faceted as a result, being technical and conceptual, with a mélange of behavioral

psychology, financial economics and decision making justifying the selection of risky choices and managing consequential risks, in unsureness of the whole. (Kogan et al., 2007, pp. 383-385).

Benton, W. (2009, pp. 9-12 - 19) is stating numbers of risks including the outsourcing are hidden costs. The quality costs arising can be divided into four categories: preventative, appraisal, internal failure and external failure. The most challenging of these quality costs is the external failure cost, as the company needs to have proper mechanism to able to detect quality failures created by external source. Outsourcing also creates costs due to vendor relationship management in manner of time and coordination, which are: labor expense of purchasing personnel, travel costs, IT infrastructure and management and supplier development programs. Also the internal coordination of outsourcing increases the costs compared to internal sourcing as the bureaucracy costs, payroll, benefits management, utility expenses, IT expenses, etc., tends to keep in the same level though the amount of work is maybe decreasing. This internal overhead cost must be understood thoroughly so the impact of outsourcing can be recognized and the overhead cost can be reduced after implementing phase of outsourcing.

The transition phase when switching from internal to external sourcing model will create costs: supplier search including evaluation and contracting, transfer of physical assets, travelling during start-up and training of the new source. Not only costs are created on the vendor side of operations, but also with internal workforce: internal employees needs re-training, possible retention bonuses, severance packages, employee turnover, management time required to handle all these internal issues.

According to Benton, W. (2009, pp. 9-20 - 25) the coordination of product and/or service design and development with the new vendor is time consuming operation thus creating costs. Also the company needs to prepare for the worst and find other optional sources, not to mention company should never rely on only one vendor. What are more difficult to predict, are governmental and political related expenses. These expenses are heavily involved with legal expenses (foreign and domestic) depending on how complicated the laws and regulations and bureaucracy in the foreign country are. If the new vendor is in

country with tradition of lobbying, complicated taxation and customs, there can be very high unexpected costs.

The outsourcing situation will born a need for more comprehensive risk management approach which leads to various costs depending on the risk scenario: higher insurance costs, dedicated risk management personnel, financial hedging costs and operations hedging costs. These risk management related costs cannot be under estimated, as they may be high as well. The last but not the least hidden cost is the new vendor itself. With the new customer their scale of economy will increase and therefore coming more strong opponent. This though is a benefit to the company, as the vendor then can make his own development more efficiently. Also there is a factor which can be used as a benefit to the company, vendor's possibility to aggregate the demands of their multiple customers giving leverage to negotiations, pricing or growing the margin.

3. ANALYSIS ON CHALLENGES AND POSSIBILITIES OF FULL SCOPE DELIVERY

3.1 Procurement in Company

As the Group is multinational large corporation, the procurement is heavily instructed with detailed code of practice. The procurement has its own ruling established by Group headquarters, although there are location dependent deviations and practices. The code of practice determines the rules how suppliers are evaluated, audited, boarded to case company group's supplier relation management system, how the supplier constant monitoring is executed and managed, and the rules how the purchasing is executed. The basic rule is that supplier must be boarded and accepted into supplier relation management system and audited before actual purchasing orders can be sent to supplier.

Procurement in Group is divided into two main activities, operational and strategic sourcing, though these two activities are not totally separated but more operating together. The strategic sourcing main objectives are making and managing frame contracts, annual contracts and in some large scale projects negotiating very large contracts together with operational procurement. Strategic sourcing also searches new supplier candidates and making supplier surveys.

Due to nature of project business, procurement of the Company is heavily depended on the characteristics of project business sourcing. There are various factors effecting the procurement: project size, type, scope of delivery and location, customer, nature of business areas, and country specific factors. Project size has big impact how the procurement is planned, in small projects the planning typically is related to delivery time and use of known best suppliers. In large scale projects the sourcing planning starts always in the sales phase and is more widely executed, as the amounts of goods or services sourced are typically from several hundreds of thousand euros up to few tens of millions.

The delivery projects are classified to five main project types (Table 9) according to delivery scope. The most common project types in the business area where Company is

operating are EP, EPS and EPC. There are some E-type projects, but EPCC-type projects are rare. In certain countries in EPS or EPC projects, there are typically in the first phase E-type project, and customer makes decision of main delivery after some period, typically 6-8 months. Depending on customer and project, the decision can be just simply granting the main contract, but it can also be place of last tendering phase, and the decision for the main contract may or may not be realized to EPS or EPC project.

Table 9 Project types

E	Engineering only (also including advisory services)
EP	Engineering + Procurement (delivery) w/o supervision or advisory services <ul style="list-style-type: none"> • typically unit machine business ("equipment in a box"), • or (partial or complete) deliveries for a plant / project
EPS	EP + Supervisory or advisory services for erection / commissioning
EPC	EP(S) + Construction (including erection / commissioning)
EPCC	EPC + Civil works Work below +/-0 such as interference a/o geological studies, earthwork, piling works and foundation works Work above +/-0 such as building structures, demolition work, road work, HVAC and non-structural items (roofing, cladding, doors/windows, partition walls, tiling, floors, etc.)

Project types (Table 9), categorized (Figure 16) according the scope of delivery, volume and amount of product groups involved, is determining the bases of the project procurement. When project involves 2 or more product groups or is multi-divisional, the procurement organization is jointed between product groups by commercial project management, and joint sourcing over product groups can be thus executed.

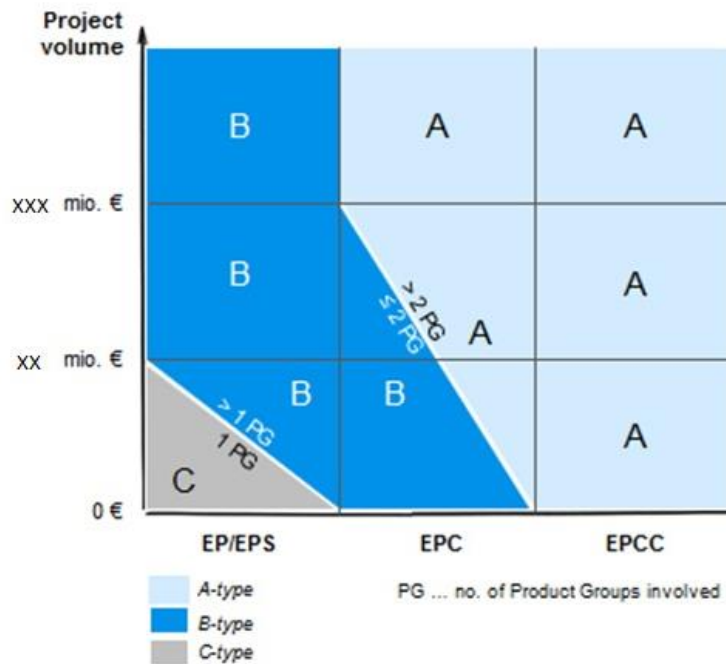


Figure 16 Project categorizing

The form of project organization in projects is established according to the project categorization. The categorization depends on three main factors: volume of the project in EUR, number of product groups involved, and project type. EP and EPS projects types are in C-category when only one product group involved and volume is less than XX EUR. If the volume is over XX EUR, then category changes to B-category. EPC project type is in B-category when one or two product groups involved, if more than two product groups are involved, then category changes to A-category. EPCC-projects are always in A-category.

The project type categorization determines the project organization form, A- and B-category projects are always multi product group projects, and the organization is matrix form in over divisions level (Appendix 5). In Division level the project organization is in functional form (Appendix 6), as well in C-category projects. This organization is for single contract projects.

Scope of delivery, beside the scope of delivery determined by project type, is defined also by project location, type of erection and contract. These definitions mainly determines the

level of assembly of equipment, in which they are delivered: are the equipment fully assembled and equipped, are the equipment delivered only as steel structure and components as loose parts, etc. The scope of delivery determined by project type is related to larger scale issues, such as is the erection included, are civil works included, etc. The difference between these two scopes of deliveries must be kept apart, as they are not the same.

3.2 Questionnaires of offshoring: global and local view

As the Group procurement organization is spread globally, in several business areas in numerous locations and sub-divisions, a comprehensive view of present situation of offshore outsourcing was needed inside the case company group, as well more focused and detailed survey inside the Company. The investigation of the offshore outsourcing was carried out by establishing two questionnaires: global questionnaire to find out what is the general situation of the Company regarding offshore outsourcing, and local questionnaire to study what are the factors of offshore outsourcing to different operation activities. Questionnaires were executed by sending them to recipients in written. The local questionnaire, appendix 7, is prepared in Finnish and constructed to fit to each targeted operation: product management, sales, project management, engineering, procurement, and quality. The local questionnaire was sent to 21 recipients. The global questionnaire, appendix 8, is constructed to get overview of Company's present situation of offshore outsourcing. The global questionnaire was sent to 15 persons in different countries.

The percentages of received answers of sent questionnaires were 47,6 % on local, and 46,7 % on global questionnaire. The local questionnaire returned wide and well informative answers.

Results of global questionnaire

The global questionnaire indicates the offshoring to be used in the Company, with positive outcome (Figure 17). Though lack of answers, this result still presents the situation, as the answers were received from different locations and business areas. The offshoring area

geographically locates to Europe, Asia and South America. Africa as sourcing location is due to project location. All activities are represented, from engineering to “full scope”. The overall experience is very high in positive side, only one negative experience.

Questions	Result
1. Have Your organization done offshore outsourcing? If the answer is NO, stop here and continue Your own work. a. yes/no	yes: 4 no: 3
2. What is Your primary offshore outsourcing area? a. Europe HCC b. Europe LCC/BCC c. Far east d. North America e. South America f. Africa	2 3 3 0 2 1
3. What activities You have offshore outsourced? a. engineering b. manufacturing c. manufacturing including components d. full scope (incl. engineering, manufacturing, components, assembly)	2 4 2 2
4. Experience of offshore outsourcing a. contractually: positive / negative b. manufacturing and quality: positive / negative c. economically: positive / negative	pos: 4 neg: 0 pos: 4 neg: 1 pos: 4 neg: 0

Figure 17 View of offshoring in Company

The free comments included several issues, continuous tracking and follow up, documentation and communication, reclamation, rework, replacement, and inspection protocols. Following pros and cons were mentioned:

PROS:

- quicker problem solving
- learning and understanding local requirements and cultures
- supplier contract creation easier
- reducing manufacturing costs, especially LCC countries
- reducing transportation costs
- reducing travel costs by long stays
- find new solutions and contacts

CONS:

- cost for relocating personnel
- quality issues
- supervision costs
- more detailed and complex contracts
- in contracts, disputes and arbitration to be carefully considered, applicable law
- local supervision suggested (“not our own man”)
- cultural differences

The main issues find out from these answers are focusing on cost, supplies contacts, local requirements and contractual issues. Quality was not on so big role.

Results of local questionnaire

For the local questionnaire the amount of answers was in the same level as in global questionnaire, but the information received was comprehensive. The local questionnaire was summarized (Table 10) to find out what topics are dominant, which issues different departments consider are important in full scope sourcing.

Table 10 Local questionnaire summary

Department	Question no.	Topics			
Sales	1	public procurement vs lowest price	understanding what we are selling and what customer wants, or does customer know what he wants		
	2	own knowledge in different areas	full scope supplier in it's own field	problem to find capable and suitable supplier	
	3	appropriate existing supplier network	specifying of delivery scope		
	4	"full scop" easy to buy, but hard to sell			
Product management	1	specifications exactly determined	technology used, company's or supplier's		
	2	3D modelling/PDMS	purchase decision done in early phase		
	3	who's technology used?	how well productmodels are prepared, ready for sourcing?		
	4				
	5				
Project management	1	cost is most important in project realization => GM	if not core business => sourcing	better risk management	
	2	responsibility sharing	risks, supplier capable or not, contracts		
	3	decision should be done in sales phase	contracts must be "bullet proof"	supplier monitoring	own "nest" must be clear
	4	full risk at company always	long term partners	quotation phase more easier with reliable partners	
Engineering	1	precise layout engineering	change management, how to?		
	2	keeping schedules	local/project standards/requirements/regulations		
	3	clear delivery limits	contract review		
	4	capable supplier	proper monitoring		
	5	capable supplier helps with project execution			
Procurement	1	supplier's knowledge	definitions, specifications	purchasing process	technical knowledge of purchaser
	2	precise contracts	specifying delivery limits	supplier evaluation,	
	3	schedule	supplier selection	risk evaluation/management	
	4	"focusing" of purchasers knowledge	contractual jurisprudence		
Quality	1	risk evaluation/management			
	2	supplier's own monitoring	manufacturing with supplier's "own" drawings may help monitoring		
	3	broader quality monitoring needed due to full risk at company			
	4	reliable vs new or unreliable supplier			

Analyzing the found topics from local questionnaire, there are 10 factors which are common, and 6 of them points out (Table 11). These 6 factors, specifications, risk

monitoring, supplier's knowledge, supplier evaluation, responsibility sharing, and own knowledge and operation, are commonly very important factors for successful project execution. Though this result shows the cost, contractual and schedule issues are in not so high position, they are important as well, and due to the questionnaire was directed to each department with target to get their view, this is quite expected result.

Table 11 Major factors in local questionnaire

Activity	Quantity
Specifications	9
Risks & monitoring	10
Supplier's knowledge	10
Supplier evaluation	8
Follow-up	5
Price/cost	6
Responsibility sharing	8
Contracts	5
Schedule	5
Own knowledge, operation	9

Outsourcing requirements to organization

The answer from local questionnaire gives quite full description of the requirements to organization needed for outsourcing. Firstly, Company must have detailed knowledge of their products and mill process, to define what products and specifications fulfills the process requirements. Secondly, Company must have appropriate processes, with measuring, monitoring, and corrective action plans, for each following activity to ensure clear and smooth progress of the process. Thirdly, supplier evaluation and selection with audits, quality and performance, must be done according to Company rules, applicable standards and local regulations. Fourthly, the contract management from quotation phase to contract signing and project execution must be done carefully considered, to avoid

contractual pit falls. Fifthly, the supplier monitoring during manufacturing must not be left on supplier only.

3.3 Purchasing methods and variants in the present procurement

To have clear view with the product costs analyses, the purchasing methods must be defined, and therefore the present purchasing situation and which method or methods are used at the moment must be defined as well.

The present purchasing of products can be divided into six purchasing categories (Table 12):

Table 12 Present purchasing activities categorized

	Layout Engineering	Detail Engineering	Manufacturing	Assembly	Components by supplier	Components by Company
Purchasing Category 1		YES				
Purchasing Category 2			YES			
Purchasing Category 3			YES	YES	YES	
Purchasing Category 4		YES	YES	YES	YES	
Purchasing Category 5		YES	YES	YES	YES	NO
Purchasing Category 6	NO	YES	YES	YES	YES	NO

The purchasing categories 1 – 3 are considered as traditional subcontracting, from domestic or abroad suppliers. Purchasing category 4 is called “full scope delivery” in the Company. Purchasing categories 5 and 6 and not implemented at the moment, we can see activities layout engineering and components by Company are not outsourced yet, yet layout engineering is an activity that can be outsourced only partially.

Comparing these categories to purchasing theory, the make or buy theory can be disregarded in case of manufacturing and assembly, as there are no such activities inside the Company at the moment. Only activities executed in-house are layout engineering and component purchasing. On the other hand, the engineering, in case of layout engineering, and components by Company are the most difficult activities to outsource. The layout

engineering requires expertise on the mill process and equipment, which knowledge is rarely owned by suppliers, as well wide communication with customer. Typically the suppliers having the expertise and knowledge of mill processes, are competitors to Company making purchasing of layout engineering together with the product very challenging or impossible. The make or buy decision in this respect needs strategic decision how Company should proceed. The layout engineering inside product, if there is such, can be outsourced, as it is product related knowledge, which supplier more likely owns.

The components by Company is also complex issue, as there are components which are related to customer requirements, project types, Company group purchasing contracts and certain specific requirements of products. The component supply also differs project by project. In some projects, where the erection is on customer's side, and delivery is transported in "small pieces", it is rational to purchase most of the components centralized by the Company, to gain profitability by volumes. Also such issue could be determined in the main contract by customer requirement. The distances between Company, component suppliers, equipment suppliers, and mill site, may also be determining factor, as the transportation of components to equipment suppliers for installation may be costly as the cost for transportation to mill site is less costly.

When comparing the purchasing methods subcontracting, outsourcing and offshoring, it is difficult to determine exact method, as the variety in the purchasing activities is quite broad. The purchasing from home country, can be identified as subcontracting and outsourcing, and purchasing from foreign countries as offshore outsourcing. Offshoring, as in meaning by relocating business processes and work overseas, cannot be identified as existing purchasing method for the studied products. As the majority of the products are purchased from foreign countries, the analyses concentrates on offshore outsourcing and consequentially to offshoring in conclusions.

The open book accounting as such, is not commonly used in contracts between Company and supplier, but more between customer and Company. Though open book accounting could be a potential purchasing method also with suppliers, but only with following

conditions. Use of open book accounting requires solid and trustful relationship between parties willing to open their books and act in transparent way, in both up- and downstream of the business. Most likely this could be used in cases where the supplier is a nominated trading partner. This purchasing method cannot be used with new or unreliable suppliers.

3.4 Product definitions and cost drivers

Selection of the products for case study is based on categorization of products and the cost drivers of the products. Product types in A-category, strategically important products, are out limited, and the product types in B- and C-category are accepted to be researched. The cost drivers of the products used for selection are: engineering, manufacturing including components and materials by supplier and Company supplied components. These cost drivers were gathered from eight executed projects to have more reliable result. The engineering cost was defined to be used as the major cost, that could be decreased by offshoring, due to fact that most of the engineering has been done in high cost country. The engineering cost was then compared towards the total cost of product, revealing the engineering cost percentage of the total cost.

The created list of products is evaluated so, that products with approximately 10% of engineering cost share, were filtered and from this group was selected the suitable products for further research. There were some products over 10% engineering cost share, which were not suitable for research due to small amount delivered or they were not in the scope of delivery in every projects. So some products chosen, has engineering cost share less than 10%, but this does not have effect on the research. After listing the products, each product type was numbered from 1 to 10, to have possibility to separate the results of each product type.

The next step for further product selection is adding the product weights into the list. The weights, total weight and manufacturing weight, are important figures used to estimate project costs, for example erection cost, transportation cost, typical engineering cost, etc.

Due to variations and scarce information of delivery scope in some of products in the executed projects, it was not possible to determine the weight of each product. As a result, the weights are gathered for products in five projects, giving total weight of products, 116 pieces, of 3.568.454 kg. The amount of the data is sufficient to reach credible results.

Costs acquired from the Company's ERP-system per product type in average are presented as percentage of total cost in Table 13 of actual figures. We can see from the table, that the amount of engineering by product type varies in quite large scale, from 8,8 % to 37,3 %. There are reasons for this: product is complicated, product has many connections to surrounding, product is well standardized, or product has many variables. Basically the product type with highest engineering cost should be benefitting the most from offshoring, if thinking the lower hourly rate in low cost countries, but this is only one dimension in cost structure of a product. This argue is based on fact, that the manufacturing costs do not have such significance compared to subcontracting, where the cost level is already low.

Table 13 Product main cost drivers

Product type	Engineering	Components supplied by Company	Manufacturing including materials and components by supplier
1	15,8 %	33,4 %	50,8 %
2	8,8 %	31,1 %	60,1 %
3	10,2 %	25,1 %	64,7 %
4	9,3 %	6,1 %	84,6 %
5	10,8 %	21,2 %	68,1 %
6	16,4 %	28,2 %	55,4 %
7	22,2 %	19,6 %	58,2 %
8	13,9 %	17,8 %	68,3 %
9	37,3 %	10,3 %	52,3 %
10	23,5 %	6,5 %	70,0 %

Product cost structure of the product itself and ruling out product management and sales costs, as well procurement and quality costs can be opened into cost drivers, and how they relates to project types (Table 14), as well what cost drivers can be effected by purchasing methods (Table 15). The cost driver relation to project types shows which cost drivers have increased amount of work or costs by project type. The finding in the table is, that project type EP creates more work and costs than EPC, although the increase of the amount is not obvious and transparent, and can be partly a hidden cost.

Table 14 Cost drivers related to project types

Supplier	Cost driver relations to project types		
	EP	EPC	comment
detail engineering (if in delivery scope)	more	-	Sectioning
materials	-	-	
components purchased by supplier	-	- / more	
components purchased by Company	-	- / less	
work			
o work planning	-	-	
o procurement by supplier	-	-	
o manufacturing	-	-	
o painting	more	-	Additional covering due loose parts
o assembly	less	more	Installation of components
o packing	more	less	Size of delivered sections/parts
o documentation	-	-	
quality documentation	-	-	
shipment documentation	more	less	
project documentation (invoicing etc.)	-	-	
Company			
sales	-	-	
product management	more	-	Sectioning
engineering	more	-	Sectioning
procurement	less	more	Contractual issues
QA/QC	-	-	

The Table 15 establishes the correlation between cost drivers and purchasing methods. The cost drivers are analyzed if they have any effect in purchasing methods, with certain conditions mentioned in the comment column. Neither this correlation analyzes is fully transparent, as there can be other effecting correlations and conditions.

Table 15 Cost drivers correlation to purchasing methods

Supplier activities	Purchasing method effect				comment
	Subcontracting	Outsourcing	Outsourcing incl. Engineering	Offshore outsourcing	
detail engineering (if in delivery scope)			X	X	
materials			X	X	If supplier's own design/technology
components purchased by supplier			X	X	If supplier's own design/technology
components purchased by Company	X	X			By volume, or over division purchasing
work					
o work planning			X	X	If supplier's own design/technology
o procurement by supplier			X	X	If supplier's own design/technology
o manufacturing	X	X	X	X	If supplier's own design/technology, co-operation with supplier
o painting					
o assembly	X	X	X	X	Supplier selection
o packing					Customer / project requirements
o documentation					
quality documentation					
shipment documentation					
project documentation (invoicing etc.)					
Company activities					
sales				X	Easy to handle
product management			X	X	Can be - or +, supplier depended
engineering			X	X	Can be - or +, supplier depended
procurement	X	X	X	X	More or less, depends on project and supplier capability
QA/QC	X	X	X	X	More or less, depends on project and supplier capability

To be able to determine the cost effect of different procurement methods, there must be defined cost drivers that are typically comparable over projects. Such cost drivers are project management cost, head engineer cost and documentation cost, which are more project management type of costs. These cost are defined as average cost, as exact cost for each product is not possible to find out.

As all products are subcontracted, the detailed cost drivers e.g. manufacturing, painting etc., cannot be defined on exact level for each product. There are knowledge of estimated hours by supplier for some products, which are used in this analyses. Most of the suppliers are reluctant to give detailed information of their manufacturing, therefore the figures for detailed cost drivers are mostly estimated. Using estimated figures does not though effect on the analyses, as it is done in comparative way.

3.5 Analysis of purchasing methods

In this chapter are analyzed product costs to find out if the costs could identify the products related to purchasing methods. Analyzing is done using existing data from Company ERP-system of executed projects, offers from suppliers, and estimations of costs which are not possible to find from the system. The summaries of the cost analysis shows the cost difference between selected products with different factors and project types, and in two sourcing areas. The costs are compared to the base line, subcontracting cost, and the total cost of product (including all costs). Following summaries are established, see Table 16 and Table 17, where is shown the changes between the project types and delivery scopes in percentage for each changed activity.

1. Outsourcing (Traditional subcontracting) for project type EP
2. Outsourcing (Traditional subcontracting) for project type EPC
3. Offshore outsourcing for project type EC
4. Offshore outsourcing for project type EPC

Project type EPCC is not taken into consideration, as the difference to project type EPC is the added civil works, which do not effect to equipment delivery and sourcing. The delivery scope of equipment is assumed to be following. In project type EP without components installation and delivered in containers, meaning delivery in small entities. The variable cost in EP compared to EPC is lower installation work. In project type EPC it is assumed that project delivery includes erection, and therefore the equipment are delivered with components installed as much as possible, and in large sections. This delivery scope definition defines partly amount of the manufacturing work, but especially amount of assembly work.

The outsourcing activity in this summary is actually the normal subcontracting activity how sourcing is executed in LCC countries, including manufacturing and supplier components. The costs of Company are not included, as for this sourcing method, they do not act as variables. When reviewing the offshore outsourcing in this summary, it includes all costs except layout engineering, and there are number of variables: engineering,

manufacturing, components, materials, and Company related costs, such as QA/QC and purchasing costs.

The factors inside the product cost are changed according to either calculated factors, or estimated factors. Estimation of factors is done by consulting different persons in engineering and using own expertise. Usage of estimated factors does not endanger or skew the result of this study, as the factors are as well altering continuously in the real life, since the result is more of guiding than ruling.

Table 16 Cost summary of project types, Sourcing Area 1

Cost factor of products compared to subcontracting cost, AREA 1										
Product type:	1	2	3	4	5	6	7	8	9	10
Product cost subcontracting: Base line	1	1	1	1	1	1	1	1	1	1
TCO subcontracting: including all costs	1,92	2,07	1,56	1,59	1,56	1,90	1,79	1,39	2,20	1,38
Outsourcing: Project type EP	0,97	0,97	0,97	0,97	0,97	0,97	0,97	0,98	1,00	1,00
Outsourcing: Project type EPC	1,00	1,00	1,00	1,00	1,00	1,00	1,00	1,00	1,00	1,00
Offshoring: Project type EP	0,96	0,97	0,96	0,95	0,95	0,95	0,96	0,96	0,90	0,95
Offshoring: Project type EPC	0,97	0,98	0,98	0,97	0,97	0,97	0,97	0,98	0,91	0,97
Difference against Project type EP										
Outsourcing: Project type EPC	3,4 %	2,6 %	3,1 %	3,3 %	3,1 %	2,6 %	2,8 %	1,9 %	0,1 %	0,1 %
Offshoring: Project type EPC	1,8 %	1,3 %	2,3 %	2,6 %	2,4 %	1,8 %	1,8 %	1,6 %	1,5 %	1,8 %

Cost changes:

Engineering cost in offshoring	-32 %
Packing EP (in Material total incl. Work)	-2,5 % Estimated 50/50 materials/work
Packing EP (in Work total)	-5 %
EPC including packing	

Table 17 Cost summary of project types, Sourcing Area 2

Cost factor of products compared to subcontracting cost, AREA 2										
Product type:	1	2	3	4	5	6	7	8	9	10
Product cost subcontracting: Base line	1	1	1	1	1	1	1	1	1	1
TCO subcontracting: including all costs	1,92	2,07	1,56	1,59	1,56	1,90	1,79	1,39	2,20	1,38
Outsourcing: Project type EP	0,64	0,72	0,67	0,64	0,67	0,72	0,70	0,79	0,72	0,72
Outsourcing: Project type EPC	0,67	0,71	0,68	0,64	0,67	0,68	0,68	0,77	0,64	0,70
Offshoring: Project type EP	0,75	0,81	0,73	0,69	0,71	0,76	0,76	0,80	0,64	0,74
Offshoring: Project type EPC	0,77	0,83	0,78	0,74	0,75	0,79	0,79	0,83	0,65	0,76
Difference against Project type EP										
Outsourcing: Project type EPC	5,2 %	-1,0 %	1,3 %	-0,2 %	-0,7 %	-4,7 %	-2,4 %	-2,4 %	-12 %	-2,9 %
Offshoring: Project type EPC	2,2 %	1,3 %	5,7 %	7,1 %	6,1 %	4,3 %	4,0 %	3,8 %	2,2 %	2,3 %

Cost changes:

Engineering cost in offshoring	-61 %
Packing EP (in Material total incl. Work)	-2,5 % Estimated 50/50 materials/work
Packing EP (in Work total)	-5 %
EPC including packing	
Work cost (in Material total incl. Work)	-25,0 % Estimated 50/50 materials/work
Work cost (in Work total)	-50,0 %

The costs analyzed with the given information, results following cost reduction:

Sourcing Area 1:

Outsourcing EPC, from 0,1 % to 3,4 %

Offshore outsourcing EPC, from 1,5 % to 2,7 %

Sourcing Area 2:

Outsourcing EPC, from 2,6 % to 6,1 %

Offshore outsourcing EPC, from 1,6 % to 3,6 %

As the cost changes are very low, costs are not determining factor on which purchasing method each product belong. Though when analyzing the cost trend adding more changes to activities, the costs are dropping down accordingly differentiating the total product costs of each product.

To find out effect of changing costs for different activities, an example calculations and product costs analysis was executed and three model cases with estimated cost reductions was established. The cost reductions used are defined as follows:

1. Engineering cost according to typical engineering cost in each sourcing area
2. Engineering efficiency estimated
3. Manufacturing cost reduction estimated
4. Component cost estimated by actual cost inquiries (supplier purchased)
5. Buyer portion of components estimated
6. Materials cost estimated

The cost analysis are presented in three charts, which are showing the cost changes for three purchasing methods

1. Product cost + engineering
2. Product cost Outsourced
 - includes subcontracting, engineering and components costs
3. Product cost Offshore outsourced
 - includes subcontracting, engineering, components and buyer costs

, in three model cases:

Case 1: New supplier

Case 2: Frequent supplier

Case 3: Developed long term supplier

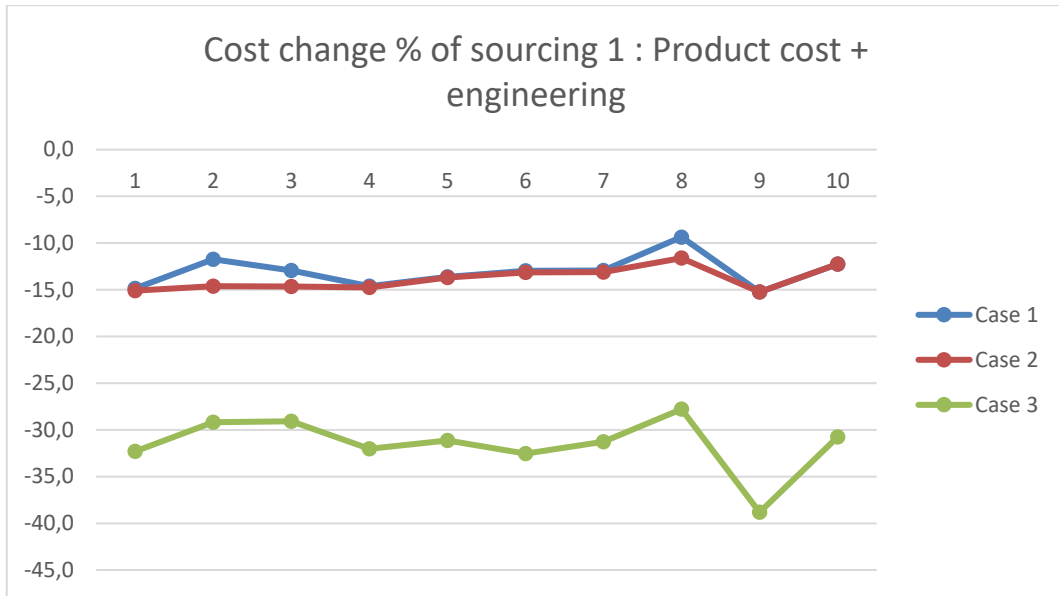


Chart 1 Cost change in Product cost + engineering

In Chart 1, product cost added with engineering cost, we can see product types 1, 4 – 7, 9 and 10 have approximately same cost in cases 1 and 2. Though, all product types success to lower cost in case 3.

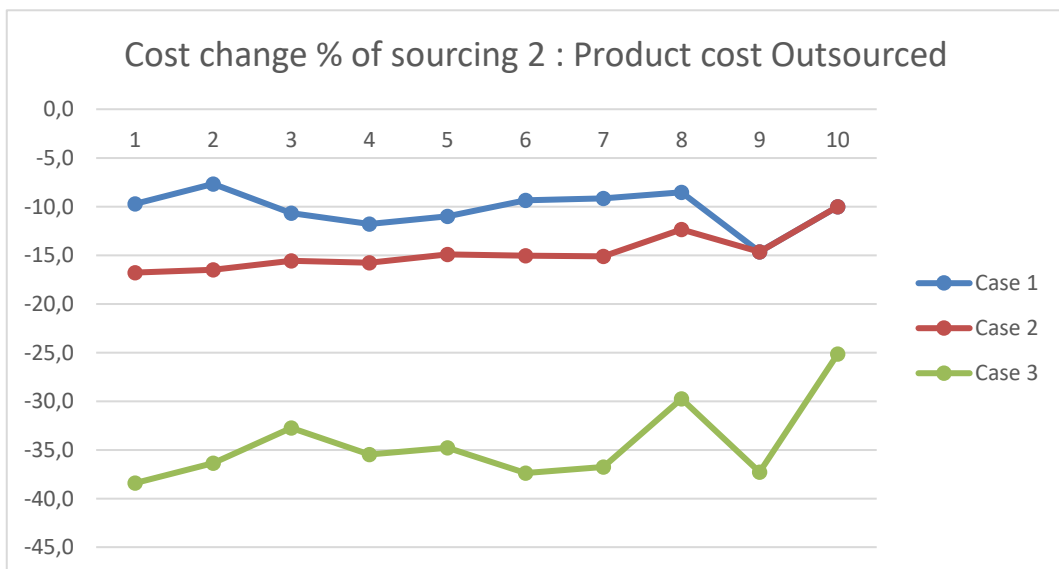


Chart 2 Cost change in Product cost Outsourced

In Chart 2, product cost outsourced, we can see product types 9 and 10 have approximately same cost in cases 1 and 2. Compared to Chart 1, product types 1 – 8 are in lower cost level, but product types 9 and 10 in higher cost level in case 3.

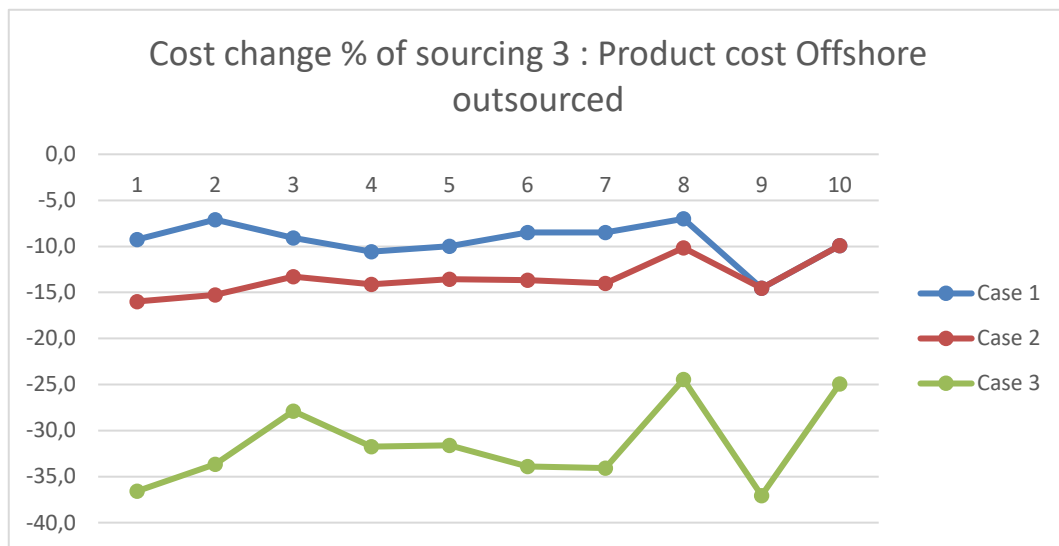


Chart 3 Cost change in Product cost Offshore outsourced

In Chart 3, product cost offshore outsourced, we can see product types 9 and 10 have approximately same cost in cases 1 and 2, as in Chart 1 and Chart 2. Compared to Chart 2, all product types are in higher cost level in case 3.

This product cost analysis shows how the costs behaves in different situations, compared to purchasing method and to product type. Basically the cost change follows same trend in each product type, but depending on the product type the change varies slightly due to cost driver share of total cost. The biggest finding of this analysis is, that with long term supplier with the best knowledge of the products, the purchasing method “offshore outsourced” is not the most cost efficient but the purchasing method “outsourced” (Chart 4). In the Chart 5 is shown the cost development between purchasing methods 1 and 2, and 2 and 3. This clearly shows costs decreases moving from purchasing method 1 to method 2, but increases when moving from method 2 to method 3. This can be caused only by the buyer costs (QA/QC, QA/QC travel cost, purchasing, freight of components, forwarding) that are transferred to supplier in purchasing method 3, and there are no

estimation if the cost could be lowered by supplier. Based on this one analysis the offshoring outsourcing may not be the most profitable way of purchasing

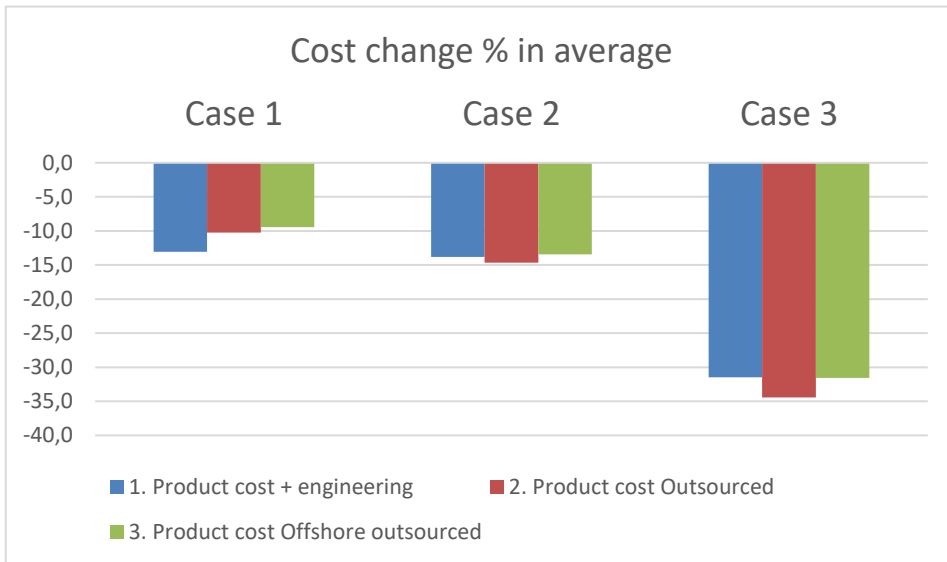


Chart 4 Cost change % of products costs in average

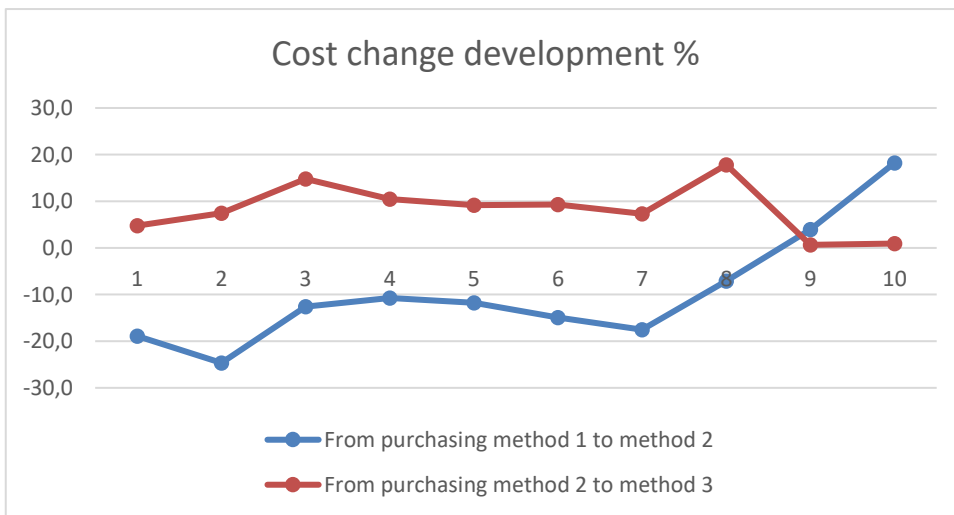


Chart 5 Cost change development %

3.6 Analysis of product specifications

Second objects to analyze are product specifications. The products have various specifications and requirements must be met to have well operating equipment. Product management has identified three major specifications: complexity of a product, weight optimization of a product, and mill process requirements. The complexity of a product means the complexity of product as whole, considering structure and operation in mill process. Weight optimization is used in some products, which needs specific knowledge and engineering programs, to execute the engineering. Mill process requirements are more demanding for some products than others. Company standards and practices as well mill standards must be recognized as one specification, since they define for example materials on product structure, used components and their specifications. Third issue is recurrence of a product structure, which is benefit when making supply contracts.

To identify the significance of the factors, it must be determined which factors to use for comparison. Following significance factors are decided to be used:

-2 to present less significant factor

0 to present the factor is not important

2 to present more significant factor

The product specification significance factors, showing what the significance of each specification is, are presented in Table 18 for each product. The higher the total significance value product has, the more demanding a product is, firstly, to engineer, and secondly, to manufacture. This significance total value can be converted to guide line which products are plausible to transfer to outside Company engineering, and as continuance to offshore outsourcing. The given significance value is not a cold fact, merely a thin red line assisting to suggest to a decision which purchasing method to use, as it follows the decision is the product engineering done in-house or outsourced.

Table 18 Product specification analyses

Product specifications: Activity significance: -2 = less, 0 = not important, 2 = more										
Product type:	1	2	3	4	5	6	7	8	9	10
Complexity	2	-2	0	2	-2	0	-2	0	-2	0
Weight optimization	2	2	-2	-2	-2	2	-2	0	2	2
Mill process requirements	0	0	2	2	-2	-2	2	2	-2	0
Company/mill standards	2	0	2	0	0	0	0	0	0	-2
Recurrence of a product	0	2	2	2	2	2	2	2	0	2
Total activity significance	6	2	4	4	-4	2	0	4	-2	2
=> selected purchasing method: <=2 = offshore outsourcing; >2 = outsourcing										
Outsourcing	YES	NO	YES	YES	NO	NO	NO	YES	NO	NO
Offshore outsourcing	NO	YES	NO	NO	YES	YES	YES	NO	YES	YES

By the result of this product specification significance factor summary, there can be seen the difference between products. The division into two purchasing methods, outsourcing and offshore outsourcing, is done according the total value, and it is suggested to follow rule: when value is 2 or over 2, product is not plausible for offshore outsourcing, but suitable for outsourcing, and when value is less than 2, product is plausible for offshore outsourcing. Of course, as this is just guide line, there must be done further investigation before any actual decisions, as well the project situation must be taken into consideration. The identification of product specific purchasing method established in Table 18 defines product types 2, 5, 6, 7, 9 and 10 as possible to purchase with offshore outsourcing method.

Although purchasing method selection for products can be done by the activity significance, further investigation is suggested to be done to ensure successful outcome. For such investigation SWOT-analysis is an effective tool, to provide additional information to support decision making. SWOT-analysis is described in chapter 2.3.1. Figure 18 represents SWOT-analysis of a typical product, with takes in account product specifications, engineering issues and supplier requirements.

Strengths	Weaknesses
<ul style="list-style-type: none"> - supplier learning the product in long run - volume of the product 	<ul style="list-style-type: none"> - construction of product - project based construction and delivery scope changes
<ul style="list-style-type: none"> - lowering engineering cost - lowering manufacturing cost 	<ul style="list-style-type: none"> - supplier don't have engineering knowledge - component cost
Opportunities	Threats

Figure 18 SWOT-analysis of a typical product

The SWOT-analysis shows the product structure and project related issues are weaknesses, and supplier experience and knowledge, as well components costs are threats. These issues are concerned when the structure and specified components are according to Company product management specifications and technology, and they are not possible to change, re-engineer, or re-specify. If supplier could use their own design and technology, the possibility to effect on costs created by structure and components, and consequently to manufacturing cost including work and materials, there are more opportunities to lower the costs. This could also impact the forecasting, by standardized equipment, and even to delivery times by shorter delivery cycle.

3.7 Possible risks in outsourcing

The sourcing always involves risks, which need to be recognized, evaluated and mitigated. Although operating with known suppliers, the risk review should be done on each purchasing, either in small purchases shortly evaluating “in mind” or in larger contracts by risk review procedure. The problem when evaluating risks, is transforming the risks into money, as the money is the main decision making factor. Also defining on which risk level Company can still be successful, should the operation be always on low risk, or is it possible to have higher risk level. Typically avoiding and mitigating risk to level as low as possible is money costing, although it will be costly as well if higher risks are realized.

The risks which can be directly calculated in money, delivery delays, currency rate fluctuations, and material price changes, are possible to evaluate and partly mitigated. Delivery delays cannot always be foreseen before the manufacturing, and therefore the mitigation is done typically during the manufacturing phase with several actions: pushing supplier to put more effort, arranging capacity, transferring goods or parts of the goods to other supplier, or re-arranging the delivery schedule or transportations. Currency rate fluctuations are mitigated by hedging. Material price changes can be mitigated contractually by binding the material price into fixed price of certain time period, or agreeing rules how the material price changes are handled.

Financial issues regarding supplier are up to certain level possible to mitigate. Shortage of cash flow, which is quite common, can be mitigated contractually by payment terms, when it is foreseen that large material purchases will weaken the supplier's cash flow. If the cash flow is too low for supplier to operate, seen from financial reports or other financial investigations during quotation phase, such supplier should not be used. If supplier faces bankruptcy, the situation is always very difficult, as the materials and goods at supplier should be clearly marked as buyer's property to have possibility to move them out of the supplier. The bankruptcy situations are quite rare, and they are managed always case by case.

Most typical risks, amongst delivery delays, are quality defects in the products. The quality issues are contractually managed, but it is not always clear what is the reason and who is responsible, and who will bear the occurred quality cost. Suppliers are evaluated and audited for quality to have proper knowledge, equipment and tools, and quality systems to provide accepted products. But this doesn't fully proof the work will be carried out flawless. Company is having constant surveillance and monitoring at suppliers, suppliers are required to inform any raising quality issues, and before delivery is carried out final inspection. Despite of all these preventative actions, there are sometimes faults that will not be found until the erection phase at mill site. The faults in the products or in the delivery process can be caused by faulty fabrication, faulty drawings, misunderstandings, and even negligence. It is mostly challenging to find core reason for faults, and therefore

many claim situations tend to take much time before they are solved. The crucial issue is the documentation of found faults which must be done with great accuracy.

Risks in resources, in every steps of sourcing starting from engineering to transportation, are not to be disregarded. Firstly, there can be lack of resource in engineering due to high project load, which typically leads to delays and faults in engineering designs, which then automatically effects the manufacturing phase and may cause problems in delivery schedule, depending on the general situation in the supplier markets. Also, there have been, and most probably will be, movement in supplier workforce. This movement have been result of workforce moving to high cost countries from low cost countries in hope for better salaries. This phenomenon have been going on especially in Europe, not so much in Asia or South America, where the local political situations and regulations do not allow such to happen easily. On the other hand, change of workforce for example in China have been quite common, leading to situation where workers learned to do certain work or products, are left and new workers are hired causing the development of supplier starts from zero. Concerning transportation, resources there are related to world economy situation, either capacity is full, or in recession period the capacity is cut down leading also to full capacity, which then leads to increase of transportation costs.

Country risks are not so dominant when outsourcing is in moderate level and the volumes are not high. When making large contracts, country risk should be considered more carefully. On the other hand, the customs clearance and taxation varying on each country have to be considered as a risk on every contract and delivery. There are some countries where customs clearance is always risk, such countries are Russia, China, India, and Brazil. Avoiding the customs clearance risk requires a lot of from the documentation, as it must be water tight from engineering to forwarding. This is connected to taxation, which importance in project business has been growing rapidly over last five years. Tax authorities are now operating electronically between each other and authorities in every country are now very precise getting the taxes they see belongs to them. There have been malpractices in past by many companies, which has led to countries tightening their regulations. The taxation issues are critical especially in projects that are getting permanent establishment status. In these projects the taxation, as well followed regulations, are as the

projects are considered as project realized in that particular location fully following the local laws and regulations, and the supplies must be done according project location taxation not depending where they are manufactured.

The differences between common and civil law can be defined as country risk as well. When sourcing from countries with common law practices, there are issues that must be taken into account when preparing contracts. When making contracts with suppliers in United Kingdom, as it is in process of exiting EU, there can be consequences that might need more attention in contracts, since the outcome of Brexit is still unknown which may be unsecure situation for following years.

In the theory is mentioned climate change as a risk. This is not so relevant in typical outsourcing, mainly connected by requirements for sustainability and code of conduct. Though these risks should not be forgotten and must be evaluated when seen necessary. The more probable risk to be realized related to nature, are natural disasters, which may even destroy whole factories, needed infrastructure like roads, energy lines, or in other way interrupt the operations. There have been many vast natural disasters effecting the economy of whole world, and much more of smaller ones which may have more focused consequences during shorter periods.

As the last, but not the least issue, which in today's procurement that must be taken into account together with the risks, is sustainability and code of conduct. Some customers are requiring the whole supply chain to follow their own "global supplier standards" or "sustainability requirements", which presents more demands to the supply chain. Suppliers, component, equipment and subcontractors, are obligatory to qualify and comply these requirements, to be able to be an accepted supplier for the Company. Risk for not being qualified and comply, may realize as a rejection of a supplier by the customer during the project, which causes contractual and legal problems with supplier, as well operational challenges as the goods must be transferred to other supplier, and possible delays on delivery. Also, it must be remembered, the Company reputation and image may be harmed by such event in the eyes of customers, and the loss of reputation and image can be the most expensive and stagnating for the Company. Building up the trust and image back to

level before will be very costly and timely long process. The probability for such event is although very minor, but consequences could be significant. The sustainability and code of conduct are related into many risk types or risk classes, such as financial risks and country risk, and they are not a separate issue beside “normal” risks, but rather linked or overlapped with almost all risks types.

4. CONCLUSION

In the conclusions is represented results of product cost analysis, the relation of findings in literature review and in the actual procurement of the Company. The main objective of this study was to establish guideline defining the relations between product types, purchasing methods and project types, giving guideline for procurement planning in projects. The suggestion for this is given in this chapter.

The research questions set for this study are:

- What purchasing variations can be defined?
- What are the cost structures of the products?
- Does cost structures effect to purchasing method?
- How purchasing methods apply to various products in various projects

The basement for ability to understand the questions is the literature research of purchasing methods and procurement in general. Together with questionnaires and actual data acquired from Company systems the view over purchasing methods, in theory and in actual projects, was build up. First research question was answered in chapter 3.3 by the analysis of the present procurement and establishing categorization for purchasing types. The question of requirements established for organization by different purchasing methods was analyzed in the chapter 3.2, by analysis of the local questionnaire answers. The chapter 3.4 studied the cost drivers and costs analysis of the products in different purchasing methods. Last research question, how purchasing methods apply to various products in various projects is answered here in conclusions in chapter 4.1.

4.1 Outsourcing theory versus practice

As the purchasing of equipment, and outsourcing in general, is a complex process in project business with many variations, the relation to purchasing methods found in

literature is not one-to-one. As seen in chapter 3, there are typically features of all purchasing methods used, and also the purchasing methods in literature tend to be partly similar or mixed. Viewing procurement in simplified way, subcontracting purchases are mainly either outsourced or offshore outsourced, though offshore outsourcing is not fully according to the literature, lacking the full delivery scope, but still outsourced from foreign countries. Looking into more detailed, purchasing of goods includes more pure subcontracting than outsourcing or offshore outsourcing, which are lacking some elements. Purchasing methods make or buy, and open book accounting are not used, as the nature of business in relation to large variety of products, and the fact company does not have own workshop, does not support such methods. Open book accounting though could be implemented, only it requires long term partnership with supplier where the common trust between parties already exists.

This interpretation between of how the purchasing is done and how literature defines it, leaves studying of purchasing methods partly contradictory or inconsistent, and unambiguous answer or definition could not be found. There are not many purchasing activities executed in subcontracting exactly according to purchasing methods mentioned in literature. Such outcome implicates the reviewed purchasing methods are not fully applicable in project business, at least in case of Company, as in reality procurement is done in various mixture of purchasing methods. Reasons for this phenomenon are variations caused by numerous ways of project contracts and execution of projects. Although it is not overruled that some individual products could be sourced exactly according to certain purchasing method.

When identifying the requirements for organization, there can be found some issues which clearly supports the complexity related to outsourcing and offshore outsourcing, as the sourcing party must have deep knowledge of their products and processes, and the supplier must have similar knowledge either existing or by being able to learn such knowledge. Although supplier could be enough skilled to learn, it may not correlate as wanted result, since the learning process of products and processes tends to be time consuming. On the other hand, answers from the local questionnaire were well covering what the requirements for Company's organization are. In fact, the found requirements are very typical and they

are describing organization should be operating in proper manner with all activities functioning as they should be. No special requirements are set, since the organization is expected to work according to rules specified and set in the Company rules. It is another question though, is the organization operating as instructed and expected. If not, there should be done evaluation of which activities needs improvement in their operation, to achieve the level of required operation for successful outsourcing.

4.2 Cost structures versus different purchasing methods

Analyzing of the product cost structure was mainly calculated by average figures for each product type, which were based on more detailed investigation on costs, though the investigation did not go into parts level. The analyses of main cost drivers shows engineering cost, cost for components supplied by Company and manufacturing cost including materials and work. This gives already perspective which are the cost drivers that needs attention and further investigation. The cost analyses for purchasing method correlation was going much deeper into product cost structure, splitting each main cost drivers into several detailed cost drivers, and taking into account costs occurred inside Company on top of the purchasing cost. It was not possible to go into even more detailed cost drivers, as the information for example working hours was not available, which effected the final result of analyses in negative way.

The cost analysis concerning EP- and EPC-type projects for outsourcing and offshore outsourcing, did not give significant difference when comparing costs with only the engineering and packing costs changing. When analyzing the product costs in three model cases, it was found out that in this analyzing method by using cost drivers as entities and average figures, and not going very deep into product cost structure and identifying costs for each detailed parts, the result shows only some difference between product types. The main finding was the behavior of calculation model giving purchasing method 2, explained in chapter 3.5 page 80, to be most cost efficient way to execute purchases. But, it must be remembered this result was based on estimated figures effecting costs, not real and actual figures.

As mentioned in the chapter 3.6 on SWOT-analysis, the opportunities for best cost savings are when products are suppliers own technology and design. With Company technology and design the opportunities are “tide up” with the existing structures and components specifications. This phenomenon can also found in the costs analysis, where more significant cost reduces are realized only when the manufacturing and component costs are reduced. This finding drives the purchasing decision towards offshore outsourcing.

4.3 Suggestion for the basic guideline for outsourcing planning

The complexity of project purchasing involving various product types, purchasing methods, project types, sourcing locations, supply market situations, and delivery scopes, is creating challenges to planning project purchases in every project. Managing all these factors and variants in supply chain is loading the procurement with additional work, which should be avoided. The guideline, how each project purchases could be well planned and managed by showing the project purchasing in a structured manner, would benefit the whole project process. This guideline could be used from sales phase by foreseeing how the purchasing will be done, giving full view of the project cost structure and enabling more accurate basis for the budgeting.

The requirements to organization found by the local questionnaire give outlines how the process should be planned and organized. Related to knowledge of a product and mill processes as well contract management, Company should be more strict on the delivery scopes in each different case and trying to standardize to use only some repeating delivery scopes, and not to follow too much on the project in case and customers wishes. Also, there should be internal decisions made to narrow down the variety of delivery scopes. Important issue is the supplier selection process, where should be done more thorough evaluations and analyses to truly find out suppliers knowledge and skills. The problem today is, that the evaluation process is the same for very different suppliers, causing possible impreciseness and consequently partly misguided decisions.

As a guideline for purchasing method selection process is established flowchart (Appendix 9) representing typical process with decisions and determinants involved in the decision

making. This process must be evaluated product by product, as the determinants are product related, to find out the most suitable purchasing method. In this process the SWOT-analysis plays important role when identifying what are the key points to concentrate. Executing SWOT-analysis requires step-by-step plan prepared where the essential and carefully thought questions, for each products planned for offshore outsourcing, are presented. It is very important to make the SWOT-analysis case-by-case, as both products and projects have their various case specific factors or determinants.

Addition to SWOT-analysis, there should be also executed risk analyses to review what are the foreseen, estimated, and possible hidden risks. Risk analyses has some common issues with the SWOT-analysis, as SWOT-analysis tries to find out the weaknesses and threats. But on the other hand, opportunities and strengths may also include risks, when looking over the whole process. For example very low price means better margin, but it may as well lead to problems with tax authorities in some cases. As the risk analyses scope varies of course due to scale of planned contract, risk analyses must be also done case-by-case. Investing in well prepared and executed SWOT-analysis together with detailed risk analyses most probably will pay-off in the latter phases of the project.

As the final conclusion, it can be stated that, basically all types of products can be offshore outsourced, limitations for this are technology used in products and how Company sees the importance of each product to core business, and as well project contract or locations based issues. Despite there can be achieved cost savings by outsourcing or wider delivery scope in outsourcing, strategic decision of offshore outsourcing is required to proceed with the purchasing process to gain real benefits. Successful project procurement can be fulfilled, when properly and carefully considered offshore outsourcing decision is done, and it has been taken care of the proper follow-up, monitoring, measuring, feedback and corrective action plan implementation.

4.4 Suggestions for future research

The findings of cost analysis points out the importance of very detailed investigation of product cost structure down to smallest parts. This was not possible to do during this study,

as finding all needed data for materials, work, components, engineering etc., needs not only thorough search from the Company ERP and other systems, but as well wide co-operation with suppliers. The data acquiring from suppliers is most likely the most difficult part of investigation of actual costs, and needs very good relationship with the supplier, and the commitment and willing to implement such transparent operation with their customer.

Such cost figure mining should be done with one or two carefully selected suppliers for one or two product types, in the first steps of cost reducing process. When the detailed cost structure of product or products is finalized, only then thorough and successful cost analysis for different purchasing methods can be achieved.

As the project types, project categories and the delivery scopes inside projects varies project by project, a full study of projects during 10 years, or of enough long period, should be done for selection of product types to map the mostly used delivery scopes, supplier's and Company's, with the supply location to enable the execution of cost analysis. If it is not known, what are the delivery scopes and how outsourcing or offshore outsourcing will change the delivery scopes, there are no solid foundation to cost analysis.

REFERENCES

- Bals, L., Kneis, K.C., Lemke, C. & Pedersen, T. 2013. Toward a Flexible Breathing Organization: R&D Outsourcing at Bayer. In: Pedersen, T. (eds.) *The Offshoring Challenge: Strategic design and innovation for tomorrows's Organization*. Springer-Verlag, 2013. pp.211-226
- Bellow, E. 2013. Climate Change and the Offshoring Decision: Risk Evaluation and management. In: Pedersen, T. (eds.) *The Offshoring Challenge: Strategic design and innovation for tomorrows's Organization*. Springer-Verlag, 2013. pp.271-286
- Benton, W. 2009. *Purchasing and Supply Chain Management*, McGraw-Hill Education
- Burgess, K., Singh, P.J., Koroglu, R. 2006. Supply chain management: a structured literature review and implications for future research. *International Journal of Operations & production management*, Vol. 26, No. 7, p. 703-729
- Burtonshaw-Gunn, S.A. 2009, Pre-Contract Risk in International PFI. In: Zsidisin, G.A. (eds.) *Supply chain risk: A Handbook of Assessment, Management, and Performance*, Springer Science+Business Media., pp.186-198
- Caglio, A. Ditillo, A. 2012. Opening the black box of management accounting information exchanges in buyer–supplier relationships. *Management Accounting Research*, Vol 23, p.61-78
- Cambra-Fierro, J., Ruiz-Benitez, R. 2011. Notions for the successful management of the supply chain: learning with Carrefour in Spain and Carrefour in China. *Supply Chain Management: An International Journal*. Vol. 16, issue 2, p.148-154
- Cáñez, L., Platts, K. & Probert, D. 2000. Developing a framework for make-or-buy decisions. *International Journal of Operations & Production Management*, Vol. 20, Issue 11, pp.1313-1330

Central Intelligence Agency, The World Factbook [www.document], [Accessed 31.3.2018]. Available at <https://www.cia.gov/library/publications/the-world-factbook/fields/2100.html>

Chopra, S., Sodhi, M.S. 2004. Managing Risk To Avoid Supply-Chain Breakdown. *MIT Sloan management review*, FALL 2004, p.53-61

Christopher, M., Holweg, M. 2011. "Supply Chain 2.0": managing supply chains in the era of turbulence. *International Journal of Physical Distribution & Logistics Management*, Vol. 41, Issue 1, p.63-82

Christopher, M., Mnea, C., Khan, O., Yurt, O. 2011. Approaches to managing global sourcing risk. *Supply Chain Management: An International Journal*, Vol. 16, issue 2, p.67-81

Diaz, J.M. 2012. Southern Fire Exchange: Economic Impacts of Wildfire. SFE fact Sheet, 2012-7.

Dolgui, A. & Proth, J-M. 2010, Supply Chain Engineering: Useful Methods and Techniques, pp.77-108

Editorial 2009. Global sourcing and value creation: Opportunities and challenges. *Journal of International Management*, 2009, Vol. 15, p.121-125

Editorial 2013. Purchasing and Supply Management in a Changing World. *Journal of Purchasing & Supply Management*, Vol. 19, pp.119-121

Ellersdottir, E.T.. The Student Economic review, Vol. 28

Ellram, L. & Carr, A. 1994. Strategic Purchasing: A history and review of the literature. *International Journal of Purchasing and Materials Management*, Spring 1994, Vol 30, 2, p.43374

Ellström, D., Larsson, M.H. 2017. Dynamic and static pricing in open-book accounting. *Qualitative Reseach in Accounting & Management*, Vol. 14, Issue 1, p.21-37

Euler Hermes, Country risk map Q1 2018 [www.document]. [Accessed 03.04.2018]. Available at <http://www.eulerhermes.com/economic-research/country-risks>

Euler Hermes, Country risk ratings Q1 2018 [www.document]. [Accessed 03.04.2018]. Available at <http://www.eulerhermes.com/economic-research/country-risks>

Euler Hermes, Country report Estonia [www.document]. [Accessed 03.04.2018]. Available at <http://www.eulerhermes.com/economic-research/country-reports/Pages/Estonia.aspx>

Euler Hermes, Global machinery report [www.document]. [Accessed 03.04.2018]. Available at <http://www.eulerhermes.com/economic-research/sector-risks/Global-Machinery-Report/Pages/default.aspx>

Hoffjan, A., Kruse, H. 2006. Open book accounting in supply chains-when and how is it used in Practice?. *Cost management, Nov/Dec 2006*, Vol 20, Issue 6, p.40-47

Hoffmann, P., Schiele, H., Krabbendam, K. 2013. Uncertainty, supply risk management and their impact on performance. *Journal of Purchasing & Supply Management*, Vol. 19, p.199-211

Holl, A. 2008. Production subcontracting and location. *Regional Science and Urban Economics*, Vol. 38, p.299-309

Hopp, W. 2003. Supply chain science, 149 pages

Hwrang, H.B., Chong, C.S.P., Xie, N., Burgess, T.F. 2007. Modelling a complex supply chain understanding the effect of simplified assumptions. *International Journal of Production research*, Vol. 43, No. 13, p. 2829-2872

IOC International chamber of commerce, Incoterms® rules 2010 [www.document]. [Accessed 12.3.2017], Available at <https://iccwbo.org/resources-for-business/incoterms-rules/incoterms-rules-2010/>

Katkar, R. & Pawar, K. 2011. SWOT analysis of manufacturing outsourcing - a case study. *International Journal of Research in IT & Management*, Vol. 2, Issue 2, pp.924-935

Kogan, K. & Tapiero, C.S. 2007, Supply chain games: Operations management and risk valuation, Springer Science+Business Media 510 pages

Krause, D., Pagell, M. & Curkovic, S. 2001. Toward a measure of competitive priorities for purchasing. *Journal of Operations management*, Vol. 19, p.497-512

Krzemiska, A. 2008, Determinants and Management of Make-and Buy, Gabler edition wissenschaft, 212 pages

Mahaorand, T. & Al-hakim, L. 2005, Make or buy decision: perception gap analysis. International Conference on Business and Information, 14-15 July 2005.

McIvor, R.T., Humphreys, P.K. 2000. A case-based reasoning approach to the make or buy decision. *Integrated Manufacturing Systems*, Vol. 11, Issue 5, pp.295-310

McIvor, R., Humphreys, P. & McAleer, W. 1997. A strategic model for the formulation of an effective make or buy decision. *Management Decisions*, Vol. 35, Issue 2, pp.169-178

Mentzer, J.T., DeWitt, W., Keebler, J.S., Min, S., Nix, N.W., Smith, C.D. & Zacharia, Z.G. 2001. Defining supply chain management. *Journal of Business Logistics*, Vol. 22, No. 2, 25 pages

Merriam-Webster, Incorporated, Definition of subcontract [www.document]. [Accessed 19.3.2017], Available at <https://www.merriam-webster.com/dictionary>

Mol, M. 2003. Purchasing's strategic relevance. *Journal of Purchasing & Supply Management*, Vol 9, p.43-50

Moschuris, S. 2015. Decision-making criteria in tactical make or buy issues: an empirical analysis. *EuroMed Journal of Business*, Vol. 10, Issue 1, pp.2-20

Moses, A. 2011. Cross-functional make or buy decision process ownership. *Management Research Review*, Vol. 34, Issue 9, pp.1042-1060

Moses, A. & Åhlström, P. 2008. Dimensions of change in make or buy decision processes. *Strategic Outsourcing: An International Journal*, Vol. 1, Issue 3, pp.230-251

Nieto, M.J. & Rodriguez, A. 2013. The Challenge of R&D Offshoring: Implications for Firm Productivity. In: Pedersen, T. (eds.) *The Offshoring Challenge: Strategic design and innovation for tomorrow's Organization.*, Springer-Verlag 2013, pp.175-190

Olson, D. and Wu, D. 2010. *Enterprise Risk Management Models*. Springer-Verlag 2010

Paz-Aparicio, A., Ricart, J.E., 2013. Offshoring Activities Impact a Company's Business Model: The case of BBVA and Banco Santander. In: Pedersen, T. (eds.) *The Offshoring Challenge: Strategic Design and Innovation for Tomorrow's Organization.*, Springer-Verlag, 2013, p. 21-35

Pedersen, T., Bals, L., Örberg Jense, P.D., Larsen, M.M. 2013. Exploring Layers of Complexity in Offshoring Research and Practice. In: Pedersen, T. (eds.) *The Offshoring Challenge: Strategic Design and Innovation for Tomorrow's Organization*, Springer-Verlag, 2013, p. 1-18

Pickett, D. 2013. A blueprint for supply chain optimization. *Supply chain Management Review*, September/October 2013, pp.30-39

Primo, M. & Filho, J. 2012. The role of procurement and supply chain in the success of large projects. Proceedings of the 2012 Industrial and Systems Engineering Research Conference.

SourceSuite.com, Purchasing Related Articles & Insights, article 22 of 34 [www.document]. [Accessed 12.3.2017], Available at <http://www.sourcesuite.com/procurement-learning/purchasing-articles/history-of-procurement-past-present-future.jsp>

Quinn, J. & Hilmer, F. 1994. Strategic outsourcing. *Sloan Management Review, Summer 1994*, Vol. 35 Issue 4, p.43-55

Quintens, L., Pauwels, P. & Matthyssens, P. 2006. Global purchasing: State of the art and research directions. *Journal of Purchasing & Supply Management*, Vol 12, p. 170-181

Rangan, U.S., Schumacher, P., 2013. Entrepreneurial Globalization: Lessons From The Offshoring Experiences of European Firms. In: Pedersen, T. (eds.) *The Offshoring Challenge: Strategic Design and Innovation for Tomorrow's Organization.*, Springer-Verlag, 2013, p. 37-55

Schneider, L., Wallenburg, C.M. 2013. 50 Years of research on organizing the purchasing function: Do we need any more?. *Journal of Purchasing & Supply Management*, Vol. 19, p.144-164

Seppälä, T., 2013a. Tracking Offshoring and Outsourcing Strategies in Global Supply Chains. In: Pedersen, T. (eds.) *The Offshoring Challenge: Strategic Design and Innovation for Tomorrow's Organization*, Springer-Verlag, 2013, p. 57-76

Shorten, D., Pfitzmann, M. & Kaushal, A. 2006, *Make Versus Buy: A decision framework*, 9 pages

Slepnirov, D., Larsen, M.M., Waehrens, B.V., Pedersen, T. & Johansen, J. 2013. Global Operations Coevolution: Hidden Effects and Responses. In: Pedersen, T. (eds.) *The Offshoring Challenge: Strategic design and innovation for tomorrows's Organization.*, Springer-Verlag, 2013, pp.123-140

Søberg, P.V. & Waehrens, B.V. 2013. The dual Role of Subsidiary Autonomy in Intra-MNC Knowledge Transfer. In: Pedersen, T. (eds.) *The Offshoring Challenge: Strategic design and innovation for tomorrows's Organization*, Springer-Verlag, 2013, pp.155-171

Tassabehji, R & Moorhouse, A. 2008. The changing role of procurement: Developing professional effectiveness. *Journal of Purchasing & Supply Management*, Vol 14, p.55-68

United Nations, United Nations Commission on International Trade Law UNCITRAL, United Nations Convention on Contracts for the International Sale of Goods (Vienna, 1980) [www.document]. [Accessed 03.04.2018], Available at http://www.uncitral.org/uncitral/en/uncitral_texts/sale_goods/1980CISG_status.html, 3 pages

Vrat, P. 2014. *Materials management: An Integrated Systems Approach*, Springer, 408 Pages

Wagner, S.M. & Bode, C. 2009. Dominant risks and risk management practices in supply chains. In: Zsidisin, G.A. (eds.) *Supply chain risk: A Handbook of Assessment, Management, and Performance*, Springer Science+Business Media, pp.271-290

Welch, J.A., Nayak, P.R. 1992. Strategic sourcing: a progressive approach to the make or buy decision. *Academy of Management Executive*, Vol 6, No. 1, pp.23-31

World bank group, Key Features of Common Law or Civil Law Systems, [www.document]. [Accessed 31.3.2018], Available at <http://ppp.worldbank.org/public-private-partnership/legislation-regulation/framework-assessment/legal-systems/common-vs-civil-law>

World Meteorological Organization (WMO), What is Climate Change?, [www.document]. [Accessed 12.3.2017], Available at http://www.wmo.int/pages/prog/wcp/ccl/faq/faq_doc_en.html

Zsidisin, G.A. & Ritchie, B. 2009, Supply Chain Risk Management. In: Zsidisin, G.A. (eds.) *Supply chain risk: A Handbook of Assessment, Management, and Performance*, Springer Science+Business Media, pp. 1-18

APPENDICES

Appendix 1: Country risk map Q1 2018

Appendix 2: Country risk rating

Appendix 3: Country report Estonia

Appendix 4: Global sector report Machinery

Appendix 5: Organization multidivisional

Appendix 6: Organization single contract

Appendix 7: Local questionnaire questions

Appendix 8: Global Questionnaire

Appendix 9: Purchasing method selection process

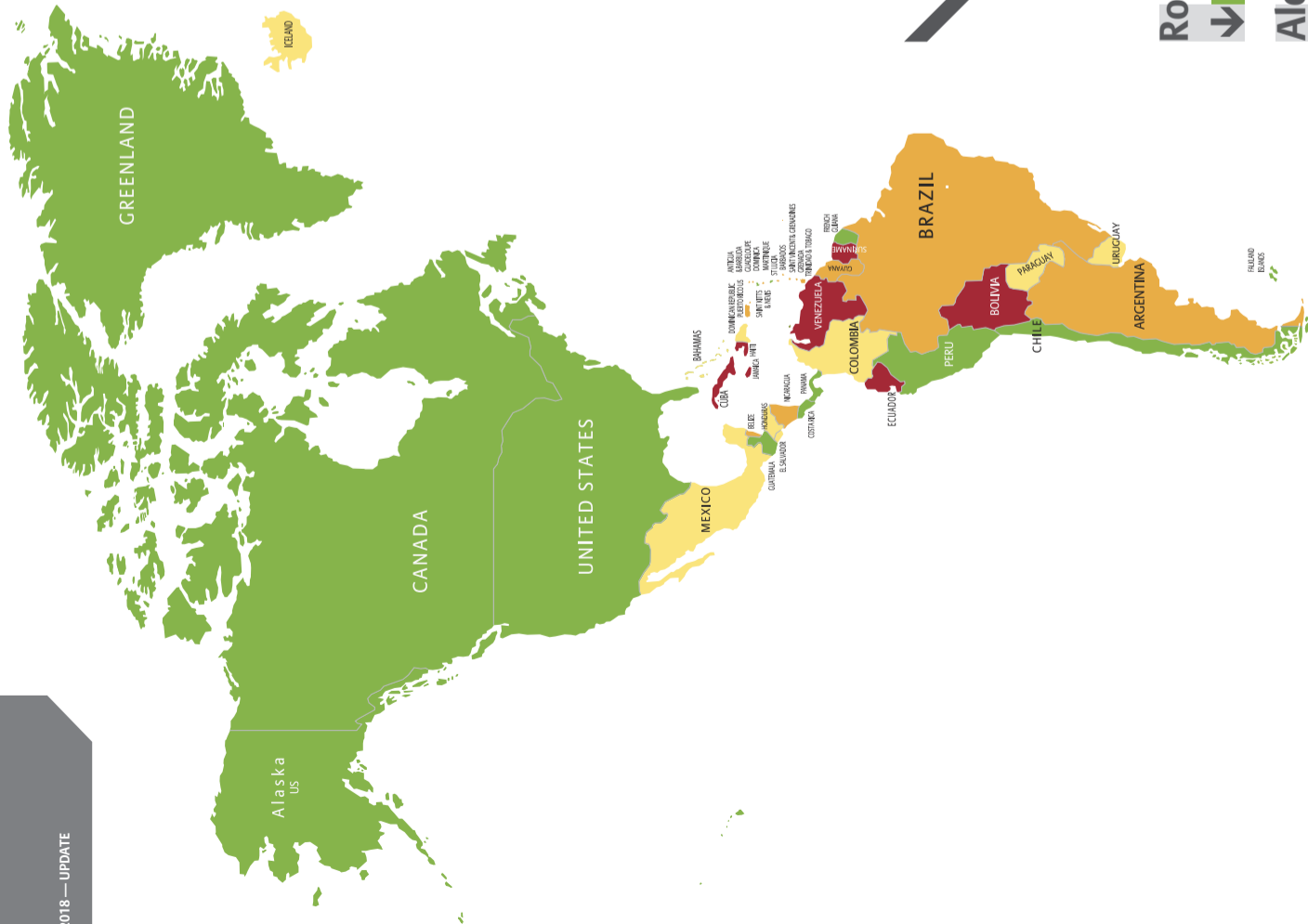
8 changes in country risk ratings 1st Quarter 2018

5
↑ countries with upgraded ratings

- Chile** ↑ A2 → A1
- Ghana** ↑ B2 → B1
- Côte d'Ivoire** ↑ C3 → C2
- Egypt** ↑ C3 → C2
- Russia** ↑ C4 → C3

3
↓ countries with downgraded ratings

- Romania** ↓ B1 → B2
- Algeria** ↓ C2 → C3
- Tunisia** ↓ B3 → C3



Medium term risk scale comprises 6 levels: AA represents the lowest risk, D the highest.

Short term risk scale comprises 4 levels: 1 represents the lowest risk, 4 the highest.

Source: Euler Hermes, as of March 27, 2018

↑ Improved rating
↓ Deteriorated rating

Low risk Medium risk Sensitive risk High risk

Economic Research



EULER HERMES
Our knowledge serving your success

DISCLAIMER
These assessments are, as always, subject to the disclaimer provided below.
This material is published by Euler Hermes SA, a Company of Allianz, for information purposes only and should not be regarded as providing any specific advice. Recipients should make their own independent evaluation of this information and no action should be taken, solely relying on it. This material should not be reproduced or disclosed without our consent. It is not intended for distribution in any jurisdiction in which this would be prohibited. Whilst this information is believed to be reliable, it has not been independently verified by Euler Hermes and Euler Hermes makes no representation or warranty (express or implied) of any kind, as regards the accuracy or completeness of this information, nor does it accept any responsibility or liability for any loss or damage arising in any way from any use made of or reliance placed on, this information. Unless otherwise stated, any views, forecasts, or estimates are solely those of the Euler Hermes Economics Department, as of this date and are subject to change without notice. Euler Hermes SA is authorised and regulated by the Financial Markets Authority of France.
© Copyright 2018 Euler Hermes. All rights reserved.

Country Risk Classifications of the Participants to the Arrangement on Officially Supported Export CreditsValid as of: **26 January 2018**

	Country Code ISO Alpha 3	Country Name ⁽¹⁾	Classification		Notes
			Previous	Current Prevailing	
1	AFG	Afghanistan	7	7	
2	ALB	Albania	6	6	
3	DZA	Algeria	4	4	
4	AND	Andorra	-	-	(9)
5	AGO	Angola	6	6	
6	ATG	Antigua and Barbuda	7	7	(8)
7	ARG	Argentina	6	6	
8	ARM	Armenia	6	6	
9	ABW	Aruba	4	4	
10	AUS	Australia	-	-	(6)
11	AUT	Austria	-	-	(6) (7)
12	AZE	Azerbaijan	5	5	
13	BHS	Bahamas	3	3	
14	BHR	Bahrain	4	4	
15	BGD	Bangladesh	5	5	
16	BRB	Barbados	-	-	(5)
17	BLR	Belarus	7	6	
18	BEL	Belgium	-	-	(6) (7)
19	BLZ	Belize	7	7	
20	BEN	Benin	6	6	(8)
21	BTN	Bhutan	6	6	
22	BOL	Bolivia	5	5	
23	BIH	Bosnia and Herzegovina	7	7	
24	BWA	Botswana	2	2	
25	BRA	Brazil	5	5	
26	BRN	Brunei Darussalam	-	-	(5)
27	BGR	Bulgaria	3	3	
28	BFA	Burkina Faso	7	7	(8)
29	BDI	Burundi	7	7	
30	CPV	Cabo Verde	6	6	
31	KHM	Cambodia	6	6	
32	CMR	Cameroon	6	6	(8)
33	CAN	Canada	-	-	(6)
34	CAF	Central African Republic	7	7	(8)
35	TCD	Chad	7	7	(8)
36	CHL	Chile	-	-	(6)
37	CHN	China (People's Republic of)	2	2	
38	COL	Colombia	4	4	
39	COM	Comoros	-	-	(5)
40	COG	Congo	7	7	(8)
41	CRI	Costa Rica	3	3	
42	CIV	Côte d'Ivoire	6	6	(8)
43	HRV	Croatia	5	4	
44	CUB	Cuba	7	7	
45	CUW	Curaçao	5	5	
46	CYP	Cyprus	-	-	(2) (7)

Country Risk Classifications of the Participants to the Arrangement on Officially Supported Export CreditsValid as of: **26 January 2018**

	Country Code ISO Alpha 3	Country Name ⁽¹⁾	Classification		Notes
			Previous	Current Prevailing	
47	CZE	Czech Republic	-	-	(6)
48	PRK	Democratic People's Republic of Korea	7	7	
49	COD	Democratic Republic of the Congo	7	7	
50	DNK	Denmark	-	-	(6)
51	DJI	Djibouti	7	7	
52	DMA	Dominica	-	-	(5)
53	DOM	Dominican Republic	4	4	
54	ECU	Ecuador	6	6	
55	EGY	Egypt	6	6	
56	SLV	El Salvador	5	5	(8)
57	GNQ	Equatorial Guinea	7	7	(8)
58	ERI	Eritrea	7	7	
59	EST	Estonia	-	-	(6) (7)
60	ETH	Ethiopia	7	7	
61	FJI	Fiji	6	6	
62	FIN	Finland	-	-	(6) (7)
63	MKD	Former Yugoslav Republic of Macedonia	5	5	
64	FRA	France	-	-	(6) (7)
65	GAB	Gabon	6	6	(8)
66	GMB	Gambia	7	7	
67	GEO	Georgia	6	6	
68	DEU	Germany	-	-	(6) (7)
69	GHA	Ghana	6	6	
70	GRC	Greece	-	-	(6) (7)
71	GRD	Grenada	-	-	(5)
72	GTM	Guatemala	4	4	
73	GIN	Guinea	7	7	
74	GNB	Guinea-Bissau	7	7	(8)
75	GUY	Guyana	6	6	
76	HTI	Haiti	7	7	
77	HND	Honduras	5	5	
78	HKG	Hong Kong (China)	2	2	
79	HUN	Hungary	-	-	(6)
80	ISL	Iceland	-	-	(6)
81	IND	India	3	3	
82	IDN	Indonesia	3	3	
83	IRN	Iran	6	5	
84	IRQ	Iraq	7	7	
85	IRL	Ireland	-	-	(6) (7)
86	ISR	Israel	-	-	(3) (6)
87	ITA	Italy	-	-	(6) (7)
88	JAM	Jamaica	6	6	
89	JPN	Japan	-	-	(6)
90	JOR	Jordan	5	5	
91	KAZ	Kazakhstan	6	6	
92	KEN	Kenya	6	6	

Country Risk Classifications of the Participants to the Arrangement on Officially Supported Export CreditsValid as of: **26 January 2018**

	Country Code ISO Alpha 3	Country Name ⁽¹⁾	Classification		Notes
			Previous	Current Prevailing	
93	KIR	Kiribati	-	-	(5)
94	KOR	Korea	-	-	(6)
95		Kosovo	7	7	(4)
96	KWT	Kuwait	2	2	
97	KGZ	Kyrgyzstan	7	7	
98	LAO	Lao People's Democratic Republic	7	7	
99	LVA	Latvia	-	-	(6) (7)
100	LBN	Lebanon	7	7	
101	LSO	Lesotho	6	6	
102	LBR	Liberia	7	7	
103	LBY	Libya	7	7	
104	LIE	Liechtenstein	-	-	(5)
105	LTU	Lithuania	-	-	(7)
106	LUX	Luxembourg	-	-	(6) (7)
107	MAC	Macau (China)	2	2	
108	MDG	Madagascar	7	7	
109	MWI	Malawi	7	7	
110	MYS	Malaysia	2	2	
111	MDV	Maldives	6	6	
112	MLI	Mali	7	7	(8)
113	MLT	Malta	-	-	(7)
114	MHL	Marshall Islands	-	-	(5)
115	MRT	Mauritania	7	7	
116	MUS	Mauritius	3	3	
117	MEX	Mexico	3	3	
118	FSM	Micronesia	-	-	(5)
119	MDA	Moldova	7	7	
120	MCO	Monaco	-	-	(9)
121	MNG	Mongolia	6	6	
122	MNE	Montenegro	7	7	
123	MAR	Morocco	3	3	
124	MOZ	Mozambique	7	7	
125	MMR	Myanmar	6	6	
126	NAM	Namibia	4	4	
127	NRU	Nauru	-	-	(5)
128	NPL	Nepal	6	6	
129	NLD	Netherlands	-	-	(6) (7)
130	NZL	New Zealand	-	-	(6)
131	NIC	Nicaragua	6	6	
132	NER	Niger	7	7	(8)
133	NGA	Nigeria	6	6	
134	NOR	Norway	-	-	(6)
135	OMN	Oman	3	4	
136	PAK	Pakistan	7	7	
137	PLW	Palau	-	-	(5)
138	PAN	Panama	3	3	(8)

Country Risk Classifications of the Participants to the Arrangement on Officially Supported Export CreditsValid as of: **26 January 2018**

	Country Code ISO Alpha 3	Country Name ⁽¹⁾	Classification		Notes
			Previous	Current Prevailing	
139	PNG	Papua New Guinea	6	6	
140	PRY	Paraguay	5	5	
141	PER	Peru	3	3	
142	PHL	Philippines	3	3	
143	POL	Poland	-	-	(6)
144	PRT	Portugal	-	-	(6) (7)
145	QAT	Qatar	3	3	
146	ROU	Romania	3	3	
147	RUS	Russia	4	4	
148	RWA	Rwanda	6	6	
149	KNA	Saint Kitts and Nevis	-	-	(5)
150	LCA	Saint Lucia	-	-	(5)
151	VCT	Saint Vincent and the Grenadines	-	-	(5)
152	WSM	Samoa	-	-	(5)
153	SMR	San Marino	-	-	(9)
154	STP	Sao Tome and Principe	-	-	(5)
155	SAU	Saudi Arabia	2	2	
156	SEN	Senegal	5	5	(8)
157	SRB	Serbia	5	5	
158	SYC	Seychelles	6	6	
159	SLE	Sierra Leone	7	7	
160	SGP	Singapore	0	0	
161	SXM	Sint Maarten	-	-	(5)
162	SVK	Slovak Republic	-	-	(6) (7)
163	SVN	Slovenia	-	-	(6) (7)
164	SLB	Solomon Islands	-	-	(5)
165	SOM	Somalia	7	7	
166	ZAF	South Africa	4	4	
167	SSD	South Sudan	7	7	
168	ESP	Spain	-	-	(6) (7)
169	LKA	Sri Lanka	6	6	
170	SDN	Sudan	7	7	
171	SUR	Suriname	6	6	
172	SWZ	Swaziland	6	6	
173	SWE	Sweden	-	-	(6)
174	CHE	Switzerland	-	-	(6)
175	SYR	Syrian Arab Republic	7	7	
176	TWN	Chinese Taipei	1	1	
177	TJK	Tajikistan	7	7	
178	TZA	Tanzania	6	6	
179	THA	Thailand	3	3	
180	TLS	Timor-Leste	6	6	
181	TGO	Togo	6	6	(8)
182	TON	Tonga	-	-	(5)
183	TTO	Trinidad and Tobago	3	3	
184	TUN	Tunisia	5	5	

Country Risk Classifications of the Participants to the Arrangement on Officially Supported Export CreditsValid as of: **26 January 2018**

	Country Code ISO Alpha 3	Country Name ⁽¹⁾	Classification		Notes
			Previous	Current Prevailing	
185	TUR	Turkey	4	4	
186	TKM	Turkmenistan	6	6	
187	TUV	Tuvalu	-	-	(5)
188	UGA	Uganda	6	6	
189	UKR	Ukraine	7	7	
190	ARE	United Arab Emirates	2	2	
191	GBR	United Kingdom	-	-	(6)
192	USA	United States	-	-	(6)
193	URY	Uruguay	3	3	
194	UZB	Uzbekistan	6	6	
195	VUT	Vanuatu	-	-	(5)
196	VEN	Venezuela	7	7	
197	VNM	Viet Nam	5	5	
198	PSE	West Bank and Gaza	7	7	
199	YEM	Yemen	7	7	
200	ZMB	Zambia	6	6	
201	ZWE	Zimbabwe	7	7	

Notes

(1) *This document and any map included herein are without prejudice to the status of or sovereignty over any territory, to the delimitation of international frontiers and boundaries and to the name of any territory, city or area.*

(2) Footnote by Turkey

The information in this document with reference to « Cyprus » relates to the southern part of the Island. There is no single authority representing both Turkish and Greek Cypriot people on the Island. Turkey recognises the Turkish Republic of Northern Cyprus (TRNC). Until a lasting and equitable solution is found within the context of the United Nations, Turkey shall preserve its position concerning the “Cyprus issue”.

Footnote by all the European Union Member States of the OECD and the European Commission

The Republic of Cyprus is recognised by all members of the United Nations with the exception of Turkey. The information in this document relates to the area under the effective control of the Government of the Republic of Cyprus.

(3) *The statistical data for Israel are supplied by and under the responsibility of the relevant Israeli authorities. The use of such data by the OECD is without prejudice to the status of the Golan Heights, East Jerusalem and Israeli settlements in the West Bank under the terms of international law.*

(4) *This designation is without prejudice to positions on status, and is in line with United Nations Security Council Resolution 1244/99 and the Opinion of the International Court of Justice on Kosovo’s declaration of independence.*

(5) *Currently not reviewed or classified.*

(6) *High Income OECD Country not reviewed or classified.*

(7) *High Income Euro Area Country not reviewed or classified.*

Country Risk Classifications of the Participants to the Arrangement on Officially Supported Export CreditsValid as of: **26 January 2018**

Country Code ISO Alpha 3	Country Name ⁽¹⁾	Classification		Notes
		Previous	Current Prevailing	

- (8) According to article 26 of the Arrangement, for all countries classified through the county risk classification methodology, the risk of the sovereign is also assessed in order to identify, on an exceptional basis, sovereigns that are: (1) not the lowest risk obligor in the country and (2) whose credit risk is significantly higher than country risk.
- (9) European micro-state that uses the euro through monetary agreement with the European Union not reviewed or classified.



Growth should pick up in 2017 with investment

General Information



GDP	USD22.7bn (World ranking 105, World Bank 2015)
Population	1.31mn (World ranking 154, World Bank 2015)
Form of state	Parliamentary Republic
Head of government	Juri RATAS (Prime Minister)
Next elections	2019, legislative



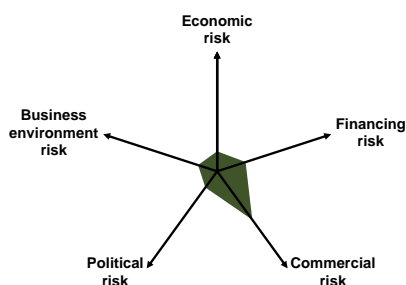
Strengths

- Low systemic political risk
- Good regional and international relations (except with Russia), EU membership
- One of the most open and liberal economies in the world
- Eurozone membership provides for low transfer and convertibility risk
- Healthy public finances
- Strong business environment, supported by stable institutions and an independent judiciary

Weaknesses

- High gross external debt
- Trade and energy dependence on Russia

Country Rating

AA1


Source: Euler Hermes

Trade Structure

By destination/origin (% of total)

Exports	Rank	Imports
Sweden	16% 1 12%	Finland
Finland	13% 2 11%	Germany
Russian Federation	13% 3 11%	Russian Federation
Latvia	9% 4 7%	Latvia
Lithuania	5% 5 7%	Poland

By product (% of total)

Exports	Rank	Imports
Telecommunications Equipment	12% 1 12%	Refined Petroleum Products
Crude Oil	6% 2 6%	Telecommunications Equipment
Electrical Apparatus	6% 3 6%	Electrical Apparatus
Refined Petroleum Products	6% 4 4%	Cars And Cycles
Non-Edible Agricultural Prod.	4% 5 4%	Plastic Articles

Sources: Unctadstat, Chelem (2014)

Economic Overview

Weak investment holds back growth

Real GDP growth decelerated from +2.8% in 2014 to +1.4% in 2015 and edged up slightly to a still modest +1.6% in 2016. The latter was mainly driven by domestic consumption and inventories. Private consumption increased by +4% and government consumption by +1% in 2016. However, fixed investment decreased again, by -2.8% y/y, though this marked an improvement from -3.4% in 2015 and -8.1% in 2014. Meanwhile, inventories added +0.8pp to 2016 growth, a marked rebound from the drop in 2015 (-1.5pp). External trade activity recovered in 2016 as the adverse effects of the Russia crisis in 2015 faded. Exports grew by +3.6% but were outpaced by imports (+4.9%) so that net exports subtracted -0.8pp from growth in 2016.

Going forward, fixed investment should return to growth mode in 2017, in part because government investment is expected to surge as EU-funded projects will enter the implementation phase. Consumer spending is likely to ease somewhat due to the return of moderate inflation. Still, domestic demand is set to remain the key growth driver in the next two years. Euler Hermes forecasts full-year real GDP growth to accelerate to around +2% in 2017 and +2.2% in 2018.

Good macroeconomic fundamentals

As expected, deflation gave way to inflation in 2016. After falling in the first seven months, consumer prices have picked up since August and reached an increase of +2.2% y/y in December, taking the average of 2016 to +0.1%. Euler Hermes forecasts average inflation of just over +2% in 2017. Meanwhile, bank lending to the private sector picked up to a healthy +11% y/y in the first 10 months of 2016, boding well for a recovery of private investment in 2017.

Public finances remain favorable. Euler Hermes expects small annual fiscal deficits of up to -0.5% of GDP in 2017-2018 and public debt should remain very low about 10% of GDP.

The current account balance is favorable as well. Surpluses were recorded in 2014-2015 and in the first 10 months of 2016 (EUR387mn). As energy prices are set to pick up gradually, the surplus is forecast to narrow to around +1% of GDP in 2017.

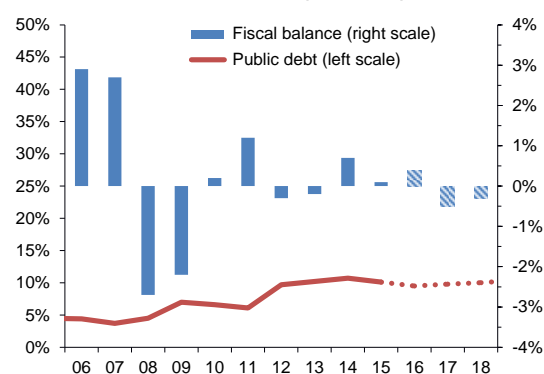
Gross external debt remains the weak spot. It soared to an alarming level of 139% of GDP in 2009, built up by earlier large current account deficits. The ratio fell to a still high 92% in 2015 and should remain around that level in the next two years. Hence external debt remains a cause of some concern and requires close monitoring.

Key economic forecasts

	2015	2016e	2017f	2018f
GDP growth (% change)	1.4	1.6	2.0	2.2
Inflation (% , end-year)	-0.9	2.2	2.0	2.2
Fiscal balance (% of GDP)	0.1	0.4	-0.5	-0.3
Public debt (% of GDP)	10.1	9.5	9.8	10.0
Current account (% of GDP)	2.1	1.5	1.0	1.0
External debt (% of GDP)	91.9	92.0	91.5	91.0

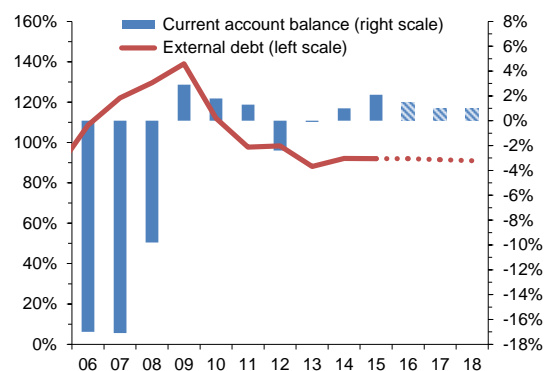
Sources: National statistics, IHS, Euler Hermes

Public finances (% of GDP)



Sources: Eurostat, Euler Hermes

Current account and external debt (% of GDP)



Sources: National statistics, IHS, Euler Hermes

DISCLAIMER

These assessments are, as always, subject to the disclaimer provided below.

This material is published by Euler Hermes SA, a Company of Allianz, for information purposes only and should not be regarded as providing any specific advice. Recipients should make their own independent evaluation of this information and no action should be taken, solely relying on it. This material should not be reproduced or disclosed without our consent. It is not intended for distribution in any jurisdiction in which this would be prohibited. Whilst this information is believed to be reliable, it has not been independently verified by Euler Hermes and Euler Hermes makes no representation or warranty (express or implied) of any kind, as regards the accuracy or completeness of this information, nor does it accept any responsibility or liability for any loss or damage arising in any way from any use made of or reliance placed on, this information. Unless otherwise stated, any views, forecasts, or estimates are solely those of the Euler Hermes Economics Department, as of this date and are subject to change without notice. Euler Hermes SA is authorised and regulated by the Financial Markets Authority of France.

© Copyright 2017 Euler Hermes. All rights reserved.

View all Euler Hermes Economic Research online

<http://www.eulerhermes.com>

Contact Euler Hermes Economic Research Team

research@eulerhermes.com

Last review: 2017-03-03
Country Risk Analyst:

Manfred Stamer
manfred.stamer@eulerhermes.com

2

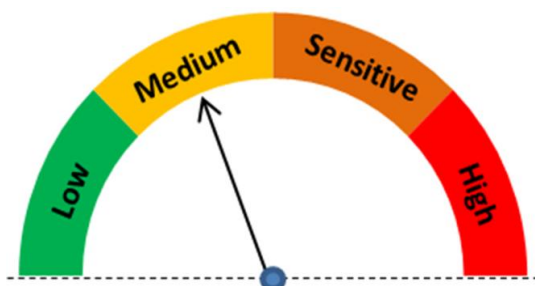


Euler
Hermes
Economic
Research

Global Sector Report

MACHINERY

Sector Risk Rating



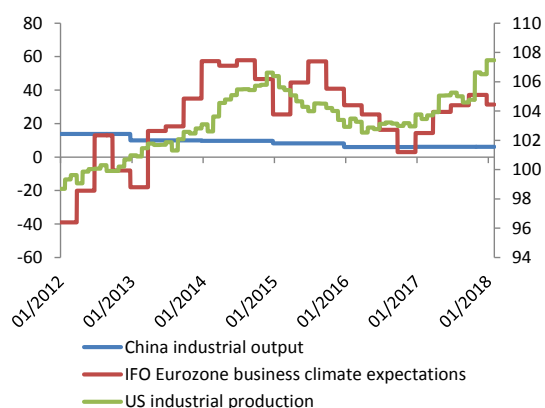
What to Watch?

- Order book momentum
- Indications of change in pricing power and input commodities volatility
- Reversal of USD weakness
- Impact of monetary policy on economic activity and inflation as key drivers for sector earnings

Motoring on with the economy

As one of the most cyclical sectors, synchronised economic growth will buoy activity in the machinery sector across all major regions. 2017 was the best year for the sector since 2011 on various accounts and the outlook remains positive: Business confidence in Europe stands at two year highs as does US industrial production. For a very export driven sector, global trade growth of +6.8% (EH forecast 2018 in nominal terms) USD weakness will support activity as about 50% of machinery exports happen in USD. All of the major end markets are expected to deliver growth: Construction equipment sales growth +3.4% y/y 2018, mining capex +7% 2018, oil & gas capex +4% globally / +11% US Independents (source all: Bloomberg consensus). The commodity sectors (oil/gas, mining) are coming out of recovery and likely to increase capex, driven by strong pricing and cash flow growth while. Construction remains buoyant albeit with the caveat of slowdown in China. New infrastructure investment, namely in the US should drive orders of construction equipment. While rising commodities and materials costs, which can account for up to 75% of the total cost base in certain sectors, pose a risk to profitability, at this point, pricing power is strong enough to protect margins. On average, solid double-digit sector earnings growth is evidence of the recovery, to +34% y/y according to Bloomberg consensus.

Key demand indicators:
Industrial production and business expectations

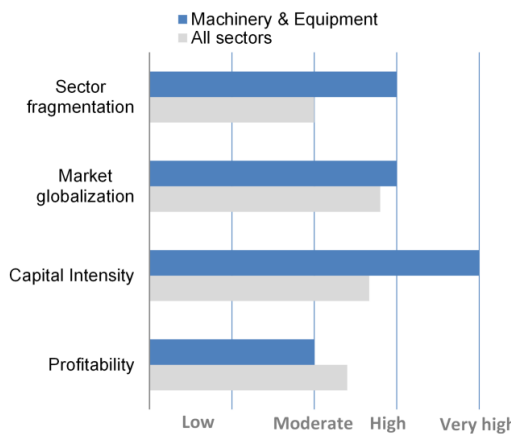


Sources: Bloomberg, IFO

Key Players

Country	Role	Sector Risk
China	#1 producer #1 exporter #2 importer	●
United States	#1 importer #2 producer #3 exporter	●
Germany	#2 exporter #3 importer	●

ID Card



Strengths

- High barriers to entry
- Long-run business cycle serves as a buffer to short term market variations
- Core of industrial innovation

Weaknesses

- Volatility in commodity driven end markets and very cyclical sectors
- Capital intensity
- Increasing dependency on riskier counterparties

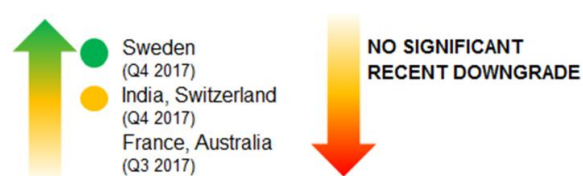
Subsectors Insight

Robotics manufacturers: The sector benefits from a secular growth trend in fab automation. Automotive is a strong driver but also electronics and other sectors

Heavy manufacturing machinery: Sustained growth in industrial manufacturing should continue to support sector order books

Specialised technologies: Global economic activity along with recovery in mining and structural demand related to clean energy and sustainable manufacturing underpin activity

Recent Sector Risk Changes



DISCLAIMER

These assessments are, as always, subject to the disclaimer provided below.

This material is published by Euler Hermes SA, a Company of Allianz, for information purposes only and should not be regarded as providing any specific advice. Recipients should make their own independent evaluation of this information and no action should be taken, solely relying on it. This material should not be reproduced or disclosed without our consent. It is not intended for distribution in any jurisdiction in which this would be prohibited. Whilst this information is believed to be reliable, it has not been independently verified by Euler Hermes and Euler Hermes makes no representation or warranty (express or implied) of any kind, as regards the accuracy or completeness of this information, nor does it accept any responsibility or liability for any loss or damage arising in any way from any use made of or reliance placed on, this information. Unless otherwise stated, any views, forecasts, or estimates are solely those of the Euler Hermes Economics Department, as of this date and are subject to change without notice. Euler Hermes SA is authorised and regulated by the Financial Markets Authority of France.

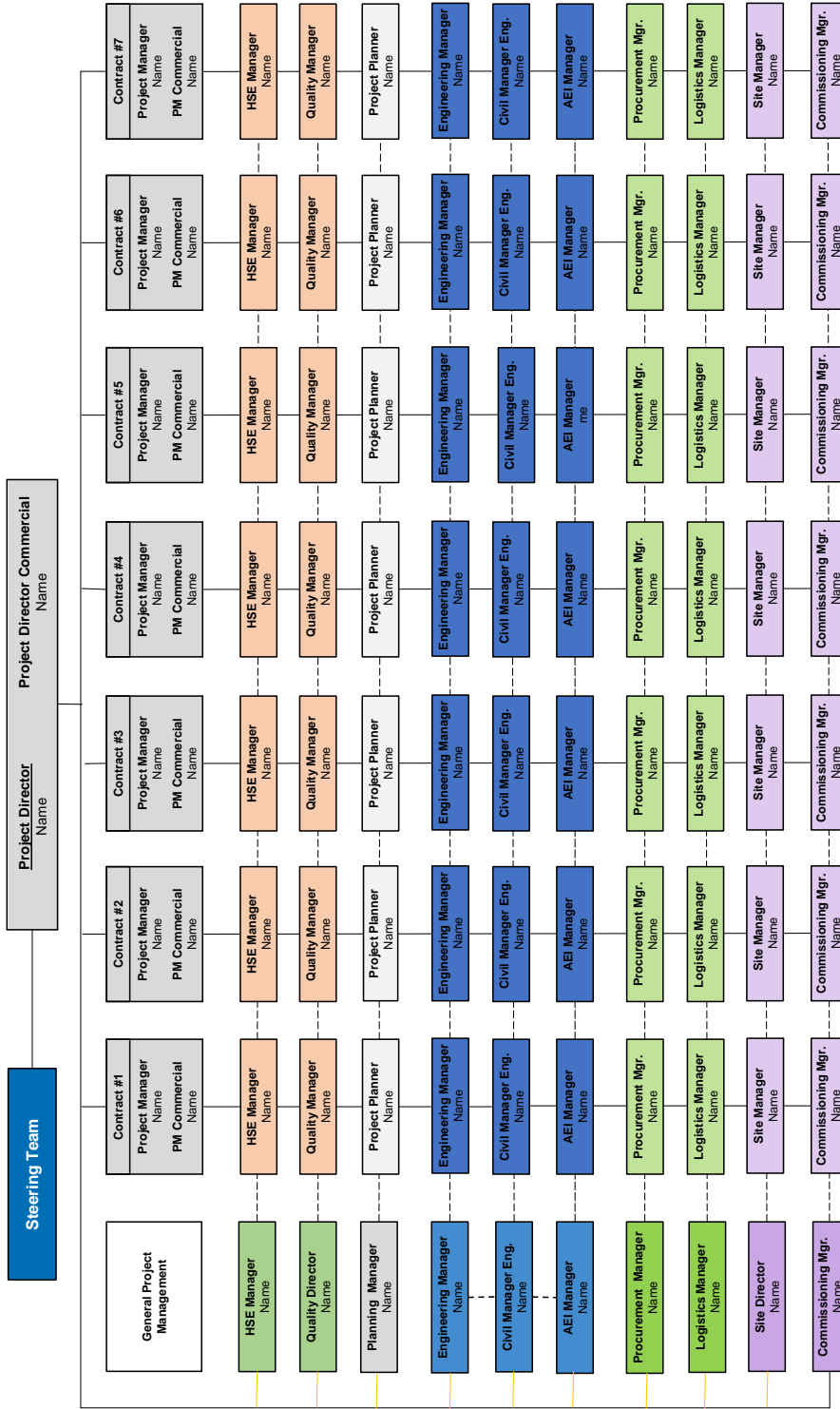
© Copyright 2018 Euler Hermes. All rights reserved.

View all Euler Hermes
Economic Research online
<http://www.eulerhermes.com/economic-research>

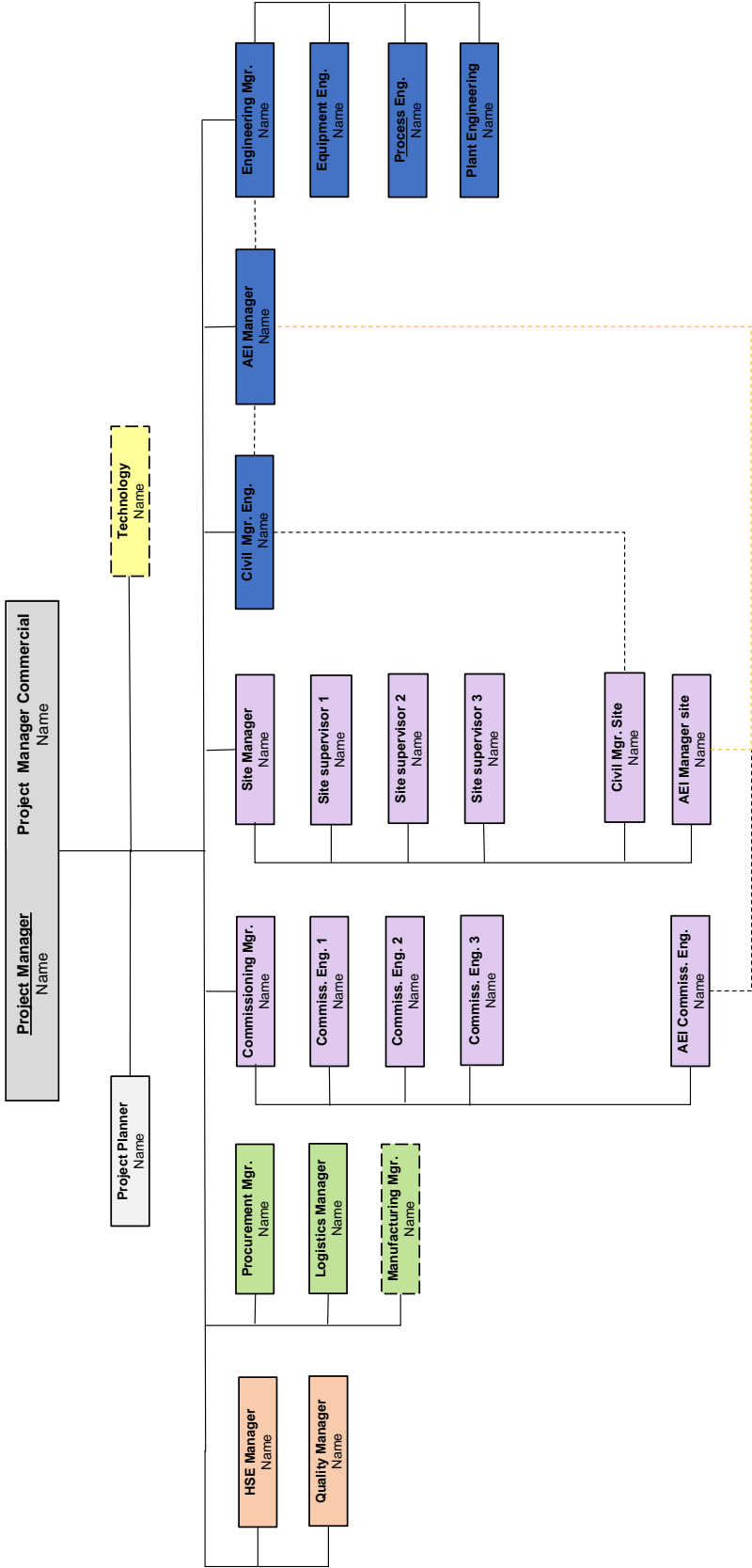
Contact Euler Hermes Economic
Research Team
✉ research@eulerhermes.com

Last review: February 2018
Sector Risk Analyst:
Catharina Hillenbrand-Saponar
✉ catharina.hillenbrand-saponar@eulerhermes.com

Project Organization – Multi Divisional Project



Project Organization – Product Group Single Contract



Local questionnaire for following operations:

Sales:

1. Miten laitteiden kokonaishankinta vaikuttaa myynnissä?
2. Onko kokonaishankinnat helpottava tekijä myynnin kannalta?
3. Mihin haasteisiin/ongelmiin on varauduttava?
4. Tuleeko muuta mieleen?

Product management:

1. Mitä vaatimuksia kokonaishankinta luo tuotehallinnalle?
2. Mitä asioita kokonaishankinnan toimittajan täytyy osata?
3. Mitä ongelmia tutkittavien laitteiden kokonaishankinnassa voi olla tuotehallinnan näkökulmasta?
4. Mihin haasteisiin/ongelmiin on varauduttava?
5. Tuleeko muuta mieleen?

Project management:

1. Miten laitteiden kokonaishankinta vaikuttaa projekteissa?
2. Onko kokonaishankinnat helpottava tekijä projektin kannalta?
3. Mihin haasteisiin/ongelmiin on varauduttava?
4. Tuleeko muuta mieleen?

Engineering:

1. Mitä vaatimuksia kokonaishankinta luo suunnittelulle?
2. Mitä kokonaishankinnan toimittajan täytyy pystyä tekemään?
3. Miten kokonaishankinta vaikuttaa suunnitteluun?
4. Mihin haasteisiin/ongelmiin on varauduttava?
5. Tuleeko muuta mieleen?

Procurement:

1. Mitä vaatimuksia kokonaishankinta luo hankinnalle?
2. Miten kokonaishankinnan hankintaprosessi eroaa normaalista alihankinnasta?
3. Mihin haasteisiin/ongelmiin on varauduttava?
4. Tuleeko muuta mieleen?

Quality:

1. Mitä vaatimuksia kokonaishankinta luo laatutoiminnalle?
2. Miten kokonaishankinnan valvonta onnistuu verrattuna normaaliin alihankintaan?
3. Miten varmistetaan toimituksen laatu?
4. Mihin haasteisiin/ongelmiin on varauduttava?
5. Tuleeko muuta mieleen?

Questionnaire

Definitions to clarify difference between outsourcing and offshore outsourcing:

- outsourcing: contractual relationship between a company and a vendor providing services outside a home country.
- offshore outsourcing: relocating business processes, services, and work to overseas (outside home country) locations as a strategy, in locations where business is most rational to execute.

Give Your answers the best way You can. All the answers are handled only by me and they will be anonymous on the analysis.

The answer is needed by **18.4.2018**. The schedule is quite tight due to deadline of the thesis work.

So enjoy the “ride” through the questions !

1. Have Your organization done offshore outsourcing? If the answer is NO, stop here and continue Your own work.
 - a. yes/no
2. What is Your primary offshore outsourcing area?
 - a. Europe HCC
 - b. Europe LCC/BCC
 - c. Far east
 - d. North America
 - e. South America
 - f. Africa
3. What activities You have offshore outsourced?
 - a. engineering
 - b. manufacturing
 - c. manufacturing including components
 - d. full scope (incl. engineering, manufacturing, components, assembly)
4. Experience of offshore outsourcing
 - a. contractually: positive / negative
 - b. manufacturing and quality: positive / negative
 - c. economically: positive / negative
5. What factors / issues have been the pros and cons
 - a. free comments

