LAPPEENRANTA UNIVERSITY OF TECHNOLOGY
School of Business and Management

SUPPLY BASE DEVELOPMENT FOR LIFE-CYCLE BUSINESS

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ABSTRACT

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Supply base management development for supporting life-cycle business

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Abstract

Company business models have been evolving continuously for the last ten years. Traditional manufacturing companies have expanded their business to life-cycle offering and eagerness to offer different kinds of services to their customers have raised. Due to this change, expectations for company supplier base have changed. Companies cannot produce all productized services by themselves, but instead they need to utilize capabilities of their supplier base to produce services needed into securing their future success. In the literature part the basic theories of supply base management are presented. Apart from literature this thesis is based on action research inside the target company. This thesis presents possible means to develop operations of organization and the company supply base to lay the foundation for becoming a service provider instead of equipment manufacturer. Suggested means presented in this study can be applied separately without other proposals being completed.

TIIVISTELMÄ

Antti Häkämies

LAPPEENRANNAN TEKNILLINEN YLIOPISTO

LUT kauppatieteet ja tuotantotalous

Supply base management development for supporting life-cycle business

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Hakusanat: toimittajakenttä, product-service systems, PSS, toimittajakentän hallinta, toimittajasuhde, toimittajasuhteen hallinta, hankinta, toimittajan valinta

Tiivistelmä

Yritysten liiketoimintamallit ovat jatkuvan kehityksen kohteena. Viimeisinä vuosina valmistavien yhtiöiden kiinnostus huolehtia asiakkaistaan koko tuotteen elinkaaren aikana ja tarjota erilaisia palveluita asiakkailleen on kasvanut. Tämän palvelujen laajentumisen myötä myös vaateet yrityksen omaa toimittajakenttää kohtaan ovat muuttuneet. Yritykset eivät kykene tuottamaan kaikkia tuotteistamiaan palveluja itse, jolloin yrityksen toimittajakenttä ja sen kyvykkyydet tuottaa tarvittavia palveluita ovat avainasemassa yrityksen menestystekijänä. Tämän työn teoriaosuudessa on esitelty toimittajakentän hallinnan perusteorioita. Kirjallisuus osuuden lisäksi työssä on hyödynnetty toimintatutkimusta kohdeyrityksessä. Tässä diplomityössä on tutkittu mahdollisia keinoja kehittää organisaation omaa toimintaa ja sekä yrityksen toimittajakenttää niin, että se tukee liiketoimintamallin kehitystä koneenrakennusyrityksestä kohti elinkaariliiketoimintaa. Työssä esitetyt keinot voidaan ottaa käyttöön, joko yksitellen tai kokonaisuutena.

PREFACE

For me it was evident during all these years that one day I will graduate. Some of the closest persons to me might have thought that; *is this studying ever going to end?* And now it has. None should start studies like I have done, please discuss with your wife and family about starting studies before you apply and start.

I want to thank Mr. Pekka Heikkilä for spreading my view about practices at Outotec and in supply perspective generally. Also reward goes to Senior Lecturer Jorma Papinniemi for several discussions and guidance during the whole process.

Most grateful I am to my wife Eve, without that great support and opinions from you I could have not done this. Thanks. Jenni and Matias, you have also helped *isi* to achieve this. Also thanks to grandparents who have helped during these years. Now it is time to clean the garage.

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Antti Häkämies

PICTURE LISTING

ACRONYMS

ATO	*Assemble to order*
BCC	*Best cost country*
B2B	*Business to business*
BOM	*Bill of materials*
BCS	Best-country sourcing
BSS	*Best-sourcing strategy*
CRM	*Customer relationship management*
ERP	*Enterprise resource planning*
ETO	*Engineer to order*
IPR	*Intellectual property rights*
LCC	*Low cost country*
MTO	*Make to order*
MTS	*Make to stock*
PDM	*Product data management*
PLM	*Product lifecycle management*
PSS	*Product-service system*
SBM	*Supply base management*
SME	*Small and medium sized enterprise*
SRM	*Supplier relationship management*
VME	*Virtual manufacturing enterprise*

1 INTRODUCTION

Many global megatrends are affecting to companies and consumers and have raised the flags like sustainability, globalization, competitiveness of developed economics and company responsibility at the competitive cost countries to the awareness. All these topics have become drivers of change in attitudes and companies at all levels in order to become more flexible and proactive to meet customer demands.

In a global business environment, fluctuation has increased dramatically for the last ten years. This fluctuation will affect immediately the globally operating companies and within certain time period smaller companies also. Since increased fluctuation, many companies are expanding from the equipment and service manufacturer to the service provider, to have more than one type of business to support the growth targets or to maintain a current level business volume and profitability. This transition would require not only their internal processes, functions, metrics and incentives re-organization, but at the same time emphasis of the business model change from transaction- to relationship based (Kallenberg and Oliwa, 2003).

1.1 Background

Sustainable development, sustainability, is defined at late 80´s by United Nations to mean; “meeting the needs of present, without compromising the ability of future generations to meet their demands.” This guideline has since then developed into one of the world´s business megatrends. Companies call this social responsibility. Without a doubt, every company needs to review vision, mission, products, demands, needs, operations and organization to meet the demand of its industry, business partners and shareholders (Sollish and Semantik, 2009).

Apart from being sustainable, companies are using world resources more expertly than previously, since the development of transportation, internet and manufacturing facilities have made world literately smaller. Corporate responsibility and sustainable operations and at the same time focus to human rights have minimized exploitation almost in every corner of the world. The reverse side of this development has touched people widely in the developed economies, as almost all manufacturing industry has been off shored to the low cost countries (LCC) (Chakravarty, 2014). During last year's there has been a shift from LCC towards Best-Sourcing Strategy (BSS) or Best-Country Sourcing (BCS). While low cost country sourcing was focusing mainly to finding a source that can produce and sell desired parts with lowest possible cost, the Best-Sourcing Strategy consists components like, risk management, Total cost of ownership, landed cost analyses and the value creation. Therefore business that has high variation in purchased parts benefits much more from BSS than from LCC (Siegfried, 2013). All this culminates to a possible need of restructuring of the supply chain to increase process flexibility (Chakravarty, 2014).

At the same time many global companies have nowadays applied the matrix organization as their operation model to support faster reaction. In the matrix organization a certain part of the organization takes care of all related actions across other parts of the organization. Eventually the goal is to improve the organization´s flexibility and scalability. This is without a doubt necessary in order to response global competition.

This study is concentrated in finding and defining demands and needs from the target company spare part business area towards the target company supply function and indirectly towards its suppliers. The challenge has multiplied since there have been organizational changes in the target company and they have also established a separate Supply function, which is responsible for the supplier base. Primary goal for the Supply function is to establish and manage the supply base in a way that it supports target company´s Life-Cycle Solutions business model and

to better support profitable business growth. The current supply base is tuned to support previous project-by-project business model.

Purpose of this study is to outline the challenge areas of the existing project business based supply base and to create definitions and references of life-cycle business supply base from the spare parts perspective. One of the primary targets of the spare parts organization is to reduce turnaround time of the customer quotations and shorten end-to-end delivery time of customer orders. To be able to achieve these targets, several improvements needs to be done, both, in internal processes and external supplier interface. This study focuses in producing and increasing the understanding of challenges and in producing a preliminary list of recommended means, so that those can be applied into real-life and thus improve the situation. The introduction defines the target company and also the goals and limitations of this study. The main research question, the supporting questions and the structure of this study are also presented in the introduction.

1.2 Objectives and scope

The primary objective of this thesis is to find the pain points in the communication and cooperation between the operational functions. The current situation causes frustration and undesired results. While certain categories and supplier relations are in high level and some are improving, in a large scale, everything seems to mark time. As a main restriction for this thesis; customer interface is to be limited out. Focus is purely on the supplier interface and internal knowledge transfer between functions. The key focus area of the thesis is limited to spare part business area.

There is one main research question in this thesis:

How to develop supply base management in life-cycle business?

This question is scattered into five supporting questions:

What are key areas and methods in supply base management?

What kind of characteristics do product service systems have?

What kind of challenges does target organization have in current supply base?
How can supply base be developed to support life-cycle business?

1.3 Research method and structure of thesis

The thesis theory part exploits already existing literature. At the empirical part semi-structured interviews are used when reaching to meet the target. Interviews were conducted to the company key people in Spare part and Supply functions of the target company. Interviews were semi-structured (Hirsjärvi and Hurme, 1990), but were based on pre shared supporting topics. Apart from interviews, opinions were also gathered via an email questionnaire, which had the same questions. An important part of this thesis is also action research based on own experience after several years of employment at the target company. Being part in one of the company mergers have given good experiences that are exploited in this thesis.

This thesis is categorized into different sections. Theoretical part consists of the supply base management view as well as introduction of the Product-Service System theory. The second part focuses on suggested development actions for Target Company in cooperation and information sharing between respective functions and suggests immediate actions and conclusions.

1.4 Outotec Oyj introduction

The history of Outotec known by its current name starts from year 2007. Outotec, which was back then part of a government owned company Outokumpu Oyj, was listed on its own to Helsinki stock exchange 2006 with the name of Outokumpu technology Oyj. The name change in Outotec was done in April 2007. (Outotec, 2015)

The Outotec strategy is tied to the company mission statement; "*Sustainable use of Earth´s natural resources*". The company is developing and providing sustainable technologies with competent people and values. The long term target is to offer wider portfolio of green technologies with minimized environmental effect and added by life-cycle solutions to provide safety for customers. Products and solutions sold by Outotec are more than 85 percent sustainable products according to the United Nations definition. This clearly points out the fact of Outotec selling technically developed products and services. Outotec is holding over 6000 national patents and over 70 different trademarks (Outotec, 2015).

Outotec has a wide portfolio of market leading technical solutions for mineral processing and for metal processing solutions, energy production and water treatment as presented in picture 1.

MINERALS PROCESSING	METALS, ENERGY & WATER
Concentrators	Non-ferrous metals
Comminution	Ferrous metals and ferroalloys
Flotation	Light metals
Dewatering	Industrial water treatment
Services	Services
Operation & maintenance	Operation & maintenance

Picture 1: Outotec technology split (Outotec, 2015)

Outotec offices are located close to customers, in strategic locations. There are 27 sales and service centres at six continents to provide equipment, solutions and services to customers. Outotec routed deliveries to over 80 countries back in 2013. Outotec turnover has developed from approximately 740 million euro to 1,7 billion euro from 2006 to 2013. The company has made profitable result at all

years. Number of personnel has risen from approximately 2000 employees to the nearly 5000 employees in between 2006 and 2013. Partially the growth is due to company acquisitions, but there has also been organic growth. Outotec has done 17 company acquisitions as an independent company since 2007 (Outotec, 2015).

Organizational development at Outotec is an on-going process to support wide offering of sustainable and environmental friendly solutions and services. The company has made deliveries of whole plants including life-cycle services of a plant. This business model transition from the traditional “project delivery” - oriented company to “a life cycle service provider” has started and first experiences are gathered and projects and sites are between start-up and full operation phases.

Outotec´s own manufacturing plants are located in three different cities in Finland and assembly workshops at Canada and China. The company is purchasing over 90 % of its project manufacturing from external sources. Since the company is manufacturing equipment for different kinds of industries, it is evident that companies manufacturing and supplying products to Outotec are mainly mechanical workshops, component manufacturers and suppliers offering assembly, design and engineering services. Outotec has a supplier policy in place and majority of suppliers have signed that policy (Outotec, 2015).

While own manufacturing has still a very strategic role, also the role of service functions and operations has raised significantly in the last five years. At 2013 service sales represented approximately 26 % of Outotec annual sales (Outotec Financial statement). Outotec offers the following services to customers; technical services, including services like: maintenance, Installation & Start-up and research & analysis, Modernization solutions; like upgrades, Operation and Maintenance, including services like: process optimization. Also Spare Part Solutions, Shutdown services and Manufacturing services are part of Outotec services portfolio as presented at picture 2(Outotec, 2015).

Picture 2: Outotec service agreement maintenance portfolio (Outotec, 2015)

There are several different supply chains defined and used by Outotec. One supply chain used by specific project implementation is a parallel model, due to own manufacturing. The supply chain can vary a lot between projects, depending on many different factors. Service uses their own hubs and warehouses to deliver all kinds of parts to the customers, some parts are delivered directly from supplier to customer due to measurements, weight or just simplified supply chain. The Outotec organizational model, in which every market area has their own Purchasing Office being responsible of suppliers and supplier relationships and possible project execution at their own area, also creates several new supply chains (Outotec, 2015).

2 SUPPLY BASE MANAGEMENT

Every company has suppliers. The suppliers can be, either indirect suppliers, such as for office supplies, cleaning services and transportation companies or direct suppliers, which are related to the products or services that the company offers to customers and markets. All of these suppliers formulate the supply base. Research of the supply base management has developed in the last decades in to a direction where several research lines such as; operative purchasing, strategic procurement, sourcing and supply chain, have produced a lot of studies and material for this thesis. All of these different research lines and alignments can be roughly simplified into the idea of moving desired objects from supplier to customer within adequate quality, cost and time (Lindgreen et al., 2013). This chapter includes general supply base management point of views and focus areas. Presented are organization structures and work split between organizational levels and the supplier relationship management, as well as supply decision, supplier selection, segmentation and performance measuring.

The supply base management is part of a supply chain management. The supply chain is usually described as the whole chain of transactions and organizations the materials move through from initial suppliers to final consumers. The supply chain can also be seen as product life cycle processes covering physical, information, financial and knowledge flows the purpose of which is to gratify end-customer requirements with products and linked services from suppliers (Ayers, 2006).

2.1 Concept and purpose of the supply base management

In a supply chain of an organization, the supply chain can be divided into 2 different streams. Organization´s *supplier side* consists of parties that are delivering and refining raw material or goods which the organization needs for their value adding work. *Customer side*; acting in a chain after the organization

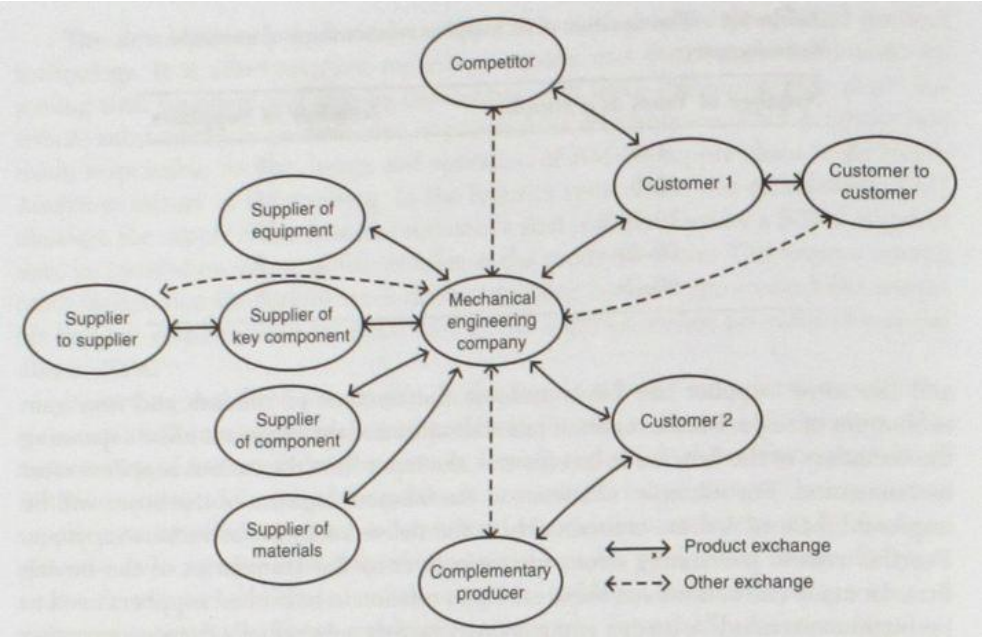
has done their part and initially the product is delivered to the final customer. According to Waters these are called; upstream (Supplier side) and downstream (Customer side) (Waters, 2009). The supply chain management term can be derived easily from the supply chain definition. Supply chain management is creation, maintenance and operation of supply chain processes, including services from whole product life cycle for satisfaction of end-users (Ayers, 2006).

The service supply chain has several differences compared to the traditional manufacturing supply chain (Maull et al., 2012). People tend to think that services visualization and measuring are relatively more difficult than in traditional supply chains (Ellram et al., 2007). The establishment of the service supply chain needs commitment from the company´s top management, importance and ownership needs to be very clear. Only that way the importance can be spread around global organization (Richardson, 2014). Adding just one strategy more on top of all other strategies, the service supply chain will not fly. It needs to be preciously defined with terms of supply chain performance. A description of variables and required performance across different markets and products for speed, flexibility and reliability are crucial when defining the service supply chain strategy (Richardson, 2014).

Not only strategic steps are important when creating the service supply chain, but also a different classification of the parts and components sold are important when planning distribution centres and local stocks. As soon as locations are clear inventory holding policies need to be updated, to meet customer demands better. When agile responding to the customer demands is required, it is clear that global operations need to communicate and serve each other's fluently. The organization needs to be structured to support agility. In the centre of the service supply chain is the customer. Bringing the service closer to the customer will improve the service levels from the customer´s point of view and support faster reaction times and lower stock balances from the seller's point of view (Richardson, 2014).

Efficiency and effectiveness of the company supply base are determined by coordination across the company border. Work performed by different departments inside the company, needs to be in correspondence with the company´s external suppliers (Gadde et al., 2010). Purchasing and supply function together as a business function, which manages organization´s external resources and acquire inputs by the best means possible (Lindgren et al., 2013). Company Quotation and Sales function creates the same outputs to the customer interface. Therefore the supply organization´s strategic role is to develop a global competitive supply base and to integrate these suppliers and company business strategies efficiently (van Weele, 2005).

The most important role that the supply side of the company has is developing an appropriate relationship with the suppliers. For the last decades companies have focused more on improving efficiency of their operations, which has caused also specialization, outsourcing and increased complexity to the supply networks, like shown on picture 3. This means that companies are more dependent on their suppliers, makes the supply side increasingly significant from the strategic point of view and enhances the importance of purchasing (Gadde et al., 2010).



Picture 3: Example of Supply network (Gadde et al., 2010)

Organizations are spending a lot of their sales revenues on purchasing from an external suppliers, the performance of the buying organization depends increasingly on the supplier performance (Lindgreen et al., 2013). Some organizations might use up to 70 – 90 percentage of their costs in the purchasing of goods and services from the external suppliers (Gadde et al., 2010). This makes the purchasing side a key contributor to the company´s success in the long run.

2.2 Strategic planning of supply management

The best cost country suppliers are closer than ever for all sized business, due to developed freight services and increased completion. Globalization makes also highly competitive world market available for SME´s (Baily et al., 2008). The Best –Sourcing Strategies are normally considered to be Far East, but also Eastern Europe and Africa can offer a lower cost level than highly industrialized Western Europe. Biggest benefits of using BSS suppliers can be achieved, if the company has significant volumes and standardized products. The company should drop surroundings out of their radar and act efficiently even if social, economic, politic, legal and technology issues raise challenges on everyday life (Johnson et al., 2011). According to Johnson companies need to capitalize on opportunities by formulating and executing the strategic plans to generate future earnings and even survive.

The supply strategy can cover for example the following areas; procedures, actions and approaches about ongoing; new developed actions in a pipeline of being phased in; new innovations with the risks; presentation of alternatives and finally doing the right things at the right time (Baily et al., 2008). The supply strategy can consist of the inter-organization networks, the formulation and implementation of strategies for discovering, creating and satisfying customer needs with setting boundaries for products and services supply (Harland et al., 1999).

According to Gordon it is vital for a company to develop procurement strategy to be able to be efficient in procurement actions. Gordon states that the companies should consider several angles when creating the procurement strategy; products, services, technologies, financial plans, global presence, geopolitical and economics risks, growth plans, competition, customer satisfaction, corporate social responsibility, regulatory and political environment, and employee growth and satisfaction (Gordon, 2008).

A supply action plan is a strategic level plan for reaching the goals and objectives stated in an action plan. Johnson et al. suggests that the overall supply strategy could consist of the following subcategories:

Assurance-of-supply strategies; Planned and designed to make sure that the future needs for supply base are targeted and met quality and quantity wise. These strategies must consider the unsteady and changing situations in demand and supply based on financial target setting and forecast provided by sales (Johnson et al., 2011).

Cost-reduction strategies; Includes a detailed plan of how to reduce the cost per unit of purchased goods or services, and the total cost of life-cycle. With changes in environment and technology, alternatives may be available to reduce an organization´s overall operating costs through changes in operational model, ways of working, use of materials, suppliers and supplier relationship (Johnson et al., 2011).

Supply chain support strategies; maximize the knowledge of people in procurement function. Map capabilities of the supply chain members and make sure these capabilities are visible and usable for the persons working at operational purchasing. Build instant communication methods and systems and implement those into use between purchaser and supplier to produce at real time notification of changes and to make sure that the supply of products and the production speed of goods are aligned with the needs (Johnson et al., 2011).

Environmental-change strategies; to make sure that the changes in economics, organization, people, legal, governmental regulations and controls, and systems availability are notified. Possible changes needs to be adapted in to real life immediately. These changes can manipulate the long-term advantage of the buying organization (Johnson et al., 2011).

Competitive-edge strategies; every company should always be seeking the significant competitive edge to be able to beat the competitors and be successful at markets. The organization needs to define the possibilities and its own organizational strengths (Johnson et al., 2011).

Risk-management strategies; a risk management is needed to secure consistency in the company operations. This strategy gives the supply side strategy adequate coverage (Johnson et al., 2011).

Company supply and purchasing strategies need to be integrated into the other business strategies and it cannot be isolated, in order to make the company succeed. Purchasing has grown into bigger scope than just reducing cost and that has caused need for the strategic action plan in supply and purchasing areas (van Weele, 2005).

The objectives of a strategy will have to affect the operational behaviour, for example a strategic goal could be setting up a range of dedicated suppliers for certain product range. It would mean a decrease in quotation work for operations and sourcing, since sole suppliers have been selected according to a strategy goal (Baily et al., 2008).

Purchasing strategies can also lead to supply base deductions; or consolidation. The biggest effect a deducted supplier base can have is that it allows the buying organization more time to develop a deeper relationship with the remaining suppliers (Goffin et al., 1997). The more company dedicates resources to develop deeper collaboration with suppliers the fewer resources are available for handling

a big supplier base, a natural cause of that is deduction in the amount of active suppliers (Gadde et al., 2010). The buying company should achieve advantages in the following areas when deducting supplier amount; reduced costs, improved quality and increased amount of innovation (Goffin et al., 1997).

The strategies usually include a decision about a share of a supplier´s capability to deliver. If the share that a single customer represents is more than half of the supplier output it usually makes the supplier too dependent on a single customer. This can cause undesired attitude in the relationship and limits a buyer's freedom to choose the supplying partner (Baily et al., 2008). Target for avoiding situations like this needs to be defined at the risk management strategy.

All strategies developed must be aligned with the company´s positioning with the major stakeholders and boundary surfaces; customers, competitors and suppliers. Without a link to these the strategy is not feasible (van Weele, 2005).

2.3 Supply organization

The company´s purchasing side organization should be able to obtain the right materials, in the right quantity, for delivery at the right time and right place, from the right source with the right service and at the right price in the short and long term (Johnson et al., 2011). The challenge in meeting these tasks is bigger than ever, due to globalization. The company´s supply side organization can be built successfully in many alternative ways. It is also highly dependent on company size and business model. In a case of larger manufacturing company, there normally are several dedicated persons at the supply side (van Weele, 2005).

The supply organization can be divided in many several ways depending on the company structure, size and position at the market. Small- and midsized companies can have people working at the supply side as their secondary responsibility. It is clearly recognized that assigning supply responsibilities to

supply professionals the results are better (Johnson et al., 2011). At SME businesses supply personnel will have broader field of tasks performed (Johnson et al., 2011). Especially at small sized companies supply work can be led by the general manager or the chief of financials. At all sized companies, top management defines the role and organization of purchasing based on their view of purchasing and supply side criticality to company. Reporting lines of purchasing managers can vary a lot between companies. Companies representing traditional manufacturing industries might use the reporting line to the production manager. Companies producing more products to more rapidly emerging markets can use the reporting line to the product management (van Weele, 2005).

Larger companies will have their own challenges in organizing the supply organization. Normally the issue is related to a centralized – decentralized model. There are actually three different choices; *centralized, hybrid* and *decentralized*. *Centralized* supply means that there is one organization making decisions and carrying responsibility of supply-related decisions and actions. In a *hybrid* model responsibilities and decision making is spread between the organization and for example local business units or plants. The hybrid model allows also a so called centre-led organization in which strategic issues are centralized and execution is decentralized or localized. In a *decentralized* model the supply responsibilities have been spread around the organization for all necessary parties acting at supply field (Johnson et al., 2011). One right single way of organizing the supply side actions does not exist.

2.3.1 Strategic level organization

The highest level of the supply side organization is the strategic level. In this level all strategies and purchasing decisions that influence the company´s position in the market five to ten years perspective are created. People performing these roles take responsibility for making or buying decisions. Tasks performed are normally closely related to guidelines, procedures, long-term agreements, sourcing decisions; single sourcing versus multi sourcing and decisions about major

investments to tooling and manufacturing capabilities (van Weele, 2005). Many supply / procurement organizations have introduced category management as their high level function to support supply base development initiatives. This function can be described as Baily et al. does; “Continual monitoring of expenditures and supplier performance in specific buying categories with the intent of driving ongoing cost or supplier performance improvements.”

The idea is to categorize all purchases that the organization does and then split those into subcategories. For these categories respective the staff can then develop separate strategies to maximize the value of each particular category (Baily et al., 2008). Categories can consist of item similarities at; supplier sources, production processes, internal use, material content / complexity, specifications and underlying technology (Baily et al., 2008). Each organization can find the most suitable way to categorize their purchases. By splitting the categories, companies can get a strategy implemented centrally to several suppliers in exactly the same manner. The category management is usually responsible for creating and maintaining the supply category strategies.

2.3.2 Tactical level organization

Decisions made at tactical level normally have effect on the company in mid-term from one to three years positioning and financial result. Tactical level has cross-functional dimension since a lot of supporting functions, for example engineering, product management and logistics are to be considered as stakeholders in their decisions. Tactical level has high involvement in the purchasing function affecting supplier selection, product and processes. The main tasks performed at this level are; agreeing of annual agreements with suppliers, analysing spend data, tasks related to product standardization, supplier audits and supply base management in accordance with the strategic level (van Weele, 2005).

The most commonly used term for the tactical level is sourcing. In previous times sourcing meant just picking the right suppliers or contractor for each requirement.

Nowadays it also involves continuous relationship management with suppliers, even ones which currently are not supplying anything. These suppliers create the potential supply base for the company of which the tactical level is responsible of. More than anything sourcing is an allocation of available business to suppliers´ best matching company supply criteria (Baily et al., 2008).

Sourcing can be categorized into several different types of sourcing or source decision (Baily et al., 2008). The split is always done based on strategic level decisions and their categorization. Baily et al. suggests that one split for source decisions and responsibilities could be:

Consumable supplies / in-direct supplies	Capital purchases (eg. machinery)	Intellectual property
Production materials and components	Subcontractors	Services

Table 1: Example of sourcing categories (adopted from Baily et al, 2008).

All of these have different drivers behind the source decisions, for example geographical limitations, different types of supply chain, logistics, agent / distributor or directly from factory (Baily et al., 2008). All of these can create a very complex matrix, if the rules of sourcing are not carefully defined on the supply strategic level.

Nevertheless sourcing as tactical level of purchasing is still valid for every company to map and evaluate new suppliers for company. Exploring new suppliers and managing the current supply base accomplishes each other so that the need of finding new suppliers is reduced.

2.3.3 Operational level organization

All activities at the operational level are to be conducted as designed and instructed by higher organizational levels. The work consists of mainly the following task; handling purchase orders according to procurement process, expediting activities for all open purchase orders, daily problem solving with suppliers consisting of problems in lead time, quality or payments and escalating ones which cannot be solved to higher level, monitoring and evaluation of supplier performance (van Weele, 2005).

Measuring the success of targets set to the supply organization are often defined in the operational phase of purchasing process. Initiatives can be defined very ambitiously to the strategic plans on the organization´s higher levels, but if they are missing from the operative people, those will never be accomplished.

The trend of having separate organization handling call-off according to plans has spread from mobile phone and car manufacturers based on large repeatable business and adaptation to traditional industries. This operation model and organization fits very well to repeating business, in which volumes to supplier pool are very high and manufacturer has applied a Just-In-time, or similar, manufacturing model (O´Brien and Head, 1995). The basic idea is to agree everything ready for "call-off" action to be performed by a purchasing person. Prerequisites are that the supplier has an agreement, with agreed price and lead time and normally a purchase order has been placed to the supplier to secure that goods are ready (O´Brien and Head, 1995). The lead time has been programmed to the purchasers ERP system. Call-off requisition or purchase requisition is released to the purchaser at latest possible moment. This of course requires also reaction from the supplier and a possibility to have stock available for the last minute call off´s. Without everything being agreed formally before transactions, it is very hard to see this operating properly (O´Brien and Head, 1995).

2.4 Supplier relationship management

According to Sollish and Semanik; "*Good supplier relationship does not just happen; as with any relationship with value, it demands effort and perseverance*". Supplier relationship is something that happens between companies, but Supplier relationship management is done by the people. It is based on constant communication and by holding regular meetings with suppliers (Sollish and Semanik, 2010). With good supplier relations, expected service level from the supplier is better. In a situation of urgency, it supports faster quoting process or helps to improve lead times. The target of building supplier relationships should be to build such relationships that sense and eliminate supply problems before they happen (Chakravarty, 2014). The most important factor and the foundation of successful relationship is trust (Handfield and Nichols Jr, 2004). There are two factors which can be seen to define effectiveness of a company´s supply chain; *supplier capabilities* and the *interface* between supplier and the company (Chakravarty, 2014). Both of these needs to be focused on SRM work.

Companies are justified to have different types of relationships with their suppliers, since suppliers make different types of capabilities and resources available to the buying company. Relationship in the supply base of a company represent one of the most important assets of the company, as all other asset values are not absolute but context dependent states Gadde and Håkansson. The importance of supplier relationship can be measured with different measures. Some relationships can be important due to business volume reasons, others might have future business potential for the buying company or some relationships can be important due to technical reasons, for example pending patents.

According to Gadde and Snehota, there are three dimensions that a company should strengthen, when applying deeper partner kind relationship with the supplier; coordination of activities, adoptions of resources and interaction among individuals. Gadde and Snehota will refer these three dimensions into; *activity links, resource ties* and *actor bonds*. The first dimension includes activities carried

out by the supplier and the customer companies are tightly coordinated. Tight activity coordination can be for example an integrated delivery system developed to reduce the costs of CAPEX investments and the material flow. At the second dimension the resources of the companies are specially adapted to the requirements of the buying company to support their business model. Mainly the supplier is then supplying customer specific products with customer dedicated processes. This way of operating is common in many supplier relationships; especially in the case of extensive resource adoptions. Thirdly, the individuals in the companies may inter-act at all possible organization levels quite intensely. A close interaction among individuals in the two organizations make their choices more interdependently and promote both commitment and trust, which reversal impacts on coordination and adaptations of both parties (Gadde and Snehota, 2000).

Many of the older studies have suggested that a buyer – supplier relationship is either transactional or relational. Purchasing today is more of a mix of both and anything in between. Both relationship types and all mixes in between have pros and cons. An evaluating of the best choice for each situation and relationship can only be made, if the organization can measure the type and strength of its purchasing relationships and then judge against specific performance indicators (Lindgreen et al., 2013).

The traditional supplier relationship, arm-length transactional based model, can be useful in many cases. That being other end and long-term joint alliance between buyer and seller can also be meaningful in some cases. Many of the relationship companies have fallen somewhere in between. Relationships are always based on two-way communication and usually big companies do not make strategic alliances with very small companies and in turn the same applies to small companies versus big companies (Baily et al., 2008). The relationship level with suppliers can vary between suppliers. According to van Weele there are four different levels; *supplier, preferred supplier, supply partner* and *design partner*. Supplier is providing their goods order by order without an official agreement.

Preferred supplier has an agreement with a pricelist and rebate and the agreement length is normally one year. Supply partner has a long term agreement and the supplier is making quality checks, calculating batches according to offered forecasts and the supplier has cost reduction targets. The highest level, design partner has a strategic role, perhaps joined product development, system-to-system connections, price being based on open calculations and the supplier has responsibility on the continuous improvement of product and internal processes (van Weele, 2005).

It is suggested by Lindgreen et al. that purchasing practices could be separated into four different categories viewed by the supply management approach. *Transaction purchasing*; refers to the use of aggressive sourcing to obtain goods and services on the best possible terms and conditions. *Network purchasing*; involves positioning the organization within a wider organizational system or network. *Electronic purchasing*; refers in organization using internet based or other one-to-one and one-to-many technologies to create and mediate data exchanges with suppliers. It is to be noted that this electronic purchasing is visible from the supply management perspective and it is not the same as electronic procurement, which is referring to a set of tools to support the purchasing function. *Interactive purchasing*; implies to personal interactions between employees and individual suppliers (Lindgreen et al., 2013).

The first one of these, transaction purchasing, is representing transactional perspective and the remaining three are relational perspective purchasing practices. As this would be the main difference between these practices, another one being how the buying organization manages its exchange relationship with suppliers and interacts with them. As an example the frequency of communication and the nature of interdependency between an organization and its suppliers differ between transaction purchasing and relational purchasing practices (Lindgreen et al., 2013).

Most of all the supplier relationship should not be evaluated only by direct purchasing costs or direct transaction costs. The supplier relationship value is formed largely by its suitableness into the buying firm operations and customer needs. Even the most appropriate supplier relationship today can be formed as trouble, when buying firm organization, operations nor market position changes (Gadde et al., 2010).

2.4.1 Sourcing decision

All suppliers in the company supply base should have a relatively clear picture of their role and position in the supplier field. The buying company has a normal decision making role, so they should always have a clearly stated purchasing strategy that covers a plan for the sourcing decision by category or by supplier (Ayers, 2006). The sourcing decision is normally related to choices like; single versus multiple sourcing, manufacturer versus distributor and supplier´s geographical location (Johnson et al., 2011).

The most common alternative sourcing decisions are; Single sourcing, multiple sourcing and parallel sourcing (Richardson, 1993). In the single sourcing situation the buying company is placing all orders of certain components or products in to one supplier. In multiple sourcing, the buying company has several possible sources for a certain component or product. The parallel model feeds competition between supply sources, since the available business is divided between sources (Johnson et al., 2011).

Directing all the available business volume to one supplier would create a single source situation. Depending on the situation this supplier relationship can be very efficient, but there is always a high risk factor built in to this relationship. In cases where patent or other immaterial rights apply, this can anyhow be the only option, if the buyer wants to have certain material or product. Single sources can be attractive because the price level is usually competitive, since all the business is focusing on a single supplier, meaning for example larger manufacturing batches.

On the other hand prices can get high afterwards due to a lack of competition. Tooling costs are definitely lower than in the model were several tools should be available for several suppliers (Gadde et al., 2010). Eventual goal of each and every company is to maximize their own profit. In a long run single source has a good opportunity to do this if not managed properly

In the single source model supply security is high, in terms of stocks and other services securing high availability. These services are usually available upon request or negotiation, since the supplier is willing to give very good service. Supply risk against supplier delivery fault due to natural disasters, plant fire, or plant breakdown with single source is definitely higher. These accidents do not happen more often than with multiple sources, but in case it happens, problems are more severe. Additional risks for single source situations can be caused by a static situation, if the single source supplier is not keen on product development due to fear of losing their position as single source (Baily et al., 2008). Single source and deep relationship can decrease in-direct purchasing costs, since it is easier to build efficient information exchange channels between two highly involved companies than several low involved companies (van Weele, 2005).

Single sourcing situations can be evolved into a new level; partnership. It is a type of relationship in which ways of working, willingness to share openly sensitive information and full trust to opposite party will need to take place. Partnership kind of relationships also includes joined product development (van Weele, 2005). Partnership situations are very disposed ending up in a mess, if agreement status between parties is not carefully composed to fit these situations. Product development has always the IPR dimension and the ownership of results can be tricky.

There are situations where the buying company realizes that for some particular reason, for example manufacturing capabilities, patents or products, a single source can be optimal solution. Gadde and Håkansson suggest that being not so dependent on one supplier, in a so called multiple source situation several

advantages can be gained. Most likely protection against disasters of any kind effecting to supply are minimized. A competition situation can be accelerated and price advantages can be achieved. The buying company is out of monopoly situations and possibilities to adjust workload between suppliers can be applied. By developing smaller suppliers via correct workload are available for buying company, in case of correctly built multi-sourcing option (Gadde et al., 2010). Other advantages from multiple sourcing situations can be related to supplier economics. It is not very clearly defined in literature, but the fact is that giving too much business, more than 30 percent of supplier turnover, to one supplier can create situation where the supplier comes too dependent on one customer. This causes an economical risk for the supplier (Johnson et al., 2011).

One aspect of the sourcing decision is whether to buy from a manufacturer or some delivery channel of manufacturer. The decision can be right in both occasions. The use of a manufacturer gives advantage in cases where purchasing quantities are huge and special prices can be negotiated. It is probably more flexible to acquire smaller quantities and immediate from a distributor. In case a local distributor is representing multiple trademarks the marketing and other overhead costs can offer a relatively competitive purchasing price (Johnson et al., 2011).

Sourcing decisions of services and services bundled with products are to be handled with the same professionalism as sourcing decisions of products and components. Lack of expertise at sourcing of services exposes the organization to new risks. Background information of suppliers might not be checked or possible conflict of interest situations are not cleared (Ellram et al., 2007). Services cannot be stored and usually the definition of services is comprehended as barely an intangible task or service (Baily et al., 2008).

Any sourcing decision the company should make, it should always be justified with a risk management plan. Especially single source situations should be covered one by one with a risk and contingency plan. This plan is defined for each

situation separately and should consist of the following steps; *risk identification*, *risk evaluation*, *risk checking* and *recovery plan* (Hallikas, 2011).

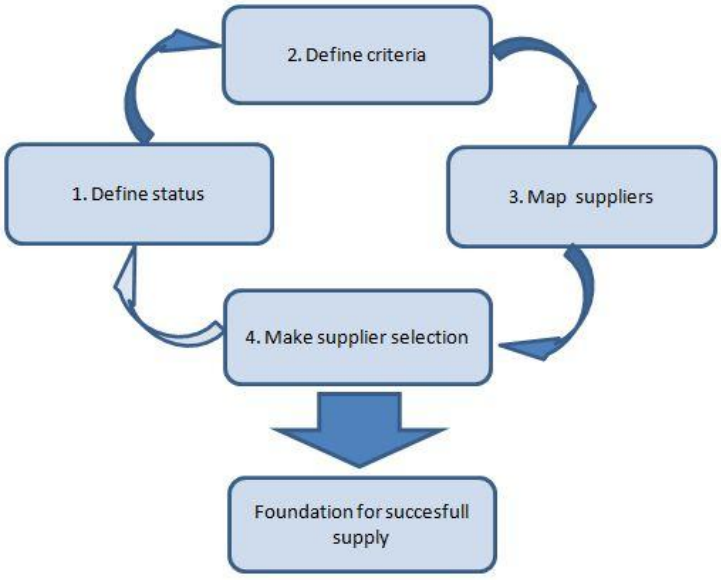
2.4.2 Supplier selection

In the phase of supplier selection, companies use different criterion for selecting most suitable supplier for their current and future needs. In wide area of criterion, the most commonly used criterion is based on themes like quality, price of materials and services, supplier response, service level and delivery capability (Hsu, 2006). Since companies have focused their core competences (Hamel and Prahalad, 1990) and outsourced a lot of operations and manufacturing, they have become more dependants of their suppliers and the supply risk has increased dramatically (Micheli et al., 2008). Companies have outsourced more and bigger scopes of their projects to selected suppliers causing system specialized supplier pools (Hellström and Wickström, 2005). At the same time globalization and increased data networks have enlarged purchaser´s options dramatically (de Boer et al., 2001). The ultimate goal in supplier selection is to build company the supply base that maximizes the fit between what it needs and capabilities that suppliers can provide (Chakravarty, 2014).

Several decisions have already been made inside the corporation, until the supplier selection can be done. Risks and opportunities have been weighed. All purchases do not demand very detailed consideration, but bigger ones can definitely justify careful decision making (Baily et al., 2008). According to Johnson et al. it is the supplier selection phase in which all wisdom, preparation work and organizational needs come to fruition. All opinions underline the fact that whoever makes the final purchasing decision, they need to understand reasoning and expectations; the criteria which the organization creates towards this decision. The supplier selection reflects to the supply base transaction costs, normally as, transaction cost, are calculated supplier indentifying approved suppliers, monitoring, contracting and placing purchase orders as well as return of purchased goods, changing orders and cancellation of orders. With already

existing suppliers a part of these transaction costs have already covered (Chakravarty, 2014). Companies with wide portfolio, small manufacturing series and changing specifications are not optimal choice for BSS manufacturing offshore. BSS manufacturing location can be used, but it should be close to the company to secure sufficient possibilities to control quality and supervise manufacturing if needed.

The simplified process of selecting suppliers can be roughly standardized as follows. *First* the company needs to define the status in detail level, the question would be; what we want to achieve with the supplier selection? This supplier evaluation can also stop at this step. It might end up with a fact that nothing can be done to improve the situation. First step can be launched by a problem or willingness to change the supplier due to several different reasons, like increased supply risk, change in supplier´s economic situation or possibility to technological development. The *second* process step is to define criteria's for successful selection. After a criterion is clear the *third* step would be to discover suitable suppliers. The *fourth* and final step would be to make supplier selection (de Boer et al., 2000). This process is continuing and presented at picture 4. Process needs to be repeated according to company policies in a certain time period.



Picture 4: Example of simple supplier selection process (adopted De Boer, 2000).

Earlier studies of supplier selection were purely focusing on supplier criteria at purchasing situations (Ellram, 1990). One suggested set of criteria for attributes of a good supplier is claimed by Baily et al. to be; *Supplier delivers on time, provides consistent quality, gives a good price, has a stable background, provides good service back-up, is responsive to our needs, keeps promises, provides technical support* and *keeps the buyer informed on progress* (Baily et al.,2008). Working with all the parameters is not valid for all suppliers. It is highly dependent on the supplier´s strategic role at supplier base and the type of purchased goods or service to which parameters are suggested to be used (Hsu et al., 2006). Important criteria for supplier selection is the supplier´s financial performance, since profitable companies usually have long-term plans and they are far more interested about serving customers in time and with good quality (Baily et al., 2008). Supplier financial monitoring is continuous process, very important when selecting the appropriate supplier, but as important as an active supplier base. A proper supplier selection needs to cover both the existing supplier base and possibility to add a completely new supplier into supply base. Using already existing suppliers company might be also achieve benefits due to scale of economy (Chakravarty, 2014).

After all, not many procurement and supply people can define these attributes very clearly. Even people responsible for supplier selection can have lower level of interest into attributes of a good supplier (Baily et al., 2008). Defining a one-size-fits-to-all solution suitable for all businesses and situations cannot be defined.

2.4.3 Supplier segmentation

Not until very last few years, supplier segmentation has raised interest in a field of study among researchers researching the supply base management. The idea behind supplier segmentation is that a buying company can exploit the relationship with the supplier most beneficially. Supplier segmentation can be seen as a process of dividing suppliers into different groups based on their needs,

characteristics or behaviour. As a result of analyzing these, different kinds of relationship structures are needed to exploit the relationship with maximum benefits (Day et al., 2010). Creating portfolio models and supplier segmentation are useful tools when a company is considering any changes at the supply side of organization (Gadde et al., 2010).

Supplier segmentation can be done in all maturity levels of supplier base and in all business stages, like assessing a new possible supplier, analyzing the historical data or at the stage of building a new supply strategy for a company (Day et al., 2010).

The base of supplier segmentation lies on categorization of suppliers throughout the complete expenditure of company. Classification or segmentation of suppliers can be done by several qualifiers. It can be done by purchased items categorization. Supplier segmentation can also be made according to geographical and country based analysis (Gadde et al., 2010). A qualifier can be for example the profit margin of certain part or component or the supply risk of a part or a component (Kraljic, 1983). If qualifier is importance of purchased material, it places the strategic importance of purchased materials in a key role. Classification of spend and suppliers will always lead to an end result in which some commodity groups and suppliers have higher importance than others (Gadde et al., 2010). The highest importance category would go to materials with patents or some other competitive reason. Lowest importance category would be given to materials with several supply sources and the most standardized structures. Based on this segmentation it is clearly easier to create and maintain different supply strategies for different segments (Gadde et al., 2010).

Kraljic (1983) matrix is still in use and it is classical four cell analysis. The model has two different dimensions, the other having the importance of the purchased good and the other having the supply risk. In the first of these dimensions it is possible to place for example criteria like purchase price, profit impact or purchasing volume. The second dimension, the supply risk, can be for example

the number of potential suppliers or part availability. Another traditional and well-known classification tool is ABC classification developed originally by Pareto. ABC can be used in many occasions at companies. Most commonly it is used to define inventory plans, but it suits as well the spend analysis tool to support supplier segmentation. In normal application A-class is 70 % of usage, B-class 20 % and C-class 10 %. ABC –classification can also be applied to supplier segmentation and with the use of these proven systems, companies can achieve improvements in their operations.

2.4.4 Supplier performance measuring

A common way of measuring suppliers is based on quantitative measures, like supplier on-time arrival percentage or amount of monthly delivered purchase order line. Rarely companies are measuring by qualitative metrics. The most common qualitative metric is measuring of claim percentage or amount of claims. This metric gives reasonably easily a result of supplier quality, but still is highly dependent on purchasing organization´s technical capabilities. Supplier performance measuring is a platform for analysing supplier performance, mitigating supplier risks, reducing cost and facilitating continuous improvement processes (Handfeld and Nichols Jr., 2004).

Targets can be set almost for any possible purpose. According to Meekings et al. there are two different types of target setting; *Close-as-you-can* and *Far-as-you-can* targets. Close-as-you-can targets are normally set to be high, an organization or an individual can very seldom reach these targets, but getting close means high level performance. Far-as-you-can target is built through verbal sentence and has no limit to be better. At Outotec supplier base Far-as-you-can target could for example be "*Maximize average spend per supplier*". With this target setting and allowing enough time to work with suggested actions, the supplier field would be optimized (Meekings et al., 2011).

An aavailable method for adding qualitative methods of measuring is to adopt the SERVQUAL model presented originally by Parasuraman et al. In this model the total quality experience is based on the following measures; tangibles, reliability, responsiveness, assurance and empathy. This system is originally developed for measuring service quality at customer service. The five areas of the SERVQUAL are defined with the following terms. Tangibles mean company´s physical surroundings, personnel appearance and condition of their machinery and equipment. Reliability is stated to mean an ability to respond coherently and accurately with agreed performance level. Responsiveness means willingness to help customers quickly and without any delays. Assurance according to Parasuraman et al. is knowledge and courtesy of employees and their ability to inspire trust and confidence. Last one, empathy, is described to be; carefulness and personal attention the firm offers its customers (Parasuraman et al., 1988).

With the current supply chains, in which the chain is relatively long and the supplier has many sub-suppliers, it is an increasingly important area of supplier assessment to assess also sub-tier suppliers. Even basic information or visibility of sub-tier supplier operations is difficult. At the same time it is a huge concern in several industries like aerospace and automotive. Characteristic for these businesses is that the end customer is generally the systems integrator and depends on its supply base to manufacture the components and subsystems that go into the final product (Gordon, 2008). Sub-tier supplier delays and quality issues can turn into expensive faults at end product and their impact on company reputation and business can be massive. A relatively low cost item can stop a high value project or product and replacing it can be costly (Gordon, 2008). Even with knowledge of importance of sub-supplier assessment, it is not very common to assess sub-suppliers. Companies with normal supply resources cannot meet the challenge. The problem can be partially solved by using ISO - certified suppliers (ISO, 2015). Suppliers having for example ISO 9001 certificate have established systematic approach also towards their supply chain (ISO, 2015).

The importance of development of evaluation strategy for companies that are very dependent on their suppliers is very high. At some cases it is not possible to measure all suppliers the same way, due to a large amount of suppliers. Decisions on which supplier you wish to measure are needed. Out of those suppliers that have been decided to be measured regularly, the company needs to determine what levels of evaluation the supplier require. The range of measuring can vary a lot, from high-level monitoring of few measures to detailed evaluation with all possible measures (Gordon, 2008). To be able to follow these suggestions, the company supply base needs to be evaluated and segmented.

Gordon states to follow segmentation dimensions like; risk, cost, quality, delivery, service, technology, product development, responsiveness and communications (Gordon, 2008). Adding all these to the supplier measurement can be valid in most strategic cases, but in most of the cases such wide dimensions are not usable.

Gordon suggests that good supplier measurement should follow these characteristics; meaningful, valuable, balanced, linked, practical, comparable, credible, timely, simple, robust, reasonable number of metrics (Gordon, 2008). In the end the idea is to define how good a job the supplier is actually doing (Johnson et al., 2011).

Supplier performance can be measured on many different levels. Johnson et al. suggest that at least the following evaluation methods could be used;

Informal and Semiformal Evaluation and Rating; for small purchasing organizations, semiformal /informal evaluation could be the most suitable way of measuring. When the supply personnel is close to the supplier and also the other purchasing personnel, even the smallest signs can alert that everything is not in satisfactory level. For big purchasing organizations a formal supplier evaluation works better, since the buying organization can be spread on several countries and locations and the structure of the organization does not support informal operations due to large number of stakeholders. Also feedback coming from

people handling daily transactional relationships does not come into the knowledge of negotiators, perhaps located in a different continent (Johnson et al., 2011).

Executive Roundtable Discussions; Simple and semiformal supplier evaluation tool is regular, annual discussion between top executives in the buying organization and the supplier. These top level discussions are dedicated only to major suppliers with major or strategic requirements. The number of these roundtable discussions must be kept very limited, but gives both organizations very strong signal of commitment to the buyer-supplier relationship (Johnson et al., 2011).

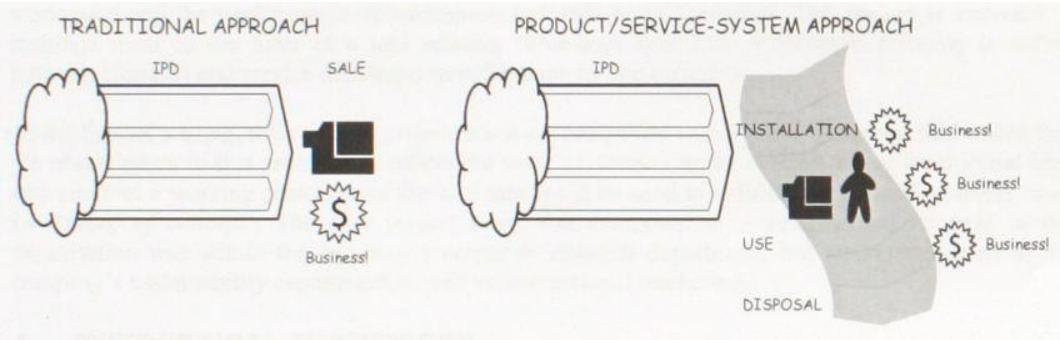
Formal Supplier Evaluation and Rating; Traditional measurements tied to meters like; quantity, quality, price and delivery could be supplemented with modern measurements of continuous improvement. The piercing idea behind the supplier evaluation should be; how can this supplier perform in future and possible increased demand, instead of only evaluating historical performance. In the most formal way of supplier rating, approach is to track actual performance over time. As orders normally are delivered, quantity, quality, delivery, price and service objectives and other terms and conditions should be measured. Whenever he supplier is considered to be given more business, which normally is a new order, the results of past measuring should be considered as an advantage or disadvantage for new business. Most of these measured attributes can be easily tracked, like quantity, quality, delivery and price, but service objectives are most likely the hardest to measure and also the most valuable to the buying organization. Opinions should be collected for example about the quality of the technical assistance, general attitude, and response time to requests or support staff qualifications. Most formal behaviour requires buying organization supplier segmentation to allow purchases only from certified and approved suppliers (Johnson et al., 2011).

Weighted Point Evaluation Systems; Supplier measuring with different meters and ratings is the most common way to evaluate supplier performance. When the company has set measurable meters and then certain performance gives certain amount of points, these points can then be weighted by different factors to evaluate the most important areas of performance. This weighting can vary between criticality categories and sourcing classification. In case there are several sources of the same service or components available, then weighting point systems can offer a possibility to cross-reference between sources (Johnson et al., 2011).

3 PRODUCT-SERVICE SYSTEMS

The first stage of industrialization revolution focused on manufacturing large series of pieces with most efficient ways, without considering environment, needs of customers or customization when requested. The focus was purely on manufacturing standardized units efficiently. Traditionally companies perceived their added value and revenues purely from the product and its performance (Peters et al.., 2013). Today the role of services has increased and flexible manufacturing, environment and sustainable solutions are drivers guiding the output. Services can create added value by technological improvements, immaterial property, product image and brand names, aesthetic design and styling; all non-material features of the product (Mont, 2002). An important driver behind the change is increased customer orientation throughout all types of businesses. By increased customer orientation the traditional measures of success, falling below budget or keeping up with schedule, are replaced at least partially by an ambition for performance (Hellstöm and Wickström, 2005).

A traditional mindset of things can be called an industrial economy. By Mont´s definition, industrial economy places central value on the exchange of the products that are consumed. Nowadays a service oriented mindset could be called; a service economy, stating centrally that it recognizes the value of utilization, a performance driven orientation where the consumer pays for utilization of product or production results. Therefore, the service economy is often referred to as functional economy. This means that both the product and technology are mere models of providing function. Functional economy rests on the basic idea that the function is the key to customer satisfaction, not just product (Mont, 2002). The service-orientation will add customer value more than just product, but also offers manufacturer possibilities to sell additional services like described in picture 5 (Tan et al., 2007).



Picture 5: Differences between traditional approach and PSS approach (Tan et al., 2007)

Stahel claimed about Functional economy, that it optimizes the use (or function) of goods and services and thus, the management of already existing wealth. The economic objective of the functional economy is to create the highest possible use of value for the longest possible time while consuming as few material resources and energy as possible (Stahel, 2008).

According to Kallenberg and Oliva, services are in relation to products installed base and are defined as follows; Services are not restricted to services bundled with the product: Installed base services encompass all services required by the end-user to obtain a desired functionality, i.e. use the product in the context of its operating process. Service suppliers are not restricted to product manufacturers; components manufacturers, system integrators, end-users´ maintenance units and third parties also compete in installed base markets. End users are not restricted to be industrial firms: this distinction is important when focusing on the role of services for customer relations (Kallenberg and Oliva, 2000).

The suppliers need to adopt new capabilities to be able to offer product-service system to their customers. These traditional skills and capabilities must not be forgotten. Many suppliers can still rely on their technical expertise, research and development, but to work towards a better satisfaction of customer needs, the

necessary new capabilities are based on service and relationship (Rese and Gesing, 2013).

3.1 Definition of Product-Service Systems

Product-service systems are defined in several different ways. According to Peruzzini PSS concept always starts from the concept of extended product, where immaterial features are added into the physical product. Manzini defined PSS as follows; "*An innovation strategy, shifting the business focus from designing (and selling) physical products only, to designing (and selling) a system of products and services which are jointly capable of fulfilling specific client demands.*" According to Wong (2004); "*Product-service system may be defined as a solution offered for sale that involves both a product and a service element, to deliver the required functionality*." Elima (2005) stated that: "*Product-service system is defined as a system of products, services, supporting networks and infrastructure that is designed to (be): competitive, satisfy customer needs, Have a lower environmental impact than traditional business models.*" Product-service system is a common term for a mix of material and immaterial components and services bundled together. In addition an important piece of PSS is the third dimension of satisfaction of requirements of stakeholders (Morelli, 2006). Product-service systems can also be seen as innovation strategies where companies innovate and improve their products and support customers throughout product life-cycle (Tan et al., 2007).

The definition of PSS according to Wang et al. is; "PSS integrates tangible artefact and intangible service to achieve sustainability, improve enterprise competitiveness, and meet customer needs better." This definition combines all world economy megatrend drivers currently being on top (Wang et al., 2011). Definitions of the Product-service system key elements are: *Product*; a tangible commodity manufactured to be sold. It is physical item or product and is fulfilling a user´s needs. *Service*; an immaterial activity performed for others by service provider. It has an economic value and often done on a commercial basis. *System*;

is a combination of elements from both product and service, including their relations (Goedkoop et al. 1999).

The whole concept of Product Service System (PSS) can be stated most simply in sentence; Companies selling “sale of use” is more emphasized, instead of product (Pergande et al., 2012). Naturally products are integrated into sales. One of the key objectives when developing PSS was to create competitive advantage against simply lower priced products. In PSS a customer is usually paying for the usage of an asset, instead of paying of the product itself.

All these definitions conclude one issue over others; the goal is to see things from the customer´s perspective and offer solutions to problems, not machinery that solves one problem but creates two new ones. Another trend that can be seen here is the increased use of wording sustainability and environmental friendly. The idea is that when a customer has possibility to purchase also the expertise of the supplying companies, things are done more environmentally friendly.

Many complicated systems including mechatronic subsystems, hydraulics, pneumatics and electronics fulfil many characteristics that create the most promising ground to implement PSS. In many cases PSS at industrial solutions means use of functionalities and performance already existing at products (Sakao et al., 2011).

3.2 Classification of Product-Service systems

Since the first publication of the term PSS by Stahel and Reday, PSS has taken steps forward. According to Wong et al. re-recognizing and re-understanding of development strategy are led by PSS. Most experts agree that classes of PSS are; *product-oriented PSS*, *use-oriented PSS* and *result-oriented PSS*. As the first step, product-oriented PSS, include most of the old economics features. In this level of PSS, the customer is the owner of equipment and PSS elements integrated into customer service portfolio are traditional; maintenance, repair, spare part sales,

reuse, recycling and possible user training and consulting. In use-oriented PSS the ownership of products remains with the manufacturer, but the usage and the function of products are with the customer. The most typical examples are; leasing, renting or sharing. In the most developed form of PSS; result-oriented PSS, the manufacturer is selling capacity or the result of a certain product, not product or ownership of the product itself. The manufacturer normally offers variety of products and services and gives guarantee of a certain result or capacity (Wang et al., 2011).

In product-service systems companies will have to adopt a new way of thinking. Companies cannot provide all necessary services by themselves, so they will need to collaborate with service companies. According to Peruzzini et al., this collaboration is called a virtual ecosystem. When the former responsibility of producing and delivering a product is extended to a product-service system, the manufacturer needs to develop not only the product, but also the related services and life cycle concepts (Peruzzini, 2008).

Many products have been 'servitizated', which according to Morelli means that the product identity based on material has faded and product identification including the service system has become stronger. As much as products have been 'servitizated', services have been 'productized'. This gives services including product or just services marketed as product. However, it seems that at the current business environment, line between products and services is fading, even without the use of PSS (Pergande et al., 2012).

3.3 Advantages of Product-Service Systems

Product-service system can offer customer targeted improvement for their needs. This can come through added service component or be decreased downtime of their equipment, after planned service and shutdowns. Customer benefits are always depending on the seller´s operation level. If the seller is a traditional

equipment manufacturer adopting new PSS features, the most considerable benefits are to be achieved (Baines et al., 2007).

The manufacturer of equipment will become more responsible for waste, recycling and take-back services, which all benefits the environment. Responsibility needs to be adapted to the whole chain of manufacturing, starting from the design phase of new equipment in order to be able to decrease use of material, improve efficiency and use less energy. While the manufacturer is improving and adapting PSS as part of their operations, it means the same actions for the company´s supply chain. The company suppliers are required to do their part of the improvements.

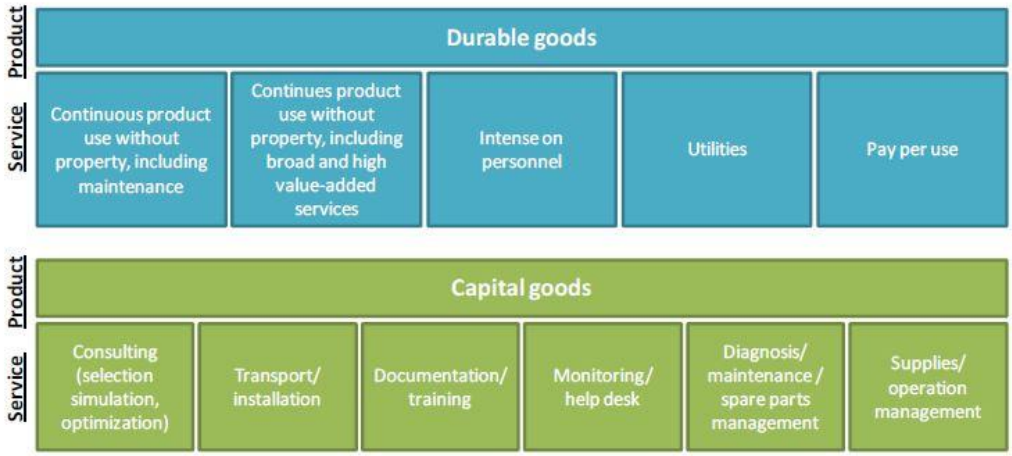
According to Baines the PSS applications can create more jobs in sales and service areas, while traditional jobs at manufacturing are decreasing. For developed economics this is a realistic scenario in all cases. The economical view is that according to Peruzzini (2014), services can create higher margins and profitable business for the manufacturer and for the customer the productivity of equipment is improved along with reduced operation costs due to longer lifetime of equipment.

When the supplier and the customer have applied PSS and their relationship is based on cooperation and trust, it opens natural possibilities to deepen the relationship and as an outcome to improve offering to new level. As an example in a transactional business deal, the product is sold and the supplier is waiting new order, but at PSS model the supplier is able to improve the product by gathering feedback from the site and then integrate those improvements to product design (Rese and Gesing, 2013). For suppliers this offers a route to continuous improvement according to LEAN principles. Another significant benefit to the supplier is differentiation, but also the customer does need benefits from PSS.

3.4 Implementation of Product-Service Systems

Traditional companies cannot become fully PSS optimized companies overnight. All manufacturing companies can develop certain value-adding services around their core product. Several different services already in use, can be conceived as part of PSS. Peruzzini et al. defines for example After-sales services like; maintenance, hotline services, tele-service, spare parts, service and customer training as part of PSS service.

The change from a traditional company into a PSS oriented company with re-thought and re-structured processes and products takes a lot of time. Even the company´s business model and earning logics need to be re-structured to be able to fully capitalize the PSS benefits. Some small or midsize companies might not have the knowledge and resources to do so; even large companies will not have capabilities to handle this change in a short period of time. By adopting PSS the company is struggling to enter new markets with new competition. The company can plan new Product-service systems offering at their current product portfolio by placing their products into one of the product groups shown at picture 6. According to Pergande et al. Durable goods and Capital goods are the main categories in which the company can create their own categorization for their products and then develop and maintain their service offering (Pergande et al., 2012).



Picture 6: Product-Service System types (Pergande et al., 2012).

According to Peruzzini (2014) one of the models for PSS definition and implementation into company operating model has five steps:

AS-IS analysis of processes and assets; First to be performed is an analysis of Product Lifecycle Management process in use, to map the whole process path from the idea to delivery and re-use of the used product. Second; map all relevant assets in use in the company, for example tangible ones; machines and materials and intangible ones; capabilities, skills and knowledge (Peruzzini, 2014).

Analysis of 'Servitization' readiness; this analysis is conducted by different questionnaires of four different areas; lifecycle management capability, ecosystem creation capability, innovation level and network management capability. Questionnaires will discover whether the company is ready to create and manage a PSS solution (Peruzzini, 2014).

Mapping of tangible and intangible assets; PSS is defined to be set on assets, tangible and intangible. The whole idea of the PSS concept is about assets and their producers in the company ecosystem are to be named by this mapping. The mapping work consists of discovering who will produce for example; knowledge, components, software or application, a certain product or certain service. (Peruzzini, 2014).

Business model definition; the previous steps have clearly opened the company´s business model and it can be analysed with the Canvas model. After Canvas model implementation it is easier to define areas of necessary actions for implementing new business (Peruzzini, 2014). The Canvas model has nine building blocks classified under the following categories; *infrastructure, offering, customers* and *finances.* Infrastructure building blocks are *key partners, key activities* and *key resources*. Offering building block is *value proposition.* Blocks under customer category are; *customer relationship, customer segments* and *channels*. Finances category consists of *cost structure* and *revenue streams*. With

these actions the company can discover new possibilities and create a new earning logic (Osterwalder and Pigneur, 2010).

Definition of the TO-BE integrated product-service lifecycle and VME; at this step it is relatively clear for the company to manage both product-related and service-related activities and the actors involved (Peruzzini, 2014).

4 SUPPLY BASE MANAGEMENT IN TARGET ORGANIZATION

Companies which are manufacturing in several locations and have large global sales network are normally using a large supply base. With history of decades in manufacturing business, also roots for supplier relations have been planted ages ago. In previous times the business model of the company has been relatively different and it has been based on strong and close relationships with customers during a new site build-up phase. After the site was started and being in full operation, Outotec main focus has turned on new projects. The business model did not support the operations; maintenance and spare part business thus leaving those businesses open to project time suppliers, local companies or even direct competitors.

One option of defining spend at industrial business can be split into two different types; CAPEX and OPEX. Term CAPEX means Capital Expenditure; all costs related to investment build up or investment to increase capacity. OPEX on the other hand is Operative Expenditure; all cost related to operate site and / or equipment, Outotec was strongly focusing on new CAPEX deliveries with new and existing customers. In Outotec´s situation, both CAPEX and OPEX are namely using the same supply base, although some differences also exists.

4.1 Current state of the target organization´s supply base

Outotec is using globally more than 10000 direct suppliers. The annual spend of Outotec on external companies was 980 million euro at 2013 (Outotec, 2015). The supply base consists of suppliers of all sizes, the variation being from one-man micro companies to companies employing hundreds of thousands of people. According to interviews and my own experience, the same supply base is used for all operations; own manufacturing, spare parts, life cycle operations,

modernizations and other service offering. Own manufacturing or assembling of the same product or equipment can also take place in more than one location globally due to possibility of the BSS manufacturing and that itself is creating a need for a local supply base. It is justified to have this variation and multiple sources due to strategically planned manufacturing and assembling network.

The company´s product portfolio is very wide, which partly also explain the high number of suppliers in use. There are more than 20 product lines. With the total amount of different materials, product capacities and technical solutions, there are more than enough different products available. These products are always tied into a certain product line. Based on interview results, Outotec´s previous business model was supporting sourcing and procurement work to be done at product line and in CAPEX projects. Supplier selections were based on a certain product line preferences and on project procurement bidding processes. As a consequence, the supply base development was not managed on corporate or even divisional level and re-usage of the same supplier was not optimal.

Comments from interviews also pointed out that another possible reason for changing suppliers from project to project might have been a lack of manufacturing resources at suppliers, for example the supplier in the first project might still be fully booked with that particular project and new project need to be started immediately. As an addition to this Outotec´s service sales network is wide, serving customers at all continents from 27 different countries. Processes and ways of working on the supply base handling vary a lot between offices. The target company has also done several company mergers and acquisitions in the last few years. These acquisitions have also expanded the supply base dramatically. All acquired companies have merged as part of Outotec´s operations, but the supply base has remained as it was before the acquisition. This means that the supplier base for standard components like bearings, bolts and nuts, consists of multiple sources, which spreads the spend too much and causes a lack of purchasing power. The brighter side of things is that with a large supplier base Outotec can guarantee relatively high availability for these components.

Another view that came up during the interviews concerning the size of the supplier base is that it is actually not such a big problem, since with the current large supplier base Outotec has been able to keep the business profitable. The major issue with this large supply base is; how to manage it properly? Outotec´s global sourcing is working on the supply base harmonization, but the work is resource intensive as much as the supplier changes require also engineering work.

4.2 Bottlenecks and challenges at supply base

The current supply base of Outotec has several bottlenecks to be solved to increase efficiency and improve Outotec´s customer experience. Based on interviews with key people and my own experiences, possible bottlenecks can be quite easily named. The first and definitely the largest bottleneck is a too *large supply base*. This is caused by acquisitions and historical reasons of the previous business model. It used to be a normal procedure to make the supplier selection at single product lines. Some smaller bottlenecks can also be named, depending on the point of view inside company; some *single source situations*; causing problem from the risk management point of view for some product lines, many suppliers not having *agreements*, also pricelists, terms, conditions missing and immaterial rights not clear, *lack of coordination* in operations, *communication and ways-of-working*, caused by shortage of personnel in certain functions and mismatch inside organization targets,

Interviews highlighted that the biggest bottleneck of *too many suppliers* is a huge challenge for the whole organization. The problem has developed during years and will remain and grow, if any actions are not taken. Several suppliers are getting only a few orders annually. The costs for maintaining supplier records at ERP system and keeping up complete supplier relationships, are bigger than turnover with that specific supplier annually. Even components purchased from these suppliers are standard or nearly standard. Several of these suppliers are distributors and are in direct competition with each other.

From among interviews, this is a consequence of wide technology portfolio and the previous *project business model*s where every project had accountability for project profitability and also project sourcing and operative purchasing. Such a business model operates on lowest total cost on a CAPEX project level. At current perspective this seems to be inefficient, but it was a very profitable approach in CAPEX driven business model. Traditionally some of target organization´s product lines are more standardized and documented than others. Usually the product lines in which documentation level is higher have a higher amount of supplier agreements in place. Some product lines have traditionally delivered more tailor made projects on customer needs and the poor repeatability of purchased items has not justified specific longer term delivery agreements with selected suppliers.

On the current supplier base there are a lot of materials and components being in a single source or sole source situation. According to interviews some of these are to be handled extra carefully. When single sourcing is voluntary to both parties it can work for a while, but as time goes by companies and technology evolve and business focus shifts make the single source relationship more complicated. So in long term these relationships can only work, if these relationships have support from an additional growth of business and even joined product development. Single source situations can be fruitful for both parties, but only if there is full trust between them and both can exploit the relationship and constantly grow. Typically a single source supply relationship requires a lot of management over time in order to guarantee mutual benefits.

Supplier relationship management does not have high priority at point-to-point project business. There is no high demand to maintain supplier relationship, since it is project based and next order can be years away. This same strategic choice affects also the after sales business and even competition has been able to reap business benefits of the situation. Spare parts organization has followed project purchasing and placed purchase orders of components mainly to the same

suppliers as the project procurement has done during project implementation. According to my own experience, this has caused a situation in which the supplier relationship management work would have been needed. A lot of suppliers lacking SRM comes´ to issue since there are the limited amount of resources for taking care of supplier relationship. Globally the target organization has sourcing specialists and managers to take care of supplier relationship on tactical level but the resources are limited. It came up in few interviews that partially due to this Outotec has not been able to use its purchasing power and has suffered from long lead times and even un-desired business between Outotec and its suppliers, since the original agreement was about the project delivery and SRM work has been done at operational level of organization. When, and if SRM is done at operational level, there might be risk that issues like immaterial rights are not agreed or discussed at all. Naturally all immaterial right issues need to be agreed with agreements between both parties in strategic or tactical level, but the need for an agreement can also be raised from day-to-day cooperation with the supplier.

The current way of managing the supply base is to do it through one organization; the Supply. This organization part takes care of everything related to the supply base management, suppliers and supplier relationships. The supply organization has been built during the last few years and it operates cross-functionally, so that every action towards suppliers would be based on for example agreement, relationship, way-of-working or sourcing rule made by the supply personnel. The organization inside the supply function is partially global and partially local; although reporting lines are built to support global actions. From the supply base management point of view, there is category management team whom are responsible for managing the supply base in strategic and tactical level. Based on interviews, this operational model has already shown that it works, but challenges still remain with the supply base management through the wide technology portfolio and non harmonized approach within Outotec causing inefficiency and misunderstanding among suppliers.

Outotec has several different kinds of *supplier agreement* stages. The most thorough one is frame agreement. This agreement covers all terms and conditions, roles and responsibilities of agreement parties, and is very lengthy to negotiate. Currently there is on-going development work to create a lighter version of the frame agreement. That would cover most important issues of agreement, leaving some of the detailed issues out. The third level is a pricelist and terms and conditions of delivery and payment. The pricelist can also be attachment to a higher level of agreements. The fourth level is "quotation-offer" level and it is actually performed by the operational level. According to discussions it was pointed out that with several suppliers, commercial relationship is based only to the "quotation-offer" level. This means that every time the supplier is requested to offer new price and lead time on each transaction and "agreement" has formed after the order and the order confirmation have been accepted by both parties. This formulates problem on pricing and profitability of parts.

A lack of speaking the *one Outotec voice* towards suppliers was also mentioned to be one of the key bottlenecks. It is not rare that in the beginning of a project, teams given one message to the supplier and then at the end of the project, or at some check point list where service personnel is already participating, new totally different message is given to the supplier. People who where interviewed found this very frustrating and even hazardous for Outotec´s business. The organization cannot work efficiently, if targets and message towards suppliers are not understood and communicated internally. An un-clear statement in different phases of CAPEX and OPEX businesses creates fuss and inefficiency between Outotec and its suppliers. With better coordination and clearer communication, a lot of improvements could be done. High level targets of the organization parts are defined to be the same, but the team or individual targets can be defined differently. Resources working with sourcing activities and resources working in operative purchasing cannot have too different target setting and target setting needs to support each other. As an example, if the sourcing resources are targeted to reduce amount of suppliers and the purchasing personnel´s target is to secure on-time deliveries. If these two are done independently without proper feedback

from the other, it is clear that either of these targets cannot be properly met. Working with suppliers would actually require quite similar target setting for all supply and purchasing personnel at all levels. The reason behind unclear supplier communication is partly due to very young organization structure. Suppliers still have their old relationships to Outotec personnel and new supply people have not been able to bond with the suppliers. Technical developments are done with the product line and final commercial decisions are made in the project execution phase. This fact can also cause conflicting messages. As a result suppliers are using their old connections and might get a conflicting message. Another reason for unclear communication is also based on the young organization and roles inside the organization. Responsibilities are not clear and neither is the correct communication method towards suppliers. In this situation the company workload has been tremendous for the last few years. Adding up the organization changes and huge workload it can be seen that the daily life has been surviving at the changed environment.

4.3 Life-cycle requirements of the supply base

According to interviews the current business model of Outotec is aiming to increase the life-cycle solutions sales and OPEX business in total. This target setting is partly adopted from the Product-service systems and is causing also bottlenecks to the company´s supply base. According to interviews there are several bottlenecks realized also from the life-cycle perspective. The issue mentioned most often was *Supply base is built for projects*, others listed were *Outotec carrying all business risk, IPR, internal competition* among suppliers, *agreements*; including pricing, quality and lead time issues and *internal communication;* sorting out requirements for all businesses and towards suppliers.

Acting previously by the project business model, it has naturally also formulated Outotec´s supply base into a certain format. This issue was mentioned by each person. From the life-cycle perspective, it can be seen as a limiting feature in the supply base. A lot of business is lost due to long waiting times at quotation phase.

The current business volume can offer the target company and its supplier's steadier income and security towards fluctuation at the global economy. Changing first internally the Outotec mindset to the life-cycle mode and then also changing the mindset of suppliers to also appreciate smaller, but repeating orders, is a giant leap that needs to be taken.

Another problematic issue is that, the nature of project business is totally different from the schedule point of view. Based on my own knowledge, a normal project delivery at Outotec environment takes from months to years and has a certain date when everything needs to be finalized from engineering. After this fixed date changes are not allowed anymore. There are few differences compared to service deliveries. First the time schedule is different and reacting to order needs to happen immediately after the release of purchase order to the supplier. Normal delivery time requested to service deliveries is maximum of two months, but in 90 percent of cases it can be delivered immediately to customers. Very often the service orders remain as they are in a day of order placement, but in some cases changes needs to be done. In the changed case, the supplier needs to be able to react immediately to the requested change; otherwise the supplier is delivering parts that end up into the trash bin. The supplier needs to have flexibility to support life-cycle demands of business.

Based on interviews, a big problem from the Life-cycle point of view is rolling the supply risk to the suppliers. According to several answers, *Outotec Business risk* has not been completely rolled to the supplier end. This means that those few cases where Outotec´s business risk has been realized; also costs of failure have been carried by Outotec. At the same time the supplier has been able to avoid economic impact. In fact in few cases the supplier has been awarded in future with new business from Outotec.

A big bottleneck from the life-cycle point of view is the agreement status of Outotec suppliers. Based on interviews; *a current supplier field has very few suppliers with adequate agreements in place*. The supplier agreement should have

coverage also for life-cycle issues, like the use of *documentation*; can Outotec use the supplier´s exploded views and modify them to Outotec template? , sale of *wear and spare parts*; Agree on a price model that would really support Outotec as primary wear and spare part distribution channel. If these are lacking from the agreement, it means that there is a possibility that Outotec´s supplier at the project phase, will become Outotec competitor at life-cycle business phase. Agreements should also cover issues like intellectual property rights, IPR. Outotec provides technical specifications, drawings and other documentation to several suppliers. In case where the supplier is making modifications or improvements for example due to lower manufacturing costs or time, there might be later issues with the IPR, if there is no agreement in place, were these changes and ownerships of model or documentation are defined carefully.

Agreements coverage on OPEX business is much more important than in project business. Project business can work with project based agreements. There is enough time to negotiate agreement each and every time. Even timeline for quotation phase is completely different; large CAPEX project quotation phase can take months and OPEX should work in hours to a few days timeline. The delivering phase of projects is long, even up to several years.

The same supply base for projects and life-cycle operations can be problematic, especially in high peak seasons. Based on my own remarks, since the same supply base is used also in own manufacturing, there can be more than up to 4 Outotec entities purchasing materials or components from the same suppliers and even without knowing it. The supplier is treating each and everyone as different customers, like they should, only until there is a capacity problem. A better coordination of supplier usage is needed, that could improve delivery times and also supplier price level, in case all Outotec spend would be combined as one.

5 NEW SUPPLY BASE DEVELOPMENT IN OUTOTEC

Targeted suggestions to develop the supply base at Outotec are communicated at this chapter. Based on interview findings, it is very clear that a lot of good work has already been done, dedicated organization has been established and operations are running at an adequate level, but to be able to take the next step and increase the awareness of supply work, these proposed means should be taken into use. All of these means are targeted to improved *customer experience* when dealing with Outotec. Since a large portion of Outotecs projects and products are manufactured by external suppliers, improved supplier operations reflect directly as improved customer experience. Based on interviews, it seems that when the Outotec supply side organization and functions are examined from higher perspective, big lines are in good order. It is also clear that big development points are related to the supply base size, the supplier relationship management and the performance measuring to support overall performance of the supply base and the Supply organization. When taking a closer loop, a lot of smaller challenges can be seen and part of those can donate quick wins for whole organization.

In general level different business demands have different kinds of limitations and those limitations need to be addressed to the supply base. Project business has very large deliveries, even full plants to customers. These deliveries require a large portfolio of suppliers with relatively large capacity. From the supplier point of view CAPEX business allows them to make capacity reservation according to their current manufacturing schedule. Even if scheduling was to be fixed, changes can still happen, the project might get delayed on the customer side. OPEX business delivery window is usually only weeks and capacity should be vacant or reserved for producing and delivering immediately.

At a minimum the strategic suppliers working with Outotec should see CAPEX and OPEX as good business opportunities to develop their own operations. Suppliers can benefit OPEX business as fluctuation minimiser and use OPEX business as a bridge over low CAPEX volumes.

Propositions are divided into categories based on literature part of this thesis. First there are propositions related to strategies and planning of the supply base management. The second category of propositions are related to organization, the third concerning the supplier relationship management and finally fourth are propositions of exploiting the product-service systems theory to the supply base management.

5.1 Propositions for the supply strategic planning

Many decisions related to the supply strategies and the supply strategies themselves already exist. Based on interviews Outotec has strategy rounds expanded to product level, which is a very good development. The supply strategic planning should be tied into operational behaviour as well. According to interviews; it seems like this linkage is missing. Interviews opened also the fact that the supplier field is very fragmented and suppliers do not know their position. Opening this fact to the supplier would serve as an analysis of the current state for suppliers. When the supplier has knowledge of the current as-is situation, improvement work can actually start proactively by the supplier.

The suggestion at this first chapter is aiming at a united supplier field, in which comparison from Outotec´s point of view and competing from the supplier´s point of view can actually start. Following chapters have been raised to the strategic level because they demand high level lining or supply tools development. Justifying development has to be done through strategic points, and to have the company´s top level approval.

5.1.1 Supplier segmentation model

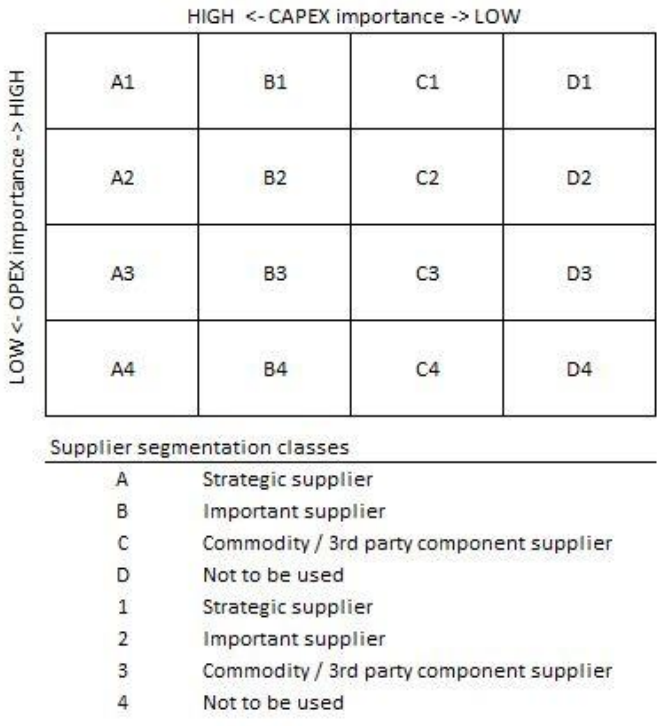
The first proposal for the target company is to analyze the whole supplier base. There is need for this work to support solving the namely biggest bottleneck discovered during the interviews. The supplier segmentation model will be the

first step of adjusting the supplier amount to the optimum level. This can be done in purchasing offices with the cooperation of the respective product line and service personnel and with the guidance of Global Category Management. The supplier base should be segmented top-down to spend and strategic importance. Directing idea is to categorize the current supplier base via spend figures. Ideally the situation would naturally be to analyze the complete supplier base, but as resources are limited, so certain limitations in overall spend needs to be considered.

The target in the supply base development is that it serves the whole company. Projects and services are running the same supply base, but with different perspectives. This places challenge to the organization in charge of the supply base. Developing proper supplier segmentation should also bring up supplier importance for service and spare parts business. Suppliers whom are willing and capable of doing life-cycle business with Outotec would also be much more transparent throughout the whole organization. With this two-angle segmentation it would be much easier to discover prospect suppliers, whom at this moment are important for CAPEX business and will become important to OPEX business in few evaluation cycles. Developing selected prospect suppliers towards good service supplier capabilities would give additional improvements to lead times and immediate availability. This would also require true willingness from the supplier to work with Outotec service and after sales operations and see that as the primary sales channel for their products and services. With newly presented supplier approval and selection process, the Supply can support the managing and maintaining pool of suppliers. All new suppliers coming into supplier base are evaluated and approved according to new policies and OPEX evaluation needs to be included into these policies.

At the suggested supplier segmentation model, letter means importance for CAPEX business and number gives OPEX business importance. As an example supplier segmentation class A1 would mean class A supplier for Outotec in CAPEX business and class 1 for OPEX business, importance classes and

explanations are shown on picture 7. By building the segmentation this way, it would be more visible for people working in Outotec at either the supply side or at the engineering to see what the current weighting of business volumes and importance with this supplier is. Maintaining of this segmentation can be applied for example annually with annual spend and changes in technology and product strategies and service strategies. Segment information must be made visible to all personnel. Outotec´s supplier database is the right place to add this information. All suppliers' related information should be gathered into one system. Transactional data naturally belongs to the ERP system, but apart from that Outotec should exploit possibilities of its supplier database. This tool is now used on daily basis by all personnel, but Outotec should openly discuss about development and limitations of the current tool. According to user experiences the usability of the current tool could be improved.



Picture 7: Example of supplier segmentation matrix

Benefits of the segmentation cannot be measured immediately. In longer perspective placing purchases to “correct” suppliers can increase the company´s bargaining power and improve lead time and availability. While OPEX share of company turnover is increasing, these improvements will pass on directly to company profitability. The segmentation will also provide toolbox for supply personnel to develop supplier capabilities to suite better the OPEX business.

5.1.2 Purchase material data classification

Linking supplier segmentation and purchase material data information is useful when classifying purchases and making decisions of future supply sources. Spend analysis as a tool for starting the correct improvement programs is widely used. Analyzing of data cannot be done if there is no data classification at all.

Especially at OPEX business all purchases are done at the ERP system and with individualizing material codes. These purchases the company should categorize for future analysis. There should be codified purchasing or sourcing category mentioned on materials master data at the ERP system. Sourcing categories are naturally defined at Outotec level and for each material code this information exists. Classification is not done in the ERP system at all or it is in a very native level. By adopting this categorization to every material, a systematic approach of supply base development can be more easily managed.

Large numbers of purchases from several suppliers are categorized to a standard item category. For these purchases there are no price and lead time information available. In case a value of a single purchase remains under a pre-defined level the Procurement Specialist is allowed to make purchasing decision. This should remain as it is. As a development point these purchases should be scanned through on monthly basis by the sourcing organization and make sure that the correct approved suppliers are used and pricelists are updated according to the purchase history. Technically purchases should also be crosschecked to make sure that for example a certain product line of bearings, not just the purchased one, is

completely available at the pricelist. With this action the pricelist coverage would actually be higher. Most beneficial for the organization would be to have a process were all purchase data is analysed first days of month by sourcing organization and then the results should lead into a monthly info letter to the operative personnel to guide operative procurement into the right direction.

As a result the ERP system needs to be developed to be the master tool for purchased parts data collection. Any other systems to hold transactional data should not exist at all. Other systems can be developed to analyse transactional data, but the master data needs to remain at the ERP system.

5.1.3 Formalization of Outotec supply terms

Communication terms clarification is probably needed at Outotec. There are several comments in interviews about inefficient meetings and mis-understandings due to un-clear terms or use of different terms in different contexts. In general the supply chain and the supply base related terms are used differently between companies. As a problem this is not the largest, but causes a lot of mistakes and hidden costs, when presentations and actions need to be done again.

The solution for this challenge would be to create an “Outotec Supply” – dictionary for open use. The company has good communication platforms and technical capabilities to build this quickly. Benefits of this would be seen immediately as improved understanding and shorter and efficient meetings. At first the scope of the dictionary does not have to be the largest possible, but covering enough so that it can be used as an example of clarifying things with a new technology. The dictionary could be developed in a similar form than commonly known “Wikipedia” -platform. This would allow people using this software also to edit it and add content. The dictionary would require one person to be responsible and maintain it. This can be done part-time as an addition to current duties. Clarified terms must also be shared with suppliers to secure that

once Outotec is speaking the same language internally also the supplier is speaking the same language. One option would be to offer this information also to external parties, like suppliers, on a cloud service.

5.2 Propositions for the organization model

Changes and adjustments for the organization should not be done in a short perspective. In case where organizational changes are to be done, those need to be considered as long term actions when the first results can be expected in more than 6 months from the change. The basic idea of these suggestions is to create groundings for the future success. The main driver in these suggestions is the supplier performance improvement through improved internal understanding of Outotec´s needs and then communicating those needs to suppliers.

The target behind the first suggestion is to increase internal awareness of OPEX business demands or at least amplify OPEX voice at certain parts of the organization. The project business and the supply organization are unable to fulfil the need of the service organization, if needs are not properly communicated in all necessary forums. The second point is relevant for whole organization to adopt. The fact based communication throughout all pre-defined communication layers and channels will improve Outotec´s operations quality.

5.2.1 Organization adjustment

The organization of Outotec has been re-organized several times during the last three years. Changes have been targeted to have better response for the customer needs and expectations. The separate supply organization has been good improvement, especially when simultaneously business strategies have been changed. Product lines have exploited the supply function with variability. Work done by Product lines and supply will benefit both, project implementation and life-cycle business, by having things agreed before the beginning of the project or

operations. When project implementation is utilizing the supply function during project, it is still up front work from the life-cycle perspective.

Importance of Service and life-cycle, OPEX business, is fundamental to Outotec. This also requires initial attention to the project business side. The current model of a service person being a part of the project organization is beneficial for the company in a long run. The person who should be doing these actions needs to be correctly addressed, since good practise needs attention and supports of having good results. The organization needs to take the responsibility that proper resourcing is in place to support the services´ point of view at projects. The organization´s senior management guidelines and commitment for increasing service presence at the projects is mandatory to make sure that the service person has support and necessary tools to make the difference in the projects. By adding only one and the same person into every project organization does not make a difference.

Services should also be integrated better into the Supply organization. The current global category management is missing a member who is dedicated for Service and Life-cycle view of supply base management. With the added resource in the highest level of supply decision making it would give added value for selecting the suppliers and having the possibility to coach life-cycle requirements to the other members of category management. The tactical level organization has service dedicated resources. These resources are fighting against a huge workload and definitely need guidance and support of priorization on workload. The operational level of purchasing resources is covered quite well, but globally some challenges still exist. Problems may still occur if OPEX demands are not totally understood at operational level, but instead purchases are handled with negligent attitude.

5.2.2 Formalizing of communication

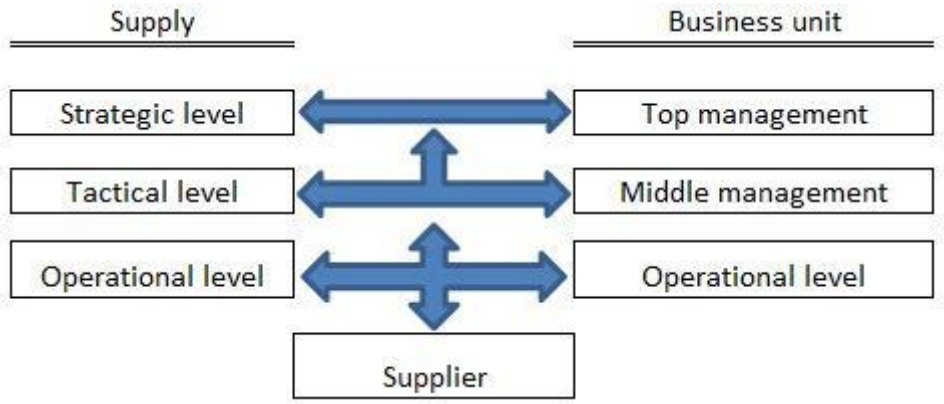
Outotec´s suppliers have suffered from the organizational changes inside Outotec. Based on my own experience, only few strategic suppliers know their contact

persons and understand Outotec´s matrix organization. People working at Outotec give conflicting information about the company targets and expectations towards it suppliers. The one Outotec voice is not spoken or heard inside company or towards the suppliers. Internal communication lines need to be cleared first and only after that improvement for external communication can happen.

This requires all counterparties to work with suppliers to increase and sharpen their communication. It is important to specially communicate Outotec´s expectations for suppliers with one voice. Communication should be layered throughout the organization. It is not common for the top management of business function to have all necessary information about the supplier. On the other hand operational people do not have sufficient information about the company´s supply strategies and priority areas. Information that operational people have is related to supplier responsiveness and capability to react to changes. This non-numerical information is hardly ever used when evaluating suppliers. The target is that this information is utilized in the ERP system, so that it can be used during negotiations or top level communication with suppliers on strategic and tactical levels. Setting a clear communication channel for top-down and down-top information is important, when trying to secure conformity at communication.

For strategic highest level components there are monthly core teams in place with agreed agenda and reporting. In these meetings every stakeholders has possibility to put pain points on the table waiting for development actions. That idea can be refined even for lower importance classes. With service differentiation in supplier segmentation it would be possible to collect all suppliers with service importance to one monthly meeting including people working in operative purchasing. As an additional benefit, the operative personnel would also become part of the decision making process and sharing strategies would have natural meeting. People included at the decision making process usually have higher commitment and motivation towards their work.

Improvements for the current situation can be found from internal clearance and guidance from the supply strategic level. Single person at the supplier surface must stay in good cooperation with suppliers. Clarification of Outotec´s organization would benefit both Outotec and its suppliers. The suggested model of communication with suppliers is described at picture 8 and supplier counterparties should be limited to tactical and operational level. Only cases in which the supplier has strategic value should strategic level of supply or top management of business unit be involved. The main focus of the strategic level is to create and maintain supply strategies.



Picture 8: Suggested communication model.

Another perspective for the communication problem is that when new guidelines or work instructions are published, those need to be really shared and made sure that they are really understood, instead of just publishing those at the intranet. In Outotec´s organization model processes, guidelines and work instructions are developed at headquarters. This model is essential when creating processes and securing their conformity. Outotec has a huge program called OPAL, of which renews all processes, ways of working and tools. According to interviews however, during OPAL start-up phase everything seems to work fine. But are new working models adopted into everyday life? Each and every office should have person or people in charge of ways of working audits internally. Supervisor is always in charge of making people work with expected processes and tools, but working with headquarter based instructions can be sometimes hard to adopt.

5.3 Propositions for the supplier relationship management

People working with the supplier interface are natural assignors to the supplier relationship management. In case there is no plan or guidelines to be executed at the supplier interface as a result the company will get as many styles of handling SRM as there are actors in the respective field of SRM. Different kind of supplier relationships demand different amount of tending, it all depends on how much time and resources there is available for this relationship work. Throughout supplier relationship work, the company can build and formulate the most fitting supplier base for themselves.

The first proposal focuses on increasing SRM work importance inside organization and towards the suppliers. The second proposal is about formulating the supplier base into the streamlined and efficient shape. The third proposal is natural continuation to the first two and is actually one of the key enablers for first one. Measuring and what you are measuring is a major part of the supplier relationship management.

5.3.1 Increase SRM work importance

Supplier relationship management has a big role when formulating working and flexible supplier base. Outotec has done SRM only with very few selected suppliers. Beside that SRM work is naturally done by operational people on order level with all suppliers. Another stream of SRM has been situations where Outotec has negotiated agreements with suppliers. The situation has been very complex since resourcing has been inadequate.

With proper SRM work Outotec can achieve improved results in both CAPEX and OPEX business. An important question from the SRM point of view is that how to maintain the supplier relationship in times of lower business volumes or even economic recession. Being strong both in CAPEX and OPEX business fluctuation can be controlled a little bit better. Suppliers, after all, will respect the

same steady business level as Outotec. One key aspect on SRM work is communication of Outotec´s expectations towards suppliers. When groundings, like agreements, terms and conditions, are agreed and supplier and Outotec relationship is formalized, it is important to have trust relationship with people being in SRM role. Based on supplier segmentation other than highest segment, person in charge can have a strategic, tactic or operational role in Outotec´s supply organization. That really even does not matter what organizational role is, since a big part of the supplier relationship management is managing daily person-to-person communication. With strategic suppliers SRM work needs to be done in regular, perhaps in quarterly meetings with suppliers. At these meetings the Outotec member should have high position at the supply organization. By this selection Outotec will underline the importance of the supplier.

Based on improved supplier relationship management OPEX business can achieve improvements for example in lead times, lower price level, especially when business needs can be rolled on to suppliers more efficiently and the supplier can adjust their manufacturing or order points to be more suitable to Outotec´s business.

When the importance of SRM work has been raised internally it is necessary to have counterparty for Outotec SRM professionals at the supplier side. Especially from OPEX perspective this is very important. For highest segment suppliers this is natural, but for lower importance suppliers, it should be considered as one of the key features that the supplier needs to have; a nominated account manager for Outotec, especially for OPEX business purposes. Having this big importance from the supplier requires adjustments at the supplier base and big enough share of suppliers' turnover to have.

5.3.2 Formulate strike out supplier base

An inefficient and fragmented supply base causes inefficient operations for the buying company and shines through its customers. According to interviews, there are long lead times, constant delays and the company profit level is not at targeted level. Outotec supplier base has been growing due to business model and many acquisitions. The business model has changed and that causes inevitable changes at the supplier base.

Outotec should consider using only suppliers that are willing to handle all after sales business and spare parts with and through Outotec. Selected supplier needs to have certain service orientation at their company culture to support Outotec´s life-cycle business. Based on interviews choosing always biggest market leader for all projects is not the most value adding model. Choosing partners and suppliers who are the right size to you is more important than having largest possible supplier, to whom you shall not have any influence at all with your limited purchasing power. A part of good supplier responsibility is to offer documentation for assemblies and machinery they have built. This should be considered as the main criteria when choosing suppliers. Based on experience, reasons why a supplier would not want to do this is that, they might have their own after sales organization that is taking care of all OPEX demands from Outotec project end customer. Every company is targeting for more profitable OPEX business. Aligning the business interests with the supplier in this dimension is the biggest challenge.

The supplier selection needs to be developed to be based on supplier classification. Resources and all stakeholders need to focus on supplier comparison and selection only to strategic supplier classes. When all suppliers have valid class of importance decided, then only the top priority suppliers, strategic ones, all stakeholders should be taken into the discussions. For lower importance classes, strategies need to cover targets and tactical and operational organization can take responsibility of actions reaching those targets. According

to my own experiences the complexity of supplier selection can be reduced significantly this way. Efficiency and results will be on a higher level and resources are aligned most efficiently. Complexity of the supplier selection and the supply base needs also to be taken into new level from the engineering point of view. All technical selections and by those, most of the supplier selections also take place at engineering. Information flow from the Supply organization will need to be enhanced. With the correct content at *Outotec preferred supplier model* and *Outotec supplier database* are the links to improve information flow. Existing supplier database tool should be easy enough to use also for the engineering department. Pre-defined searches of approved suppliers, suppliers of certain category and suppliers with full coverage agreement would support the "right" choices for engineering.

Considering operational organization and material master data, it could be helpful to add a trademark feature to Outotec´s supplier database. This would mean that the wholesale suppliers providing several trademark, would have a list of available trademarks in their supplier database. According to interviews this would help placing RFQ´s to the correct approved suppliers. This additional feature would also help engineering people to make the right choice.

As a first short term proposal; all suppliers having less than 6 purchase orders in average for the last two calendar years should be evaluated by sourcing personnel in cooperation with the relevant stakeholders. This should be done in each location that has technology ownership and global role at the service network. If there is no reason, strategic, technological, commercial or service level, to keep this supplier at the supply base, there should be an alternative supplier named for them. To this alternative supplier, the sourcing organization should also create a price list with lead times at minimum and this list should be updated into the ERP system to secure that new agreed prices are used in every transaction. Eventually, when repeated long enough, for example once a year, the supplier base would be optimal for in one hand managing it and in the other hand having enough competition to secure the right price level for the purchasing company.

All in all, preferred features for good OPEX phase suppliers are quite normal. To have a *nominated account manager* for Outotec; all Outotec business should be guided through this single point of contact. Naturally big CAPEX cases can have separate project manager also from the supplier side, but account manager needs to be aware of the progress. Other features are common ones, *fast reaction to quotations*. Especially OPEX business is dependent on fast turnaround time towards its customers, so the same is expected from the suppliers. A good OPEX supplier *can deliver quickly*; this requires forecast model development from Outotec side and then sharing of forecast with suppliers. Working with forecasts can lead to an establishment of buffer stock, manufacturing of semi finished goods or even stocking decision inside Outotec.

5.3.3 Agreements

According to interviews especially people working with OPEX business see the lack of agreements as obstacle. All suppliers do not need an agreement, but suppliers with several weekly transactions should have an agreement covering in place. The supplier agreements and the supplier segmentation are to be closely linked. For all supplier segments Outotec should define an agreement stage that would match the supplier importance. The current agreement stages offer good groundings and can be fitted into the supplier segmentation. In case a supplier is an A1 segment supplier, an agreement should cover everything from joined product development to pricelist items and possible buffer stocking at supplier premises. The agreement stage for other supplier segments is varying.

Use of "*global agreement*" should be considered very carefully. Global agreements can be negotiated in Finland, but hardly ever those agreements can be followed in decent level for all locations globally. Even easiest things like information flow of existing agreement can take time, if it will ever happen. People in South-America for example have a different business environment. According to interviews and my own experience agreements negotiated at Finland

might seem unreasonable to them as global price agreements easily lead to a situation in which region´s price level is subsidised by some other region. Those agreements can even work against themselves, by harming local business relationship with suppliers.

5.3.4 Performance measuring

Performance can only be improved, if it is properly measured with visible meters. Supplier performance measurement is not, according to interviews, systematic at all, but instead missing completely. Suppliers are only given verbal feedback and in most of the cases the feedback comes only after something has gone wrong. Good measurement should not always be measuring the easiest possible number, like On-Time-Arrival-percentage, but instead a measurement of how a better supply base management can add customer value (from customer perspective) (Meekings et al., 2011). From the business perspective Outotec´s commitment on its own customers cannot be rolled to suppliers since their current performance is cannot be validated. Current reports offer numbers to reporting use, but according to interviews there is no trust on the figures. It is unclear to users how these figures are calculated and a manual calculation from raw data, gives different a result. Lack of trust causes an additional obstacle for using the current report.

The supply strategic level needs to set measurable KPIs including a quality dimension. Setting meters must be unified with reporting tools and ERP system to secure easy creation of numbers. These meters and set targets must be visible to the suppliers. According to these meters the operational organization must then raise improvement needs and tasks for the supply organization. People working with suppliers on daily basis have the best knowledge of supplier capabilities and changes to meet to the demands. Supplier measurement and feedback could be used, to make suppliers in valid segments compete against each others. Measurement and feedback should contribute as improved supplier performance. The first step of measuring and evaluating suppliers would be measuring based on

transactions. Transaction data is available at ERP system and some reports are available.

Valid meters of supplier performance are regularly related to quantitative meters, numbers that are relatively easy to measure based on transactional data. A system for supplier feedback and performance measuring should be built to exploit transactional data and as an addition there should also be possibility to easily add qualitative meters. These meters are to be added by project implementation or operative personnel. Qualitative measures can be based on SERVQUAL measuring system dimensions; tangibles, reliability, responsiveness, assurance and empathy. Setting a clear understandable definition of these dimensions and creating for example a web-based tool for fast evaluation of supplier qualitative performance would support the supplier performance development.

Outotec is piloting a web-based *Jakamo* tool for creating reclaims to suppliers. On the other hand Outotec is using Liaison technologies´ *Anionline* tool for sending out purchase orders to suppliers. There are some development actions on-going at the supply base management tooling. There would now be possibility to create a strategy that would support work with a maximum of these two already existing partners. Adding partners and tools would increase costs and dependence on external service providers.

5.4 Propositions for adopting PSS for supply base management

Not necessarily the whole product-service system ideology can be adopted as supply base management tool, but at least some of the parts could be adopted. Product-service system offers possibilities to the supply base management, but the engineering perspective or at least minimum services product management perspective as the key contributor is central. PSS value is focusing on selling of services that the customer needs and the service provider should be able to exploit their network out to a maximum.

Most appropriately PSS adaptation could be done to the strategic segment suppliers. There needs to be regular and constant discussion and communication between parties to be able to crucially benefit both parties. At Outotec´s case, PSS adoption to the supplier segmentation could be done through designing new services in cooperation with suppliers and their products. Service engineering or service product management could exploit suppliers more when designing new products and services. For the suppliers with the highest strategic importance, PSS benefits can be applied in cooperation with, but for lower importance classes PSS features need to be built by Outotec. Even if services are built by Outotec, it does not mean that suppliers should be completely left out, but instead making them participate to design phase. PSS basic elements are product and service, making those together with the supplier will benefit both parties. The supply organization should scan possible suppliers who would be available for offering these services to Outotec. Outotec´s added value for this cooperation is a wide service network and presence and access to many sites. Since many customer sites have applied pre-approval of a service partner to improve occupational safety at sites, smaller suppliers might not have the possibility to access these sites.

In PSS strategies one of the key messages is that when using service-product system perspective during the design phase, as the company will get more sustainable products and services. These added value services can be for example disposal services or re-cycling of consumables. At Outotec´s case some of the product lines have equipment producing a lot of disposable waste for example consumable wear and spare parts, which could be reused. Designing services for reusing this waste would advance Outotec´s image as a “Cleantech” company. There are many challenges of getting environmentally friendly reuse services profitable, but as image building they would be beneficial. From the supply base point of view this would create a need for localized supplier who would be close to site to perform physical work.

6 CONCLUSIONS AND DISCUSSION

In the beginning of this master´s thesis the research questions were defined and through those questions the thesis structure was created. All together there was one main question and 4 supporting questions. The main goal for this thesis was to put pain points on the table and by exploiting existing literature discover possible solutions for the pain points. Literature of the supply chain management and the supply base management exists up to several decades back. For Outotec, the supply base management contributes highly to company profitability, due to high external manufacturing. Therefore the supply base management plays an important role when preparing company for even tougher competition in future.

The supply base management theories hold a large set of tools available for every organization. Some organizations have adopted parts that fit best for their business environment and others have followed more complete models presented by several authors. Every organization has had benefits out of methods adjusted to their organization. Outotec has adopted several good practises and many of those practises have already proved to work in real-life. These proposals presented at this thesis are natural continuum for things already done.

As all changes, even inevitable ones need a business driver to happen. Setting business drivers for proposals suggested at this thesis need top management target setting. Measures based on budgeting cannot be mixed with measures planned for work improvement or development. Setting these targets, require also a change of mindset and the concept from the traditional thoughts that measuring something will improve something. Measuring of things has nowadays evolved into evaluation of things, as a result *what gets evaluated gets improved*. This idea should be the main thread in developing strike out supplier base.

Especially important at Outotec is to realize that with correct resourcing at the supply function and improved communication throughout the organization things can improve and be more governable. Due to a high level of external

manufacturing, Outotec´s resources need to be focused on preparation and maintaining the supplier relationship. The improvements done at the supply side can actually make a difference to the company´s financial figures.

Product-Service systems offer models for product *servitization* and for service *productization*. These models can support companies in many industries to develop their product portfolio and operations to support transition from product manufacturer to service provider. Linking Product-Service Systems and the supply base management can help companies when designing new products and services. Basically designing or engineering is needed to create product structures in a way that product holds structure down to the component layer. Other option is to use the PSS view when creating new product service packages for already existing products. The product management would apply additional service, for example mounting or maintenance and physical product into one sellable package. Other than that the PSS cannot really offer anything new to the supply base management.

In this master´s thesis are presented several methods to improve the supply base management at Outotec. Many good development projects have started and many of those have finished during the last five years, and as a result several new developed processes and tools are presented into use. But there is always room for development. Hopefully these methods will start internal debate about the state of the supply base management. As a result of this debate, hopefully some of these presented methods are adopted to real-life and throughout these methods actual improvements can be achieved.

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Interviews in Outotec Oyj:

- 15.1.2015 Purchasing Manager
- 20.1.2015 Head of category management
- 23.1.2015 Head of Product management
- 26.1.2015 Head of Purchasing office
- 27.1.2015 Procurement Specialist

Email surveys conducted during weeks 4 and 5, 2015.

APPENDIX

How do you see Outotec current supplier base?

How do you think current supplier base is fitting in to needs of Outotec life-cycle business (excluding project deliveries), in terms of?

- Price
- Quality
- Immediate availability
- Lead time

What are the painpoints (if any) in cooperation between Outotec business units?

How would you describe current status of following supply base management areas?

- Sourcing decisions
- Supplier selection
- Supplier relationship management
- Supplier segmentation
- Supplier performance measuring & feedback