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Supplier Evaluation and Selection Process

Helsinki Metropolia University of Applied Sciences

Master of Business Administration

Master's Degree Programme in Entrepreneurship and Business Competence

Thesis

2016-03-02

Author Title	Hannele Lammi Supplier Evaluation and Selection Process
Number of Pages Date	45 pages + 4 appendices 02 March 2016
Degree	Master of Business Administration
Degree Programme	Master's Degree Programme in Entrepreneurship and Business Competence
Instructors	Siv Relander, Lecturer Esa Väänänen, Head of Degree Programme
<p>The subject of this thesis was the creation of a common supplier evaluation and selection process for Vaisala's sourcing department. The goal was to analyze the current situation and to develop a global Vaisala supplier selection and evaluation process by unifying currently used processes and removing overlapping templates and instructions.</p> <p>This thesis mainly utilizes qualitative methods such as action research. Other methods utilized were PDCA (Plan, Do, Check, Act) as the process development method and theme-centered interviews. Documents were analyzed and categorized, workshops organized, and the new process developed and piloted.</p> <p>Vaisala's new supplier evaluation and selection process was developed together with the organization. The process consisted of four steps: 1) prepare, 2) analyze and plan, 3) new supplier evaluation, and 4) scan and evaluate. The process was based on the Monczka et al. (2011, 241) supplier evaluation and selection process model together with three different existing process models from the organization. The Sourcing personnel were trained and the new process was piloted with three potential new suppliers.</p> <p>The analysis of the pilot cases indicated that the process could benefit from a wider set of sourcing requirements or criteria that would be followed throughout the whole process from the initiation of the new supplier selection process to the analysis and finally the selection of a supplier. In addition, a selection tool on how to analyze the data would be useful for the sourcing manager performing this task in a proper manner</p> <p>To ensure a proper implementation of the process at the organization, the researcher recommended a process refresher training to the sourcing personnel, new pilot cases, a new tool for the analysis of the supplier evaluation data, and follow-ups of the Key Performance Indicator metrics with agreed corrective actions. The researcher presented also a training handout of the new process. The supplier evaluation and selection process should have a wider entry and evaluation criteria for new suppliers in order for it to be able to support Vaisala's environmental and strategic goals better.</p>	
Keywords	Purchasing, Supply Chain Management, Evaluation, Supplier

Tekijä Otsikko	Hannele Lammi Toimittajan arviointi- ja valintaprosessi
Sivumäärä Aika	45 sivua + 4 liitettä 02.03.2016
Tutkinto	Tradenomi (ylempi AMK)
Koulutusohjelma	Yrittäjyys ja liiketoimintaosaaminen
Ohjaajat	Lehtori Siv Relander Hankintatoimen koulutusvastaava Esa Väänänen
<p>Opinnäytetyön aiheena oli yhtenäisen ja globaalien toimittajan arviointi- ja valintaprosessin luominen Vaisalan hankintaosastolle. Tavoitteena oli nykytilan kartoitus, analysointi ja toimittajan arviointi- ja valintaprosessin kehittäminen yhtenäistämällä nykyprosesseja ja poistamalla päällekkäisiä ohjeita ja dokumenttipohjia.</p> <p>Opinnäytetyössä käytettiin lähinnä laadullisia tutkimusmenetelmiä kuten toimintatutkimusta. Muita menetelmiä olivat PDCA (Plan, Do, Check, Act) eli suunnittelu, tekeminen, tarkistus ja korjaaminen prosessikehityksen menetelmänä ja teemakeskeisiä haastatteluja. Dokumentit analysoitiin ja kategorisoitiin, työpajoja järjestettiin ja uusi prosessi kehitettiin ja pilotoitiin uusilla toimittajilla.</p> <p>Vaisalan uusi toimittajan arviointi- ja valintaprosessi kehitettiin yhdessä organisaation kanssa. Prosessi sisälsi neljä vaihetta: 1) valmistelu, 2) analysointi ja suunnittelu, 3) uuden toimittajan arviointi ja 4) kartoitus ja valinta. Prosessi pohjautui Monczka ym. (2011, 241) toimittajan arviointi- ja valintaprosessiin sekä organisaation kolmeen olemassaolevaan prosessiin. Prosessi koulutettiin organisaatiolle ja se pilotoitiin kolmen potentiaalisen uuden toimittajan kanssa.</p> <p>Pilottien perusteella voitiin todeta, että prosessia hyödyntäisi nykyistä laajemmat hankintavaatimukset tai kriteerit, joita seurattaisiin koko prosessin läpi ihan alkutarpeen määrittelystä aina toimittajavalintaan asti. Myös valintatyökalu kuinka analysoidaan kerättyä tietoa auttaisi hankinnasta vastaavaa henkilöä suorittamaan valinnan systemaattisesti.</p> <p>Jotta prosessi otettaisiin vielä paremmin käyttöön organisaatiossa, tutkija suositteli prosessin uudelleenkoulutusta, uusia pilotteja, uutta työkalua tiedon analysointiin ja keräämiseen sekä mittareiden seuraamista ja niiden pohjalta toimenpiteitä prosessin parantamiseksi. Tutkija teki myös lyhyen sivun koulutusmateriaalin prosessista. Toimittajan arviointi- ja valintaprosessilla pitäisi olla laajempi arviointikriteeriat uusille toimittajille, jotta prosessi tukisi paremmin Vaisalan strategiaa ja kestävä kehityksen tavoitteita.</p>	
Avainsanat	Hankinta, Valinta, Arviointi, Toimitusketju, Prosessit, Kehittäminen

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1 Introduction

Many international companies have increased their level of outsourcing and begun to rely more on their supply chain network as a foundation of competitive advantage (Ting & Cho 2008, 116). Companies have downsized and they are more focused on their core competences while leveraging their suppliers' capabilities and technologies (Kannan & Tan 2002, 11). The role of purchasing and sourcing in a company is crucial and shifting towards a strategic direction. Professional sourcing of materials and services can be an enabler in a situation of aggressive competition and in a varying business environment. As companies are more dependent on suppliers, poor decision making can have serious consequences (Gonzales & Quesada & Monge 2004, 492). An inappropriate supplier selection can weaken a company's financial and operative stability (Herbon & Moalem & Shnaiderman & Templeman 2011, 434).

Pooler, Pooler and Farney (2004, 87) say that "the ability to select reliable suppliers is a mark of successful purchasing". Selecting the right suppliers is a key task in an organization because it has a direct effect on cost reduction, profitability, and the flexibility of a company (Ting & Cho 2008, 116-117). Vaisala's corporate level strategy themes are the creation of customer value, company reliability and simplification of processes. Company reliability can be achieved by ensuring the quality of products and services. The simplification of processes will create operational efficiency (Strategy 2014-2018). A part of this strategy implementation is to improve strategic sourcing processes to gain flexibility in demanding market situations and to achieve cost savings. One of Vaisala's strategic development projects is sourcing process development implementation and training (Operations Strategy 2013). The sourcing process development aims at an improvement of the supplier selection and evaluation process.

In recent years companies have shown more interest in sustainable practices that decrease their environmental impact on society (Ladd & Badurdeen 2010). The supplier selection strategies have shifted from pricing inquiries to fulfilling qualitative, quantitative and environmental criteria (Mushanyri 2012, 5). Vaisala aims to be a sustainable and environmentally responsible company the products of which help to measure climate change. Vaisala expects their suppliers to sign a code of conduct and to improve their

environmental system (Sustainability 2015). Sustainability can also be one criteria of selecting a new supplier to a company.

1.1 Company overview and organization

Vaisala is a high-technology company that provides observation and measurement products and services for controlled environment and weather related markets. The company was founded in 1936 by Professor Vilho Väisälä and it has customers in 150 countries. Vaisala's headquarters are located in Finland and the company employs 1600 people globally. (Facts Vaisala Group 2015.)

In 2014 Vaisala had 299.7 million euros in net sales out of which approximately 98% were international sales. Vaisala has sales offices in 17 countries and two manufacturing sites – one in Vantaa, Finland and another one in Louisville (Colorado), United States. A major contributing factor to Vaisala's success is strong research and development (R&D) activity. Vaisala invests around 11 % of its net sales to R&D where approximately 20% of its personnel work (Vaisala Corporation Financial Statement 2014, 9-12).

Vaisala's organization consists of two business units, Weather and Controlled Environment (CEN). There are also supporting units that serve these business units in a matrix model (Figure 1). The Weather business unit has three main customer segments that serve customers globally in Meteorology, Transportation, and Energy. The CEN unit has a local approach and it serves customers in three different business areas (North and South America; Europe, Middle East and Africa and Asia Pacific). (Vaisala Organization 2015.)



Figure 1. Vaisala’s organization chart (Vaisala Organization 2015).

Vaisala Operations is responsible for the supply chain management and it sources, manufactures and delivers products, systems and services to customers. The Vaisala Operations organization chart is represented in Figure 2. It consists of manufacturing factories and their supportive functions. The Weather Factory and the Boulder Operations manufacture weather systems. They also do system integration. The Instrument Factory manufactures instruments and the Sensor Factory manufactures sensors in their own clean room for Vaisala products.

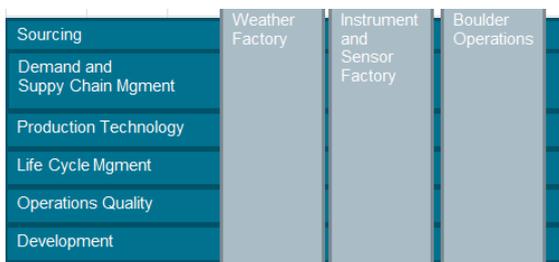


Figure 2. Vaisala Operations’ organization chart (Operations organization chart 2015).

The support functions serve factories in a matrix model. The Sourcing selects, manages, and develops suppliers. The Demand and Supply Chain Management (DSC) is responsible for material forecasting and sales order planning for manufacturing teams as well as material procurement and material handling - (warehousing; inbound and outbound shipments; and material feed from warehouse to factories). The Production Technology is responsible for the development of production test equipment for new and current products at Vaisala’s own factories, service depots, and suppliers’ sites. The Life Cycle

Management introduces new products from R&D to production and ensures the implementation of changes to existing products. The Operations Quality function performs incoming and outgoing quality inspections and is responsible for quality development in the factories and with the suppliers.

1.2 Vaisala Sourcing

The Sourcing department is divided to the following categories: Electronics Manufacturing Services (EMS); Mechanics; Electronics and Electromechanics; Program and Project; Trade and Compliance Logistics (TCL), and Supply Chain Development (Figure 3). The Sourcing personnel are located in Finland, USA, and China.



Figure 3. Sourcing organization chart (Operations organization chart 2015).

Sourcing is responsible for supplier selections and managing supplier relationships, capabilities, and development. The Supplier managers of the different categories are responsible for certain sub-category suppliers (e.g. machining suppliers) and they monitor and develop suppliers according to Vaisalas' needs and requirements. The Program and Project sourcing functions as sourcing representative in product development projects, engineering tasks, and major project deliveries. The TCL team is responsible for selecting and booking logistics suppliers. The Supply Chain Development analyzes Vaisala's current and new supply chains and suggests improvements and development strategies to achieve more efficient delivery chains.

Sourcing was reorganized in July 2011 to a category management model and the personnel were divided in different categories and teams. Local management was removed and the sourcing personnel began to report globally to category managers instead. In 2013 the Finnish procurement personnel (buyers) were rearranged and placed in the Demand and Supply Chain (DSC) management team.

Vaisala has been investing heavily in the Sourcing department and during the years 2013 and 2014 several new employees were recruited. Sourcing at Vaisala has started to become more strategic with the assigning of supplier reduction targets globally in 2014 and

with the creation of preferred supplier and manufacturer lists to be used for steering supplier selections.

1.3 Current state analysis

Vaisala does not have one common global sourcing and supply management process. There are several separate sourcing processes and templates in Finland and in the United States but not one unified process that would cover all the separate sub-processes. This is due to Vaisala Sourcing consisting of local sourcing teams that are merged to one global organization. The current separate processes do not have clear linkages to Vaisala's core processes. There are different ways of working within teams and between different geographical locations. Some of the templates are not up to date or do not include information on global aspects or requirements.

Suppliers are divided into categories. The same supplier can deliver materials to different categories and all suppliers should be treated equally. At Vaisala the stakeholders generally see sourcing as one function but individual work is done differently depending on the employee performing the task. However, major critical decisions should be made following the same guidelines. There are no key performance indicators (KPIs) that can be used to measure the success of each process.

Currently there are 37 different recognized process descriptions, manuals, or templates that refer to sourcing processes (Appendix 1). Without common processes between the different sourcing categories there is no linkage between the ways of working and the description of how these recognized process descriptions, manuals, or templates should be used. A new employee's orientation would be easier to achieve if there were clearly defined processes and guidelines.

Vaisala needs to fulfill certain regulatory requirements due to customer requirements. Vaisala also has ISO9001, ISO14001 and AQAP2110 certificates which means that common supplier evaluation and selection processes are required. There are no defined criteria that new suppliers need to fulfill.

Table 1. Current state of supplier selection and evaluation process at Vaisala.

Measurement	Current state
One global supplier evaluation and selection process	N/A
ISO9001 capability in supplier evaluation and selection process	Needs to evaluated
Number of templates to support common ways of working	37
New supplier evaluation criteria	N/A
Key performance indicators to measure supplier selection and evaluation process implementation	N/A

The current state of the supplier selection and evaluation process at Vaisala is summarized in Table 1. There are no defined common sourcing processes. Vaisala needs to fulfill the ISO9001 requirements in the supplier evaluation and selection process. Also there are no defined new supplier evaluation criteria. As there are no common processes there are also no KPIs that measure the processes.

1.4 Research topic

Vaisala's sourcing process development needs to begin with the development of a common supplier evaluation and selection process for Vaisala's sourcing department. The goal is to analyze the current situation and to develop a global Vaisala supplier selection and evaluation process by unifying the currently used processes and removing overlapping templates and instructions. The new process will be stored to Vaisala's process portal (QPR) and linked with Vaisala's main processes and templates. The new process needs to be global and new common ways of working need to be developed and trained to personnel.

1.5 Research questions and measurement

The researcher identified the following research questions to be answered in order to develop a global supplier selection and evaluation process at Vaisala.

1. What supplier selection and evaluation process theory and analysis method would fulfill Vaisala's requirements and needs?
2. How were suppliers selected and evaluated at Vaisala prior to this study?
3. How should Vaisala's current supplier selection and evaluation process be developed and modified?

4. What support material (templates and work instructions) were needed to implement the new supplier selection and evaluation process at Vaisala?
5. How could it be verified that the new modified supplier selection and evaluation process would fulfill Vaisala's requirements and needs and be taken into use?

Answering the first research question requires analyzing, describing, defining, and comparing different existing supplier selection and evaluation process theories and methods of analysis. The goal is to find a suitable process theory and evaluation model that would suit Vaisala's requirements and needs and that could be used as a basis for process development.

The second research question aims to evaluate the existing supplier selection and evaluation processes at Vaisala. Information will be gathered using qualitative methods, such as conducting theme-centered interviews and analyzing currently existing written process material.

The third research question deals with the comparison of existing supplier selection and evaluation processes with the selected supplier selection and evaluation theory. Workshops will be arranged for personnel to gather thoughts regarding the new process and to modify it to be better suited for Vaisala's needs and requirements.

With the fourth research question the focus is shifted to defining different written guidelines and templates of the supplier selection and evaluation process. The currently used templates will be analyzed. The new template requirements will be identified in workshops. The existing templates will be modified according to the needs of the sourcing department and new templates will be created if needed. The documents and templates will then be linked with the new supplier selection and evaluation process and stored to the Vaisala Product Data Management (PDM) system Aton.

Answering the final research question will be done in two steps. In the first step the focus will be on the new process that will be used in selected new supplier selection pilot cases in product development projects. Comments will be collected from the employees involved in those projects and the process will then be modified based on the findings. In the second step the modified process will be trained for personnel and feedback will be collected. After performing these steps it will be possible to define how to change the

existing ways of working, train personnel how to use with the new process, and ensure that the new process will be followed systematically.

Table 2. Selected research measurements and targets for process development.

Measurement	Current state	Target
One global supplier evaluation and selection process	N/A	One process stored in QPR
ISO9001 capability in supplier evaluation and selection process	Needs to evaluated	Pass the audit without remarks
Number of templates to support common ways of working	37	Max 10
New supplier evaluation criteria	N/A	Set of criteria
Key performance indicators to measure supplier selection and evaluation process implementation	N/A	Defined KPIs to measure new process

Five research measurements will be used in this thesis (Table 2). The first one is that Vaisala should have one global supplier selection and evaluation process, which will be stored in the internal process portal (QPR). The second measurement is that Vaisala should pass the ISO9001 audit without remarks on the supplier evaluation and selection process. The third measurement is a decrease in the number of different processes and templates currently used versus future state with the new process. The fourth measurement is a set of criteria for new supplier evaluation. The fifth measurement is to identify suitable KPIs for the new supplier evaluation and selection process.

1.6 Restrictions

There is a set of evaluation and selection related processes or tools that are not included in this thesis. This includes aspects such as risk assessment, supplier categorization, supplier audit procedures, and quality assessments. Also other supplier management processes are excluded (e.g. contracting process and sourcing relationship management process).

Process and change management related theories and practices are also excluded from this thesis. Vaisala uses PDCA (Plan, Do, Check, Act) as a global model for change management and process development, hence it is applied in this thesis as well.

1.7 Research methodologies and researcher's role in the organization

This thesis utilizes mainly qualitative methods and the theory is largely based on action research. The researcher is the main contributor in this study through participation in identifying and designing the processes together with the organization. The researcher was the team leader of one of the sourcing teams (Program and Project Sourcing). The team's role was to evaluate and select suppliers (both new and existing) of new materials in R&D product development projects and engineering tasks.

Existing written process material (templates and descriptions) were requested from Sourcing personnel by email and in monthly meetings between November 2012 and May 2013. All process and guidance materials related to sourcing processes were collected by the researcher from Vaisala's Vintra site (Internal web pages), Aton (Product Data Management –system), and internal network drive. The researcher identified supplier selection and evaluation related materials from the data and categorized the materials according to the chosen supplier selection and evaluation process theory steps. The materials were then analyzed and compared with the existing literature. The templates were modified by the researcher according to the findings from the literature, the conducted interviews, and the group brain-storming sessions.

Silent knowledge and information on existing ways of working were collected with a questionnaire. The purpose was to identify the supplier selection and evaluation process steps and to compare them with the theoretical context. The researcher prepared a questionnaire for the interviews to ensure that the interviewees were treated equally. Interviewees were category managers, Head of Sourcing, and one senior sourcing manager in the USA. The interview with the senior sourcing manager in the USA was conducted via a conference call. The theme-centered interview method was used in this thesis because clear subjects and areas could be identified as problematic and in need of review and discussion in the beginning of this study. However, the groups were not homogenous enough to be able to conduct structured interviews. Using an unstructured interview method would have been unsuitable for collecting information on precise subjects and areas.

The validity and the content of the different steps and processes of supplier selection and evaluation were reviewed after they were identified. The method used was team idea mapping in group brain-storming sessions. The team idea mapping method was

chosen because it includes both individual and group brain-storming sessions, thus ensuring that all individuals have the possibility to express their ideas in the sessions.

To ensure that all the supplier selection and evaluation process steps are well-grounded and applicable, the new process was used in selected three new suppliers (two in Finland and one in the USA) to pilot the new process. The process was reviewed and changes were made when necessary.

2 Supplier evaluation and selection theories

Supplier selection process is the foundation of strategic sourcing and the basis of supply advantage. The overall goal of the evaluation process is to reduce the purchasing risk and to maximize the overall value to the purchaser (Monczka & Handfield & Giunipero & Pattersson 2011, 240). Usually a formal evaluation and qualification process is used when selecting a supplier for a complex or high-cost one-time contract as well as when establishing a long-term partnership (Sollish & Semanik 2011, 101). A supplier selection process can begin when there is a need for a new supplier (Özfiat & Tasoglu & Memis 2014, 292). The purpose of supplier assessment is to assure that a potential supplier can meet the technical, financial, and commercial requirements (Lysons & Farrington 2012, 367).

Supplier evaluation of current suppliers is the process that is used to assess supplier performance on a set of criteria over a period of time (Salam 2011, 106). Over decades researchers and practitioners have paid supplier selection a great deal of attention. In literature supplier evaluation and selection theories can be divided into three different categories: process related theories, supplier evaluation criteria models, and supplier selection methodologies and techniques.

2.1 Supplier selection and evaluation process theories

The supplier evaluation and selection process according to Monczka et al. (2011, 241) (Figure 4) consists of seven steps: recognizing the need for supplier selection, identifying key sourcing requirements, determining a sourcing strategy, identifying potential supply sources, limiting suppliers in a selection pool, determining a method of supplier evaluation and selection, and finally selecting a supplier and reaching an agreement. Monczka et al. (2011, 250) recommend that before spending time evaluating a supplier

further it should be confirmed that the considered suppliers fulfill certain entry requirements, such as financial strength, appropriate business strategy, strong supportive management, proven manufacturing capability and design capability.

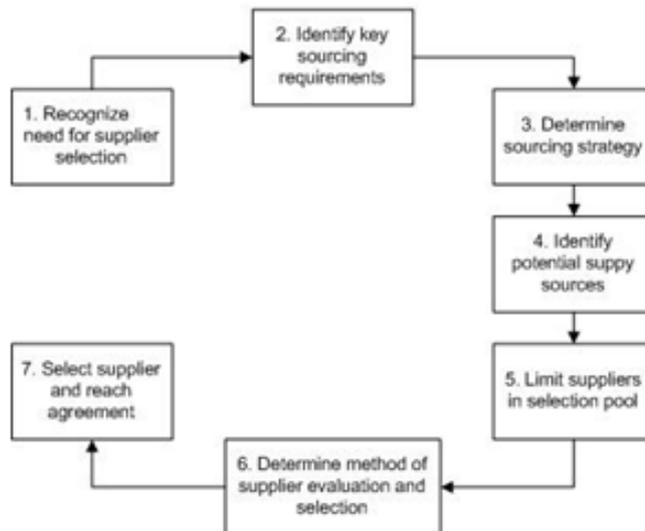


Figure 4. Supplier evaluation and selection process (Monczka et al. 2011, 241).

The supplier evaluation and selection process according to Monczka et al. (2011) is simple and easy to scale according to the needs and requirements of each instance of supplier selection. It is an upper level process but it nevertheless brings together all necessary elements of the supplier evaluation and selection steps. Vaisala already has some of the suggested elements in place, e.g. preferred supplier lists, preliminary surveys of suppliers, and financial checks. This process also includes elements that could be useful if introduced to Vaisala's current process. These are such as defining general Vaisala level sourcing requirements and entry qualifiers for new suppliers.

The strategic supply management process according to Mentzer, Myers and Stank (2007, 256) consists of five steps (Figure 5). This process model begins with the analysis of opportunities and the gathering of data after which a strategy is developed. Then the suppliers will be screened and selected, with whom agreements will be negotiated and finalized. The final step is implementation and management.



Figure 5. Strategic supply management process (Mentzer et al. 2007, 256).

This five-step strategic supply management process model is used for example at Tesco and American Express (Mentzer et al. 2007, 255). The purchased items should be classified according to Kraljic classification of purchased items (Figure 6) in order to be able to follow this process model. Together with the data from the organization and the products that are developed to commodity strategies, this classification forms the basis of the Mentzer process model (Mentzer et al. 2007, 256). Based on this Krajlic classification system, suppliers are evaluated, information on the suppliers is collected, and then a few potential suppliers are selected for a negotiation process. Finally an agreement is signed and the supplier is monitored following established metrics.

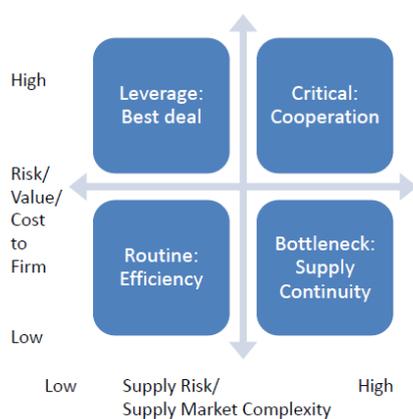


Figure 6. Kraljic's classification of purchased items adapted from Mentzer et al 2007, 258.

The classification of purchased items is a major task and considering the quantity of purchased items at Vaisala, a whole thesis could be written on the matter. The supplier selection and evaluation related steps of the Mentzer model (2007, 256) are mainly the steps of screening suppliers and the selection of one as well as negotiating and finalising an agreement. These steps are quite similar with the steps in the Monczka et al. (2011) model, but they are described on a more general level and do not have any detailed descriptions of how the suppliers should in fact be evaluated. Thus, thinking of the subject and the goal of this thesis, this process model is not suitable for this study.

Weele (2010, 29) divides his purchasing process model (Figure 7) into six steps: define specification, select supplier, contract agreement, order, expedite, and evaluate. This purchasing process (Weele 2010, 29) is a very high level process and aimed rather at operational purchasing than strategic sourcing. These supplier selection steps describe more traditional evaluation criteria, such as pricing and delivery terms, but sustainability and environmental criteria are neglected. In conclusion, this process model is not a suitable strategic sourcing supplier selection process model for Vaisala.

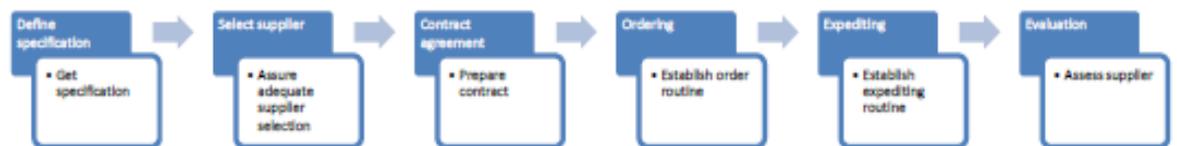


Figure 7. Purchasing process (Weele 2010, 29).

Fogg (2009, 172) introduces a ten step supplier appraisal process (Figure 8). This process begins with planning ten questions that need to be answered. In this process (Fogg 2009, 172), the steps of supplying market research and targeting, determining the evaluation areas and the importance of each area, and identifying sub areas follow each other. Then the questionnaire is sent to potential suppliers, supplier on-site visits are arranged, and finally a decision on a supplier is made (Fogg 2009, 172-176).

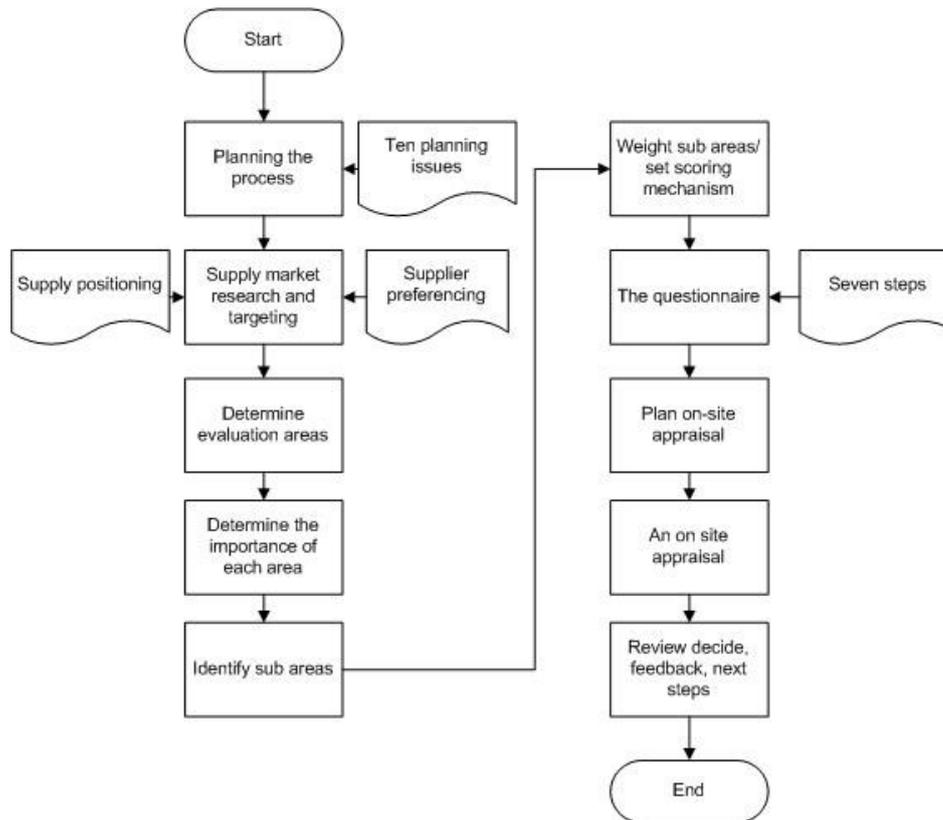


Figure 8. Supplier appraisal process (Fogg 2009, 172).

Fogg's supplier appraisal process model (2009, 172) is a more operative than a strategic sourcing related supplier selection model. It describes an upper level process but it does not contain detailed descriptions of how each step should be performed. The evaluation areas are listed but not described and all vital evaluation criteria for Vaisala (e.g. sub-contracting, environmental aspects, and R&D related competence) are missing from the model. The on-site appraisal aspect consists of two steps but an on-site visit is not always performed in cases when the risk level and spend are low. Nevertheless, there is one key question addressed in the planning step: "Will the benefit of the process be greater than the cost?" In other words, heavy supplier appraisal process should be performed only with regard to strategic and key requirements and suppliers. Hence this supplier appraisal process does not meet Vaisala's requirements.

The supplier search and evaluation process according to Iloranta and Pajunen-Muhonen (2011, 235) consists of five steps (Figure 9): market analysis, ensuring supplier's interest, request for proposal, request for quotation, and negotiation. This process model might be a too high level process for Vaisala because there are no criteria models utilized but

merely questions asked on each step. There are interesting focal points, such as ensuring mutual interest, which other models do not include. Due to Vaisala's high mix, low volume product base the supplier's interest to deliver products for Vaisala needs to be explored. Additionally requesting a proposal is a good idea at least when quoting services, as a detailed specification of the required service might not exist. The process is not described in detail making its implementation in an organization difficult. Due to this reason this process model is rejected in this thesis.



Figure 9. Supplier search and evaluation process (Iloranta & Pajunen-Muhonen 2011, 235).

Johnson, Leenders and Flynn (2011, 317-332) describe in their supplier selection process model the steps of identifying, evaluating, and ranking potential sources. There are three potential supply options for a new need in an organization. The first option is to make in-house. The second option is to use a current supplier. The third option is to find a potential new supplier. The potential supplier is analysed on three levels: strategic, traditional, and current additional which are visualized in Figure 10. The strategic evaluation includes analysis of potential sources against the organization's sourcing strategies and risk assessment using pareto analysis and portfolio analysis models. (Johnson et al. 2011, 317-332).

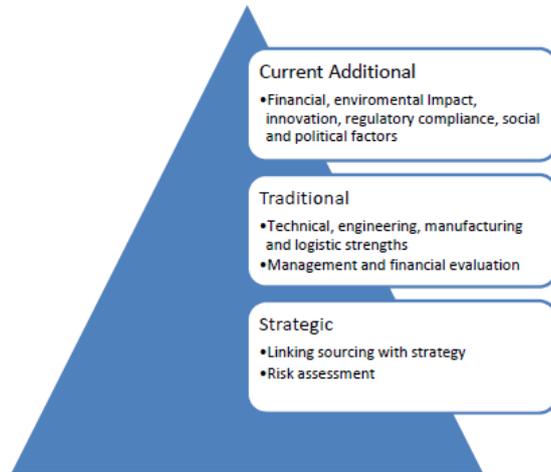


Figure 10. Three levels of supplier assessment (Johnson et al. 2011, 328).

The first step of the supplier selection process according to Johnson et al. (2011) is a make or buy -analysis. The make or buy process is already defined at Vaisala and needs only to be linked to the supplier selection process. The use of a current supplier is an easy choice but not always the best. This process model fails to note that preferred suppliers should be considered. Otherwise the purchaser may end up using suppliers whose delivery or quality performance is poor or who are in a risky financial situation. Like the Mentzer (2007) strategic supply management process, also this supplier selection model relies on risk analysis and the Kraljic model. This type of categorization of products and risk analysis is already excluded from this thesis, as the amount of attention it would require exceeds the limits of this study. Otherwise this process is similar to the Monczka et al. (2011) process model.

Trent (2007, 165) also introduces a seven step process model. The steps are: recognize a supplier selection need, identify supply requirements, determine a supply strategy, identify potential suppliers, reduce the number of suppliers in the selection pool, conduct a formal evaluation, and select a supplier and reach agreement. The Trent (2007, 165) process is identical with the Monczka et al. (2011) process model. Only the steps are named differently.



Figure 11. The supplier selection “funnel” process (O’Brien 2012, 215)

O’Brien (2012, 214-223) describes the supplier selection process as a funnel (Figure 11) with six steps (pre-qualification, 1st evaluation, 2nd evaluation, 3rd evaluation, negotiation, and contracting). This process model is quite straightforward from the initiation phase through the evaluation steps before finally negotiating and reaching an agreement. The process model according to Monczka et al. (2011) consists of clearer steps towards creating a business case and gathering sourcing requirements in different business environments and complex situations. Due to this reason the O’Brien funnel model (2012, 215) is rejected from this study.

2.2 Supplier evaluation criteria models

Supplier selection decision criteria can vary depending on the number of qualitative and quantitative elements (Özfiat et al 2014, 292). The process itself is described as a multi-attribute decision-making (MADM) problem (Thakur & Anbanandam 2015, 770). One of the first researchers of supplier selection decision criteria was Dickson (1966, 28-41), who recognized 23 different criteria like price, quality, delivery, capacity, and performance. Carter (1995, 44-45) introduced the so called seven Cs of supplier evaluation (competency, capacity, commitment, control, cash, cost, and consistency) which is recognized as one of the main theories of supplier selection. Later on Carter updated his model with three new Cs: culture, clean, and communications. The model was renamed as the 10Cs of supplier evaluation (SM 2005). The SOCCER supplier evaluation model (Rogers 2009, 96-98) consists of the elements strategy, operational capability, customer approach, cost structure, economic performance, and research and development (Figure 12). According to Monczka et al. (2011, 254-261) the evaluation criteria are cost or price; quality and delivery; management capability; employee capabilities; cost structure; total quality performance, systems and philosophy; process and technology capability; sustainability and environmental compliance; financial stability; production scheduling and

control systems; e-commerce capability; supplier's sourcing strategies, policies and techniques; and long-term relationship potential. Lysons and Farrington (2012, 367) state that potential suppliers should be evaluated from ten perspectives which are finance, insurance, productive capacity and facilities or service support capability, quality, health and safety, environmental management, existing contracts held and performance, organisational structure and key personnel (resources), sub-contracting and procurement capability, and supply chain management. According to a literature review by Thakur and Anbanandam (2015, 772), the most used criteria are quality, cost or price, delivery and reliability (87,11%), then responsiveness or services (67,74%), and location or facilities (35,48%).



Figure 12. SOCCER supplier analysis model (Rogers 2009, 97).

There are two different types of supplier evaluations: process-based evaluations and performance-based evaluations. A process-based evaluation is an assessment of the supplier's actual production or service process which is typically done by auditing the supplier's site. A performance-based evaluation is an assessment of the supplier's actual performance based on a variety of criteria such as delivery reliability and cost. The performance-based evaluation is more common because objective data are readily available and easier to measure than the supplier's production or service process. (Benton 2010, 163).

The detailed evaluation criteria SOCCER model (Rogers 2009, 97) is easy to remember and it also covers the research and development factors that other criteria models neglect. It is also easy to scale up or down the SOCCER model depending on what kind of a supplier needs to be evaluated. The aspect of environmental management is missing from the SOCCER model, which is a vital criterion when evaluating suppliers for Vaisala. For example, the ISO9001 certificate requires checking the environmental systems the suppliers have and monitoring their sustainability practices. The SOCCER model also does not include health and safety criteria or criteria on the supplier's personnel capabilities. However, at least in low cost countries, it is important to check health and safety

issues. Personnel capabilities give a picture of what the co-operation will be like in the future. For example, manufacturing a component board prototype for Vaisala requires good overall knowledge of electronic components and how to purchase them rapidly.

Monczka et al. (2011) introduce the key evaluation criteria of supplier selection but leave it up to the reader to decide which areas are more important. There is no actual model but rather a listing of different types of criteria. In the listing sustainability and environmental compliance criteria, which the SOCCER evaluation model (Rogers 2009, 97) lacks, are introduced. There are concrete tips on and guidance of how a supplier's financial stability should be analysed. Then again the Monczka et al. model (2011) lacks research and development aspects, which are important when considering Vaisala's needs.

Lysons and Farrington's evaluation criteria (2012, 367) covers the key areas of what to evaluate when selecting a supplier. For example, sub-contracting is an essential criterion that is missing from the other models. However, it is suggested in the SOCCER model (Rogers 2009, 97) that the supplier's core competences are analysed. This leads to an evaluation of what the supplier manufactures themselves and what they purchase from an outsourced partner. Purchasing capability is mentioned as an independent aspect which is many times forgotten when evaluating a supplier. Purchasing materials and components to be used in Vaisala's products requires competent technical understanding. The analysis of cost and cost structure is missing from Lysons and Farrington's (2012, 367) criteria. Total cost is a traditional but nevertheless an essential part of the supplier selection process. Lysons and Farrington's evaluation criteria model (2012, 367) is not as good as the SOCCER model (Rogers 2009, 97). Overall, the SOCCER model is the more suitable option to be used in this thesis.

2.3 Supplier selection techniques and methods

The supplier selection methods can be divided into four categories (Table 3): mathematics methods, single methods, artificial intelligence methods, and integrated methods (Shahgholian & Shahraki & Vaezi & Hajhosseini 2012, 6257).

Table 3. Supplier Selection techniques (Shahgholian et al. 2012, 57)

Mathematics methods	Single Methods	Artificial Intelligence Methods	Integrated Methods
Analytical Hierarchy Process (AHP)	Cluster Analysis	Neural Network (NN)	AHP, DEA
Linear Programming (LP)	Conjoint Analysis	Case-Based Programming (CBR)	AHP, GP
Multi-Objective Programming (MOP)		Expert System (ES)	AHP, MOP
Goal Programming (GP)		Fuzzy Set Theory (FST)	DEA, MOP
Data Envelopment Analysis (DEA)		Analytic Network Process (ANP)	DEA, SMART
		Genetic Algorithm (GA)	Fuzzy, AHP
		Simple Multi-Attribute Rating Template (SMART)	Fuzzy, GA
			Fuzzy, QFD (Quality Function Deployment)
			Fuzzy, SMART
			NN, AHP, DEA

Ordoobadi and Wang (2011, 631-633) differentiate between Categorical method, Linear weighted average method, Cost-ratio method, Vendor profile analysis, Vendor rating with AHP, Dimensional analysis, Data envelopment analysis, Cluster analysis, Artificial intelligence-based models, Mathematical programming models, Taguchi loss function method, and Hybrid methods.

Özfirat et al. (2014, 293) divide methods into five categories: multiple attribute decision making methods, mathematical programming approaches, statistical/probabilistic approaches, intelligence approaches, and hybrid approaches.

Most of the methods are quite heavy and require separate systems and systematic data gathering to be implemented at an organization. The method for Vaisala should be quite simple to use and possible to integrate in existing templates.

2.4 Process theory and criteria model for Vaisala

The supplier selection and evaluation process theories described earlier are all similar with each other. Fogg's model (2009, 172) is a more detailed process whereas the other models describe more upper level processes. Because Vaisala currently does not have

a global supplier evaluation and selection process, more upper level processes with detailed instructions and templates within each process step are needed. The goal of this thesis is to create a common supplier evaluation and selection process for Vaisala that can be used for evaluating and selecting both direct and indirect suppliers. Direct suppliers deliver materials to Vaisala production and indirect suppliers are delivering services or materials to Vaisala that are not directly assembled to Vaisala products, for example software, travel, or furniture suppliers.

The Fogg's model (2009, 172) includes an on-site visit. On-site visits are not always performed, for example when selecting a commercial off-the-shelf supplier. The process according to Mentzer et al. (2007, 256) includes more negotiation and finalizing agreement steps than the process according to Monczka et al. (2011, 241). The Monczka et al. (2011, 241) process model suits Vaisala's purposes better because it is of a more general character and leaves room for different types of supplier selection cases. Additionally the more detailed agreement negotiation and contractual processes, which are present in the Mentzer et al. (2007) model, were excluded from this thesis, hence making the Monczka et al. (2011, 241) process model a better choice also from that point of view.

The reviewed supplier evaluation criteria models all include similar factors, such as cost, capability, and financial or economical factors that are the foundation of supplier selection. As the supplier selection cases at Vaisala can vary from selecting a software supplier to a machined part supplier, the implemented criteria model should also be broad enough to cover all possible cases. Out of the reviewed criteria models, the SOCCER model (Rogers 2009, 97) is the most extensive one but it is missing health and safety as well as environmental and sustainability factors. These factors are especially important when purchasing from low cost countries and supporting Vaisala strategy as an environmental friendly company. Vaisala also wants to ensure that new suppliers are committed to defined environment and sustainability practices. Interest and strategic fit between the supplier and Vaisala is crucial because Vaisala deals with high mix, low volume products and the supplier's willingness to help and co-operate in this environment is crucial. Quality as such is one selection criterion and one of the strategic themes of the Vaisala strategy.



Figure 13. Modified SOCCER (Rogers 2009, 97) evaluation criteria model.

The SOCCER model (Rogers 2009, 97) was modified to fit the purposes of this thesis in such a manner that it includes all the aforementioned aspects (Figure 13). As a result there are eight different criteria areas: strategic direction and fit; operational capability and quality; customer approach and interest; cost structure; economic performance and insurance; R&D and sub-contracting; health and safety; and environment and sustainability.

Table 4. Selected theories for process development.

Measurement	Current state	Target	Theory
One global supplier evaluation and selection process	N/A	One process stored in QPR	Monczka et al (2011) process model
New supplier evaluation criteria	N/A	Defined set of criteria	Modified SOCCER (Rogers 2009) model

Two theories are selected (Table 4) for process development and as the theoretical context. The Monczka et al (2011) process model will be used to support the supplier selection and evaluation process and the modified SOCCER model (Rogers 2009) will be used to create evaluation criteria for selecting suppliers at Vaisala.

3 Research methods

This thesis utilizes mainly qualitative research methods, such as action research. The goal of the action research is to solve a specific problem within an organization by engaging the people within the organization in the problem solving process (Whyte 1989, 513). Action research can be represented as a cycle with four steps: 1) constructing, 2) planning action, 3) taking action, and 4) evaluating action (Coghlan & Brannick 2014, 11). The cycles of action and reflection are an essential part of this method (Ladkin 2004, 541). A cyclic process model was followed throughout the study. The steps of constructing, planning action, and taking action are represented in this section. Evaluating action will be discussed in sections 4 and 5.

Plan, Do, Check and Act (PDCA) was used as the process and change management method. It is the main process development tool on the corporate level at Vaisala. PDCA is a four-step continuous improvement method for processes (also known as Deming cycle) (Wikipedia PDCA 2015). The first step is to plan the objectives that are required in order to be able to reach the target. The second step is to implement the plan. The third step is to study the results that follow from performing the second step. The fourth and final step is to make adjustments to the plan depending on whether it was an improvement or not.

3.1 Constructing the basis of process development

Process development in the organization started in January 2013 with weekly discussions about the purpose and the target of supplier selection and evaluation process with the Head of Sourcing. It was decided that process development will be performed together with the Sourcing personnel with a global approach. Simultaneously there should be some process development in the organization and research conducted on the theoretical context. The development project was presented with a tentative schedule at the Sourcing department's monthly meeting in February 2013. The core team of the development project was the researcher and the Head of Sourcing. All other Sourcing personnel were involved in different development actions but they were not a part of the process development as a whole.

3.2 Planning action in the organization

The development project in the organization was divided into the following steps (Figure 14): collecting information, process and template creation, and process implementation and planning the next steps. Collecting information included gathering all existing documentation and categorizing and analysing the documentation against a theoretical background. Also an interview form was created and the interviews conducted before finally analysing the data. The process and template consisted of first sketching a draft of the process proposal with process templates based on the results of the analysis. Then process review meetings and workshops were arranged to help with the developing of the draft of the new process to a final version. The final step of implementation and planning the next steps included process training, process piloting, identifying the areas of improvement, and planning the next steps of the process development.

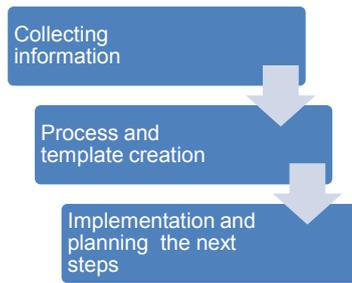


Figure 14. The development process project steps at Vaisala

3.3 Taking action in the organization

Collecting information started with gathering the existing written process materials (templates and descriptions) that were requested from the Sourcing personnel by email and in monthly meetings in January and February 2013. All process and guidance material related to Sourcing processes were collected by the researcher from Vaisala's Sourcing Vintra site (company's intranet site), Aton (PDM –system) and sourcing internal network drive. Each document was read, categorized and assembled by title by the researcher (Appendix 1).

There were 37 documents or process descriptions identified in total (Appendix 1) that were related to sourcing or procurement. The data were categorized on a higher level according to the activity the documents guide: supplier evaluation, supplier selection, procurement, supplier quality, supplier relationship management, sourcing management, and supplier contracting process. The categories were selected based on the current existing processes (supplier quality, procurement, supplier relationship management, and new process [supplier evaluation and selection]). An additional category was developed for sourcing management related documents.

In the data there were nine documents or processes related to supplier evaluation and selection. Out of these only six were used globally. Three sourcing process descriptions (one indirect sourcing process, two direct sourcing processes) were identified.

Silent knowledge and information on existing ways of working was collected with theme-centered interviews. The themes were identified from the various sourcing steps and the theoretical context discussed in section 2.4. Due to the travelling policy, the interview with the senior sourcing manager in the USA was conducted via a conference call. The

theme-centered interview method was chosen to be used in this thesis because specific subjects and areas that were in need of revision could be identified in the beginning of the work. However, the interviewees were not homogenous enough for structured interviews. Non-structured interviews are too board for that method to be used for collecting information on precise subjects and areas.

In total four people (Head of Sourcing, Sourcing Manager and two Category Managers) were interviewed using a questionnaire (Appendix 2) between August and December 2013. It was found out, that there are three different supplier evaluation and selection processes at Vaisala which were not fully implemented to whole organization.

The process creation started with making the first draft of the process proposal together with the Head of Sourcing. The starting point of the process development was the three existing processes: Indirect Sourcing, Direct Sourcing in Finland, and Direct Sourcing in the USA. The indirect Sourcing process (Figure 15) consists of five steps: prepare; analyse and plan; evaluate; negotiate and contract; and implement and manage. (Halkilahti, 2010.)

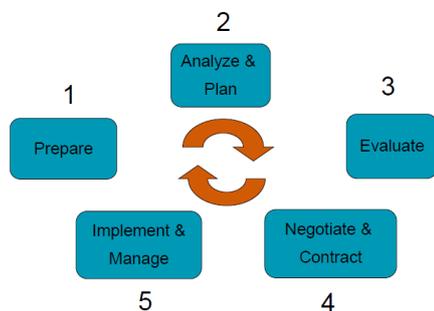


Figure 15. Indirect sourcing process (Halkilahti, 2010).

The direct sourcing process in Finland (called the Supplier Approval process, Figure 16) consists of four phases (1-4). The starting point of all the four phases is the technology and the strategic fit. The first phase includes a supplier pre-study, a NDA, and a supplier analysis. The second phase consists of a supplier visit, an initial price inquiry, and the main agreement. In the third phase costs are analysed, the supplier is assessed, and the price list is finalized. Finally in the fourth phase the documentation and materials are saved, the information is shared with the supplier and internally, and the supplier is monitored. (Sorrola, 2010.)

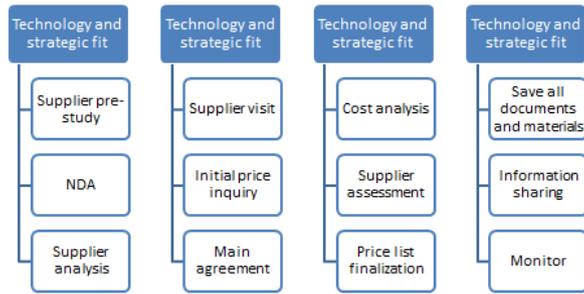


Figure 16. Supplier Approval Process (Sorrola, 2010)

The Direct Sourcing Process in the USA (called Supplier Lifecycle Management, visualized in Figure 17) consists of a set of tools and templates that cover the areas of the new supplier general overview, financial background check, sourcing managing, supplier assessment, business review and award, purchase order and contract, supplier information monitoring in scorecard, and periodic supplier audits (Martin, 2012).

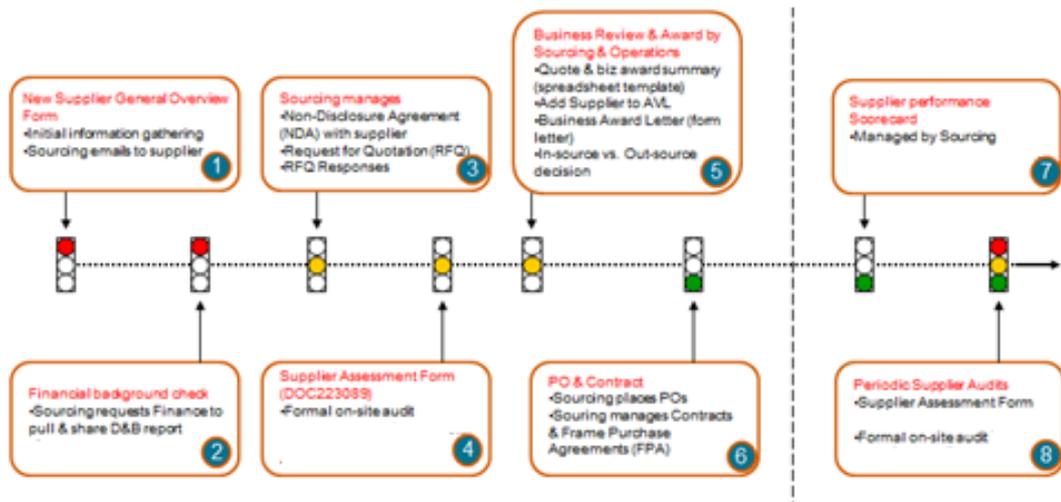


Figure 17. Supplier Lifecycle Management (Martin, 2012)

All three processes were analyzed and compared with the Monczka et al. (2011, 241) process model (Table 5). The Indirect Sourcing process and Supplier Approval process are quite similar to each other. They both include contracting and sourcing relationship management process related aspects which were excluded from the new developed process because they were overlapping with the current contracting and supplier relationship management processes. The Supplier Lifecycle Management process lacks analysis and preparation phases but includes good templates, such as a new supplier evaluation form and a business review and award template, that are missing from the Indirect

Sourcing and the Supplier Approval processes. Additionally it was possible to identify all the steps of the process model according to Monczka et al. (2011, 241) both in the Indirect Sourcing process and the Supplier Approval process. Some similarities could also be found between the process model and the Supplier Lifecycle Management. These similarities are visualized in Table 5 below.

Table 5. Comparison of existing processes and theory

Monczka et al. (2011, 241) process model	Indirect sourcing process	Supplier Approval Process	Supplier Lifecycle Management
Recognizing the need for supplier selection	Prepare	1st phase	
Identifying key sourcing requirements	Analyze	1st phase	
Determining sourcing strategy	Plan	1st phase	
Identifying potential supply sources	Plan	1st phase	New supplier overview form, NDA, Financial background check
Determining method of supplier evaluation and selection	Evaluate, implement and manage	3rd phase	Business review and award summary, supplier performance scorecard
Finally selecting a supplier and reaching an agreement	Negotiate and contract	2nd and 3rd phase	Contract

The first draft of the new process was uploaded to Vaisala's process portal (QPR) in August 2014. The process was reviewed in weekly process meetings with the Head of Sourcing and modified according to the received feedback. Then the researcher asked for comments from the category managers. Simultaneously six different workshops (five at Vaisala Vantaa and one via conference call with the US personnel) were arranged for the sourcing department and the stakeholders (quality, sustainability, and environmental managers) during the time between September and December 2014. During these sessions the researcher presented a draft of the new process and asked for comments from the participants. The new process was improved according to the feedback the first accepted version of the process received in December 2014.

The main idea in the template development was to create a minimum requirement of templates and to use or modify as much of the existing templates as possible in collaboration with the sourcing personnel. Eight templates (Table 6) were selected to be processed in discussions with the management, workshops with the sourcing personnel, and sourcing management meetings.

Table 6. Selected templates for supplier selection and evaluation process

Template name	Main purpose	Guide	Use
Vaisala Quote and Business Award Summary	To compare suppliers quotes	Supplier selection	Globally
New supplier overview form	To collect basic general and financial information from a new supplier	Supplier selection	In the USA
Approved Supplier List (ASL)	To inform Vaisala's currently approved and used suppliers	Supplier selection	Globally
Agreement templates (Purchasing Agreement, NDA, Software Agreement)	To be used when negotiating contracts with a supplier	Supplier contracting process, new supplier evaluation	Globally
Light financial check	To evaluate supplier's financial status	Supplier selection	In Finland
RFQ template	To request quotation from supplier	Supplier selection	In Finland
Supplier sustainability questionnaire	To evaluate supplier's sustainability awareness and implementation	Supplier selection	Globally
Supplier code of conduct	To commit a supplier to Vaisala sustainability and environment actions	Supplier selection	Globally

Vaisala Quote and Business Award summary, Agreement templates, Supplier Sustainability Questionnaire and Supplier Code of Conduct were already in use globally and so it was possible to adapt them in to the process as they were. Light Financial Check was in use only in Finland in order to be able to quickly check the financial status of a supplier, so it was adapted in to the process as an alternative tool for D&B or Asiakastieto reports. The supplier overview form was used only in the USA and it was modified to be suitable to a more global use by including VAT (value-added tax) numbers and other relevant information during a global workshop in September 2013 at Vaisala Vantaa. A preferred supplier list -development project headed by the sourcing category managers replaced the previous approved supplier list and it was launched in August 2014 to Vaisala personnel. During the development it was noted that there is no common Request for Quotation (RFQ) template with the result that a new RFQ template was developed by an assigned sourcing manager and launched for pilot usage in November 2014.

Vaisala Sourcing was using supplier ranking and scorecard tools and processes for existing suppliers but there was no willingness to take any criteria tool or scorecard into use for the new supplier selection. There were only two main new supplier entry criteria identified: signing of supplier code of conduct and the result of sustainability questionnaire survey (acceptable result over 30 points). Other than these, all the main tools or templates mentioned in the selected process theory were in use: Financial check (D&B/Asiakastieto report or Light Financial check), RFI (New Supplier overview form), RFQ form, and NDA templates.

Process implementation started with process training at the end of January 2015. Training was arranged using a Vaisala process café method which is a commonly used method at Vaisala for process trainings. Participants were divided into teams and they walked through the developed process step by step. At each station there was a trainer presenting the process step at hand and answering questions. The trainers were the Head of Sourcing and the category team leaders from Sourcing. The researcher got one development idea from the participants of the process training. The idea was that Vaisala sourcing should develop one place for storing supplier related documentation. Accordingly, new documentation storage was developed and created. Only sourcing, procurement, supplier quality, and operations management personnel have access to it.

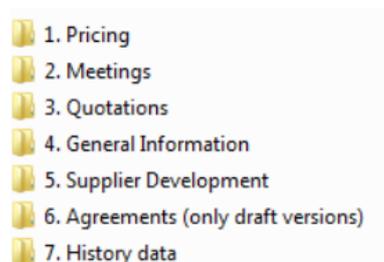


Figure 18. Template folder for supplier's documentation storage

A template folder (Figure 18) and instructions on how to use it were created in two workshops (one at Vaisala Vantaa and another via conference call to the USA) and it was launched in February 2015. The Sourcing managers were instructed globally to move all relevant data into one place by the end of July 2015. It was also decided to store all the new supplier evaluation and selection data in a folder for potential supplier data in the new documentation storage.

The process reliability was reviewed by piloting the process in new R&D product projects (three new suppliers) and by analysing data from EBS (Oracle E-Business Suite, i.e. ERP system used at Vaisala). Pilot cases were selected from new R&D product development projects: two new suppliers in Finland (supplier 1 and supplier 2) and one in the USA (supplier 3). The sourcing managers were instructed to follow the new process guidelines and write down any findings on whether the process was applicable in the single pilot cases together with ideas for improvement.

During the pilot projects it was noticed that the template documentation links were not working because the location of the documents in the Vintra site was changing. This was corrected during July 2015 when all the document templates were stored in Vaisala PDM system Aton and linked only to the new process. During the process development there were three documentation storages specified: legal repository site for storing agreements, such as the signed NDA and code of conduct, EBS (sustainability score, signing date of code of conduct), and new document storage. These correct storage places were missing from process descriptions in QPR and were corrected during November 2015. The research also showed that the code of conduct and the sustainability score were suitable metrics for the new supplier evaluation process as the data were the only entry criteria for new suppliers at Vaisala.

The researcher audited the new process by checking the supplier's documentation from the pilot cases in the document storages (Table 7). The templates that had been in use prior to this study (NDA and New Supplier General Overview form) were used correctly and usually stored in the correct location. The newer templates or process steps (the sustainability questionnaire and the code of conduct) were generally not stored in correct locations.

Table 7. Audit result of pilot suppliers' documentation

Template name	Document Storage	Supplier 2	Supplier 3	Supplier 1
Vaisala Quote and Business Award Summary	Shared drive	None	None	None
New Supplier General Overview form	Shared drive	Yes	Yes	Yes
Agreement templates (NDA)	Contract Repository	Yes	Yes but wrong location	Yes

Light Financial Check	Shared drive	No	No	Yes
Supplier Sustainability Questionnaire	Shared drive and EBS (under supplier)	Yes in shared drive, not in EBS	No	Yes in shared drive, supplier not opened in EBS
Supplier Code of Conduct	Contract repository site and EBS (under supplier)	No	No	No

Three sourcing managers were interviewed in October 2015 using a questionnaire (Appendix 3). The data collected from the interviews were put together (Appendix 4) and compared with the new process steps.

4 Results

The first research question that deals with which supplier selection and evaluation process theory and method of analysis would fulfill Vaisala's requirements and needs was covered in section 2.1.1. The process theory according to Monczka et al. (2011, 241) was selected because it functions on a more generic level and is similar to Vaisala's current existing processes. The step of reaching an agreement was left out from the theory because Vaisala has a separate contracting process for negotiating agreements with suppliers. Instead of working with a method of analysis, such as the modified SOCCER model (Figure 13), it was decided on two mandatory selection criteria: signing Vaisala's code of conduct and answering a sustainability questionnaire (the sustainability score should be higher than 30 points). Only these two criteria were implemented in the new process.

The current supplier selection and evaluation processes at Vaisala were mapped in theme-centered interviews. The result of the interviews supported the analysis of the current state. There were three different supplier evaluation and selection processes discovered (one in the USA and two in Finland [one for direct and one for indirect sourcing]).

In exploring how Vaisala's current supplier selection and evaluation process could be developed and modified two steps were conducted. First, the new process was developed together with the management. Once a draft of the new process was accepted, the

process was developed further in six different workshops with sourcing personnel and other relevant persons (from sustainability and quality).

Vaisala's new supplier evaluation and selection process (Figure 19) consists of four steps: 1) prepare, 2) analyze and plan, 3) new supplier evaluation, and 4) scan and evaluate. The distinction between actions with new suppliers and the existing supplier base is essential. The Head of Sourcing emphasized in the development phase a need for a simple and an easy to remember approach. The process is described as a cycle, which supports Vaisala's continuous improvement model and the PDCA cycle.

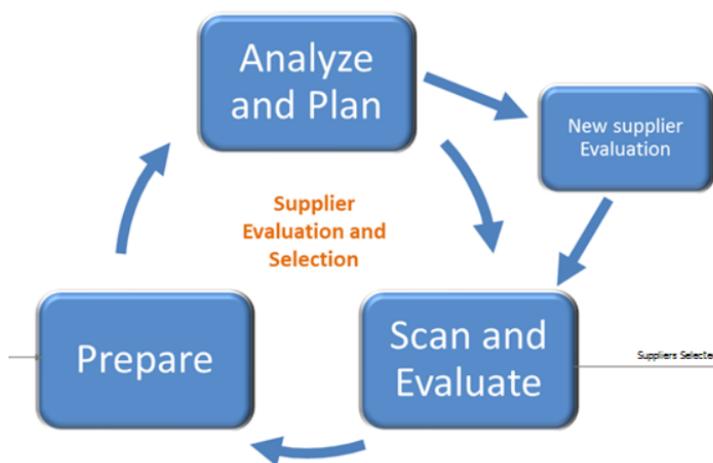


Figure 19. Supplier Evaluation and Selection Process

In the preparation phase (Figure 20) there are two steps: first, the type of purchase needs to be analyzed and second, the key sourcing requirements need to be identified. Essentially the three steps of the Monczka et al. (2011, 241) process model (recognizing the need for supplier selection, identifying key sourcing requirements and determining a sourcing strategy) are what these two steps consists of. In the analysis phase the basic data concerning the need are collected: Is it indirect or direct, Software, Hardware, or Service, COTS (commercial of the shelf) or Vaisala design, or a new technology need? What is the business case and time schedule and what are the yearly volumes? There can be a variety of key sourcing requirements, for example quality, environmental and sustainability factors, and single versus multiple source. Input and feedback on these aspects is gathered from the organization (i.e. from R&D and other stake holders). When the key sourcing requirements are identified, the process is continued with the analyze and plan -phase.

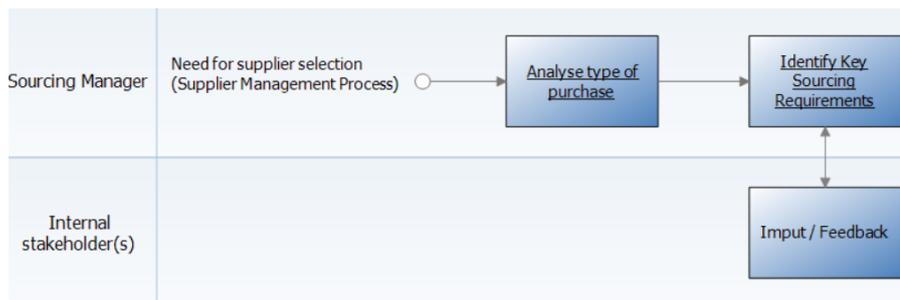


Figure 20. Phase 1: Prepare

The second phase of the supplier evaluation and selection process is to analyze and plan (Figure 21). In this phase the current supplier base and the preferred supplier list are analyzed in order to find a suitable supplier. If no suitable supplier exists in the current supplier base, the process will have to be continued with the phase of evaluating a new supplier. However, if a current suitable supplier exists, the process is continued directly at the proposal and quotation creation phase. This phase essentially includes the same actions as the 4th and 5th steps (identifying potential supply sources and limiting suppliers in a selection pool) in the Monczka et al. (2011, 241) process model but it is kept more simple and straight forward. Using Vaisala's current and preferred supplier list supports the targets of supplier reduction as well as it is a strategy of consolidating spends to preferred suppliers.

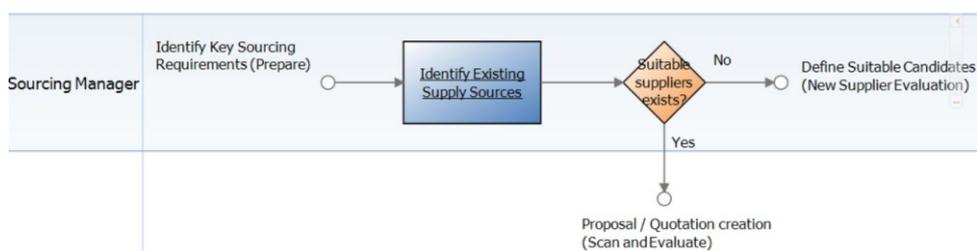


Figure 21. Phase 2: Analyse and Plan

The new supplier evaluation process consists of eight different steps (Figure 22) and it shares similarities with the 5th step (limiting suppliers in a selection pool) of the Monczka et al. (2011, 241) process model. The starting point is defining suitable candidates. Potential suppliers will be searched from websites and catalogues and recommendations will be asked from the sourcing categories, the component management, and the R&D. The most potential suppliers will be called and then inquired if they are interested in

supplying for Vaisala. The process is then proceeded in the form of discussions held with the Sourcing Category Manager. This is to ensure that no bad or non-performance supplier will enter Vaisala's portfolio. Then the NDA is signed with the most potential suppliers. This ensures that no secret or confidential information will be shared with third parties without Vaisala's permission.

At this point the supplier is requested to fill in the New Supplier General Overview form. The main purpose of this step is to get basic data with certificates for evaluation from the supplier. After this a financial check is conducted by either using an excel template or requesting a financial analysis from D&B or Asiakastiето. Finally, potential suppliers are asked to fill in the sustainability questionnaire and sign the Vaisala code of conduct. These two final steps are mandatory requirements that the supplier needs to fulfill. The ISO9001 and sustainability requirements of monitoring and following how sustainable Vaisala's supplier base and supply chain is fulfilled with the sustainability questionnaire. Additionally, the supplier is committed to high ethical standards with the Vaisala code of conduct that also encourages a culture of sustainability. The data were stored in three different locations: the signed NDA and the Code of Conduct are in Vaisala's internal intranet legal repository site for contracts, the New Supplier Evaluation form and related documents under a shared network library, and if the supplier is opened to the EBS the sustainability score and the date of signing the code of conduct will be updated there as well. If a supplier audit is needed, the process continues with the supplier audit process step. If not, it continues with the scan and evaluate process step.

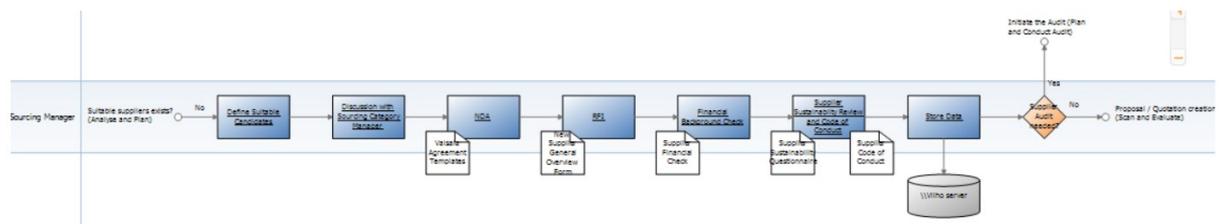


Figure 22. Phase 3: New supplier evaluation

The scan and evaluate process (Figure 23) consists of three different steps: 1) a proposal or quotation is created, 2) the quotation process is managed, and 3) the most potential suppliers are analyzed and selected. The first two steps can be performed simultaneously with the new supplier evaluation process, because the price could be one determining factor in selecting a new supplier. In this process phase are combined 5th, 6th, and 7th steps (limiting suppliers in a selection pool, determining a method of supplier evaluation and selection, and finally selecting a supplier and reaching an agreement) of the

Monczka et al. (2011, 241) process model. The creation of a proposal or quotation includes collecting relevant product documentation from Aton and Request for Quotation (RFQ) preparation. The data package for product documentation can be requested from product experts if needed. The process then continues with quotation process management.

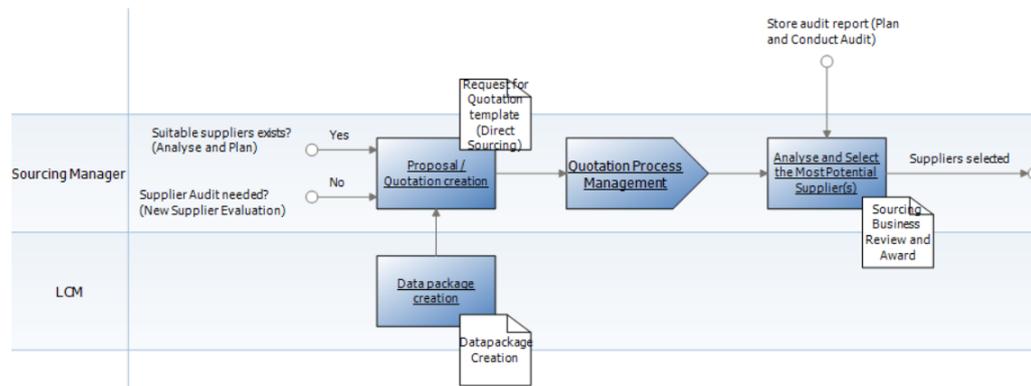


Figure 23. Phase 4: Scan and evaluate

The phase of quotation process management (Figure 24) is a sub-process with four different steps. It starts with sending a Request for Quotation (RFQ) or Request for Proposal (RFP) to suppliers. In the next step the suppliers are engaged in the process as Vaisala goes through the RFQ with them. Vaisala tries to get their interest, collect improvement ideas, and make sure that supplier has understood all the requirements. The next step is to receive the quotation or proposal from the supplier and finally enter negotiations. These two steps can be repeated several times depending on the case.

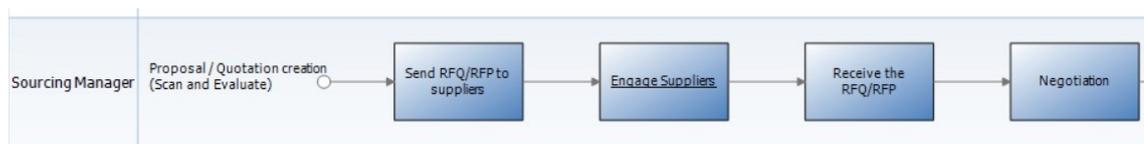


Figure 24. Quotation process management

The final phase in the process is the analyze and select –phase. In this phase all the data from the most potential suppliers are compiled together and compared with the key sourcing requirements before a supplier is selected. If the supplier has been audited, the results of the audit are available at this stage as one selection criterion. If no suitable supplier is found, the process is restarted.

What supporting materials (templates and work instructions) are needed to implement supplier evaluation and selection process at Vaisala was discovered during the process development. Eight templates (Table 8) were selected to be included in the new process in discussions with the management, in the workshops for the sourcing personnel, and in the sourcing management meetings. Documentation storages for these templates were then created or defined.

Table 8. Selected templates and documentation storage

Template name	Main purpose	Process step	Document storage
Vaisala Quote and Business Award Summary	To compare suppliers quotes	Scan and evaluate	Shared drive
New Supplier Overview form	To collect basic general and financial information from a new supplier	New supplier evaluation	Shared drive
Approved Supplier List (ASL) → changed to Preferred Supplier list	To inform Vaisala's currently approved and used suppliers → to inform what suppliers Vaisala prefers for new designs	Analyze and plan	If supplier does not exist in preferred supplier list, category manager's approval needed.
Agreement templates (NDA)	To be used in negotiations with supplier	New supplier evaluation	Contract repository site
Light financial check	To evaluate supplier's financial status	New supplier evaluation	Shared drive
RFQ template	To request a quotation from supplier	Scan and evaluate	Was not decided.
Supplier sustainability questionnaire	To evaluate supplier's sustainability awareness and implementation	New supplier evaluation	Shared drive and sustainability score to EBS under supplier
Supplier code of conduct	To commit a supplier to Vaisala sustainability and environment actions	New supplier evaluation	Shared drive and sustainability score to EBS under supplier

In this thesis the answer to the final research question on how to verify that the new modified supplier evaluation and selection process would fulfill Vaisala's requirements and needs and would be taken into use consists of two parts: training and pilot cases.

A process and template training was held in January 2015 during the Global Sourcing Days at Vaisala Vantaa. It was a half day workshop held in the process café style for all sourcing personnel globally.

Three pilot cases were selected in 2015 from R&D product development projects: two new suppliers in Finland (supplier 1 and 2) and one in the USA (supplier 3). Interview data were collected to Appendix 4 and analyzed using the new process steps: Prepare, Analyze and Plan, New Supplier Evaluation and Scan and Evaluate).

In two of the pilot cases the need for a supplier selection came from a new technology need which Vaisala's current suppliers could not fulfill. In the third pilot case there was pressure for cost reduction and a need for a more responsive and flexible supplier. Only two sourcing requirements were identified as key requirements in the pilot cases: price and flexibility. The selection of a new technology supplier required considering similar strategic sourcing aspects. These aspects were strategic decisions on requirements for location, technology or design support, co-operation and responsiveness. In one of the pilot cases the project team wrote a list of requirements "a dream supplier" should be able to fulfill. The list was followed throughout the process.

In the phase of analyzing and planning the main purpose was to use the preferred supplier list. However, it was utilized in only one of the pilot cases. In the new technology supplier pilots this was not done because there were no suppliers on the Vaisala's current preferred supplier list that could support new technology needs.

In two of the pilot cases the suppliers were narrowed down with onsite visits. In the third pilot case the suppliers were narrowed down according to preselected criteria. The documentation requirements (like the code of conduct, the NDA, the sustainability questionnaire) were met in two pilots (supplier 1 and 2). In the third pilot (supplier 3) the NDA was signed but this was done later than required in the process description (after prototype deliveries). In the same pilot also the code of conduct and the sustainability questionnaire were missing.

In two of the pilot cases the supplier was selected together with the project team and the use of defined selection criteria. The selection of a supplier was finalized in only one of the three pilot cases (supplier 3). The other two pilot cases (supplier 1 and 2) were still ongoing at the time of the analysis for this thesis. The evaluation of data from the pilot

projects is deficient as the supplier selection and sourcing requirements are lacking a wider criteria model, there thus being insufficient information for the analysis.

Table 9. Thesis measurements and results

Measurement	Current state	Target	Theory	Result
One global supplier evaluation and selection process	N/A	One process stored in QPR	Monczka et al (2011, 241) model	One process in QPR (launched Jan 2015)
ISO9001 capability in supplier evaluation and selection process	Needs be to evaluated	Pass without remarks		Passed in December 2014
Number of templates to support common ways of working	37	Max 10		8
New supplier evaluation criteria	N/A	Set of criteria	Modified SOC-CER (Rogers 2009) model	Partly implemented (code of conduct, sustainability score)
Key performance indicators to measure supplier selection and evaluation process implementation	N/A	Defined KPIs to measure new process		Partly implemented

There were five research measurements in this thesis project (Table 9). One global supplier evaluation and selection process was launched in January 2015 and then modelled to QPR. Vaisala passed the ISO9001 audit in December 2014 where supplier evaluation and selection process was audited. The number of templates supporting common ways of working decreased from 37 to 8 templates. Only two new criteria were launched: signing the Vaisala code of conduct and receiving over 30 points from the sustainability questionnaire. Due to an EBS system version change there were problems to gather system data. The key performance indicators were established in October 2015 when there was a chance to run data from the EBS reports. During that time the first two measurements were selected: the signing date of the Vaisala code of conduct and the sustainability score.

After the process training between January 2015 and October 2015 there has been 796 new suppliers in total opened in the EBS according to Vaisala internal Business Infrastructure Sourcing report. The code of conduct field was filled for three suppliers and the sustainability score for one supplier. Only one new supplier had both data filled in.

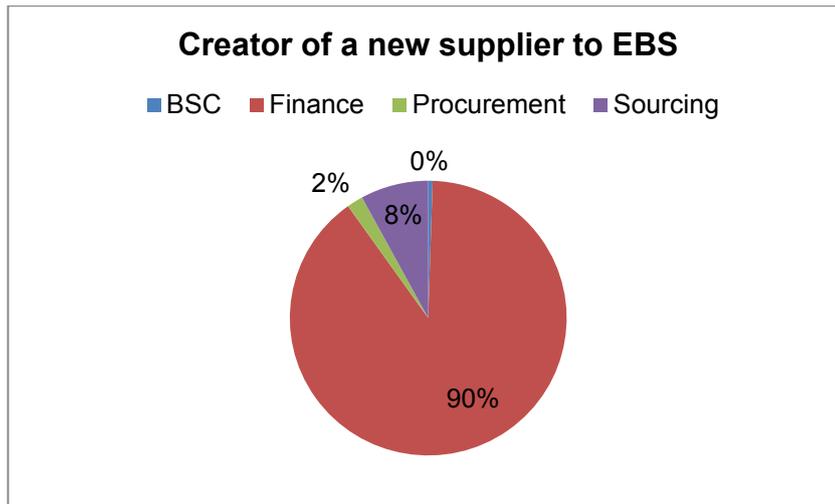


Figure 25. Creator of a new supplier to EBS

Most of the new suppliers were opened in the EBS (Figure 25) by Finance personnel (711 suppliers, 90%), the second largest group was Sourcing (63 suppliers, 8%), the third largest the procurement (buyers) (15 suppliers, 2%) and the smallest group was the BSC (Business Solution Center) (4 pcs, <1%). The sourcing personnel have opened both indirect and direct suppliers to the EBS. The people who opened these suppliers were either in Finland or in the USA.

5 Conclusions and recommendations

The aim of this thesis was to develop a new supplier evaluation and selection process and its supporting templates for Vaisala. Part of the goal was to train the personnel and implement the new process at the Sourcing department.

The existing supplier selection and evaluation processes at Vaisala contained all the elements from the Monczka et al. (2011, 241) supplier selection process model. The model was used to support the process development. It was a matter of combining the existing processes together and developing the emerging system further. A criteria model was declined by the management as it would have been too heavy to implement as this stage. However, it will be implemented later. As a result the criteria model was implemented only partially to the process. The implemented criteria were the signing date of the Vaisala code of conduct and the sustainability score, which were then selected as process KPIs.

Vaisala has a variety of supplier needs from indirect service supplier to hardware supplier to actual product made at a factory, so it was necessary for the new process to be flexible enough to support different cases of supplier selection. The utilization of this new process requires more careful preparation from the sourcing manager and a full access to the business case and facts from the organization. The analysis of the pilot cases indicates, that the process could benefit from a wider set of sourcing requirements or criteria that would be followed throughout the whole process from initiation to analysis and finally the selection of a supplier. Also a selection tool on how to analyze the data would be useful for the sourcing manager in doing the utmost crucial work in the proper manner.

The signing date of the Vaisala code of conduct and the sustainability score were not filled correctly in the EBS for new suppliers. According to the pilot projects, the employees were aware of the templates and how to fill them but they did not know the storage places for the documents or when they should be processed in the selection process. Overall the new process and its steps as well as the templates were found to be useful.

It was discovered during the manual analysis of the first report from EBS that 90% of the new supplier openings to EBS were made by Finance. Buyers were opening new suppliers, too. Should supplier evaluation and selection process be also used in these cases? It is not known where the need for these purchases comes from. The finance and procurement departments were not given any training on the new process.

Changing the ways of working is a team effort which requires commitment from the management, co-operation, communication, leadership, and efficient KPIs to measure its success. Due to the EBS system version change the new KPIs to measure the success of the new process were delayed. This deficiency is visible in the results and the schedule. The premises for this process development were not ideal, but the end result is nevertheless quite satisfactory. There is a new global process established at Vaisala that seems feasible but it is not fully implemented at the organization yet. With follow-ups and with specific changes to the process also the ways of working and culture can be changed accordingly.

To ensure a proper implementation of the process at the organization, the researcher recommended a process refresher training for sourcing personnel, new pilot cases, and follow-ups of the KPI metrics with agreed corrective actions as well as presented a training handout of the new process and a new tool for the analysis of the supplier evaluation

data. It should be studied why Finance and Procurement are also opening new suppliers in the EBS system and where the need for a new supplier comes from. The supplier evaluation and selection process should have a wider entry and evaluation criteria for new suppliers in order to be able to support Vaisala's environmental and strategic goals better.

Further studies could include aspects such as development of an electronic tool for supplier selection, which would allow the supplier to fill in their data directly to Vaisala's supplier portal, which would then be used as the basis of analysis. In general more automated ways to evaluate supplier's financial situation (e.g. periodic financial reporting and warning flags) could be developed.

Changing human behavior requires systematic change management, patience, repetition, and time. The road was not easy but the journey was enjoyable together with great colleagues.

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Categorization of Internal Documentation

Questionnaire (current state analysis)

Basic Information

Name

Role

Location

Business unit

Date of interview

Method (phone/face to face)

How long has the interviewee been working for the sourcing department at Vaisala?

1. Does Sourcing/Vaisala have a supplier evaluation and selection process?
2. If yes, please describe the steps?
3. Additional information on supplier selection and evaluation.

Pilot Suppliers' Questionnaire

Basic Information

Name

Role

Location

Business unit

Date of interview

Method (phone/face to face)

How long the interviewee been working for the sourcing department at Vaisala?

Recognizing the need for supplier selection

1. Where did the need for supplier selection emerge in this pilot case?

- a) During a new product project or a delivery project
- b) From a reduction of a supply base
- c) From a low performance of a current supplier
- d) From a new technology need that our current suppliers cannot fulfill
- e) Other, please explain

How were the key sourcing requirements identified?

2. What were the main key sourcing requirements when selecting a supplier?

- a) Price and total cost
- b) Delivery time and performance
- c) Quality
- d) Other, please explain

Strategy decisions

3. What were the main decision steps that were defined before selecting the main candidates for supplier selection?

- a) Single versus multiple sources
- b) Location (local or global)
- c) One time supplier versus long term relationship
- d) Design support versus no support
- e) Manufacturing technology

d) Other, please explain

Identifying potential candidates

4. How were the potential candidates found? By...

- a) Checking from the current supplier base
- b) Using the preferred supplier list
- c) Asking from colleagues
- d) Researching on the Internet
- e) Other, please explain

5. How were the potential candidates narrowed down?

(Open question, the answers were categorized)

6. What documentation was gathered from supplier during evaluation phase and where documentation was stored?

(Open question, which will be categorized)

7. When was the NDA signed with the supplier?

(Open question, the answers were categorized)

8. Did you sign the code of conduct with the supplier?

(Open question, the answers were categorized)

9. How did you evaluate the financial status of the new supplier?

- a) By asking the supplier for information
- b) By using an external service (D&B, Asiakastieto)
- c) Other, please explain

10. When was a RFQ sent to potential suppliers?

(Open question, the answers were categorized)

11. How were the suppliers analyzed?

- a) RFQs
- b) Audits
- c) Other, please explain

12. How was the supplier selected?

- a) Based on the RFQ
- b) Together with category
- c) Together with project team
- d) Other please explain

13. How were the suppliers informed of the business award?

- a) Per phone
- b) Via email
- c) Per business award letter
- d) Other, please explain

14. How do you see the new supplier evaluation and selection process? What is missing from it or what should be improved?

15. Additional information on the supplier selection and evaluation.

Categorization of Pilot Supplier's Questionnaire Results