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CUSTOMER-ORIENTED COLLABORATION IN REQUIREMENTS ENGINEERING

– An approach for business and IT units to successfully agree on customer needs.

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CUSTOMER-ORIENTED COLLABORATION IN REQUIREMENTS ENGINEERING

- An approach for business and IT units to successfully agree on customer needs.

This thesis development project has been carried out for a Finnish company called Lindorff Oy. Lindorff Oy is a part of Lindorff Group Ab the European leader in credit management services. The assignment given by the company was to ensure better cooperation between business and IT units in requirements engineering. The project was limited to change request process related to two invoicing systems. The approach taken was to develop customer-oriented collaboration between identified stakeholders. A core question was how to form a successful partnership between these stakeholders.

The development study executed during the thesis development project is a combination of qualitative and quantitative research. To find out how to build partnership for software requirements engineering, a leadership model was applied together with requirements engineering body of knowledge and a traditional software engineering V-model. A mind mapping technique was utilized in various phases of the study, for instance, when analyzing the selected theories. Workshops were held to find out how the IT department collaborated in requirements engineering with business at a given time.

A collaboration process was formed during this development project. The collaboration process is based on a model of dynamic work community leadership by Urpo Jalava and Risto Matilainen (2010). In addition, it was concluded that an excellent customer experience may be achieved through customer-oriented collaboration in a community where people's performance is excellent. Customer-oriented collaboration in requirements engineering increases profitability, ensuring a competitive advantage that is generated by innovations.

An initial, directive measurement was done during this development study. IT supplier performance and stakeholder experiences were measured utilizing a questionnaire. Two rounds of the inquiry were conducted. The results of the inquiry recommend that Lindorff Finland focus on two findings, which are kept confidential.

KEYWORDS:

Customer-oriented, collaboration, leadership, community, productivity, process, requirements engineering

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ASIAKASKESKEINEN YHTEISTYÖ VAATIMUSTEN TUOTTAMISESSA

- Lähestymistapa, jota soveltamalla liiketoiminta ja IT voivat onnistuneesti sopia asiakkaan tarpeesta.

Tämä kehittämishanke on tehty Lindorff Oy:lle, joka on osa Lindorff-konsernia. Konserni on johtava luotonhallinnan ja maksamisen palveluyritys Euroopassa. Kehittämishankkeen alkuperäiseksi tavoitteeksi on asetettu paremman yhteistyön varmistaminen liiketoiminnan ja IT:n välillä vaatimusten tuottamisessa. Hanke on rajattu koskemaan kahden laskutusjärjestelmän muutospyyntöjä. Lähestymistavaksi on valittu asiakaslähtöisen yhteistyön kehittäminen ja sen keskeiseksi kysymykseksi, miten voidaan muodostaa menestyksekäs kumppanuus tunnistettujen sidosryhmien kesken.

Kehittämistutkimus on laadullisen ja määrällisen tutkimuksen yhdistelmä ja osa tätä kehittämishanketta. Tutkimuksen tarkoituksena on selvittää, miten ohjelmistojen vaatimusten tuottamisessa voidaan tietoisesti rakentaa kumppanuutta sidosryhmien välillä. Apuna käytetään johtamismallia, vaatimusmäärittelyn tietosisältömallia ja perinteistä ohjelmistotekniikan V-mallia. Miellekarttatekniikkaa on hyödynnetty työn eri vaiheissa esimerkiksi analysoitaessa valittuja teorioita. Työpajojen avulla on selvitetty, miten liiketoiminta toimii IT:n kanssa yhteistyössä vaatimusmäärittelyn eri vaiheissa.

Kehityshankkeen yhtenä tuloksena voidaan pitää projektin aikana luotua yhteistyöprosessia. Yhteistyöprosessi perustuu Urpo Jalavan ja Risto Matilaisen (2010) dynaamisen työyhteisön johtajuuden malliin. Työn toisena tuloksena voidaan pitää päätelmää, että erinomainen asiakaskokemus voidaan saavuttaa asiakaslähtöisen yhteistyön avulla yhteisössä, jossa ihmisten suorituskyky on erinomainen. Asiakaslähtöinen yhteistyö vaatimusten tuottamisessa lisää kannattavuutta tuottamalla kilpailuetua, joka syntyy innovaatioiden avulla.

Kehitystutkimuksen aikana toteutettiin alkukartoitusmittaukset, joiden avulla selvitettiin IT-toimittajien suorituskykyä ja sidosryhmien kokemuksia toimittajista. Mittaus tehtiin kyselylomakkeen avulla kahdesti. Kyselyn tulosten perusteella Lindorff Suomen olisi hyvä keskittyä kahteen päähavaintoon, jotka jäävät luottamuksellisiksi.

ASIASANAT:

Asiakaslähtöinen, yhteistyö, johtajuus, yhteisöllisyys, tuottavuus, prosessi, vaatimusten tuottaminen

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LIST OF ABBREVIATIONS OR SYMBOLS

CES	*Customer Effort Score*
CR	*Change Request*
CXi	*Customer Experience Index*
EPSI	*External Performance Satisfaction Index*
IT	*Information Technology*
ITIL	*Information Technology Infrastructure Library*
KPI	*Key Performance Indicator*
MS	*Microsoft*
NPS	*Net Promoter Score®*
PG	*Planning Game*
REBOK	*Requirements Engineering Body of Knowledge*
TUAS	*Turku University of Applied Sciences*
TRW	*Thompson Ramo Wooldridge*
UAT	*User Acceptance Testing*
UK	*United Kingdom*
US	*United States*

1 INTRODUCTION

You are my customer as well as I am your customer. The moment we meet, we start to share an experience of each other. We can meet anywhere, face-to-face or through virtual channels, any interaction counts. To create an excellent customer experience, we need to collaborate to understand customer needs. To collaborate, we need to be open and honest, and to respect and support each other.

This thesis development project has been carried out for a Finnish company called Lindorff Oy (hereinafter Lindorff Finland), which is a part of the Lindorff Group Ab (hereinafter Lindorff Group) the European leader in credit management services. As an outcome of this project I will introduce an approach for making better cooperation possible between business and information technology personnel in requirements engineering. The approach is based on theories of customer experience, community leadership and performance management. For continuous improvement of collaboration in requirements engineering in Lindorff Finland, I also provide a suggestion on how to measure customer experience between stakeholders in requirements engineering.

To show how to build a successful partnership between the stakeholders in requirements engineering, a leadership model will be used together with the body of knowledge on requirements engineering and furthermore with a traditional software engineering V-model. The development study examines how excellent customer experience may be achieved via customer-oriented collaboration. A superior community and an individual performance supported by optimal energy together will increase profitability by creating business value and securing competitive advantage via innovation.

The relevance and topicality of the subject of the development study are highly current. As an example of the topicality, on February 2016 Forrester Consulting published a Thought Leadership Paper commissioned by VMware. The paper titled “CIOs: Is IT ready to accelerate Business Performance? IT Innovators deliver Business Value by focusing on enhancing Customer Experience and Business Agility” introduces key findings regarding IT innovators’ success.

An example of the relevance of this study is an analysis done based on Forrester data by Watermark Consulting in 2012, introduced by Löytänä and Korkiakoski (2014). The analysis proves that being a leader in customer experience correlates with a three times greater profit than companies which are customer experience laggards. Lindorff Group also understands the importance of a strategic partnership including business and information technology, and the company is committed focusing on this area over the next few years.

The literature used as the basis of this master’s thesis is written in Finnish and English. It deals mainly with subjects such as requirements engineering, customer experience, customer-oriented collaboration, community leadership and performance management. The books relied on in this study are mainly in Finnish and the scientific articles, blogs and research results are mostly in English. This distribution ratio reflects the research method used. The understanding the subject was created by using author’s native language. To write the report in English and to further study the subject it was natural to rely on sources written in English.

The authors of the literature used are either well educated scientists or experienced and senior business people who have had a great deal of influence on the business world. In addition, there are sources of well-known and independent consulting companies like Forrester Consulting. The literature is thus reliable enough for the purposes of this study and major deficiencies have not been found.

The goal of this thesis project was to study and develop the company's processes and practices to ensure better cooperation between business and information technology units in requirements engineering. The project was limited to the change request process for two invoicing systems. The approach taken was to develop customer-oriented collaboration between a change requestor and a supplier team, and within the supplier team. A core question was to examine how a successful partnership between these stakeholders was formed.

This thesis report is constructed such that multiple theories form a basis and justification step-by-step for the presented collaboration process. Chapters from one to three are public. Chapter two introduces the star model of dynamic leadership by Jalava and Matilainen (2010). It also discusses stakeholder collaboration and partnerships in requirements engineering. Chapter three contains the application of the leadership model in requirements engineering. Chapters four, five and six are partly public and partly confidential. The chapter four suggests what to measure and how to do it. The chapter five discusses about validity and reliability of the inquiry executed and of the development study itself. Finally, the chapter six summarizes the journey.

The development study is a combination of qualitative and quantitative research. A mind mapping technique was utilized in various phases for instance when analyzing and combining the selected theories for the thesis. To understand the initial situation of stakeholder collaboration, the performance of IT suppliers and the stakeholders' experiences of them were measured two rounds of inquiry. Workshops were held to find out how the business collaborated with information technology personnel in requirements engineering at a given time.

2 LEADERSHIP IN REQUIREMENTS ENGINEERING

2.1 The Model of Dynamic Work Community Leadership

Jalava and Matilainen (2010) have researched how strategic and operative action can be integrated with visionary and collaborative leadership. The writers have developed a model of dynamic work community leadership in which they present the central elements of work and how these elements interact. The model consists of two layers as shown in Figure 1 below. The base level concerns community and it is formed of elements of discussion, truth and trust. The top level depicts productivity and consists of challenge, clarity and completion. The writers state that these six elements are necessary for making things common and to work together.

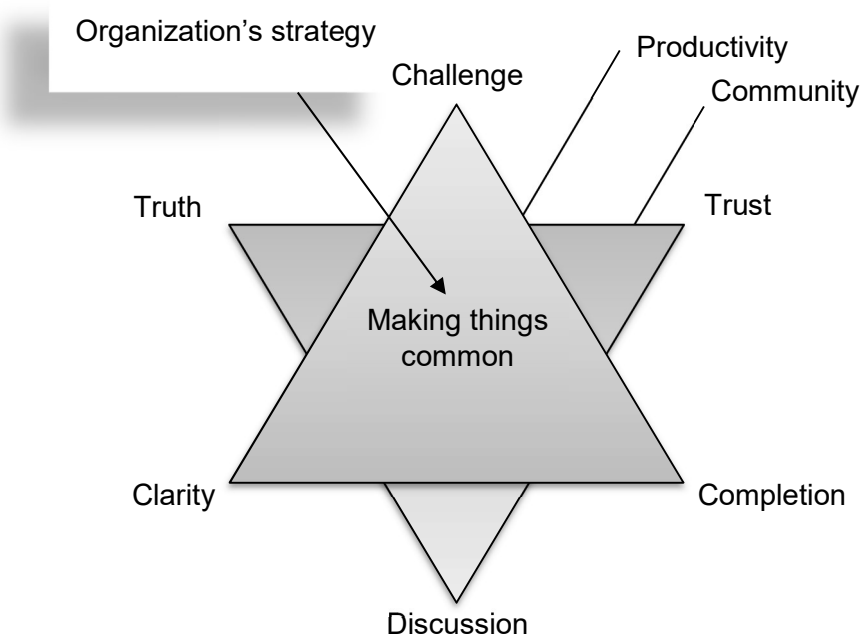


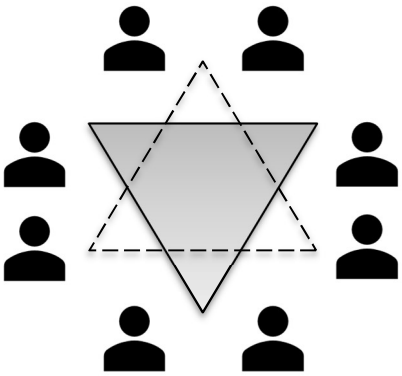
Figure 1. The star model of work community leadership (Jalava and Matilainen 2010).

An organization's strategy defines direction and guidelines for work in a community. Jalava and Matilainen (2010, 72) point out that at its best a strategy is a social structure having a strong sense of what the future will be like. A strategy implemented by an organization will create value for the organization.

2.1.1 Elements of Community

In this chapter, the elements of community will be introduced in detail. Figure 2 on this page emphasizes that collaboration is possible between people who are motivated to interact. The star symbol depicts collaboration and it refers to the star model of work community leadership by Jalava and Matilainen (2010, 94). Next to the star I have brought up important aspects of each element of community as I see them.

Common **truth** is formed by discussion and it strengthens collaboration.



Trust is based on common truth and it makes collaboration easier.

Discussion is essential for successful collaboration.

Figure 2. The star model (Jalava and Matilainen 2010) with community elements.

Discussion

Figure 2 shows that discussion, as a form of interaction, is an essential part of working together towards a common goal. According to Jalava and Matilainen (2010, 74), communal discussion gives people an opportunity to speak their minds, and present their opinions. It encourages searching and finding solutions, and solving problems together. In addition to reaching unity around a common goal, discussion also maintains communality. At its best, it makes community members feel that they belong to something bigger than they could ever be by themselves.

On the other hand, Jalava and Matilainen (2010) see that discussion can be intimidating, because it reveals personal elements, such as competence or a person's attitude. If people do not trust each other it might be safer just to sit quietly without taking part. They see that discussion can also be challenging in situations when people do not have a common language. Without a common language, it is not very easy to reach a common understanding. Despite actively listening, the contents of a discussion may be expressed in terms not familiar to the listener, thus making it hard to participate.

Truth

In collaboration truth is never absolute. According to Jalava and Matilainen (2010, 132), a community forms a common truth in discussion, see Figure 2 on page 11. Such truth needs to be good enough to serve the community and its goals. The truth needs to be based on facts and those should be well reasoned. Facts and reasoning can be shared and agreed upon through discussion. Still truth is relative in interaction and it will depend on the participants. If someone joins the conversation or leaves it, the common truth will change.

Jalava and Matilainen (2010, 150 - 151) write that truth can also take the form of new information created during collaboration. They continue that this information must have some value in order for it to be true. Without discussion and debate valuable information will not be shared and collaboration cannot lead to competitive innovations and profitability.

Trust

Finding truth together will provide a solid basis for building trust as depicted in Figure 2 on page 11. When people complete discussion with an agreement on goals, roles and responsibilities, every participant can rely on that agreement. Trust is measured, when people start to work according what has been agreed upon. If parties act accordingly, trust will grow. If they do not respect what the community has agreed, trust will diminish.

Trust is important for commitment and commitment is an important part of individual performance. Lack of trust will lead to poor performance, causing financial loss. Building trust is an important way of making profits and staying profitable via the ability to perform (Jalava & Matilainen, 2010, 154 – 155).

2.1.2 Elements of Productivity

In the former chapter I introduced the elements of community and next I will present the elements of productivity. There is a similar logic in Figure 3 on this page as in Figure 2. The figure shows the interaction between participants, the star of collaboration and important aspects of each element of productivity.

Figure 3. The star model (Jalava and Matilainen 2010) with productivity elements.

Challenge

On spring 2016, I attended a course in diplomacy in working life given by Tapani Ahola, the Director of Helsinki Brief Therapy Institute. He stated on this course that we are quite likely to express our wishes as problems. He continued that these wishes are in fact change requests. When we are not satisfied with the present situation, we would like it to change. He also said that if we are motivated to change the present situation, we opt to fix the problem, and we turn it into a challenge. In this manner challenges arise from problems which we want to solve. Ahola especially pointed out that a solution-oriented attitude helps to us achieve results in a positive manner.

The element of challenge in Figure 3 above may or perhaps should be selected as a goal of collaboration. When Jalava and Matilainen (2010, 61 - 62) discuss strategy and its implementation, they state that a well-defined direction is realizable, as it will give participants a clear picture of the future and how to get there. They add that a well-expressed direction acts as a description of the playing field and helps navigation towards the selected goals. The writers see that the most important aspect is that a challenge gives collaboration a purpose and it is similarly understood by all the participants.

Clarity

In a work community, clarity, as shown in Figure 3 on page 13, can be achieved if the members have the knowledge of what to do, as well as when, how and who will do it (Jalava & Matilainen, 2010). Processes are descriptions of how the work should be done and what steps will be required to get results. A process can be repeated as a project with a start and an ending. Projects tell people that they are required to participate and adopt a certain role with a responsibility related to that role. Projects also have a schedule and targets. To achieve targets, it is important to make timely decisions and to have a role with responsibilities defined which will help with this. Clarity is achieved by applying processes through projects.

As an element of productivity, clarity ensures that work will be carried out without waste. It gives the community courage to start working after a challenge has been recognized and a goal has been defined. Clarity supports working all the way until the work has been done and the targets are reached. Jalava and Matilainen (2010, 119) note that clarity must be built up together and by creating and applying new ways to work and collaborate.

Completion

According to Jalava and Matilainen (2010, 126) completion means finishing the work and requires energy as shown in Figure 3 on page 13. Energy is potential, and may be either physical or mental and it enables working. Rantala (2014) states that working will reveal competence and that competence will grow by working and that this growth of competence will increase dedication. Performance with its elements of potential, productivity, competence and dedication together with lasting energy are thus all very important to get the work completed.

To cross the finishing line, we need to have mental energy. Jalava and Matilainen (2010, 126) call this form of energy motivation. They also see that motivation alone is not enough, a strength of will is also required for work to be completed. They further add that challenges will motivate us, sometimes being so meaningful that they are enough to keep us going until the end. Yet sometimes we just need to be persistent.

Completion can be threatened if there are participants in the community who are not fully committed and therefore give less input to the community than they could (Jalava & Matilainen, 2010). Working independently requires that individuals are reliable and that the community trusts its members' ability to work towards a common goal by following the commonly defined and agreed processes.

2.2 Requirements Engineering

> "Requirements engineering (RE) is the branch of software engineering that deals with the early phase of software development, during which the wants and needs of customers for an intended software system are explored, understood, documented, and refined to the extent that a technical system can be developed." (Yu, Fickas, Giorgini, Maiden and Mylopoulos. 2010.)

To adapt the above cited definition by Yu (2010), requirements engineering is the very first phase of software development as I have depicted in Figure 4 below. With requirements engineering we want to ensure that a customer need is correctly understood and described in every step of the supply chain. We also need to ensure that change request orders are correctly transformed to functional and non-functional specifications. A change request order is an agreement between a customer and a provider and functional and non-functional specifications are agreements between the provider and a supplier. There must be people who make sure that the translation between these agreements is well done.

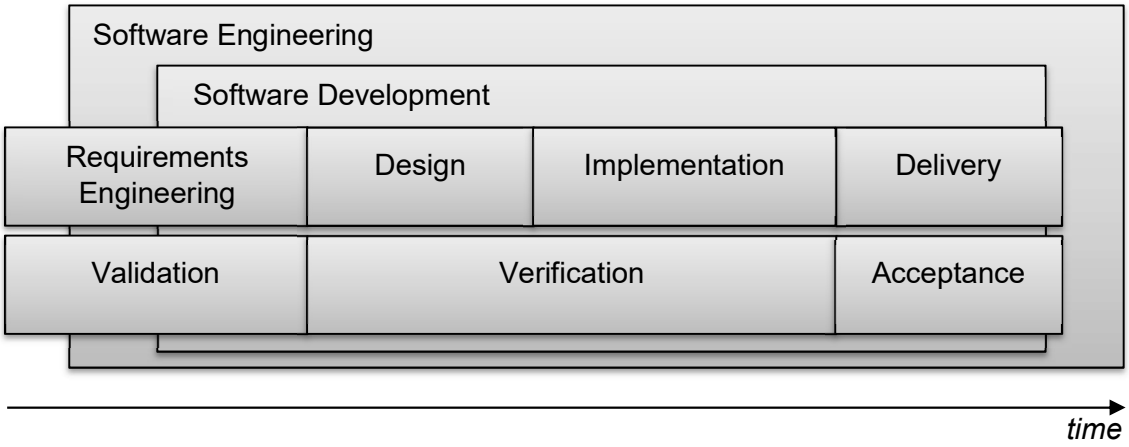


Figure 4. Requirements engineering as an area of software engineering.

> "Requirements engineering is a collaborative process carried out with the mutual cooperation and coordination of stakeholders. Requirements-driven collaboration is of crucial and utmost importance in case of agile methods, especially for geographically distributed teams." (Inayat, Salim and Kasirun. 2012.)

I do not fully agree with Inayat, Salim and Kasirun (2012) who use the expression "mutual cooperation" when they write about collaboration. In the light of my own experience I would say that cooperation does not entail a team spirit and it is more about working individually towards a given goal. In my opinion, collaboration means working as an orchestra having a leader, forming a melody together, and finding ways to master a symphony.

I agree with Inayat, Salim and Kasirun when they define requirements engineering as a collaborative process. Jalava and Matilainen (2010) see collaboration formed by

productivity and community elements. In my opinion these two ideas can be blended. Based on my work experience I see that productivity requires coordination and community requires communication as I have shown in Figure 5 below. Both are needed in collaboration.

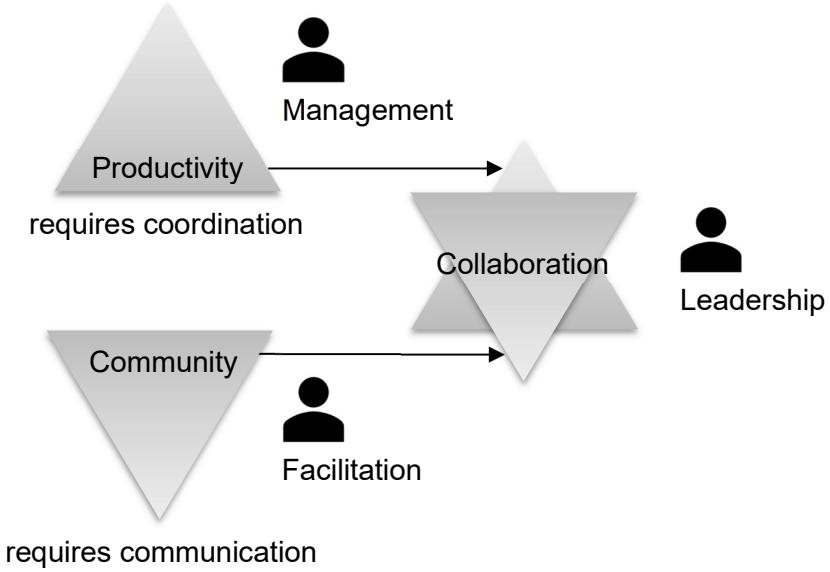


Figure 5. Coordination and communication are needed for collaboration.

In requirements engineering, a requirement manager is the person who coordinates productivity, but managing alone is not enough because productivity is created by people. It is possible to coordinate stakeholders by letting them know about things that influence their work, but to be able to truly collaborate, employees need support and they need to feel that they are a part of a community. There needs to be someone who shows the direction and from time to time reminds people about the common goal. In addition, this person should also keep stakeholders committed and ensure that they are energized and motivated. All this can be said in Pichler's (2010) words that collaboration requires leadership as shown in Figure 5.

2.2.1 Stakeholders

Stakeholder identification is important because it provides an opportunity to invite and involve people, and to explain their roles and responsibilities to them. Defining and communicating roles and responsibilities will bring clarity to requirements engineering activities, see Figure 3 on page 13 for clarity as a productivity element. I have developed Figure 6 on the next page to depict and simplify requirements engineering stakeholders from the collaboration point of view. The figure presents the core stakeholders of requirements engineering and the required roles from a collaboration administrative perspective.

In requirements engineering, the customer is the most important participant. Without a customer, there would be no customer needs to process. The provider is an actor who

collaborates with the customer and has the authority to either accept or reject a customer need. Providers can work in a company and take an internal role taking care that an order will provide value to the customer and to the company and its shareholders.

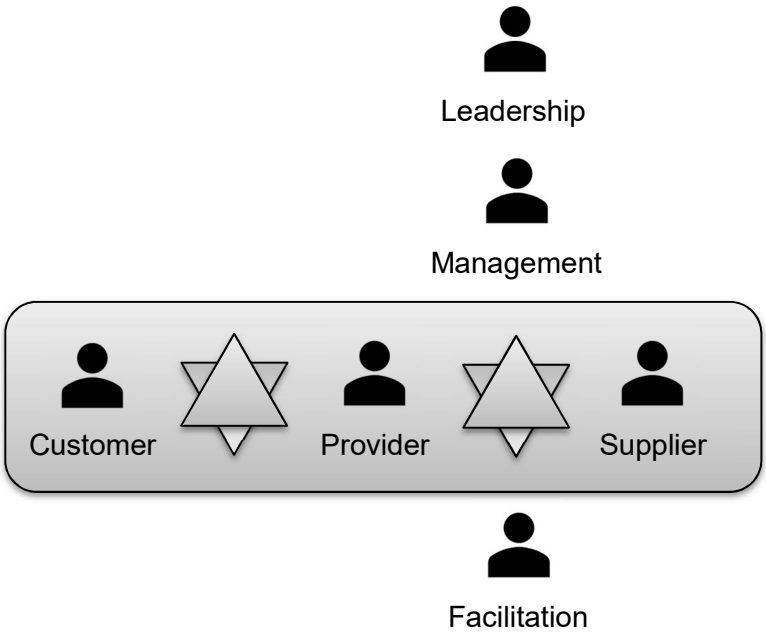


Figure 6. Core stakeholders in requirements engineering collaboration.

Requirements engineering also needs participants who deliver the customer needs. A provider places an order to the supplier and supplier processes the order in collaboration with the provider, requiring the provider to agree on the overall contents of the order. When the provider has approved an order, the supplier can continue processing it.

Facilitation promotes the collaboration between the customer and the provider. The role is there also to help the provider to collaborate with the supplier. As shown in Figure 5 on the previous page, management is there to coordinate productivity and leadership is needed for labor productivity in a community among people working in an organization.

Customer

The customer is a person, who the employees of a company should be excited about. This excitement is needed to ensure that the company remains competitive, and thus profitable. Löytänä and Korkiakoski (2014, 26) refer to a global online community of business leaders called CustomerThink, when they present the customer enthusiastic level as the highest level of customer-orientation. Other customer levels mentioned include being committed, reactive and focused. Excitement and enthusiasm can be shortly described as listening to customers and providing new ways to create value for them, even before they understand to ask for it.

As an external stakeholder, a customer could be interpreted as a client or an end-customer. A customer can also be an internal stakeholder like a shareholder, or an employee. In software requirements engineering, both external and internal customers could also be system users the same time.

To be competitive a company has to create value for customers. Löytänä and Korkiakoski (2014, 21) simplify this by stating that in the era of the customer it is necessary to focus on the customer. They continue that customers make it possible for a company to be successful. By focusing on customers and their needs, and by creating innovative solutions meeting or even exceeding those needs, it is possible to create value also for company shareholders. Löytänä and Korkiakoski present an analysis by Watermark Consulting (2012), which proves that being a customer experience leader correlates with having three times a bigger profit than companies which are poor at creating excellent customer experience. This is clearly something to pursue.

Provider

In this thesis, a provider is defined as a person who understands customers and shareholders. A provider has a company internal role and in this role, she or he needs to weigh customer needs against applicable strategies and the available resources of a company. In requirements engineering the provider decides either to promote or reject a customer wish. To have a clear decisive role, there can be only one provider per change request. A provider will have advisors, preferably also within supplier, to help to make the decision.

Following the decision, a provider has the responsibility either to order a change internally, or to provide a reason for a rejection to the customer. It could also be said that the provider is a customer representative. The provider may represent multiple roles at the same time, for instance, a provider may represent a shareholder, a client, an end-customer or even a system user.

A key account manager, a service manager, a requirement manager, a commercial or technical product manager or such could be a provider. Selected from this expert group, product management should have suitable professional tools to help all stakeholders understand customer needs. With the help of product management tools even the customer themselves could grasp the true need behind a wish or a problem more thoroughly. For this reason, I see that all change requests should flow via product management.

Pichler (2016) wrote in his blog article titled “8 Tips for Collaborating with Development Teams”, that product management should achieve a strong buy-in by creating shared goals everyone agrees on, involve people in research and validation activities, engage to develop and update the product roadmap, and have people to collaborate on the product backlog. As I have shown in Figure 7 on the next page, product management helps collaboration between the customer, the provider and the supplier.

As a competence and as a set of tools, product management may take on different kinds of roles. For instance, there might be a product owner as in Figure 7 to carry

some of the product management responsibilities or there may be for instance a technical product manager to help transform business requirements into the language of IT.

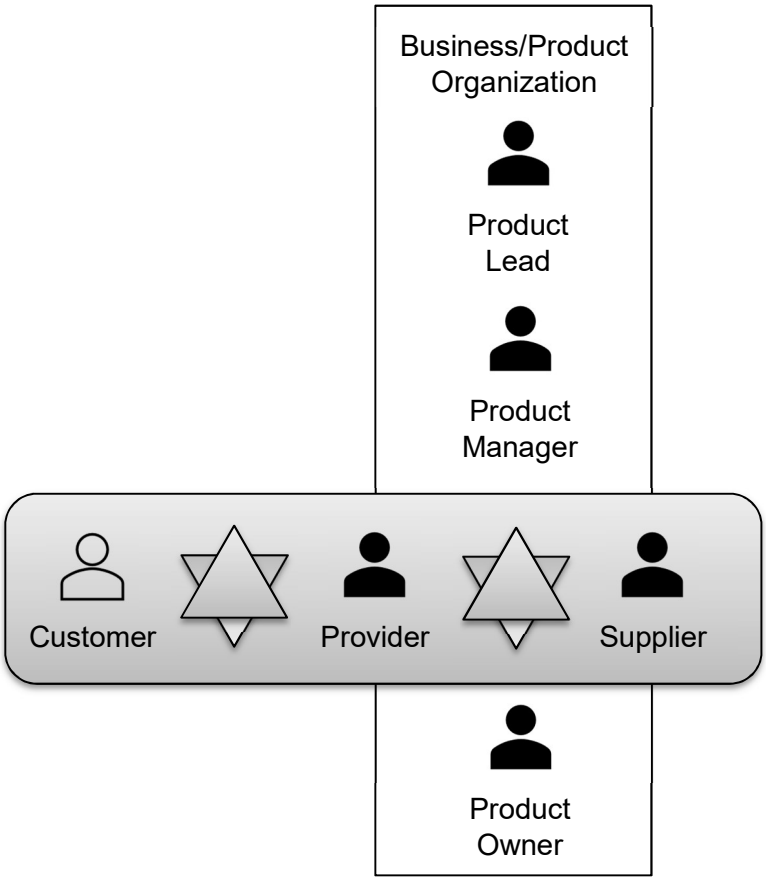


Figure 7. Product management as a collaboration competence.

Preparation, validation and approval of a change request order are done in requirements engineering collaboration. A supplier may be involved and thus committed from the very beginning of the requirements engineering. The customer will approve the prepared order. The approval should validate that a customer need is correctly understood by the stakeholders and that it will transform correctly to the supplier.

Supplier

Put simply a supplier is responsible for a full or partial delivery of a product or a system. A supply chain is formed by providing a complete solution for the customer via the provider with the help of supplier. In Figure 8 on the next page I have depicted the whole supply chain organization simplified. We can assume that everyone participating in helping the delivery are part of the supply chain from the start of requirements gathering to the delivery phase.

To ensure that an identified customer need is transformed correctly to the supplier, there must be supplier team members who are responsible of preparing functional and

non-functional specifications and members who are responsible for reviewing, verifying and accepting the specifications. Members who review and accept these specifications are the people who have prepared the change request order. This should ensure that the people accepting the specifications will understand what they are approving.

Acceptors within the supplier team can also be thought as customers of the members who prepare functional and non-functional specifications. During the preparation of a specification, members need to understand the way acceptors understand the business and product domain and customer needs. Vice versa, the members who prepare a change proposal need skills in how to transform customer needs for software development. Mutual understanding in this early phase of requirements engineering brings quality to development and testing, requires fewer resources, and saves time and effort in the implementation and testing phases.

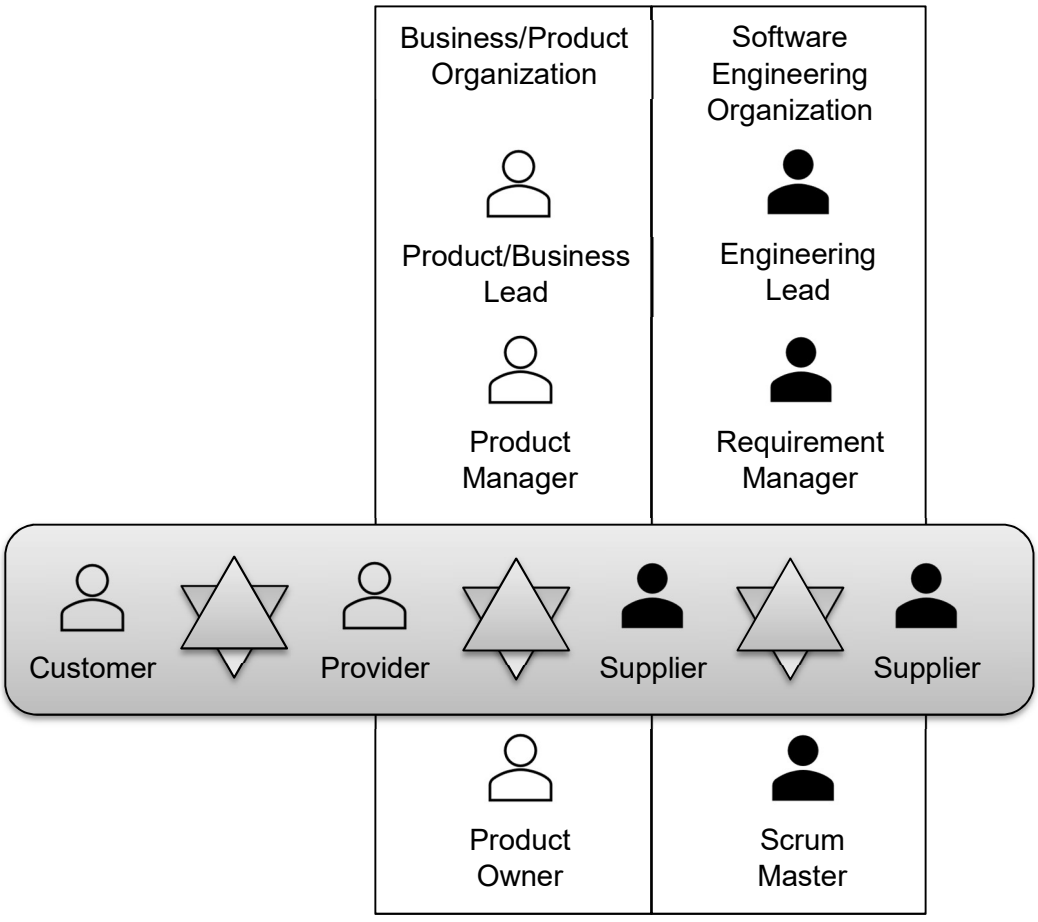


Figure 8. Software engineering as a collaboration competence.

The supply chain organization as I have compiled it in Figure 8 above shows two collaboration competencies to deliver change requests based on customer needs. The first area of expertise is product management as expressed in Figure 7 on the previous page and the second area of expertise is software engineering, which encompasses requirements engineering as depicted in Figure 4 on page 15. The supplier team is

supported by requirements management and the collaboration is supported by a facilitator, which in agile software engineering would be a scrum master as shown in Figure 8 on the previous page. A product owner and a scrum master form a pair of facilitators for the successful delivery of a customer need. A product manager and a requirement manager should work together to make the decisions on what to deliver, when to deliver it and what kinds of resources are needed for the delivery. The roles of product owner, scrum master, product manager and requirement manager may be assigned to two or more people.

Facilitator

As shown in Figure 6 on page 17, facilitators are helpers of the supply chain. A facilitator is a person who promotes requirements engineering collaboration. A person who is appointed to this role, should lead people and get them to discuss things together. She or he should ensure that stakeholders share the same goal. In this role, a facilitator makes things common by getting people to think together and share their thoughts. As Korpi and Tanhua (2007, 82 - 83) suggest, a facilitator should ask questions to make people think.

From another point of view, a facilitator is an enabler, which means that she or he creates opportunities for creativity and for being innovative. Like Nummi (2013, 9) explains, in the facilitator's role it is important to reveal the expertise of the participants to the group and combine the expertise to create something innovative.

According to Jalava and Matilainen (2010, 68), leading stakeholder collaboration is like coaching a sports team, like constructing a game. A facilitator takes care that the chain is not broken. In this role, it is important to ensure that participants know their roles and responsibilities in collaboration. The participants should feel that they are an inseparable part of the chain and its operations.

Viitala (2005, 309) refers to Jalava (2002) who suggests that as a coach your key goal is to produce advantage for a company by helping people to learn, grow and develop. She refers also to Pirnes (1989, 1991) who details that a coach takes care of the clarity of goals, makes people commit by communicating about the goals frequently, helps participants to form a coherent team, helps people to develop themselves and has an effect by being an example. Pichler who refers to Watts (2013) in his article "Every Great Product Owner Needs a Great ScrumMaster" (2014), states that eventually, coaches will make themselves redundant, because stakeholders will eventually know the process well enough and they can independently collaborate.

2.2.2 Partnership

The potential stakeholders of requirements engineering were described in the previous chapter and the required competences of product management and software engineering were presented. Competent stakeholders produce value to a company by delivering changes requested by customers. The roles and responsibilities of a change request supply chain were defined, and next partnership will be discussed.

A partnership can be explained using the terminology of sports. Players form a team and they are important partners to each other. They have a common goal, clear roles and responsibilities and a game strategy to apply. To play as a team, players need to collaborate. Additionally, to collaborate, they will need a competent coach who will lead them to win. This can be applied to requirements engineering as well.

> "Requirements Engineering (RE) activities require coordination and collaboration among different stakeholders. RE involves activities such as negotiation, analysis and requirements management in subsequent phases of development including implementation and testing. Because of RE's encompassing scope, the negotiation, understanding, and development of requirements must often be handled by a team comprised of multiple roles (or organizational functions), including customers, requirements analysts, software architects, developers, users, and testers. Such a team is known as a *cross-functional team*." (Marczak, Kwan and Damian. 2009.)

Marczak, Kwan and Damian (2009) state that requirements engineering activities require a team which is comprised of multiple roles. As shown in Figure 9 below, cross-functional team relations in requirements engineering can be at least partly described with help of the traditional software engineering V-model based on a model developed by Boehm (1979) the TRW Professor of Software Engineering and Director Emeritus at Center for Software Engineering, University of Southern California.

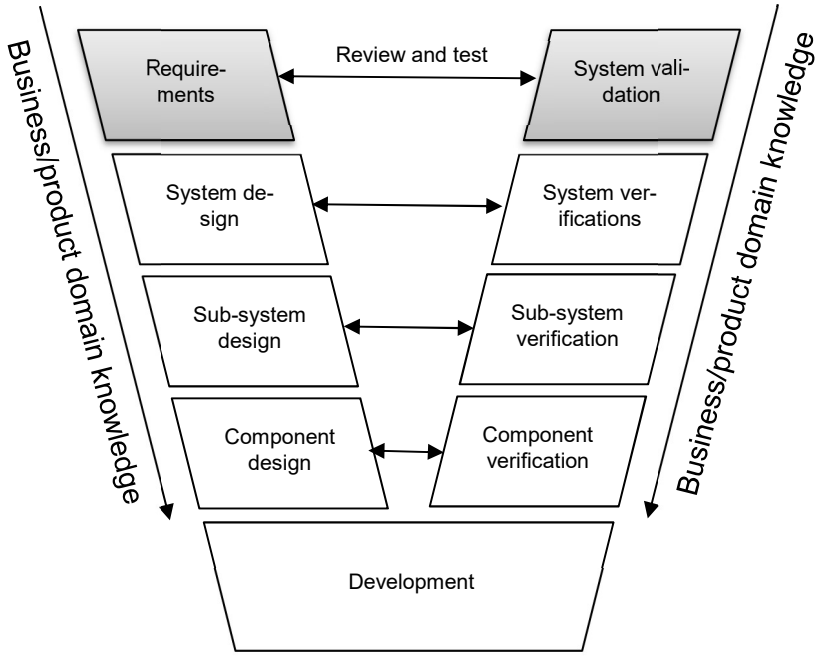


Figure 9. Domain knowledge transformation applied to the V-model of software engineering.

Using the sports analogy, the game described in Figure 9 above is mostly played by a supplier team. A customer and a provider can be thought as referees of a game. The provider would also be the person firing the game on as she or he is the one making

the decision on promoting the customer need. The facilitator is the coach of the team and the supplier team plays the actual game.

In addition to the application of the V-model to requirements engineering, a requirements engineering body of knowledge (REBOK) will be used. The model is developed by Aoyama et. al. (2010). In their later studies Aoyama et. al. (2013) state that the REBOK process is consistent with the requirements engineering process standard, ISO/IEC/IEEE 29148:2011.

According to REBOK model there are the process type of core knowledge areas which are, requirements elicitation, analysis, specification, verification, validation and evaluation. In addition, four technical type of core knowledge areas are presented. Fundamentals and process knowledge form a foundation. Practical considerations, planning and management are knowledge areas of the body. Enterprise and product analysis are incorporated as REBOK extensions and they have an impact on requirements elicitation and analysis.

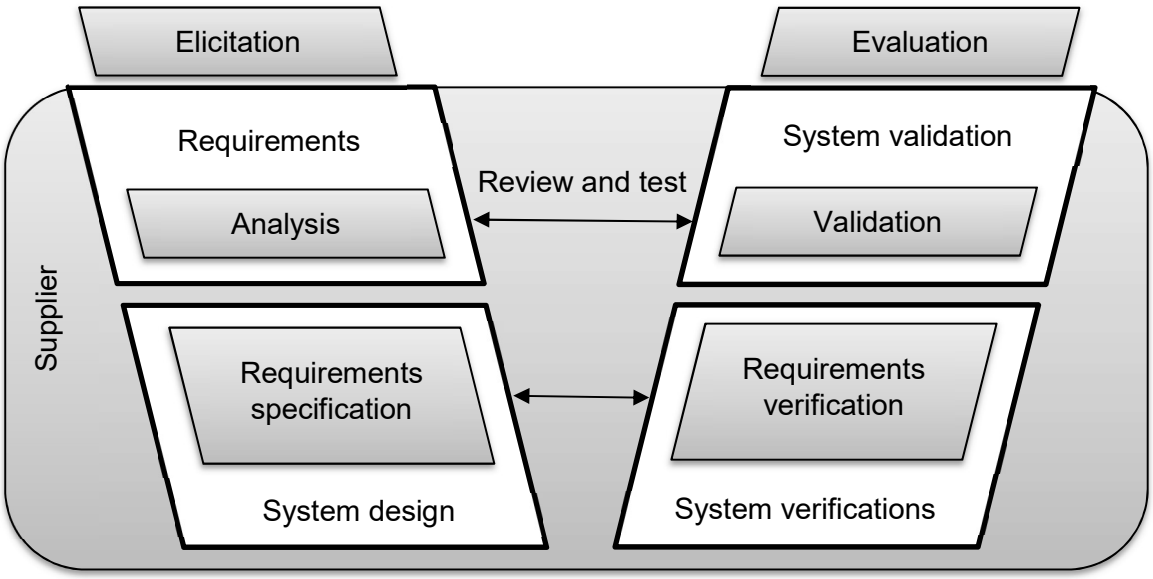


Figure 10. Requirements engineering phases applied to the V-model of software engineering as a responsibility of a supplier.

The requirements engineering phases as I have described them in Figure 10 above are applied to the V-model of software engineering to highlight the importance of collaboration in analysis and validation, specification and verification. We could imagine that the game has now started and a customer has expressed a wish or in other words a need or a problem to a provider and the phases of elicitation and evaluation has been finished. The provider decides to promote this wish and sends a change request to the supplier. Preferably the provider has also let the supplier team coach know about the new order. With these actions, the provider has launched the requirements analysis and validation phase.

The requirements elicitation phase continues with capturing of the business and product requirements in detail. The supplier team receives the change request and keeps

the coach informed about the request. First the request is registered in a general form. The form clarifies to whom the change request will be designed, what has been requested and to whom the request will provide value for. In the REBOK model this is done by a business and/or a product analyst.

Potential users are analyzed and the value proposition will be prepared by using product management tools, for instance. By utilizing the 20/80 rule, also known as the Pareto Principle, it is possible to deduce which of the customer needs will bring the most value with the least effort, thus making the results of the requirements analysis phase as lean as possible. Phillips-Donaldson (2004) states that the 20/80 rule was originally described by Vilfredo Pareto in the beginning of 19th century and later formalized by Joseph Juran on 1940's.

The requirements analysis phase is a continuum to elicitation. The analysis phase will go more deeply into the request. In this phase, system requirements are built on business and product requirements. It is now time to construct the big picture from the system point of view. The purpose is to determine how the customer needs will affect current systems and processes, and if any new systems or processes will be required. The REBOK model defines this as a part of the information system analysis and it is recommended to be done by a systems analyst.

Requirements analysis leads to a validation of the requirements. Boehm (1979) describes validation to be about ensuring that the team is building the right product. Validation reviews should be carried out together with the requirements analysis and before requirements specification to reveal possibly missing parts of requirements.

The validation of requirements is done by an acceptance testing team. The members of the team need to understand not only the business but also the product domain too, just as business and product analysts do. Both are responsible for forwarding the business and product domain knowledge further to a development and verification testing team members like shown in Figure 9 on page 22.

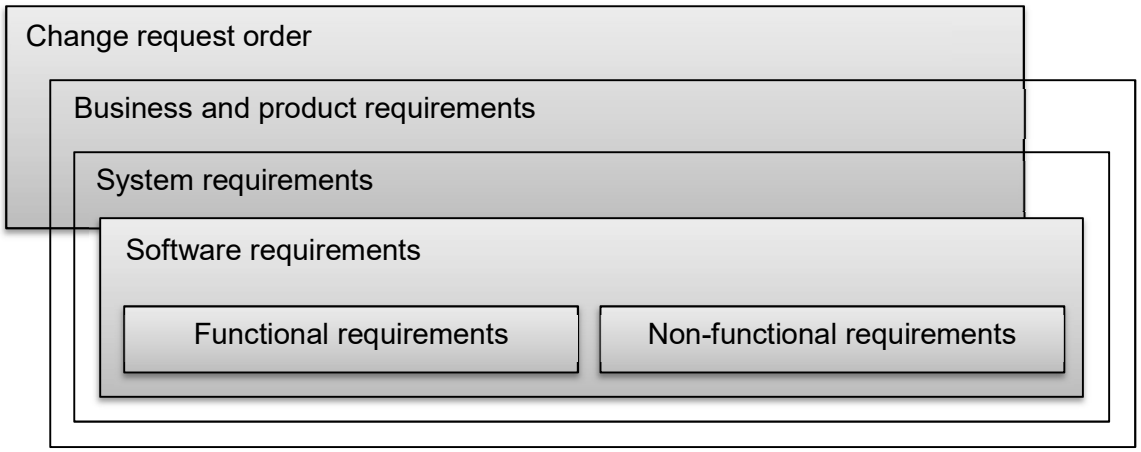


Figure 11. Change request order as applied to the REBOK model by Aoyama et. al. (2010).

After iterative discussions and negotiations in the requirements analysis phase it is also possible to agree on the customer needs and requirements on the information system level. Analysis results will be documented as a change request order as I have shown in Figure 11 on the previous page. Final approval of the change request order will be done by the customer or customer representative if the customer is not directly reachable. To ensure the quality of further specifications, it is advisable to have this approval before proceeding to the requirements specification phase. The approval is an agreement on the validity of the change request order and it ensures that the requirements engineering proceeds in a customer-oriented way.

As shown in Figure 10 on page 23, requirements specifications are done together with requirements verification. REBOK defines this as the software analyst's and requirement engineer's responsibility. They transform customer, business, product and system needs into functional and non-functional requirements. Some form of system verification will then ensure that the product will be built correctly by designing adequate test cases.

To proceed to the sub-system design and sub-system verification phase as depicted in Figure 9 on page 22, the requirements specification and requirements verification phase should be finished. After the iterative discussion and negotiation, the requirements specification should be approved. Approval is done within the supplier team. Responsibility for functional and non-functional specifications approval lies with REBOK business and product level and system level analysts. Acceptance test team members typically then give approval for the test cases per acceptance criteria described in the change request order.

The role of the coach is to make sure that the customer-oriented partnership is respected by the supplier team members. The coach ensures that the agreed collaboration process is followed to deliver the customer need through a chain of requirements elicitation, analysis and validation, requirements specification and verification. It is inevitable that the customer need must be kept unchanged in the transformation chain. The coach has the control over that the agreed reviews and approvals are done to improve the quality of change request orders, acceptance criteria, functional and non-functional specifications and test plans.

The requirements engineering collaboration as described above is not limited to certain software engineering methodologies. It could be used with traditional and agile methods. As Anitha, Savio and Mani (2013) state, it is also possible to apply the V-model in an agile environment. Further studies should be carried out to examine whether contemporary agile methodologies, like Scrum by Ken Schwaber and Jeff Sutherland, would have the roles and responsibilities defined and if these could be applied to the REBOK model. Software product line engineering could also be an additional subject to study and enrich and expand understanding of collaboration in requirements engineering. Käkölä (2015) describes software product line engineering to be "an industrially validated methodology for developing software-intensive systems and services faster, at lower costs, and with better quality and higher end-user satisfaction".

3 CUSTOMER-ORIENTED COLLABORATION IN REQUIREMENTS ENGINEERING

> "The new vision must be for an IT profession with a clear business focus as well as its traditional technology focus. This will be defined in terms of its ability to play a full part in all stages of IT exploitation and business transformation and to have appropriate non-technical skills, including management, business and leadership skills, as core competences. The good news is that work is in hand to develop that vision." (Thompson. 2005.)

To ensure that the core competences presented by Thompson (2005) and especially the non-technical skills would emerge in requirements engineering I chose to apply the model of dynamic work community leadership by Jalava and Matilainen (2010), see Figure 12 below. I chose also to follow a strategy of providing excellent customer experience by clear customer-oriented collaboration in requirements engineering.

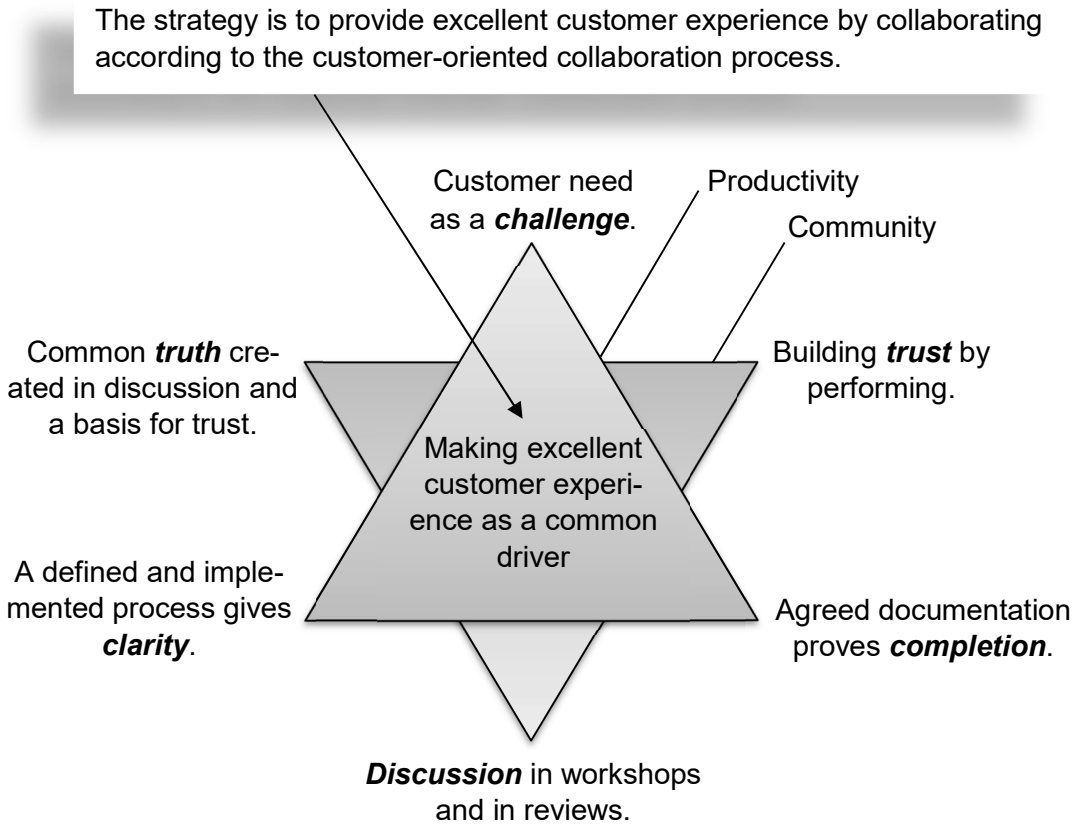


Figure 12. The star model (Jalava and Matilainen 2010) applied to the requirements engineering collaboration process.

The strategy in Figure 12 refers to the requirements engineering collaboration process developed during this thesis project (see Appendix 1 for the process diagram). The process was developed to ensure that the business and IT units agree about a customer

need in a clear, lean and sustainable way. The process was developed in collaboration within a services support department in Lindorff Finland and it is ready for introduction. It is under review of some and yet to be presented to some of the stakeholders. The detailed process itself is confidential but on a general level I am certain it can be applied in many teams who do requirements engineering, not just within Lindorff Finland.

Figure 12 on the previous page depicts the elements of community and productivity in requirements engineering. I found productivity in the requirements engineering collaboration process as follows. A customer need should be set as the challenge, the requirements engineering collaboration process itself gives this clarity. Completion is a part of that process and I specified that completion is reached via agreed documentation. The community elements support productivity and in requirements engineering they would consist of the following: forming a common truth about the customer need and about the change request in hand in discussion. Workshops and reviews enable discussion and both are part of the developed requirements engineering collaboration process. Trust is built by doing the work in collaboration according to the collaboration process by competent and dedicated people and by taking care of the potential of these employees.

3.1 Common Truth as a basis of Trust

Jalava and Matilainen (2010) state that common truth is built in collaboration by discussion. This applies to requirements engineering at least on two levels – the process level and on a project level. First, the requirements engineering collaboration process should be reviewed and agreed between stakeholders who will be applying it. After the review and agreement, the process can be thought of as a common truth for the stakeholders applying it. Second, to accomplish a common truth about the change request in hand, it is required for all stakeholders to participate in the requirements engineering collaboration process as early as possible and in every review and workshop as planned in the process, see chapter 2.2.1 for stakeholders and chapter 3.7 for more detailed information on the roles and responsibilities. Reviews and workshops are the interactive parts of the process where the common truth about the change request will be formed together in discussion.

The workshops held to map the initial situation of requirements engineering in Lindorff Finland can be thought of as an example of trying to find a common truth between workshop members about the way requirements engineering was done then. In those workshops, we saw that the time was not mature enough for a common truth to emerge. Today with the help of the defined collaboration process it would be easier to find a common truth for requirements engineering and to try to apply it across all Lindorff Finland’s products and services. By applying the process, it will evolve and it would have a chance to become a common truth for all stakeholders applying it.

From the viewpoint of the partnership presented in chapter 2.2.2, a common truth is like an agreement the team follows. It is like the rules of a game. Without rules to follow the game becomes unclear. As described earlier, a common truth needs to be formed on the process level and it must be about the identified challenge. The steps of forming common truth is important for collaboration. The requirements engineering collaboration process can be applied to change request engineering projects to ensure clarity.

The process is quite stable and needs to be reviewed and agreed quite rarely, but the common truth must be formed about every single change request.

Truth is not only a basis of trust, but creating a common truth together gives clarity. It can be stated that forming a common truth has a direct impact on the productivity of teams carrying out requirements engineering. Vice versa, if a change request lacks a common truth within the team, it could have a negative impact on productivity. If the team has not agreed on the requirements engineering collaboration process and they do not share a common truth about it, this can and most probably will lead to a negative impact on productivity due to lack of clarity.

3.2 Building Trust by Performing

Professors Kwon and Suh (2004) discuss factors affecting the level of trust and commitment in supply chain relationships. Later in the 2010s they continued their work on studying trust and commitment but in the field of specific asset investments. The study in 2004 uses transaction cost analysis and in that article they state that scholars have argued that trust has an important effect on lowering costs. This business aspect proves the importance of trust via increased profitability.

Kwon and Suh note that the literature often mentions interrelation between trust and commitment and that commitment is central in supply chain transactions. I think commitment can be thought of as a prerequisite for dedication and as Rantala (2014) notes, dedication is an element of performance and it grows with increasing competence. This proves a linkage between trust, commitment and performance.

One of the hypothesis of the study by Kwon and Suh was that information sharing will lower the degree of behavioral uncertainty and will indirectly improve the level of trust among supply chain partners. They state that in many studies information sharing is said to be the most critical agent in the trust-building process of supply chain implementation. Their study confirms this and it also indicates that information sharing reduces the degree of uncertainty, which in turn enhances the level of trust.

A culture of openness and information sharing is a great basis for competence growth. Competence growth may and most probably will lead to deeper dedication. Through better information sharing and via acknowledged competence and dedication, people become committed, which in turn builds trust through the elements of performance as mentioned earlier in chapter 2.1.1.

> “Due to the growth of operational complexity and global competitiveness, firms have recognized the worth of establishing collaborative relationships with their supply chain partners.” (Mohamed, Omar and Wei. 2015.)

Mohamed et al. (2015) discuss five behavioral signals which contribute to building trust in collaboration. First, to create trust stakeholders need to keep their performance promises. This means that they need to deliver on time and with the expected quality. Second, professional and respectful relationships contribute to collaborative trust. I would say that professional and respectful relationships influence supply chain performance via a team’s dedication and on a team’s trust via positive commitment. This kind of a relationship makes partners to do their best for the common good. Third, openness

and information sharing increase trust and in my opinion this will affect performance via competence growth. Fourth, benevolent collaboration also improves the ability to perform through increased competences for instance via training and by helping partners. Fifth, empathy supports performance due to considering the needs and situations of partners and decreasing the feeling of individual risk, thus creating grounds for trust building.

Interactive performance helps to build trust in a community and at its best the community will help the individual to perform better. Jalava and Matilainen (2010, 81) clarify this by saying that an individual employee joins a community and its organizational culture by working and discussing issues in interactive relations with others in the community. This reveals individual competences and dedication, which gives the community the opportunity to help the individual to use her or his potential to learn and build trust further via increased individual performance.

Community performance in turn is needed to achieve superior results and high levels of competitiveness. Jalava and Matilainen (2010, 82) support this by stating that a high level of expertise is a communal property. They add, that a community can remember things better than individuals and that high-grade communal competence requires interactive relations and possibilities to think things together by sharing information and different viewpoints. They see information as a raw material for learning and building competence.

Jalava and Matilainen (2010, 88 - 89) continue that supportive, permissive and enabling company culture combined with networked working methods and supporting tools of social media are the basis for communal leadership. They say that this kind of an organizational culture produces experience of success, happy customers and long-term supplier relations as its resources.

Kärkkäinen (2005, 77) describes trust and justice to be the key elements of communal leadership. She adds that communal leadership is built on community values like trust, listening and justice. She continues that community leadership is about serving communal principles and about understanding the meaning of relationships and communication. Communal leader can lead people per these principles to accomplish common goals.

3.3 A Customer Need as a Challenge

> “Achieving good results over time requires perseverance as well as patience. A strategy that can help us to nurture persistence is to aim for small, successive wins. That is, instead of trying to achieve our end goal through a single step, we can scatter our efforts within a system.” (Hämäläinen, Saarinen and Jones. 2015.)

As expressed earlier, the selected strategy is to provide excellent customer experience by applying the developed collaboration process in requirements engineering. An excellent customer experience can be defined as an end goal which Hämäläinen et al. (2015) discuss. The end goal may be achieved by setting a customer need as a challenge and handling one challenge at a time, which in turn will leads to achieving an excellent customer experience.

If we succeed to uncover a true customer need and succeed in understanding, transforming and implementing it in the correct way, this will, need by need, lead to a good customer experience. If we collaborate in such a way that innovative solutions are enabled, the customer will gain more than expected. Löytänä and Korkiakoski (2014, 32) advise that to create customer-oriented innovations there are four viewpoints to consider. These viewpoints are that, one should meet the customer earlier, be lean and eliminate unnecessary phases for the customer, create added value for the customer and make them stay longer as customers.

Mäkirintala (2011, 92, 95, 98) writes about systems theory and describes that the application of this theory starts with a clear goal. She adds that goals define actions and all decisions should be made pursuing the selected goal. Attractive goals will give people energy and get people to flow towards completion. Energy as a basis of performance needs to be channelled in a productive way. It is not always even necessary to reach the goal but to have a direction to aim for. Steps towards the correct direction might be enough to succeed and successful completion might occur earlier than expected.

As an element of productivity, challenge lends collaboration a purpose as depicted in Figure 3 on page 13. If we think about the nature and formation in which cranes fly, we can easily agree that they have a common challenge, which is to arrive somewhere. They are all going to the same destination and they collaborate to reach the target. In their formation, they regularly change the lead. Thus, every member in the flock needs to know the goal they are heading towards. It is not enough that just some of them know where they are going.

> "Team members working on a certain requirement or interdependent requirements have to establish a shared understanding about this requirement in order to successfully coordinate requirement-related work." (Marczak, Kwan and Damian. 2009.)

> "In software engineering, it is well recognized that capturing requirements that truly reflect users' needs is crucial to the success of a system development effort. A major obstacle to getting the requirements right is the difficulty in obtaining a deep enough understanding about the application domain (e.g., Curtis, Krasner, & Iscoe, 1988). Decisions in technical system development need to be related systematically to this understanding." (Yu, Fickas, Giorgini, Maiden and Mylopoulos. 2010.)

As well as the allegory of the bird migration Marczak et al. (2009) also stress the importance of understanding a common challenge in requirements engineering. There must be a clear and shared understanding about a customer need and about the requirements it breeds. Yu et al. (2010) discuss that requirements should reflect customer needs to produce software successfully and that domain knowledge is imperative for success.

> "Meeting customer needs is a key success factor for product development, and customer involvement is considered to be essential for building successful software products…The typical product-centric approach…front-loads some customer involvement during the requirements phase but it leaves most of the customer validation until after the software or one of its features is released. Our study shows that a variety of methods are used to capture customer needs, but

> that direct interface and communication between the customer and the development team in the requirements elicitation process is scarce.” (Sauvola et al. 2015.)

Applying Sauvola et al. (2015) I would add that to meet customer needs, customer validation should take place as early as possible. The development team should be able to already participate in the requirements elicitation, analysis and validation phase, see Figure 10 on page 23 for the phase. Interaction with the customer or at least with requirements analysts and validation representatives will make building of successful software products possible.

3.4 Process Enables Clarity

Kärkkäinen (2005, 77) helps us to understand the importance of processes. She states that a communal leader will take care that the productivity of teams is kept under discipline, and to succeed in that there needs to be clear ways of working which are supported by defined processes. She continues that within these processes people have freedom and responsibility to do the work that suits them best to get results.

The virtues of processes are at least that they are repeatable, measurable, scalable and improvable. They present the possibility to transform knowledge via structured information sharing. By applying processes in projects the work gets a goal, a timeframe, and has roles and responsibilities. Collaboration becomes clearer and as stated earlier clarity is one important element of productivity, as shown in Figure 3 on page 13.

In the beginning of this thesis project I was assigned a challenge to improve cooperation between business and IT units in requirements engineering. The original assignment led to development of a collaboration process. The idea of the process is to ensure that business and IT units agree on a customer need in customer-oriented collaboration. Some of the recognized challenges include, how well a change request proposal describes the customer need, how well it is presented to or within the supplier team, how well it has been understood by the team, and lastly, how well it is described in the technical form of a functional or non-functional specification. One important aspect of developing the requirements engineering collaboration process is to make it as lean as possible to maximize customer value with fewer resources.

3.4.1 Needs Assessment

The needs assessment phase covers preliminary collaboration, initial analysis and reasoning of the customer or business need. As to the overall change request delivery effort planned to be used on this phase, see Table 2 on page 38. This value is based on the Pareto Principle, the 20/80 rule mentioned earlier in the chapter 2.2.2. Controlling the resources used in each phase of the process justifies them against customer and provider commitment in monetary terms.

The first step in the requirements engineering collaboration process is to place and receive a customer or a business need. All customer wishes, problems, requests, requirements and such placed by the provider can be considered as business needs. The provider presents the need to the supplier, who in turn registers it as shown in the process diagram in Appendix 1. For traceability, it is important to register all inputs on a wish list. To be lean and reduce waste, the list needs to be checked for overlapping or related needs before registration.

A fast, customer-oriented and effective tool for registering a business need is a user story or a large user story called an epic. An epic can capture a customer need and a user story captures functional and non-functional requirements. The “role-feature-reason format” of a user story was first invented by a team at Connextra in the UK in 2001 (Agile Alliance, 2015). Later recommended by Mike Cohn (2004) a user story can also be expressed in the following format: “As a <type of user>, I want <some goal> so that <some reason>”. He describes user stories to be short and simple, told from the perspective of a user or customer of the system. He continues that user stories strongly shift the focus from writing about features to discussing them. These discussions are more important than whatever text is written to create a common truth and trust among a community as mentioned in chapter 2.1.1.

> “Personas offer a great way to capture the users and the customers with their needs. They are fictional characters that have a name and picture; relevant characteristics such as a role, activities, behaviours, and attitudes; and a goal, which is the problem that has to be addressed or the benefit that should be provided.” (Pichler. 2014.)

As Pichler (2014) writes in his blog article “From Personas to User Stories” it is advisable to use personas for writing effective user stories and to ensure a customer-oriented approach. Schneidewind et al. (2012) carried out an empirical study of how personas support requirements engineering. Their study highlights three advantages of using a persona technique. First, the use of personas helps with focusing on user-centered requirements in engineering. It does not matter which the selected domain is because personas can be applied to different domains. Second, the persona technique helps to communicate product concepts to all stakeholders involved, see Figure 7 on page 19 for stakeholders. Third, personas are reusable in further phases and for the future needs of requirements engineering.

After a personified user story is registered, it is discussed in a change advisory board, see Table 3 on page 39 for roles and responsibilities. If the board accepts the customer or the business need for further preparation it will proceed to a preliminary review with technical supplier team members, see Appendix 1 for the steps of the collaboration process. If the board does not accept the need, a reason for the refusal is given to the customer or customer representative, the provider. If the customer or the provider accepts the justification for the decline, the case will be closed. If the justification is unacceptable, the need must be redefined and the process starts again from the beginning.

After a preliminary review with the technical supplier team members, it should be possible to give an initial workload estimation, see Table 2 on page 38 for workload estimation unit used in the needs assessment phase. This estimation is agreed in collaboration with technical and business supplier team members and the review process loops

until both parties agree about the initial workload. The outcome then proceeds to a review of the customer need with the customer or customer representative, where the preliminary workload estimation is presented as a basis for decision making and prioritization. Would the customer not accept this, the need must be redefined and the process starts all over again. If the customer accepts the preliminary results, the process will proceed to the next collaboration phase which is the feasibility study phase.

3.4.2 Feasibility Study

In the feasibility study phase, the user story already has an initial workload estimation and it has been accepted for further analysis by the internal change advisory board and by the customer or by the provider. The target of this phase is to produce a minimum viable product by preparing a change request proposal for review and acceptance. In Table 2 on page 38 we can see that the proposal phase would take 20 % of the total effort used, leaving 80 % for the project phase. According to the 20/80 rule mentioned earlier, 80 % of the requirements should be found and specified during the proposal phase, thus the rest of the requirements should be found during the project phase.

The Product Canvas tool shown in Table 1 below is a lean tool for the feasibility study phase, in which we analyze the customer or the business need further. This tool can be applied to prepare change request proposals. The Product Canvas should be completed with the information gathered in the preliminary collaboration phase. We already have our goal defined as a customer need and the target group identified by the previously mentioned personas. From the customer need it is also possible to derive validation metrics in the form of acceptance criteria.

Table 1. Product Canvas tool (Pichler 2010) applied as a template for a change request proposal.

Name *Descriptive name of the change request*	**Goal** *Customer need*	**Metrics** *Acceptance criteria with definition of done*
Target Group *Customer identification using personas and value creation analysis.*	**Big Picture** *Customer journey as a tool. Epics listed. Process descriptions and needed changes to the affected processes using scenarios and/or storyboards.*	**Details** *A validation test plan and technically implementable user stories.*

The next step is to sketch the big picture as shown in Table 1 above and prepare the change request proposal. This should be done by the business supplier team members

and presented to, worked on and accepted by the customer or by the provider. The big picture needs to answer questions like, which systems does the change influence and how do we need to change our processes to implement the required customer need. Customer journeys, epics, scenarios and/or storyboards could be utilized to better understand the whole picture.

In Lindorff Finland, technical product management are expected to know the effects of a customer need in the system environment and across products, whereas process developers are expected to know processes inside these systems. The process developers should be able to describe changes in processes in a way that software development personnel can understand the descriptions. Process diagrams would be a great tool for this.

The Product Canvas tool details shown in Table 1 on the previous page are a step towards functional and non-functional specifications. A change request proposal should include technically implementable user stories and a test plan on a general level to direct the validation of the customer needs and to support later verification of the functionalities. For a lean test design, only the most important test cases should be selected from the customer viewpoint by using the 20/80 rule. This would mean that preparing 20 % of all test cases to cover 80 % of the functionality. A test plan with user stories can be later used to define use cases of functional specifications if needed.

In Lindorff Finland user acceptance testing (UAT) are expected to take care of the details by answering how the customer will use the system, but this is not the right question for validation. At this point, it is not important to describe how the system will be used or how testing will be done, but to validate and ask whether we are looking at the right functionality to fulfil customer needs. In Lindorff Finland, a UAT coordinator could be responsible for ensuring that a test plan is created on time and that it is available for all stakeholders as early as possible during this collaboration phase.

After a proposal of the change request has been prepared, it is time to organize a workshop with the customer or customer representative, or both. A good practice is to send the prepared material for review and comments before the workshop. The workshop is more effective if the participants are all well prepared, know the subject of the workshop in detail and have possibly some questions and concerns. It is the facilitators' responsibility to send the workshop meeting invitations with the proper material enclosed and to help the stakeholders to understand what to prepare and when. Another good practice is for the facilitator to ask participants to send their questions and concerns before the meeting so that the supplier will have enough time to find answers before the workshop and present the answers in the workshop. This will save time during the workshop.

The facilitator should invite the right people to the workshop meeting. At least the provider and supplier both need to attend. The facilitator should invite supplier team members who know the systems which will be affected by the change, and who have defined changes for the required processes, and who have prepared the test plan for validation, not for verification as it should not be that important to the customer on this workshop. The change request proposal should be presented and analyzed together. All information collated in the Product Canvas should be reviewed and discussed. The change request preparation and workshop meetings should continue until the customer

accepts that the change request proposal fulfils the business need. Preferably it will be acceptable without further workshops.

If the customer is now ready to accept the change request proposal, the process continues with a change request proposal review with the technical supplier team members. The review should again be led by a facilitator who is familiar with the appropriate structure for this kind of a review. The facilitator can attend from outside of the requirements engineering organization or the person may be selected from the business supplier team members.

A detailed workload estimation should be possible to give after the review with the technical supplier team members, see Table 2 on page 38 for workload estimation unit on the feasibility study phase. This estimation is agreed in collaboration with technical and business supplier team members and the review process loops until both parties agree on the workload. The change request proposal is now finalized and ready for an internal change advisory board meeting, see roles and responsibilities in Table 3 on page 39.

If the board accepts the change request proposal for further preparation it will be either added to the product backlog, or if the board does not accept the proposal, a reason for the rejection will be given to the customer or customer representative, the provider. If the provider accepts the justification for decline, the case will be closed. If the justification is not accepted, the need must be redefined and the collaboration process starts again from the beginning.

3.4.3 Design

After the vital proposal phases of needs assessment and feasibility study it is time to move to the project phase, which contains the system design and requirement specification phase, see Figures 9 and 10 on pages 22 and 23. The responsibilities of preparation, invitation and presentation now shift from the business supplier team members to the technical supplier team members. The change request proposal has been accepted in the feasibility study phase and the order has been added to product backlog.

In the design phase, technical supplier team members prepare software requirements, both functional and non-functional specifications, see Figures 10 and 11 on pages 23 and 24. The test plan prepared and reviewed in the feasibility study phase will now be broadened with test case details to support verification of the software requirements. A facilitator in the technical supplier team will arrange and lead the presentation and review of these.

Software requirements are agreed in collaboration with technical and business supplier team members and the review process loops until both parties agree on them. The change request order is now finalized, accepted and ready for implementation. Before implementation, requirements management should accept and grant final permission to proceed on to implementation.

If the change request order is not accepted for implementation, a reason for the refusal should be given to the provider. If the provider accepts the justification for refusal, the

case is closed. If the justification is unacceptable, the need must be redefined and the process starts again from the beginning.

3.5 Discussion in Workshops and in Reviews

The community and productivity levels presented by Jalava and Matilainen (2010) are held together via communication. As a form of communication, discussion can be thought of to be an inevitable part of collaboration, as shown in Figure 2 on page 11. Discussion makes it possible to agree on a common truth among stakeholders about the present challenge. This idea is supported by Inayat, Salim and Kasirun (2012).

> "The communication of changes made in the requirements and of what needs to be done is of foremost importance in enabling the teams to develop a common understanding of the requirements and to coordinate with each other." (Inayat, Salim and Kasirun. 2012.)

Requirements engineering collaboration concerns coordination and communication, as I have depicted in Figure 5 on page 16. It is about ensuring that the right people are brought together and that they are supported to discuss the same goal to gain best results. Even if having a common goal related to a customer need, there might be challenges with languages. I see language at least as two-dimensional, as we use natural language for communication and utilize vocabulary of a professional language.

> "We have noticed that evidence which occur during the CR requirement phase were rooted in communication failures between stakeholders…Respectively, mitigation methods suggested for requirement risks focus on communication…" (Segal-Raviv, Hadar and Levy. 2015.)

Segal-Raviv et al. (2015) discuss facilitating collaboration between Commercial-off-the-Shelf software system stakeholders through principles of advanced information system development methodologies from the vendor perspective. They found in this empirical case study that open and effective communication and collaboration between stakeholders in the requirements engineering phase mitigated risks in later development phases. The identified mitigation methods they present are the planning game (PG), the storyboard technique and the concept of Definition of Done in user stories. See Table 1 on page 33 for storyboards and user stories applied to the Product Canvas tool.

> "Combining the two methods – PG and storyboard – could contribute to a more open and effective communication between customer and vendor in the early requirement phase, by exposing potential problems and settling disputes and misunderstandings that might not be brought up otherwise." (Segal-Raviv, Hadar and Levy. 2015.)

> "The SCRUM concept Definition of Done (DoD) in Users Stories, was brought up in the interviews as a good mitigation method…because it encourages communication between software engineers and project managers before a planned CR is handed for execution. DoD is a closed set of requirements that the user story development must fulfill before it is defined as 'done'. It helps SCRUM teams to work more collaboratively…" (Segal-Raviv, Hadar and Levy. 2015.)

> "…the suggested mitigation methods are practices that encourage communication and knowledge sharing between those stakeholders." (Segal-Raviv, Hadar and Levy. 2015.)

In Lindorff Finland there are multilingual teams who participate in requirements engineering of invoicing systems. These teams discuss most often in English. They have a versatile set of competences in different professions within these cross-functional teams. To avoid the communication failures discussed by Segal-Raviv et al. (2015) someone with effective communication tools is needed to coordinate the collaboration during workshops and reviews in requirements engineering.

There are multiple reviews held in every phase of the requirements engineering collaboration process as described in the process diagram in Appendix 1. The first three reviews are held during the needs assessment phase. The first review is an internal approval discussion about the received business need in the form of a user story or an epic, i.e. a large user story. The second review is held in collaboration with the supplier's business and technical team members to determine an initial workload estimation for the epic or user story, see Table 2 on page 38 for details. The third review is a discussion between the business supplier team members and a customer or customer representative to ensure that the business need has been understood correctly and that the workload is acceptable. The needs assessment phase ensures that all stakeholders are committed to proceed to the feasibility study phase.

The first and only workshop with the customer and/or with the provider is held during the feasibility study. In this workshop, the business supplier team members discuss with the customer or the customer representative about the business need in the form of a change request proposal. The proposal should to be presented in a customer friendly way to help with the discussion. A good communication tool for the workshop would be the storyboard technique suggested by Segal-Raviv et al. (2015). The feasibility study phase also includes a review with the technical supplier team members. To produce a detailed workload estimation as an outcome of this review cycle the planning game presented by Segal-Raviv et al. could be a suitable tool to produce more accurate workload estimations. A facilitator who is familiar with the tools is needed to lead the discussion in these collaborative events, see chapter 2.2.1 for more information about the role. The last review in the feasibility study phase is to check this detailed workload estimation internally and give permission to proceed to the project phase.

Discussing a customer need from the product management point of view is different from a similar discussion from the software engineering point of view, see chapter 2.2.1 for more information about the two. Requirements engineering can be defined as a dual level collaboration process, where product management vocabulary is interpreted for software engineering and vice versa. There should be supplier team members who understand both professional languages, as the goal is to transform the customer need correctly as a software product. The transformation should be done by creating preconditions for software engineering by the means of product management. Understanding and speaking the same language regarding the customer need creates togetherness and trust, see chapter 2.1.1 for more about trust.

3.6 Agreed Documentation as a Proof of Completion

In requirements engineering, completion of the collaboration process is reached via agreed documentation. The change request proposals agreed as orders and functional and non-functional specifications, they are all agreements. The idea is to document things in favor of information sharing and traceability, not just for the sake of documenting itself. It is very important that the goal of the work is always visible and that it transforms correctly and acceptably from a need via a proposal and a subsequent order into clear specifications.

> "A product or solution must address a need and must have a strong business vision. Requirements are a contract mechanism for the project internally and often for a client externally. They must be documented in a structured and disciplined way, allowing both technical as well as market and business judgment. Ask a tester to write a test case before processing the requirement. Ask the marketer in the team to check whether he or she can sell the feature as described. After evaluation, the core team can approve the requirements." (Ebert. 2014.)

Inayat et al. (2012) takes a different approach than Ebert (2014). They present an agile way of dealing with requirements and state that documentation should be reduced to a minimum and coordination should be supported with appropriate tools for instance with user stories. It is not necessarily a question about how detailed a change request description is, or about several hundred pages of specifications, but more about documentation as a tool for discussion. Jalava and Matilainen (2010, 78) state that the power of agreeing is in the discussion in which the agreement has been reached. The value of the documentation is to make decisions made in reviews and workshops visible for all. It also reveals tacit knowledge.

Table 2 below depicts documentation, suggested time-boxing using the 20/80 rule and the size of the workload estimation in the phases of processing a customer or a business need. This table contains information gathered in internal discussions in Lindorff Finland. The idea is to create agreed clarity in a spiral process by setting more detailed challenges and solving them round by round. Jalava and Matilainen (2010, 123) call this spiral learning process progressive problem solving.

Table 2. The phases of processing a customer need.

Phase	**Documentation**	**Total Effort Used**	**Unit of a Workload Estimation**
PROPOSAL PHASE, needs assessment	Initial analysis and reasoning in the form of an epic, a large user story.	20 %	T-shirt, i.e. XS, S, M, L, XL, XXL
PROPOSAL PHASE, feasibility study	Change request proposal based on an epic, a large user story.		Man hours
PROJECT PHASE, design, implementation, testing and delivery until production start	Functional and non-functional specification based on change request proposal as an order.	80 %	n/a

3.7 Roles and Responsibilities

With power comes responsibility. With responsibility, there should also be authority. Pichler (2016) discuss this in his article “8 Tips for Collaborating with Development Teams”. He feels that the team members should be involved in the decision-making process to achieve a strong buy-in. In his other article “Getting stakeholder engagement right” he adds that a stakeholder is interested if the matter affects the individual. Jalava and Matilainen (2010, 57) has a good point on this about dividing power and responsibility across the supply chain. They say that by doing it, the risks and rewards would also be divided and possibly in favor of current management.

Application of the requirements engineering collaboration process calls for defining roles and responsibilities. One way of defining these, is with a project management tool known as a responsibility assignment matrix, as shown in Table 3 below.

Table 3. Roles and responsibilities described in a responsibility assignment matrix.

Step	Task	Customer or Provider	Business/Product Leader	Business/Product Manager	Business/Product Facilitator	Business/Product Supplier	Technical Leader	Technical Manager	Technical Facilitator	Technical Supplier	Change Manager (ITIL)	Change Advisory Board (ITIL)
1	Communicate a business need	RA	I	C	I	C					I	
2	Register the need	I		A		R					I	
3	Approve/Reject	I		C		C					A	R
4	Preliminary review		A		R	C	I	C	I	C	I	
5	Initial workload estimation	I		A		R	I	C	I	C	I	
6	Approve/Reject	R	I	I	I	I					A	
7	Prepare a change request proposal			A		R	I	C	I	C	I	
8	Change request workshop	C	A	C	R	C					I	
9	Approve/Reject	R	I	I	I	I					A	
10	Change request order review		A	C	R	C	I	C	I	C	I	
11	Detailed workload estimation	I		C		C	I	A	I	R	I	
12	Approve/Reject	I		C		R	I	C	I	C	A	
13	Approve/Reject	I		C		C	I	I	I	I	A	R
14	Prepare technical specification			I		I	C	A	C	R	I	
15	Technical specification review			C		C	A	C	R	C	I	
16	Approve/Reject	I		C		R	I	C	I	C	A	
17	Approve/Reject	I		C		C	I	I	I	I	A	R

R = responsible, A = accountable, C = consulted, I = informed

To determine the appropriate roles, we can use the requirements engineering stakeholders defined in chapter 2.2.1. I have combined these roles with the Information Technology Infrastructure Library (ITIL) based roles of the change manager and change advisory board, see Table 3 on the previous page. Persons appointed to the role of change manager invite and chair the meetings of the change advisory board. In the ITIL change management process, the change manager is the ultimate decision making authority.

If we consider the roles at the supplier team level and utilize an agile method known as Scrum, the roles of a supplier team would include that of a Product Owner, a Scrum Master and a development team. The role of a Product Owner would consist of all the business and product roles in the responsibility assignment matrix in Table 3. The Scrum Master would assume the roles of technical leader and technical facilitator mentioned in the same table.

The Scrum Master is viewed as a servant leader and serves the team and the Product Owner. Persons in this role have no authority within the team. Watts (2013), who is one of the leading Scrum thinkers in the world, states that the Scrum Master is not necessarily needed if a development team is a high-performing, self-organizing team with a good relationship with the Product Owner, and have a keen understanding of the Scrum framework, and do not need facilitation and have no impediments which need removing. It would require highly performing individuals who can collaborate easily, but these kinds of development teams are rare.

> “Being the product owner is no solo act. The product owner is part of the Scrum team and closely collaborates with its other members. While the ScrumMaster and team support the product owner by jointly grooming the product backlog, the product owner is responsible for making sure that the necessary work is carried out.” (Pichler. 2010.)

Pichler (2016) states in his article “8 Tips for Collaborating with Development Teams” that a product owner should focus on managing the product, not the team. He explains that in this role one should help the team acquire the relevant business and product domain knowledge and ensure that the team is aware of the product strategy and product roadmap as well as the business goals and key performance indicators, the KPIs. He continues that the Scrum Master or coach should tackle people, process and organizational issues. The development team should find out what is needed to be done to implement the user stories and other product backlog items.

> “The product owner and ScrumMaster roles complement each other: The product owner is primarily responsible for the “what”— creating the right product. The ScrumMaster is primarily responsible for the “how”—using Scrum the right way.” (Pichler. 2010.)

Table 3 shows the business and product roles and the technical roles. People appointed to the business and product roles are responsible for creating the right product and those appointed to the technical roles are responsible for how the development of the product is carried out. This division follows the way Pichler (2010) describes responsibilities of what and how.

Business and product management and supplier team members are accountable and responsible for the requirements engineering of the proposal phase and the technical

management and supplier team members are accountable and responsible for the requirements engineering project phase. Likewise, the business and product leader and facilitator are accountable and responsible for proposal phase reviews and workshops, while the technical leader and facilitator are accountable and responsible for project phase reviews. See Table 2 on page 38 for the difference between the proposal and project phase. One should notice that one person can switch between the roles if needed.

4 MEASURING CUSTOMER-ORIENTED COLLABORATION AND PERFORMANCE

Measuring is a tool for management and leadership. Spiik (2003) describes the importance of measuring by stating that we manage what we measure. Löytänä and Korkiakoski (2014, 52) support this idea and state that leaders need meters to measure the effectiveness of strategies and to measure success in implementing them.

Niemelä, Pirker and Westerlund (2008, 105 - 110) explain that good meters are needed to combine strategy with operations. They add that all meters should be connected to strategic goals. They also emphasize that a certain number of meters are needed to cover all aspects of the process and that overall efficiency is formed by availability, performance level and quality. As described earlier, customer-oriented collaboration can also be thought of as a process which requires multiple meters to be fully measured.

Measuring collaboration can be done on several levels, between stakeholders and in both directions because collaboration is about two-way communication. This thesis is restricted to measuring provider-level and supplier team internal customer experience in one direction, towards members of a supplier team who are responsible for delivering technical solutions. I have depicted the levels and the direction of measuring with red arrows in Figure 13 below.

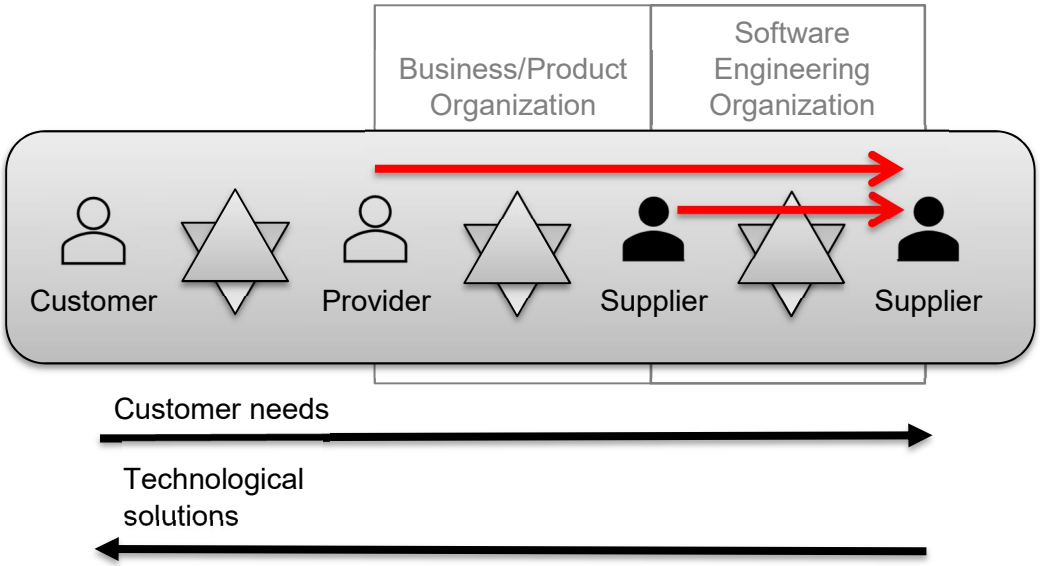


Figure 13. Measuring between stakeholder groups.

Malmi, Peltola and Toivanen (2002, 64) explain that meters can be derived by using causality based on balanced scorecard perspectives. The strategy of this thesis development project is to pursue excellent customer experience by seeking high-performance. People and communities with high-performance will enable innovations and will provide the opportunity to exceed customer expectations. This would create competi-

tive advantage and increase profitability, as described in Table 4 below. Superior performance is generated by increasing competence and dedication. Dedication combined with lean thinking drives effective operations and this increases profitability. Järvinen (2014) supports this with the idea of dedication being a basis of effective operations.

Table 4. Causality of goals based on balanced scorecard perspectives by Kaplan and Norton referred by Malmi et al. (2002, 16).

Perspective	**Goal**
Financial	Profitability via competitive advantage reached by excellent customer experience. Profitability via efficient customer-oriented collaboration.
Customer	Excellent customer experience via dedication and innovations. Innovations created in customer-oriented collaboration.
Efficiency	Dedication with lean thinking.
Learning	Competence growth through productivity. Growth of competence increases dedication.

To measure as shown in the Figure 13 on the previous page two meters are selected. Stakeholder experience is measured with the Net Promoter Score™ (NPS) and another meter is selected to understand supplier's performance as a probable explaining factor of stakeholder experience. Supplier performance will be measured on four levels of productivity, competence, dedication and potential, with the same scale as the NPS. Using the same scale will also help the respondents answer more intuitively.

4.1 Customer-oriented Collaboration

Customer experience is created directly in moments of interaction. Not only in face-to-face meetings and during phone calls, but also in virtual interaction when chatting, emailing, engaging in online meetings and so on. It is also formed indirectly by the way we treat others who interact with our customer.

Achieving an excellent customer experience requires more than just good interaction. It requires empathy towards the customer and other stakeholders. To meet customer expectations, we need to identify ourselves with the customer. To exceed customer expectations, we need to subtly and appreciatively educate the customer because we probably have more knowledge at that moment to provide something innovative which will surprise the customer.

Ruotsalainen (2014) presents possibilities for working in favor of a customer by explaining that it is easier to find items to improve a service or a product if we understand our customer. He continues that understanding a customer will lead to improved quality and will open opportunities for innovations to take place. He also adds that at its best employee performance is about working for the customer of a client.

Pichler (2016) wrote about creating value for customers in his blog article titled “8 Tips for Collaborating with Development Teams”. According to him, value creation requires creativity. Innovative people need to have time to investigate new subjects to unleash their creativity.

Productive skills and abilities reveal competence and are a part of individual performance. Community performance offers a solid base for individual performance growth towards creativity and innovativeness. In a community members have the opportunity to share and utilize their competence in discussion. By supporting each other, members can collaborate, understand a customer more deeply and find better solutions to customer needs than alone. Thus value creation via customer-oriented collaboration will result in excellent customer experience.

Net Promoter Score™

The Net Promoter Score™ (NPS) was created by Frederik F. Reichheld in 2002 to simply and effectively measure customer experience. Reichheld is a director emeritus at Bain & Company and the author of many books and articles dealing with customer experience. Bain & Company is a leading management consulting company and they help top executives to make better decisions. They state that in their guidance that those decisions are converted into actions and deliver desirable and sustainable success.

Reichheld (2003) points out that NPS is based on and proven by vast amount of practical research data. He continues that NPS “enables companies to gather customer feedback and report results in real time, funneling it directly to frontline employees and managers”. The NPS method is quick and the results can help to develop an organizational culture of excellent customer experience. It would be even possible to display NPS results in real-time to all employees for instance on a company intranet. By these means it would be possible to lead the organization more effectively towards a true customer-orientation and gain a large competitive advantage.

As a specific example, Reichheld (2003) emphasizes that an excellent customer experience might be the only way to appear advantageous in saturated markets. He sees that the “…only path to profitable growth may lie in a company’s ability to get its loyal customers to become, in effect, its marketing department”.

> “The path to sustainable, profitable growth begins with creating more promoters and fewer detractors and making your net-promoter number transparent throughout your organization. This number is the one number you need to grow. It’s that simple and that profound.” (Reichheld, 2003.)

> “NPS immediately categorizes all customers into one of three groups – promoters, passives, and detractors – allowing employees throughout a company to see right away whether a customer experience was a success or a failure – and why. NPS is generated by asking customers a single question, “How likely would you be to recommend [this company or product] to a friend or a colleague?” Respondents giving marks of 9 or 10 are promoters, the company’s most devoted customers. Those scoring their experience 7 or 8 are passives, and those scoring it from 0 to 6 are detractors. NPS is the percentage of promoters minus the percentage of detractors. Customers are then asked to describe why they would

> be likely or unlikely to recommend the company. The insights gathered from their answers enable employees to quickly identify issues that create detractors – and the actions required to address them." (Markey, Reichheld and Dullweber, 2009.)

Löytänä and Korkiakoski (2014) support Markey et. al. (2009) while stating that NPS is a method to measure and develop interaction with customers. They stress that NPS is only a measurement tool, and that it is more important is to listen customers. I would specify further that listening needs to be transformed into understanding to create value to the customer.

Löytänä and Korkiakoski (2014, 52) define three elements for measuring customer experience. These are financial, customer and employee meters. Shareholder value is created by achieving appropriate financial results and goals. Löytänä and Korkiakoski explain that development of shareholder value may be followed with the help of customer and employee meters. Customer meters indicate that interaction with customers develop in the right direction. Whereas operative efficiency and cultural change towards customer-orientation are guided by using employee meters. In my opinion NPS may also be used as a tool for the employee. It is possible to measure NPS in interaction with people because we are all customers of each other.

There are also other meters to measure customer experience. Löytänä and Korkiakoski (2014, 56 - 57) mention Forrester's Customer Experience Index (CXi) and Customer Effort Score (CES). CXi is designed for US markets and it is somewhat like the Finnish EPSI rating. Löytänä and Korkiakoski notify that both CXi and EPSI are limited to providing comparison within selected industries, but provide less value for developing the customer experience of a company. They say that NPS and CES are equally valuable for measuring interaction with customers, but continue that the greatest difference between the two is in measuring the level of promotion or effortlessness.

Löytänä and Korkiakoski (2014, 141 - 143) also discuss the improved version of NPS which broadens the basic NPS question by asking also what the provider should do to make the respondent more likely to promote the provider improve the customer experience that way. Their idea is to ask the stakeholders who have the biggest impact from the business perspective the right questions. They note that timing should be separately considered by the company. Lastly, they state the response rate needs to be adequate to be reliable.

4.2 Performance

Ruotsalainen (2014) explains that performance should be lead with the customer perspective in mind, and with the goal of providing excellent customer experience by delivering superior performance. He justifies this perspective with the constantly changing environment. Nowadays it is hard, or even impossible to define performance per some static performance evaluation elements, thus performance should be taken as an ability to adapt to constant change.

In Rantala's (2014, 68) opinion, performance is about being productive and having potential, competence and dedication. He states that these elements depend on each other. The formula in Figure 14 on the next page describes relation of the elements.

From this formula, it can be deduced that if even one of the elements is poor, the whole performance will be ruined. In other words, if the goal is to achieve superior performance, we need to take care of and develop all elements of performance.

$$Performance = Productivity \times Competence \times Dedication \times Potential$$

Figure 14. Dependency of performance elements (Rantala 2014).

At work, productivity could be interpreted as working. Rantala (2014) states that by doing the work, competence will be revealed. He continues that dedication will differentiate the best performers from the good and adds that the potential to develop is also a very important part of performance. These four elements were measured during this development study in addition to the NPS.

The ability to perform affects the trust of stakeholders. Poor quality or not being on time has negative effects and vice versa, positive performance consists of good or excellent quality and timely deliveries. Trust is needed for collaboration. Collaboration in turn is needed in partnership. Partnership between team members is needed for creating innovations. Customer-oriented innovations lead to excellent customer experiences and competitive advantages, finally ensuring profitability. According to Järvinen (2014, 28 - 29), to increase the quality and speed of performance of a team, a team leader needs to focus on developing and optimizing all elements of performance on both individual and community levels.

4.2.1 Productivity

Just as Jalava and Matilainen (2010, 94) present in their model of dynamic work community leadership, productivity is all about challenges, clarity and completion, see chapter 2.1.1 for details. Rantala (2014, 69) notes that productivity reveals competence and it reflects respect and dedication towards common goals. He continues that the easiest way to learn is to work. In other words, working and being productive increases competence. Ruotsalainen (2014, 50 - 52) discusses the spiral of potential. In practice, it means that by working it is possible to learn more and increase competence in cycles. With increasing competence, it is possible to take more responsibility and be more independent. Step by step competence and independency will lead to dedication. Competence and dedication will grow faster if the community supports development.

Rantala (2014, 69) continues that a strong organizational culture of productivity should encourage knowledge sharing and experimenting different working methods with colleagues. He states referring to Gary Hamel (2007) that being proactive is one of the most important skills. He sees proactivity as a first phase of productivity and explains that productivity as an element of performance requires energy. The level of accuracy of productivity will be shown as competence and dedication. Proactivity together with energy and accuracy will improve customer experience via high-level performance no matter what the product or service is.

4.2.2 Competence

Rantala (2014, 70 - 71) explains it is important that a work community knows what kind of competence is needed and whether there is a need to develop areas of competence related to customer expectations and competitiveness. He claims that competence is more than just having a set of skills. He reasons this by stating that competent people can optimistically focus their skills correctly and they can do their work without being heavily stressed. He continues that competent collaboration is based on individual ability to take responsibility required by the role, see more about roles and responsibilities in chapter 3.7.

Rantala (2014, 71) emphasizes that competence may be measured by quality and should also be measured related to results. This relates to the model of dynamic work community leadership by Jalava and Matilainen (2010, 94) because competent productivity with clearly completed challenges will ensure good results in respect to quality. If competence and productivity are combined with decent customer-orientation, the results will provide value to the customer and will also increase trust in collaboration. Vice versa, if the degree of competence is inadequate trust will decrease due to a lack of quality and because of poor results.

4.2.3 Dedication

To Rantala (2014, 68), dedication is an element which distinguishes truly great performers from the good. He links dedication to a positive attitude by discussing drawbacks of missing dedication. Dedication comes into existence with a positive attitude towards productivity and common goals. It grows by creating trust between stakeholders and team members, by committing to required performance levels and by being persistent enough to reach completion. Dedication is also closely linked to making good decisions related to work. It leads to courage and boosts the ability to dive into a challenge ahead. See chapter 2.1.1 for the mentioned productivity elements of challenge and completion and chapter 2.1.2 for the community elements of discussion and trust.

Kärkkäinen (2005, 75) states that in community organizations commitment can be exceptional. She continues that a healthy community organization has values which support the community. The community works well together and it should be rewarded for collaborative performance. This way an organization will become more effective and efficient.

Ruotsalainen (2014, 36) agrees on the importance of community performance by stating that if employees show dedication by only committing to personal goals at work, this can lead to decreased performance from the organizational perspective. Relying on Mäkirintala (2011, 112 – 113), I believe that optimized individual performance supported by smooth community performance will raise dedication to a passionate level and thus result is a superior quality.

4.2.4 Potential

We all have potential. Our physical and mental energy makes it possible to take advantage of our potential. This requires the willingness to take care of ourselves. We need to ensure that we are physically healthy and that we are mentally optimally loaded, and not overburdened.

Welbourne (2014) PhD, the Director of the Center of Entrepreneurship at the University of Nebraska, explains that energy is the ability to do work, and firms that optimize and direct employee energy to meet critical goals create long-term competitive advantage that drive sustained growth. She continues that in order to grow, innovate and create high performance organizations, employee energy at work must not be maximized, but optimized and directed.

Welbourne's (2014) research has shown occupational differences where employees say they are at their best. It is very interesting that according to their results, for instance, human resources and sales professionals reported having higher optimal energy than programmers and engineers. As having working experience of the latter, I assume that somehow optimal energy is related to the requirement of stress-free environment in professions which most of the time require a high level of concentration.

4.3 The Inquiry of Stakeholder Experience and Performance

One part of this thesis work is to conduct a stakeholder inquiry. The inquiry was launched in Spring 2016 with a questionnaire, see Appendix 2. The questionnaire was developed for measuring stakeholder experience in requirements engineering supply chain collaboration and to research performance as an explanatory factor of the stakeholder experience. During the inquiry, answers were requested two times in a formal way. The second round of the inquiry was arranged in Autumn 2016.

In the first round of the inquiry, the questionnaire was delivered to the respondents on paper and mainly face-to-face. Thus, it was easy to ensure that the respondents answered about the correct object and it was also easy to record the role of the respondent. The questionnaire concerned the performance of outsourced development teams and the respondents' experiences of the teams.

In this first round of the inquiry, the respondents gave feedback which led to improving the questionnaire. One of the respondents reported not to be directly working with a development team but a maintenance team, so I supplemented the questionnaire with an option to select whether the respondent is answering questions about a development team or about a maintenance team. See Appendix 3 for the improved version of the questionnaire.

In the second round of the inquiry respondents were asked to fill in a questionnaire and reply by email. Furthermore, if they wanted to be totally anonymous, they could electronically fill in the questionnaire, print it and send it to me via company internal mail. Seven respondents used email and two of them used company internal mail. The second round is lacking some important responses, four answers were not received at all.

The respondents were people working in daily collaboration with the other of the outsourced technical suppliers.

The detailed information gained in the second round about direct contact and contact frequency was utilized for the answers given on the first round as well. The answers of the second round were linked to the respondents utilizing the role information recorded in the first round and the email addresses of the respondents. The roles are not present in the results because only the contact type, indirect or direct, and frequency of the contact were analyzed from the customer experience point of view.

4.4 Results of the Inquiry

Confidential information.

5 VALIDITY AND RELIABILITY

In this chapter I will evaluate the validity and reliability of this development study and of the inquiry conducted as a part of the study. The study and the inquiry may be thought of as parts of the master's thesis project as well as this report is a part of it. The development study is mainly a qualitative piece of research. However, as quantitative information was requested in the inquiry, the validity and reliability of the inquiry must be considered too.

Kananen (2012, 161) explains that results and conclusions of a thesis development study should be correct and credible. It should be possible to rely on the results and conclusions. He continues that one of the measures of a thesis is its quality. Kananen states that in science validity and reliability explain quality from two different perspectives. Validity is about selecting the targets of measurement and deciding which meters to use to measure the target. Reliability concerns measuring and the correctness of the results.

Kananen (2015, 111) continues in his later publication that the reliability analysis of a development study is challenging because it is a combination of qualitative and quantitative research to solve an assigned challenge. He adds that reliability needs to be evaluated according to the methods used.

5.1 Evaluation of the Inquiry

Löytänä and Korkiakoski (2014, 133, 141) write about an important aspect of measuring. They question whether the results provided by meters are sufficiently valid and reliable to enable corporate management to make decisions based on them. They point out that the requirement of validity is that the right questions are addressed to the right target group at the right time. The results unveiled by the applied meters should be evaluated also from the reliability perspective. Reichheld (2003) supports Löytänä and Korkiakoski by explaining that the most basic surveys, which contain the right questions, can allow companies to report timely data that is easy to act on.

Validity

Kananen (2012, 168 - 169) explains that quantitative research aims to make generalizations based on the measurement data. External validity is about evaluating the level of generality. Kananen writes that if quantitative data is about a population and if the population is very small, external validity is not big a concern. The inquiry done during this development study was targeted at the performance of two outsourced suppliers and about the stakeholder experience they create. Respondents were selected to represent all company internal stakeholder levels. Company external stakeholders were excluded. According to Kananen, if company external stakeholders would be involved in the inquiry, then I should have paid attention to the external validity, population and a sample.

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Internal validity as Kananen (2012, 169 - 170) describes it means using suitable meters. A meter should measure the matter which is being studied. He states that one should use meters which have been used in previous studies and which have been tested. The Net Promoter Score used in the questionnaire is a globally used meter. Lindorff Finland also uses it to measure proprietary services provided by the company. The meter is thus previously used and well tested.

Measuring performance elements as an explanatory factor of stakeholder experience sufficiently measures the item being investigated. However, is not as widely used as the Net Promoter Score. The internal validity of this meter is not as good as with the Net Promoter Score. One should further study and develop the internal validity of this meter.

Reliability

Kananen (2015, 167) states that reliability is about the stability and consistency of the research results. Stability gauges the stability of the meter during a period and consistency measures that the parts of the meter measure the same matter. He states that the only way to confirm reliability is to measure items at least twice. He adds that even this is not an explicit way to ensure reliability, because the item itself may change over time.

As there were two rounds in the inquiry it may be stated that I have at least attempted to confirm the reliability of the measurements. The results show that the items did not change between the measurements. As the results of the questionnaire are quite similar in the both rounds I would suggest that the meters are stable and the consistency is acceptable.

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Another interesting aspect is whether the company the respondents work for has effected the responses, because the questionnaire originated from Lindorff Finland. What would the effects have been on the responses if the questionnaire had originated from the outsourced supplier companies? Were the respondents more open as the Net Promoter Score and performance were measured by the company they are working for or would the respondents have been politer if the Net Promoter Score had been measured by the supplier companies?

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5.2 Evaluation of the Development Study

Kananen (2012, 172) states that evaluation of the validity and reliability of qualitative research is harder than for quantitative research. This is because the meters of validity and reliability are adopted from natural science, such as physics, and applied to social science. He adds that qualitative research can be evaluated based on credibility, transferability, dependability and confirmability.

Kananen (2012, 164 – 166, 173) explains that accurate documentation creates credibility for a thesis development study. He continues that in a credible thesis development study all selections, decisions and solutions and their reasoning should be documented. Documentation is needed for traceability and for justification of the results. A valid and reliable basis for a development study is the master's thesis report itself. In the report, there should be a description of what has been done, why it has been done and how it has been done. This also affects the dependability and confirmability of the study because it provides an audit trail for the readers.

In this master's thesis report the assignment of the project has already been described in the introduction. The strategy and the goal has been explained and the approach has been described in detail with measurement data and analysis in chapters 3 and 4. In the summary, there is also a textual timeline describing what was done and when. In this report, there has been an attempt to clearly separate the opinions of the author from the theory and from the opinions of others. The report aims to reflect on the thoughts and actions of the author during the development study and express this reflexivity in this report. There is room for improvement, but still this master's thesis is sufficiently trustworthy to be presented.

Kananen (2012, 178) explains that triangulation can be used in extensive research and development projects. He continues that triangulation as a research strategy is applicable for solving complex challenges. Kananen also points out that triangulation is a combination of different data collection, analysis and interpretation methods. He adds that if different approaches produce similar results, the research results can be considered trustworthy.

Relying on Kananen (2012, 178 - 179) I have used theoretical triangulation to prove my approach and to increase the quality of the development study. In the chapter 2 I have combined various aspects of customer-orientation, leadership, performance management, software and requirements engineering to prove the importance and nature of collaboration between business and IT units. All perspectives appeared to support each other, rather than undermining themselves. Based on Kananen (2012, 180) I have also used triangulation of multiple methods in which I have combined qualitative research with quantitative research.

Kananen (2012, 175) notes that transferability refers to the trustworthiness of research results in similar cases. He continues that the researcher enables transfer by giving as accurate a description as possible about the development area. He adds that in qualitative research the person who enables the transfer holds the responsibility for it.

In my opinion the approach of this development study is transferable. I have successfully applied the leadership model presented in chapter 2.1 not only in requirements engineering in Lindorff Finland but in other environments too (see an example of it in chapter 6). I believe that the approach developed during this master's thesis study for business and IT units to successfully agree on a customer need is also transferable on multiple levels from one product to another, from one service to another, from one organization to another and from one company to another. Transferability is applicable in environments where customer needs must be identified, analyzed, validated, specified and verified, in other words transformed from business to IT.

6 SUMMARY

In the spring of 2014, I applied for Management of Technology Competence, Master of Engineering training programme at Turku University of Applied Sciences (TUAS) because I wanted to learn more about leadership. Due to having a technical background I also wanted to understand more about people who work from a business perspective. As a student of the training programme I enrolled in a course of leadership and management skills at TUAS in the spring of 2015. On that course, I got to know about the model of dynamic work community leadership by Jalava and Matilainen (2010) and got excited about it.

During the autumn in 2015 I received an assignment for my master's thesis from my employer Lindorff Finland. The assignment was to ensure better cooperation between business and IT units. I started to collect material for the thesis and read books and articles on the subject. I also started to find out how to further delimit the subject by discussing the topic with top and middle level IT management for Lindorff Finland. Based on these discussions the subject was limited to requirements engineering.

The original objective of the research for this development study was to collect information during workdays by taking notes daily, but this approach was narrowed to a few collaborative workshops. During the first quarter of 2016 I arranged a few internal company workshops to gather information on how we were doing requirements engineering at that time in different product teams. All Lindorff Finland's products were represented in the workshops. There were personnel from the Finnish organization representing information services, invoicing and part payment services, as well as invoicing and collection services. *Confidential information.*

In one of our workshops I presented some agile product management tools, such as the Product Canvas tool by Roman Pichler (2012). Later we applied parts of the Product Canvas tool to requirements engineering in collection services change request process and tried out for example personas in action, see Table 1 on page 33 for clarification*. Confidential information.*

In the spring of 2016, the development study was further restricted to invoicing services and within this product it was delimited to two invoicing systems. *Confidential information.*

I arranged the first round of the inquiry in Lindorff Finland to find out our experiences towards the personnel working in these outsourced functions.

During the summer in 2016, I took a study leave period to write the first version of the master's thesis report. It was exciting to see how multiple theories of customer-orientation, leadership, performance management, software and requirements engineering

supported each other and finally melded together as one approach for business and IT units to agree on a customer need. Meanwhile organizing my thoughts and the content of this master's thesis report I also prepared the skeleton of the customer-oriented collaboration process for requirements engineering.

The autumn of 2016 came and it was again time to measure experience of the requirements engineering stakeholders. I had improved the questionnaire based on the verbal feedback I obtained during the first round of the inquiry. The preliminary version of this report was ready and my instructors at Lindorff Finland gave me feedback about the work done. I also had an opportunity to participate on TUAS 10th anniversary jubilee celebration in honor of master degree education in engineering. I prepared a poster, shown in Appendix 4, and joined the event to present the poster to the audience.

At the start of 2017 it was time to wrap up the master's thesis report. The customer-oriented collaboration process for requirements engineering was reviewed internally. After the review I drew the process, shown in Appendix 1, with the MS Visio computer program and sent it for internal acceptance.

The collaboration process provides a basis for further development of customer-oriented collaboration in requirements engineering and it can be iteratively improved. The plan is to review the process internally in different departments. The process will be possibly presented to invoicing clients as well.

> "The IT function, whether in-house or outsourced, must be part of the business, working in partnership with other functions to deliver business transformation and exploit business opportunities." (Thompson. 2005.)

According to Thompson (2005), IT units as business partners need to support business transformation and help to exploit business opportunities. To support business this way, IT units need to understand that everything that is done is done to create value, and this means value for shareholders, for clients and their customers. Both business and IT units need to know how to create value for these stakeholders.

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If Lindorff Finland manages to improve its competitiveness and profitability by producing an excellent customer experience by applying the outcome of this thesis, it proves according to Jalava and Matilainen (2010, 64) that the company has strategic competence. To prove that by applying the results of this thesis actually does improve competitiveness and profitability, Lindorff Finland would need to continue measuring stakeholder experience in requirements engineering and use that information as a basis for

improving the collaboration of business and IT units and to support the transformation of IT units to become business partners.

If Lindorff Finland measured collaboration from the customer-orientation perspective it would advance growth in enthusiasm towards clients and their customers. In my opinion, the IT supply chain actors could be rewarded for producing excellent stakeholder experiences. By changing the mindset of IT supply chains to always put the value creation first it might considerably improve competitiveness and profitability.

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I think that it would be good to have an open mind and the willingness to share information as much as possible to strengthen collaboration. Successful collaboration would also ensure that tacit knowledge is available to everyone involved because people are motivated to talk to each other and support each other in understanding the importance of a common goal.

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> "So there is much yet to be done, both to change the image and function of the IT organisation and to equip IT professionals to meet the demands of wider responsibilities. In particular, the IT professional of the future, at all levels in the IT organisation, will require a much broader set of skills and competences than in the past. Leadership capability, business planning and change management skills will be essential, as will the full range of soft skills needed for successful business transformation and organisational change." (Thompson. 2005.)

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I have consciously improved my leadership skills and because of this master's thesis development project I now have in my hands a great leadership tool to apply to lead collaboration in dynamic work communities. I have also adopted a customer-oriented mindset for creating value for both shareholders and for clients and their customers. I understand how to support IT productivity as an element of performance.

In the spring of 2017, I have had a great opportunity as a trainer at the Turku Christian Institute to apply the model of dynamic work community leadership by Jalava and Matilainen (2010) on a course focusing on customer experience in web design. After

this experience, I am increasingly excited about the model because it also really works in practice in that kind of an environment. To me the model seems to be applicable to many leadership situations and I will use it in the future as one of my leadership tools.

To me it is easy to apply the model as I think I understand it well. In my opinion the elements of the dynamic leadership model can be ordered by causal relation to form flawless collaboration. To me it is no longer surprising that supportive community elements will come first and productivity elements are built on top of the community. I would put the elements of the dynamic leadership in the following order: discussion, truth, trust, challenge, clarity and completion.

I place discussion first because it is essential for collaboration. I set the establishment of a common truth as second, because it is formed by discussion between the participants. I see a common truth as a common belief based on known facts. This truth recurs every time the participants change. A common truth creates trust and trust strengthens collaboration.

I would place the productivity element of challenge fourth. In requirements engineering, I see that a customer need is the challenge. As a common goal, it gives collaboration a purpose. Clarity I would place as fifth, because productivity requires processes to be applied in projects. A customer-oriented collaboration process provides a structure to apply in requirements engineering. Projects have clear elements, such as a start, an ending, targets, roles and responsibilities. To get the work done, I see completion as a natural last element of these six aspects. In my opinion, in requirements engineering completion is reached via agreed documentation.

This journey has been very interesting and rewarding. It was possible with perseverance and some sacrifice. This master’s thesis would not have been completed without the supportive people around me. Now it is time to move on and to positively look ahead and remember that we are all each other’s customers.

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The Requirements Engineering Collaboration Process

Confidential information.

The Questionnaire for Measuring Stakeholder Experience

IT-OHJELMISTOTOIMITTAJAKYSELY

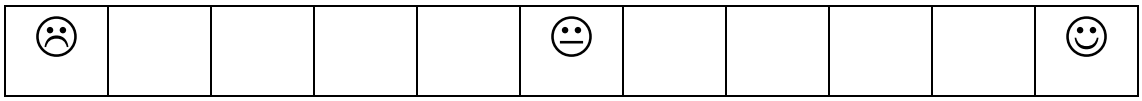
IT-ohjelmistotoimittaja _____Päivämäärä _____

Tuote ☐ Informaatiopalvelut ☐ Perintäpalvelut

☐ Lasku- ja erämaksupalvelut ☐ Saatavien osto

☐ Laskutuspalvelut

Toimittaja on **aikaansaava**?



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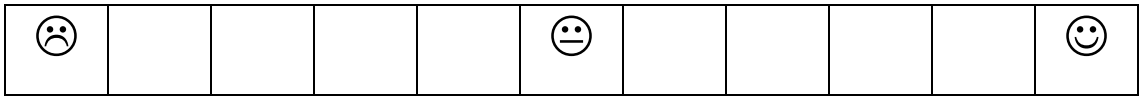
Toimittaja on **osaava**?



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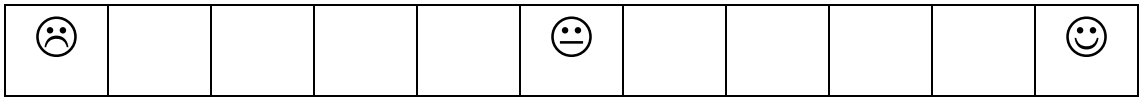
Toimittaja on **omistautunut**?



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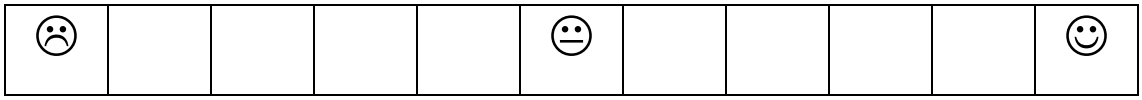
Toimittaja on **kehittymiskykyinen**?



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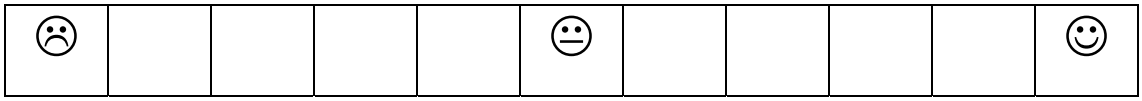
Kuinka suurella todennäköisyydellä suosittelisit toimittajaa kollegoillesi?



en suosittele *suosittelen*

Mitä muutoksia toimittajan tulisi tehdä, jotta suosittelisit heitä todennäköisemmin?

_____

_____

The Improved Questionnaire for Measuring Stakeholder Experience

Confidential information.

The Poster for TUAS 10th Anniversary Jubilee of Master Degrees in Engineering

Customer-oriented Collaboration in Requirements Engineering

#Excellence In Action

Kati Vainio (me@kativainio.net)
Client: Lindorff Oy

Supervisors: Eila Jylhä, Tommi Marttila, Monika Aho

IT as a Business Partner

The assigned goal of this development project was to ensure better cooperation between business and IT in requirements engineering (RE). The project was limited to two invoicing systems' change request process.
The approach taken was to develop customer-oriented collaboration between a change requestor and a supplier team, and within the supplier team. How to form a successful partnership between these stakeholders was a core question.

Keywords

- Requirements Engineering
- Customer Experience
- Customer-oriented Collaboration
- Community Leadership
- Performance Management

Theoretical Basis

For studying how to build partnership for requirements engineering, a leadership model was used together with REBOK* and a traditional software engineering V-model. In the study it was deduced that excellent customer experience is reached via customer-oriented collaboration and high-performance. This will increase profitability by securing competitive advantage via innovations.

*Requirements Engineering Body of Knowledge

Methodologies

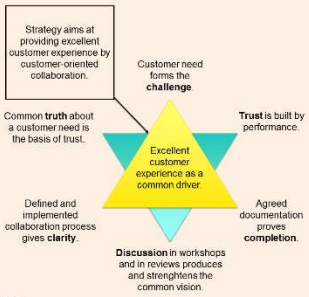
This study is a qualitative research. Mind map technique was utilized in various phases e.g. when analyzing the selected theories. In order to support the development of leadership in the stakeholder collaboration, performance and stakeholder experience were measured by a questionnaire. Workshops were held to find out how business was collaborating with IT in RE at a given time.

TURKU AMK
TURKU UNIVERSITY OF APPLIED SCIENCES

The Model of Dynamic Work Community

Jalava and Matilainen's (2010, 94) Star Model of Work Community Leadership.

Customer-oriented Collaboration in RE



Customer-oriented collaboration in requirements engineering applied to star model.

To act as a business partner, performance of IT should be led by a customer perspective.

Collaboration Requires Leadership

A cross-functional team requires a coach to show them direction, take care of the team members, and guide the customer-oriented collaboration. The challenge of the team is to find out what the customer needs, based on a wish or a problem. In order to win, the team needs to organize and have rules on how to play. Through discussions in workshops they are able to elicit requirements. They continue analyzing while documentation is iteratively prepared. By validation reviews a common truth about the customer need is built up. The team gains trust of all stakeholders. Finally documentation will be approved and it is ready for next steps in the software engineering flow.

Customer-oriented collaboration + high-performance
→ innovations → exceeding customer expectations → competitive advantage → profitability

Main Sources

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Löytänä J. & Korkiakoski K. 2014. Asiakkaan aikakausi, rohkeus + rakkaus = raha. Talentum.

Tekniikan YAMK 10 vuotta -juhlaseminaari 4.10.2016

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