TAMPEREEN TEKNILLINEN YLIOPISTO
TAMPERE UNIVERSITY OF TECHNOLOGY

Pasi Hellsten

“Together we stand, divided we fall” -
Constructivist Approach to Support Organizational Change in the Knowledge Work Context

Julkaisu 1494 • Publication 1494

Tampere 2017

Tampereen teknillinen yliopisto. Julkaisu 1494
Tampere University of Technology. Publication 1494

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Thesis for the degree of Doctor of Science in Technology to be presented with due permission for public examination and criticism in Festia Building, Auditorium Pieni Sali 1, at Tampere University of Technology, on the 6th of October 2017, at 12 noon.

Tampereen teknillinen yliopisto - Tampere University of Technology
Tampere 2017

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ISBN 978-952-15-4005-9 (printed)
ISBN 978-952-15-4026-4 (PDF)
ISSN 1459-2045

This thesis is dedicated to my meaning of life as it truly is:

To my unconditionally loved darling wife Annamaija and our ever so lovely daughters Aino and Kerttu, life gave me you. Couldn’t have asked for more!

And to my unconditionally loving parents Mauno and Hilkka Virtanen with the greatest gratitude in life, for literally everything. You gave me life. What more could a man ask?

Tread gently but confidently and self-assuredly, even though you cannot always see the road.
Think of those who went before you, what did they leave you, read their signs.
Think of those who come after you, what you will leave them, them and their kinds.
What becomes of one, no one knows, none is able to bode.

Possunt quia posse videntur (Virgil's Aeneid, Book V)

Abstract

Tampere University of Technology

Hellsten, Pasi: “Together we stand, divided we fall” - Constructivist Approach to Support Organizational Change in the Knowledge Work Context

Keywords: Organizational Change, IS/IT-related environment, Team-based Organization, Constructivism, Constructivist Approach

Contemporary organizations have a relation to information systems and information technologies (IS/IT). IS/IT sometimes forms the backbone of the operation or it may have a support function. Simultaneously this means that at some point the systems must be updated and renewed. The renewal brings along changes. Always. The disturbance and disruption caused by the change manifests itself in different ways in different parts of the organization. It is an individual trait, how an employee responds to change, and yet changes need to be managed on organizational levels too. The management of the change is important to secure the implementation of the change and to enable the swift recovery from the change so that the prospective benefits may start to realize.

Literature distinguishes levels to be noted in managing organizations operation: organizational, team, and individual levels. Similarly, the literature on change offers multiple types of change to be considered. The features distinguishing the different types of change comprise e.g. whether there is a clear, decided future solution to be (teleological change) or whether there is merely an unrefined state of the future to be (life cycle type of change). The meaning of the types of change for managing the change are elaborated in order to recognize the characteristic effects each change entails.

IS/IT literature covers various topics in this vast field. Managing IS/IT related change seems a bit neglected, especially when it comes to managing the operation with individual human aspect considered. This thesis is about managing IS/IT-related change in team-based organization by using a constructivist approach. Constructivism is a theory related to learning. Constructivist approach entails the coach-like approach of presenting subordinates with a cognitive incongruity, a challenge that makes them wanting to solve the issue building on their existing knowledge. The challenge is tackled by applying new knowledge together with the existing with feedback from more knowledgeable peers. An important feature is that the employee in midst of the change is able to reflect on her/his actions and thus acknowledging the learning. There are few examples of it being applied to professional context. This thesis studies ultimately the intersection of the three mentioned areas; IS/IT, change and constructivism. It deepens the understanding of the relationship these themes have and illuminates the suitability of the constructivist approach to managing IS/IT-related change in various contexts.

Seems that the IS/IT has its features of not being entirely about technologies nor the management being entirely about humans. An understanding of these features is required to address the issues in an orderly fashion. The organizational structure sometimes dictates the operation and culture, i. e. management. The daily routines of each member of the organization leaves little opportunities for individuals to be aware of the whole operation, save but the top management. Normally there is little need for this. This means that the ‘big picture’ that people have, varies. It is plausible to assume that each division, team, and individual observes the proceedings from their own perspective. However, the motivation of change usually stems from origins not familiar to all thus presenting the change with challenges. The thesis contributes to the increasing understanding of the phenomena related to IS/IT-related change by studying multiple cases, changes.

The research behind this thesis consists of seven major changes from six different organizations. People involved in the changes were interviewed to form the empirical material for the research.

Semi-structured interviews were used to gain depth as well as quality. The objective was to understand the dynamics that are affecting and included in the process when the working practices in an organization change. The objective entails the will to illuminate the change and to gain understanding on how a change may be addressed with better expectations for the outcome. Further, to meet the objective it means that various aspects are to be recognized and acknowledged as being significant for the change to happen.

Constructivist approach emerged as way to offer a solution on how to address such a change. The studied cases were contemplated through the 'constructivist lens' to study the phenomena and even though not intended to offer some nigh on normative suggestions on how to approach future issues of this kind.

Tiivistelmä (Abstract in Finnish)

Tampere University of Technology

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Keywords: Organizational Change, IS/IT-related environment, Team-based Organization, Constructivism, Constructivist Approach

Kaikilla tämän päivän organisaatioilla on tietotekniikkaa (IS/IT), toisinaan tietotekniikka on näiden organisaatioiden ydintoimintaa, toisinaan tietotekniikka on ’vain’ tukevassa roolissa. Tämä tarkoittaa sitä, että jossakin vaiheessa järjestelmiä pitää päivittää ja uusia. Uudistukset tuovat mukanaan muutoksen. Aina. Muutoksen mukanaan tuomat häiriöt ja keskeytykset näkyvät organisaatioissa eri tavoin. suhtautumisessa muutoksen on yksilökohtaisia eroja, tämän kanssa on hieman ristiriitaista, että muutosta kuitenkin johdetaan organisaatiotasolla. Muutoksen johtaminen on tärkeätä, jotta muutos saadaan implementoitua ja nopea toipuminen muutoksesta mahdollistetaan, jotta muutoksen aiotut edut voivat alkaa realisoitua.

Kirjallisuuden perusteella voidaan todeta eri tasoja, joilla organisaation toimintaa tulee johtaa: koko organisaatio, tiimitaso, yksilötaso. Samoin kirjallisuudessa tunnistetaan useampia muutoksen tyyppejä. Muutoksen eri tyypit erottaa toisistaan esimerkiksi se, onko muutokselle ennakkoon päätetty jokin tietty ratkaisu (teleologinen muutos) vai onko muutoksen tarve tiedostettu ja tulevaan ratkaisuun suhtaudutaan avoimin silmin (life cycle -tyyppinen muutos). Näiden eri muutostyyppien ominaisuuksia tarkastellaan, jotta saadaan kunkin tyypin luonteenomaiset piirteet ja vaatimukset selville.

IS/IT-kirjallisuudessa käsitellään useita teemoja tästä laajasta kentästä. Muutos, joka liittyy IS/IT-ympäristöön vaikuttaa jääneen hieman paitsioon. Erityisesti sellainen lähestyminen, jossa myös yksittäisen henkilön näkökulma tulee huomioitua. Tässä väitöskirjassa käsitellään IS/IT-liitännäisen muutoksen johtamista tiimipohjaisessa organisaatiossa konstruktivistista lähestymistapaa käyttäen. Konstruktivismi on teoria oppimiseen. Konstruktivistinen lähestymistapa tarkoittaa valmentajamaista lähestymistapaa, jossa muutokseen liittyvä kognitiivinen haaste esitellään johdettaville siten, että heissä on sisäsyntyinen halu vastata haasteeseen olemassa olevan tietämyksensä pohjalta. Haasteeseen vastataan yhdistelemällä uutta tietämystä olemassa olevaan saaden samalla jatkuvaa palautetta toiminnan etenemisestä kokeneemmilta kollegoilta. Tärkeätä on myös se, että muutoksessa toimiva henkilö voi reflektoida toimintaansa ja siten tunnistaa oppimisen. On esimerkkejä tämän lähestymistavan soveltamisesta organisaatiokonteksissa. Tässä väitöskirjassa selvitetään kolmen esitellyn alueen leikkauskohtaa: IS/IT, muutos ja konstruktivismi. Näiden osien välisten suhteiden ymmärrystä syvennetään sekä annetaan lisävalaistusta konstruktivistisen lähestymistavan soveltuvuudelle muutostilanteiden hallintaan erilaisissa konteksteissa.

IS/IT toimintana ei käsittele ainoastaan teknisiä asioita eikä sen johtamisessakaan ole kysymys ainoastaan inhimillisistä tekijöistä. Tämän kokonaisuuden ymmärtäminen on välttämätöntä, jotta tätä teemaa voidaan lähestyä. Organisaation rakenne sanelee joskus toiminnan ja sen johtamisen, kulttuurin. Organisaation päivittäiset rutiinit mahdollistavat vain harvoin jäsentensä olla selvillä kokonaiskuvasta, paitsi ylimmän johdon. Yleensä tähän ei juuri ole tarvettakaan. tämä tarkoittaa samalla sitä, että kuva joka ihmisillä on toiminnasta, vaihtelee. On uskottavaa, että jokainen osasto, tiimi ja yksilö, tarkastelee toimintaa omasta näkökulmastaan. Kuitenkin muutos ja sen tarve lähtee usein jostakin muualta, joka puolestaan tekee muutoksen läpiviennistä haasteellista. Tämän väitöskirjan antia on lisätä ymmärrystä IS/IT-liitännäisestä muutoksesta tutkimalla useita sellaisia muutostilanteita.

Taustalla oleva tutkimustyö käsittää seitsemän suurta muutosta kuudessa eri organisaatiossa. Pääasiallinen empiirinen materiaali on näissä muutostilanteissa mukana olleiden henkilöiden

haastatteluja. Puolirakenteellisia haastatteluja käytettiin, jotta varmistettiin materiaalin syvyys ja laatu koskien kutakin muutostapausta. Tavoitteena oli ymmärtää kunkin prosessin muutosdynamiikkaa ja muutokseen vaikuttavia tekijöitä, kun työskentelytavat muuttuvat. Tavoitteessa on mukana myös halu selventää muutostilannetta ja ymmärtää, miten muutosta voisi lähestyä, jotta lopputulos olisi paras mahdollinen. Näin ollen tavoitteen saavuttaminen tarkoittaa, että muutokseen ja sen aikaansaamiseen vaikuttavat eri tekijät tunnistetaan ja tunnustetaan.

Konstruktivistinen lähestymistapa nousi esiin ratkaisuna, joka voi sopia tällaiseen tarpeeseen. Tutkittuja muutostapauksia arvioitiin ’konstruktivistisen linssin’ kautta, jotta ilmiötä voitiin tutkia tarkoituksenmukaisesti. Vaikka näin ei alun perin ollut tarkoitus, työn yhteenvedossa otetaan lähes normatiivisesti kantaa miten kuvatun kaltaisia muutostilanteita voisi lähestyä.

Preface

What a trip! This dissertation has been a long and winding road. Up's and down's, curves, and all that. There have been people along on that road; some as co-drivers, some as passengers. Some were standing by the road and waving and some drove past blinking their headlights. The travel guides were there, as were the hitchhikers. Plenty of influencers, all parts of the whole.

This process would not have been possible without several people, who have helped, supported, and challenged me during this time. I am grateful to my supervisor, Professor Samuli Pekkola for his knowledgeable guidance, support, and good discussions throughout the process. Well done, I must say. A special thank you goes to Mika Hannula, professor at the time; he took me in to the academia and gave me an introduction and almost a brotherly nudge to move forward with it. It may have taken some time, but here I am now. Without you, this may never have happened.

I am also thankful to the pre-examiners Professor Lars Svensson (University West, Sweden) and Associate Professor John Stouby Persson (Aalborg University, Denmark), who offered valuable insights for the dissertation, and helped to finalize it. Nordic co-operation at work indeed. I am thankful also to all my co-authors of the publications, working with you has taught me a lot.

I have received funding from sponsors to whom I would like to show my appreciation and gratitude. I want to express my gratitude also to Liikesivistysrahasto (the Foundation for Economic Education), KAUTE Foundation, Wihuri Fund and TUT Foundation for the financial support. Their support has played a significant role in keeping me with the family afloat during the trying times of the research and writing process. Thanks go also to Prof. Dr. Stefan Klein and his crew in WWU Münster for accommodating me during my 'writing exile'. All these were indeed most helpful and appreciated in various stages of the process.

Another such set to have kept and keep me afloat are the colleagues, former and current ones. Thank you all. Special thanks goes to Dr. Jussi Okkonen, who has taught me heaps from early on, good fun and great experiences. Professor Nina Helander, such a knowledgeable person combined with the most helpful attitude one meets seldom; I take off my hat for you. Dr. Marianne Kukko, what a joy it was to work with you, both educational and fun. Dr. Vilma Vuori always interested and ready to comment with skills to match. Dr. Ilona Ilvonen along the previous lines, capable and willing to help. Jussi Myllärniemi, MSc., a good man, if there ever was one. You all are dear to me, I consider myself lucky to have made your acquaintance and to be able to call you my friends.

I would also like to acknowledge my dear friends, especially Jarkko Iso-Eskeli and Tommi Liimatainen, who have contributed to my life in many ways – balancing the academic with the secular. Something little about what is important in life. Similarly, the support from my in-laws Anneli and Pekka Paunu has helped me and my family in multiple ways and it has made the everyday life a bit easier. The same goes to my parents, Hilkka and Mauno Virtanen. I would not dare to ask for more; actually, I could not even if I tried. Thanks folks.

Finally, my ever so lovely daughters Aino and Kerttu Hellsten, thank you for being there. You remind me every day of how blessed I am. You give me meaning to strive for various things and strength to work. Last thank you is for my darling wife Annamaija Paunu. She has made in many ways this dissertation possible by running our daily life, supporting me, encouraging me, loving me, and just by being her annoying and lovable self. I do love you.

Tampere 28.08.2017

Pasi Hellsten

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Table of Abbreviations

CIO	Chief Information Officer	The person leading the data admin department in an organization. Executive title of the person at an organization in charge of IT strategy and the information systems required to support an enterprise's operation.
e.g.	exempli gratiae	From Latin for "for example."
et al.	et alii	From Latin for "and others."
HR	Human Resources	Function focused on activities relating to employees (recruiting and hiring, orientation and training, employee benefits, retention).
i.e.	id est	From Latin for "that is to say."
ibid.	ibidem	From Latin for "in the same place"; also refers to the preceding source in the text.
ICT	Information and Communications Technology	An umbrella term that includes all communication devices or applications.
IS	Information System	A technical solution (includes the user though) that collects, processes, stores, analyzes, and disseminates information for a specific purpose (Turban et al., 2008). Today, a computerized entity to offer available information to support personnel striving to achieve a goal and to create meaning and value (Checkland and Holwell, 1997). However, not necessarily electronic (i.e., a book may be regarded as one).
IT	Information Technology	Broader term than the previous (sometimes used as a synonym), usually refers to all things software and hardware. Set of computer-based tools which can, for example, be applied to build and operate an IS.
KM	Knowledge Management	Process of capturing, distributing, and effectively using knowledge (Davenport, 1994).
SPI	Software Process Improvement	Measures taken to improve software production processes.
SW	Software	Various kinds of programs used to operate computers and related devices.

List of Publications

This thesis is based on the following publications. The publishers of the publications have granted the rights to include the publications in this dissertation.

I. Kukko, M., Helander, N. & Virtanen, P. 2008. *Knowledge management in renewing software development processes*. In: Sprague, R. H. (ed.). Proceedings of the 41st Annual Hawaii International Conference on System Sciences (HICSS), January 7–10, 2008, USA.

II. Helander, N., Kukko, M. & Virtanen, P. 2011. *A knowledge management view to a strategic change in a high-tech company*. International Journal of Strategic Change Management (IJSCM), Volume 3, Issue 1-2, pp. 76–89.

III. Alanne, A., Hellsten, P., Pekkola, S., Saarenpää, I. 2015. *Three positives make one negative: Public sector is procurement.* 14th IFIP Electronic Government (EGOV) and 7th Electronic Participation (ePart) Conference 2015, August 30–September 2, 2015, Thessaloniki, Greece.

IV. Virtanen, P., Pekkola, S., Päivärinta, T. 2013. *Why SPI initiative failed: Contextual factors and changing software development environment.* Proceedings of the 46th Annual Hawaii International Conference on System Sciences (HICSS), January 7–10, 2013, USA.

V. Virtanen, P. 2013. *Team leaders' perceptions in the renewing of software production process*. Computers and People Research (SIGMIS-CPR'13) May 30–June 1, 2013, Cincinnati, Ohio, USA.

VI. Myllärniemi, J., Vuori, V., Helander, N., Ilvonen, I., Okkonen, J., Virtanen, P. 2013. *The role of an intermediator organization in collaboration: How can an intermediator enhance value co-creation?* International Journal of Applied Systemic Studies (IJASS). Special Issue on: "Systems Thinking in Inter-Organizational Collaboration," Volume 5, Issue 1-2, pp. 3–21.

VII. Mäki-Lohiluoma, P., Hellsten, P., Pekkola, S. 2016. *Why do we need this? Roles in the information system acquisition legitimation process*. The 24th European Conference on Information Systems (ECIS), June 13–15, 2016, Istanbul, Turkey.

In this thesis, these publications are referred to as Publications I, II, III, IV, V, VI, and VII.

Contributions of the Author in the Publications

Publication I
The author planned the research together with the research team. The author was one of the interviewers who arranged the interviews, collected the empirical material, and after the interviews, decompressed the proceedings. The author took part in the empirical material analysis and prepared the literature study. The author coordinated the writing process and wrote the paper in co-operation with the co-authors.

Publication II
The author planned the study together with the research team of three people. The author was one of the interviewers who collected the empirical material, and after the interviews, decompressed the proceedings. The author coordinated the writing process and wrote the paper in co-operation with the co-authors.

Publication III
The author co-planned the research together with another researcher. The author arranged the interviews and was one of the interviewers who collected the empirical material, and after the interviews, decompressed the proceedings. The author coordinated the writing process as the corresponding author and wrote the paper in co-operation with the co-authors.

Publication IV
The author planned the research together with the research team. The author arranged the interviews, collected the empirical material, and after the interviews, decompressed the proceedings. The author analyzed the empirical material and did the literature study. The author coordinated the writing process and wrote the paper in co-operation with the co-authors.

Publication V
Sole author of the paper.

Publication VI
The author brainstormed the idea for the paper together with the co-authors. The author prepared the literature review on collaboration and business relationships and networks, and was one of the team to formulate the theoretical part and do part of the writing.

Publication VII
The author planned the research together with another researcher. The author was one of the interviewers who collected the empirical material, and after the interviews, decompressed the proceedings. The author coordinated the writing process and wrote the paper in co-operation with the co-authors.

Contents

1. Introduction

Kelly (2003) is provocatively but appropriately quoted to introduce the theme of this thesis: "*There is no such thing as a computer project. There are business change projects that involve IT. For projects to be successful, they must consider the people dimension, explaining what is entailed, motivating and training staff and making them aware that productivity will initially fall with the move from the old to the new way of doing things.*"

Organizations undertaking such changes are likely to want their employees to continue to be active and productive members in their mundane tasks. It is centric for the success of change management to deeply understand the dynamics that have an effect on the proceedings (Beck and Cowan, 2014; Hekkert and Negro, 2009). To plan these changes and to implement them thereafter, organizations need to persuade their employees to adapt and to commit to the changes in a positive manner rather than to resist it (Fernandez and Rainey, 2006). According to the constructivist view and approach, the members of an organization are actively learning, rather than merely receiving the novelties passively (Huitt, 2003), as expected by the organization (e.g., Zack, 1999; Zhou and George, 2001). On one side, the constructivist approach is a medium to gain an understanding of a social construction and the collective learning needed to fully execute the planned initiative. The constructivist approach also assists with alleviating the hardships related to the changes, as it uses the prevailing knowledge and practices as a base for the novelties. (Haas, 2015; Kiraly, 2014). The terminology, *constructivist approach*, has a dual meaning. It is referred to in two interrelated ways; on one hand, the constructivist approach is seen as an analytical lens that a scholar may use to make sense of challenges and opportunities when doing research on managing change. On the other hand, it is considered a perspective that could guide managers in designing and monitoring a change process in their organization(s).

1.1 Motivation

Organizations today use, and have been using for quite some time now, both information systems and a team-based approach in their operations (e.g., Davenport and Short, 1990; Mitchell et al., 2012). The platitude bears within the more interesting and relevant, if somewhat concealed, suggestion that organizations must have acquired and renewed their information infrastructures, such as large systems, software, and related hardware at some point, or more often, at a couple of points along their path. Such points of discontinuity present organizations with challenges and hardships, because they tend to follow each other erratically and with temporal intervals (Ahmad et al., 2011; Lyytinen and Newman, 2008). The challenges and hardships may manifest themselves as needing to reform

both software and work procedures (Heiskanen et al., 2013). The simultaneous suggestion is that these organizations have faced the changes on various levels in their operation. The changes and their effects can be divided into the micro level and the macro level (i.e., individuals and small groups, and large groups and entire organizations; Markus and Robey, 1988). This division is further refined to include also teams and groups independently, as they differ from both the individual and the organizational level (Table 1; Molloy et al., 2010).

Table 1. Levels of Observed Change and Proceedings in Organizations (Molloy et al., 2010)

Unit/Level	Type of Change
Organization	A new working philosophy founded by and required by the decisions made
Team	A new working practice, informative meetings, team leaders' new thinking and new procedures, pressure from management and team members
(Pair/Peer)	(Informal meetings and discussions, seeking clarity through peer support)
Individual	Abandon the old way of working, learn a new way, mental adjustments

As organizations consist of individuals, the changes concerning both of them are neither only micro nor macro level events. Thus, neither approach is quite enough on its own, but fluctuations between the two are needed to fully comprehend the phenomena between information systems and technologies (IS/IT) and organizational change (Robey et al., 2013; Rousseau, 1985).

Organizations may have decided to change their operations to be more productive. This means changes in the teams or groups by introducing new working practices to them and to their members. For the individuals, this always means having to learn a novel way of doing their work. Organizations must have had meetings where they plan the renewals (e.g., what is it that is going to be introduced as an innovation, and which parts of the organization are going to be affected by these actions?). The question of how these parts are going to be affected and what they are supposed to be doing next must also have been covered. Furthermore, the question of who the people are who will be responsible for implementing the changes should also have come up. Organizations have started the implementation and most likely appointed various teams to accomplish various tasks. (Markus and Robey, 1988; Yeo, 2002). The same "rookie-mistakes" get made over and over again (e.g., Lyytinen and Robey, 1999; Pekkola et al., 2013). In that sense, there is a little room for wondering about what is going on in organizations when it comes to that particular area of introducing changes to their operations; when, for example, new systems are developed or acquired, it seems that the novelty value is, indeed, new every time around and lessons do not get learned.

Information system-related projects, renewal projects in particular, are seen as more complex and more difficult undertakings than regular engineering projects (Al-Ahmad et al., 2009). To support this statement, studies have shown that failure rates in change projects, which information system acquisitions and their associated implementations are always a part of, are high – even as high as 50% (Majchrzak, 1988) and all the way up to 70 % (Burnes, 2003). Another study suggests that only 16% of the projects are deemed successful (Sauer and Cuthbertson, 2003). The corresponding numbers concerning the fusion of two organizations, which include solutions for new working practices, are equally grim (Alaranta and Henningsson, 2008). IS/IT projects are said to have characteristics that differentiate them from other engineering projects and simultaneously increase their chances of failure. It is possible to classify these characteristics of IS/IT projects in seven categories (Peffers et al., 2003; Salmeron and Herrero, 2005):

- Unrealistic expectations and overambitious projects created by abstract constraints
- Difficulties visualizing the deliverables:
    - attributed to senior management asking for over-ambitious or impossible functions
    - IT project representation is not understandable for all stakeholders
    - late detection of problems (due to deliverables' intangible and complex nature)
- Unwarranted grasp of flexibility (causes time and budget overruns and frequent requests of changes by the users)
- Concealed complexity (difficulties in estimating project's kick-off and appearance and the functionality of the system)
- Uncertainty of what and how:
    - provokes difficulties in drawing requirements specifications for the system
    - problems implementing the system
- Tendency for software failures, caused by the inability to foresee all the necessary issues in the development process and forecast the effects of minor changes in software
- Objective to change prevailing business processes:
    - requires business understanding from IT practitioners
    - requires process understanding from IT practitioners
    - requires good enough processes to be automated

The classification as to what counts as a failure and what is deemed a success is not always obvious and self-evident. At least not from the operations point of view (Heeks, 2006). Traditionally, a project should be delivered on time and within the estimated budget with the functionality and features that were agreed upon (Al-Ahmad et al., 2009). However, there are different stages by which the

organization itself needs to assess its own state and changes (Heeks, 2006). The fact that one is able to find reports of studies showing such numbers, as mentioned earlier, is perhaps not surprising, but one might still find it a bit troubling. The failure rate must be addressed due to the significant loss of time and other resources, such as the financial ones, but also the mental burden for organizations and their employees (Marks and Mirvis, 2001). Could these losses be avoided if we better understood what was going on and took evasive actions based on that understanding?

One motivation for this study is to understand the dynamics that affect and are included in the process when the working practices in an organization change. Learning is required and included in an organizational change (Barnett and Carroll, 1995; Lipshitz et al., 2002). Thus, we strive to see whether there are distinguishable elements and features that would support the presumption of the constructivist approach originating from the learning theoretical research (Glasersfeld, 1995; Hong et al., 2000), as it intuitively appears to be a suitable way to address such situations. IS/IT as a context offers its own additional challenge as it is still a relatively new area to be researched, and the prevailing managerial literature in that context at least partly stems from another era and other disciplines (Alavi and Leidner, 2001; Bonnici, 2013). Later in this thesis, the context is introduced in more detail, but in this introduction suffice it to say that the technology and themes related to it are no longer solely the focus when IS/IT and related issues are studied. The main body of challenges, the emphasis, has shifted and is shifting towards managerial and organizational issues (e.g., Benbasat et al., 1987; Hevner and Chatterjee, 2010; Leidner and Kayworth, 2006; Myers, 1997; Peffers et al., 2007).

The aforementioned means that technological issues are still there, but more refined and specialized disciplinary boundaries now exist. The discussion is divided into branches that are more specialized; for example, Banker and Kauffman (2004) identified five research streams: the *decision support and design science* research stream observes and researches how computers may be applied in decision support, control, and managerial decision making. The *value of information* research illuminates the relationships established based on the economic analysis of information as a commodity in the management of the firm. The *human-computer systems design* research stream is concerned with designing effective systems based on the cognitive aspects. The *IS organization and strategy* research stream studies the value of investing in systems and system acquisitions presented to the organization, rather than on the perceptions of system users or the system itself. The *economics of information systems and technology* research stream uses more theoretical perspectives and methods from analytical and empirical economics to managerial problems involving IS/IT (Banker and

Kauffman, 2004). Since the previously referred study was conducted, the IS/IT environment has not grown any simpler or more unified (Iivari, 2016).

Surely, after having accomplished a project or two, the individual is able to address the emerging issues in the following change more appropriately. Has s/he learned a thing or two to make things go smoother? As the multiple research streams were mentioned before, there is also research on the IS/IT leadership (e.g., Hoving, 2007; von Urff Kaufeld et al., 2009). However, little attention seems to be paid to the IT manager who is in charge of IT management and implementation (Yu and Guo, 2008) or IS/IT acquisitions and the learning of past experiences. The change manager's role is addressed in the literature, but quite often, it is on somewhat of a higher abstract level (e.g., Broberg and Hermund, 2004; Palmer and Dunford, 2008). Interesting themes and, thus, questions to be answered are: *how may the change initiative be supported when something changes in the organizational IS/IT landscape*? And *what factors affect the change introduction and implementation in an organization?* The answers to these questions would most likely provide appropriate answers to the problems that have motivated this thesis. The aforementioned may be seen as forming a gap in the research.

There is little novelty in stating that organizations use team structures and that organizations need to deal with change. Instead, what is new is the approach of combining the constructivist views and observation to teams working while procedural changes are implemented upon them. A similar change situation is when teams are operating under contradictory objectives of management's financial- and/or production-related plans and those of the actual operation and its new development in the IS/IT-related context.

To find answers to the rather broad questions – *how is change managed in an organizational change?* And *which factors are most effective when an organization changes its working practices?* – offers solutions to many organizational dilemmas. It is all about the very basics of organizational leadership and managerial behavior. Organizations, be they business enterprises or public sector organizations, are all teams. Obviously, these organizations are further divided into departments, sections, smaller teams, and work groups to form entities that we, people, intuitively perceive as teams. Basically all the work gets done in teams (Bannon and Schmidt, 1989). The team in this respect is more or less a strictly organized group of people working according to set guidelines noted in the organization's mission statement, business plan, or strategy to meet the objectives (Sargeant et al., 2008). However, as each team consists of individuals, the teams are equally individual (Lyytinen et al., 1993).

An organization's top management sets high-level objectives for themselves and for the organization they lead. Behind this, there is the aim to please the stakeholders and look after their interests. Quite obviously, this means that various departments and other parts of the organization receive more detailed objectives based on the organization-wide long-term planning (i.e., production is given their target of how much and on what level they are supposed to produce the goods or services). Equally, the supportive functions and all the other functions get their target setting; sales need to sell, the CIO's office needs to deliver services on a certain level, to name but a few as examples (Aaltonen and Ikävalko, 2002). Today, the objectives are often dealt down to the individual level; each person has his/her own goals and objectives (Bain and Taylor, 2000; DeShon et al., 2004). Combined, they are to reach the team's target.

Why use the IS/IT as the empirical context of the study? There are several types of choices a researcher is required to make regarding commencing and in an on-going research. When one aims to conduct an empirical study, s/he is advised to carefully consider the choice of the empirical context (Benbasat et al., 1987). As this study has an objective of gaining an understanding of change dynamics and how the teams within the change cope, a knowledge-intensive ubiquitous IS/IT environment prone to change was seen as a good choice (Longley, 2005; Vodanovich et al., 2010). In today's business environment, there are so many distractions and so many changes of all sorts that change may be observed as an ever-present phenomenon (e.g., Clegg et al., 2003; Elrod and Tippett, 2002) that still gets side-tracked quite often by everyday life and the projects that must be run.

The context of this study, IS/IT, is a knowledge-intensive field; thus, the constructivist approach (CA) is appropriate. It will be shown later that CA accentuates the knowledge transfer between peers and peer support, which are also used in the IS/IT branch (Sykes et al., 2009). Prior knowledge and its utilization should be centric features in these endeavors. Even in IS/IT architectural design issues, there is a need to take organizational communication, knowledge creation, and management issues into consideration (Smolander and Päivärinta, 2006). If the operation is managed properly, it will provide a prolific context for creating the new knowledge needed to embrace the change and to make the best of it. IS/IT is defined as a highly knowledge-intensive area wherein the software development and production process, and the resulting "goods," software, and programs, are knowledge-intensive and often abstract (Hoch et al., 2000). In addition, the people are to be acknowledged as creators of the new knowledge.

1.2 Objectives for the Research and Structure of the Thesis

Whenever working practices are changed, there is an opportunity, but moreover a need, to learn something new. The objective of this study is to argue that a change of modus operandi or renewal of information systems are not straightforward projects, but rather complicated and multi-dimensional functions in need of careful planning and preparation. Technology is by no means at the center of these kinds of endeavors; it merely operates as the context. The study uses constructivism and the constructivist approach as a theoretical lens through which the presenting and the implementation of the change may be approached.

When planning an organizational change, introducing a change of working practices, or acquiring and implementing a large system, taking into account various aspects presented in this study will enhance the possibility of success with the change initiative. Simultaneously, the likelihood that business benefits are to be enjoyed when the whole potential of the change is materialized is improved. As technology is not the key, the focus will be at the beginning of the change in order to understand what should be done in the organizational setting, and in this way, we begin to comprehend why it is not about technology but the people using it. The secondary objective in this study is to understand which factors should be taken into account when dealing with an organization-wide change.

Figure 1 presents the focus of this research. To contemplate the research problem and deducted questions of what should be taken into consideration when planning, introducing, and implementing a large-scale organizational change concerning IS/IT, the themes were derived from the need to understand how the change affects the organization and its members and their work. This thesis will show how and why the constructivist approach is an appropriate way to address issues where working practices change in the IS/IT context. This thesis will also show how the context has unique features that separate it from other disciplines (Lee, 2001). The changes therein happen often erratically and temporally irregularly (Lyytinen and Newman, 2008; Smolander et al., 2016). Decisions concerning an organization's operation and the changes therein are often met by considering the organization's functions as a whole without taking the individual employees excessively into consideration (Pettigrew, 2014), as the details would make the decision-making process more arduous if not impossible. However, the changes always and inevitably affect the members of the organization. Individuals are the ones who are immediately affected by the change and the ones to make the change happen for the organization. It is necessary to note the change on both macro and micro levels simultaneously (Robey et al., 2013).

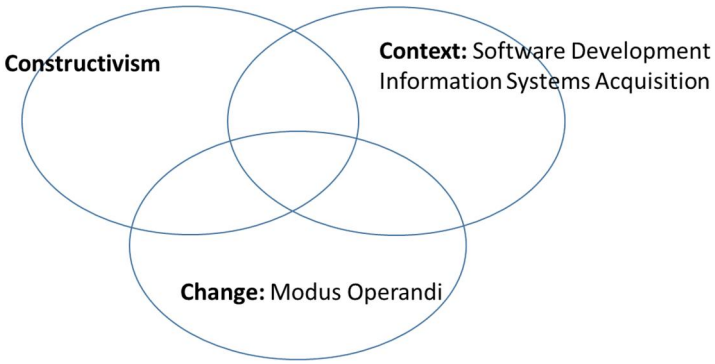

Figure 1. The Three Areas to Build the Theoretical Foundation for This Thesis

As the constructivist approach elicits the utilization of previous knowledge, it is well-suited for change situations where people tend to feel uncertainty and anxiety (Cameron and Green, 2015; Vakola et al., 2013), in that it binds the upcoming novelty to something familiar (Powell and Kalina, 2009). The constructivist approach also presents an intellectual challenge to people by creating cognitive incongruities. In IS/IT where people have multiple skillsets and competencies, this proves to be valuable. By centering on the human aspect in the constructivist approach (i.e., receiving feedback from a more knowledgeable peer when applying the new knowledge, and discussing and reflecting the learning), the change comes more naturally.

The three areas are studied more closely to build the theoretical foundation for observing the phenomena of interest to this study. IS/IT and the teams therein form the context and environment for the studied change. The idea is to observe how the given organizational context with the specific features it contains affects the operation and the change within, and especially, how and by using which methods the hardships innate in organizational change may be alleviated. The concepts of the constructivist approach and the teams used in IS/IT are observed more closely to understand the basis for well-handled change situations in this particular context. After this, the change and management thereof is defined in more detail. As will be seen in the literature review later, change is a broad and a recurring topic in the literature. Even though learning is discussed in the literature in general, it seems that there is little research on constructivism and the constructivist approach being used for change in the IS/IT context. This gap will be contemplated in order to understand the surrounding issues, and also as a part of managing change on the enterprise level as well as the team level.

This thesis has cases from both private businesses and the public sector, because change is a ubiquitous and ever-present phenomenon. Both environments are equally complex and both have their own distinctive features (Boyne, 2002). Consequently, they offer an interesting setting that is rich with material for empirical research. The traditional research methods, as described later, give an abundance of suitable empirical material to research work of this kind. The studies closely observe

organizations dealing with the exact challenges that are the focus of this research, thus enabling increasing the understanding of these phenomena while adding to prior research in intersecting areas.

The thesis is divided into two sections: firstly the introduction and summary; and secondly the original publications. This first part of the thesis introduces the area, and clarifies the motivation and the structure of the research. Chapter 2 delves into related research of the three areas that are the focus of this study: constructivism and constructivist approach, context (features of the teams in IS/IT), and change in working practices. After this, in Chapter 3, the purpose of the study is explained in more detail, the refined research questions are introduced, and later, where the related research is referred to, the research questions become more specific, further answering the question of how this research and report are done. Chapter 4 summarizes the main methods and findings of the individual publications. Chapter 5 discusses the findings. Finally, Chapter 6 concludes the first part by presenting both the theoretical and the practical implications and limitations of the thesis, and discussing the contributions of the study. Also in chapter 6, avenues for future research are proposed.

The second part of the thesis contains the seven original publications as they were published. The first part of the thesis was written after the individual publications were published. The main function of the first part is to include the main themes covered in the publications, and to point out some new insights that were not included in the publications.

2. Related Research and Theoretical Background

Chapter 2 examines the existing knowledge based on three separate areas that inseparably together affect the organizational change of operational proceedings regarding or involving IS/IT (Figure 2). Chapter 2 also takes a stand on the possible support for the organization and its members in introducing and implementing change.

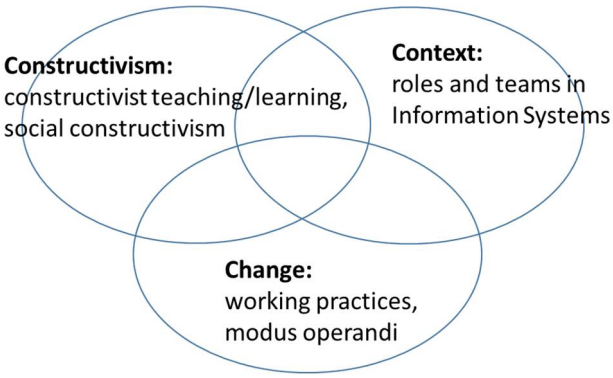

Figure 2. The Base for the Research

Firstly, the ground-laying thought concerning any human adapting to anything new is contemplated, and from the constructivist point of view in particular. There are seldom just blank minds when it comes to interacting with people. Tabula rasa, a clean slate, as the philosopher John Locke (1990) formulated in 1671, does not exist. Instead, everyone has education, previous work experience, and previous life experience, to name but a few. According to the renaissance era idea of no man being an island (Donne and Berkeley, 1964), a person is always a part of something that forms his/her person, thinking, and attitudes. All prior occurrences leave their mark on the person, affecting everything that comes next.

Secondly, the mere context is introduced and the discipline in which the research takes place: ICT utilizing, and partly producing, organizations with their team structure. Information technology and the research therein is unlike any other as it studies artifacts and/or actants (see Chapter 5), often even in and of a human-machine relationship. Information technology research "examines more than just the technological system, or just the social system, or even the two side by side; in addition, it investigates the phenomena that emerge when the two interact" (Lee, 2001, p. iii). The academic view may differ strikingly from the practical views when comes to describing the mere structure of the IS/IT, let alone the actions and practices therein (Smolander, 2002).

Thirdly, the actions and proceedings that are in focus, that is changes, are studied. Change is a much studied area. In this thesis, change is seen to mean introducing a procedural alteration that profoundly

affects the operation. The researched cases cover a drastic change in working practices in a software developing organization. In addition, cases from different organizations are presented in which new ISs were acquired, causing major changes in operations. The changes are on both technological and human terms.

2.1 Constructivism and Constructivist Approach

Constructivism is a theory of learning, not of teaching. Constructivism is sometimes either misunderstood or misused (Gordon, 2009). The poorer realization may mean that the subject is not sufficiently challenged and supported to learn and to adapt. In these cases, the learning outcomes do not excel. Baviskar et al. (2009) describes four essential features of constructivism it needs to do: elicit prior knowledge, create cognitive incongruity, apply new knowledge with feedback, and reflect on learning.

At least partly due to the previous features, constructivism is also related to the various concepts of *looped learning.* By looped learning, the reference is to various aspects or stages of learning. The first of the stages is single-loop learning, in which, or according to which, the immediate problem is aimed to be solved in relation to the situation *in situ* (e.g., Argyris and Schön, 1996; Kolb, 2014; Peschl, 2006). In the more developed double-loop learning, the emphasis is somewhat deeper, as it addresses the root causes of the problematic situations by reflecting on what has been learned before. Thus, double-loop learning aims to affect the existing body of knowledge on the intellectual and cognitive levels and to prevent the problematic situations from recurring. (e.g., Argyris, 1976; Argyris and Schön, 1996; Lewis, 2005) Double-loop learning is more about approaching problematic learning situations in a more organized manner, and questioning and altering the assumptions and observing the effects on the body of knowledge, thus challenging the solution (Peschl, 2007). Double-loop learning has a versatile background, as it may be tracked back to cybernetics, learning theory, and cognitive sciences (Peschl, 2001) as well as in the domain of organizational learning (e.g., Argyris and Schön, 1996; Senge, 2006).

Peschl (2007) introduces a development of a third loop whenever there is a profound change adding a new level to the structure of the proceedings in an organization. The new level is the existential level, including the individual features, such as attitudes and values, which are affected by the change. The individual may feel that even these fundamental features may be affected should the change be significant enough, even though these features sometimes exist mainly subconsciously (Schein, 2010, 1992). In these cases, the freedom of movement is more limited than in matters on “lower levels” of learning as, for example, the attitudes and the values are rooted deeper than just an inclination to use

a certain technology. Similarly the possibilities, and thus tools, to influence an individual on these levels requires more depth and breadth in making the change happen; thus, triple-loop learning needs to be there to justify and accommodate the change (Peschl, 2007).

In this thesis, the theme of the *constructivist approach* is seen to cover both areas of c*onstructivist teaching methods* and *social constructivism.* The aforementioned is based on the constructivist learning theory (Baviskar et al., 2009), and it maintains that constructivist teaching is based on the belief that learning is achieved when learners are actively involved in creating meaning and constructing knowledge as opposed to receiving information in a passive manner. Basically, this translates to individual learners being the makers of meaning and knowledge, omitting the organizational aspect. The latter similarly confirms that the actors in each social situation create relevant and meaningful concepts based on existing knowledge, rather than the reality that it would miraculously just be there (Powell and Kalina, 2009; Risse, 2004).

2.1.1 Constructivist Learning and Training

Originally, constructivist learning theory was formulated by John Dewey (2002, 1986) and Jean Piaget (2013). Since then, the thought of how education of and on various levels is well suited to be grounded in real experience has been applied widely in multiple contexts: medicine (e.g., Beutler, 1997; Korndorffer et al., 2005; Taylor et al., 2004), business (e.g., Altman et al., 1994; Davis-Blake et al., 2003) and also technology (e.g., Helpman and Rangel, 1999; Tapia et al., 2004). Thus, it may be concluded that constructivist teaching or training methods may be applicable not only when it comes to individual early experiences in life, but also all the way to adulthood and professional life. It is possible to solve problems that are seemingly too difficult for the person committed to them when there is a coach or more capable peers available to help along the way (Vygotsky, 1980). An individual will formulate hypotheses, assumptions, and new ideas, and select information that is integrated into existing knowledge and experience (Bruner, 2009). Learning occurs through an interaction between new materials and relevant prior knowledge that exists within the learner's cognitive structure (Ausubel et al., 1968; Zimmerman, 1989). It has been stated that the features that are more common among adults (i.e., life and work experience, set ways of doing things and opinions) would emphasize the need for a constructivist approach (Huang, 2002).

The original idea of influential education and training, also the process of learning, proposes that induction and orientation need to engage the experiences of the subject (Dewey, 1986). In order to create new knowledge, to learn something new, one needs to link it by reflecting on the existing knowledge one already possesses (Baviskar et al., 2009), which in turn is necessary in change initiatives

(Ainamo, 2001). While doing the learning, individuals simultaneously add to the existing knowledge base. According to the so-called SECI model,[1] this is one of the four ways of creating new knowledge (Nonaka and Takeuchi, 1995). Constructivism proposes that we learn by expanding our knowledge through experiences that are generated and necessary for learning (Piaget, 2013). The theories are now encompassed in the broader movement of progressive education as shown earlier. People, young and old, learn best when they are allowed to construct a personal understanding based on experiencing things and reflecting on those experiences on previous ones.

In recent years, applications of constructivism and the constructivist approach in higher education and professional training have been surfacing. Such ideas as constructionism (Li et al., 2013), problem-based learning (Loyens et al., 2007; Schmidt et al., 2007; Servant and Schmidt, 2016), cooperative learning (Hsiung, 2012) and reciprocal peer teaching (Krych et al., 2005) have found a foothold in organizations aiming to educate and re-educate their people. These methods all have the same goal of getting through to the subject to make the best possible scenario come true in an organizational context. They share a common denominator –social interaction and its power to help an individual learn new things and, thus, adapt oneself to a changing situation to ensure his/her and the organization's success.

2.1.2 Social Constructivism

According to *social constructivism*, human development is socially situated and knowledge is constructed through interactions with others (McKinley, 2015). Thus, there is a definable difference between what a person is able to learn on his/her own and in collaboration with a more capable peer (Stapa, 2007). Especially higher-level learning requires social interactions (Guk and Kellogg, 2007). The concept of *social constructivism* is closely related to the definition of *social constructionism*. However, the two should not be confused; according to social constructionism, individuals (i.e., the actors) perform activities together to construct artifacts (Leeds-Hurwitz, 2009). These artifacts may be, for example, models, which are then shared and reified through language. Social constructionism places the artifacts that are created through the social interactions of a group into the center of its interpretation of the reality. Whereas social constructivism focuses on an individual's learning that takes place because the individual is interacting with other individual(s). At the heart of constructivist philosophy is the trust that knowledge is not congenital but gained through experiences that are

[1] The SECI model comprises: Socialization (individuals interact, thus changing tacit knowledge; they learn from each other); Externalization (tacit knowledge is explicated by using further models and concepts): Combination (explicit knowledge is combined from various sources to form larger entities of explicit knowledge); and Internalization (to work on the explicit knowledge and transform it into one's own tacit knowledge). The SECI model is one of the basic components in knowledge management (KM) as it is known today (Nonaka and Takeuchi, 1995).

significant on some level to the individual and the exchange of perspectives about the experience with others (Piaget and Inhelder, 2008; Vygotsky, 1980).

A simplified example of this deviation is to observe an object like a cup. The object itself can be used to cater for many purposes, but its form does suggest some prior "knowledge" about moving liquids (Paul et al., 2012). Another more complex example closer to the academic environment is that of an online course in a curriculum. The format, the configuration of the software and tools, may reveal something about the way a particular online course should work. However, the actual activities and contents, together with behavior of the other participants, define and shape the way a single person conducts her/himself regarding that particular course. This means that the cognitive development of an individual will similarly be influenced by the organizational culture that s/he is involved in. A circle closes again on the artifacts, such as the language, history and social context manifesting the current organizational culture (Schein, 2010, 2004).

The basic idea behind social constructivism is not new, even though it is not a common concept in the information systems discipline. Social constructivism is based on Emile Durkheim's (2014) concepts of institution, dating back to the late-19th century. Notions of Alfred Schütz's (1970) sociology of knowledge from the 1940s and 1950s are also included. The term *social constructivism* might be seen to derive from the 1960s (Berger et al., 2002) as the thoughts were further refined to cover the area of subjective individual notions becoming a fact-like actant (see Chapter 5) in a social setting, such as a business enterprise. Social constructivism also has features from Russian cultural psychology, in that the organizations of individuals create meaningful "sub-cultures" and the artifacts manifesting them (Vygotsky, 1980). These sub-cultures are, in the social sciences, sometimes referred to as shadow[2] or unofficial organizations (Allen and Pilnick, 1973). Unofficial organizations manifest themselves in the informal behavior, which, in the name of tradition, habit, and expectation, is carried out on a daily basis. This consists of what people actually do rather than what they say, that is, real life. The management may use the shadow organization to promote its objectives (Behrens, 2009; Gulati and Puranam, 2009; Mattila et al., 2012), if managerial know-how and skills are there (Dilchert et al., 2007; Thomas, 2008). Should the shadow organization be at its most negative, it may well hinder the progress (Allen and Pilnick, 1973; McGuire, 2002). Even though studying organizational culture is

[2] Sociological research has defined the dual system of organizations (e.g., Burke and Noumair, 2015; Leonidou, 2004; Peltola, 2003) and their effect on organizations (Andersson et al., 2002). Unofficial organization means an organization that lives within the official one (Allen and Pilnick, 1973). They coexist simultaneously and may or may not affect each other and may be seen as positive or negative from the management's point of view. Like the official one, the unofficial organization has its norms of conduct. Some of the manifestations of this phenomenon are knowledge sharing across teams on the positive side, and the pecking order and exclusion of some individual employee on the negative side (Gulati and Puranam, 2009).

largely omitted from this thesis, it deserves to be acknowledged that the existence and the role of artifacts are centric themes in that area (c. f. Schein, 1992). A prime example of social constructivism is academic writing where an author uses other sources according to a paradigm to support his/her own ideas and combines various sources to form new knowledge.

2.1.3 Constructivism, Learning, and Information Systems (IS)

The idea of combining social science with technology, that is, to study how the design and implementation of technology are patterned, not only by technical issues but also by a range of social and economic factors, started to become increasingly popular some 20 years ago at the latest (e.g., MacKenzie and Wajcman, 1999; Williams and Edge, 1996). The previous studies show that there is more to technological alterations and developments than meets the technological eye. However, the early studies still have their doubts about the true meaning of the possible connection between the social aspects and those of technology as they deem "social analysis of technology - a developmental stage that was, in many ways, contradictory, and perhaps transitional" (Williams and Edge, 1996, p. 892). Nevertheless, one is, and would have been, advised to keep in mind the so-called Leavitt's diamond or model (1965), which brings together in an integrative way an organization's different *super-classes* that form the foundation for a socio-technical entity: people, technology, structure, and processes (Figure 3 below). These *super-classes* are fundamentally all involved in and affected by all the changes that happen in an organization, such as bringing the social and IS/IT sides closer together (Päivärinta and Tyrväinen, 2001). A change in one has its inevitable effects in the other three.

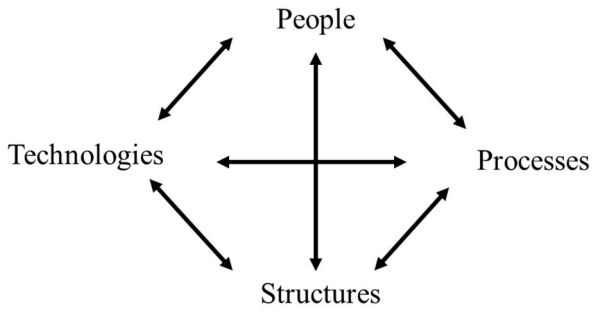

Figure 3. Leavitt's Model (1965)

The process of learning in IS/IT requires the accumulation of knowledge, both short- and longer-term perspectives of the proceedings, and overlapping developments of explorative and exploitative learning (Lichtenthaler, 2009; Nonaka and Konno, 1998; Wang and Rafiq, 2009). The learning process needs the development of specific organizational capabilities, which allow organizational actors to acknowledge and adopt external knowledge (Zollo and Winter, 2002). The capacity to explore and utilize knowledge simultaneously are essential for the learning whilst the daily projects are ongoing

practice. Equally important is the understanding that these capabilities could, and even should, be developed over time (Marabelli and Newell, 2009).

Sometimes where software development is concerned, the actual developing needs to concern itself with the business needs of an organization. It may be an internal or an external customer; in any case, there needs to be knowledge transferred between the parties. Knowledge transfer and sharing bring challenges (Kukko, 2013), which are seen to be dealt best with methods related to constructivism (Jackson and Klobas, 2008). To overcome possible difficulties by using this type of mindset offers promising avenues toward improving IS project outcomes by increasing project managers' knowledge level and offering them tools for improving a project's knowledge environment (Jackson and Klobas, 2008). Even if the social scientific approach is not centric for IS research, there are studies where the two have been brought together (e.g., Mitev, 2000), but the overall notion is that the existing research combining the constructivist approach and change in the teamwork context in IT/IS is scarce and leaves a knowledge gap in the area. Constructivist thinking and principles are applied in the IS context to study a specific IS implementation (Mitev, 2000; Sarker, 2000) and knowledge creation in a project-based operation (Jackson and Klobas, 2008), and to assess social factors in a specific implementation (Njenga, 2014), but also as a meta-theoretical possibility to conduct research (Mingers, 2004).

The actual learning in operations seen from the constructivist viewpoint also interprets and acknowledges the diversity of the personnel. The multiple backgrounds of multiple people bring more knowledge and more viewpoints to a project (Rousse and Deltour, 2012). This, in turn, may mean improved creativity and solution finding (e.g., Liang et al., 2010; Rousse and Deltour, 2012). However, simultaneously, the diversity may contribute to conflicts within the involved personnel, should there be significantly deviating levels of knowledge and know-how among the peers (ibid.). Then again, should there be differences of opinion, the following discussions, including appropriate reasoning, are also learning opportunities, which may improve overall performance, especially in the long run. The remedy for this is change management along with its communication, including promoting the opportunities to learn (Liang et al., 2010).

One area involving both constructivism and IS is computer-supported collaborative learning (CSCL) (Suthers, 2006). CSCL is a pedagogical approach where learning happens through the Internet or using a computer and centering on the social interactions therein (e.g., Lipponen et al., 2004; Strijbos et al., 2004). This type of training is characterized by constructing and sharing knowledge among participants who use technology as their primary and preferred means of communication or as a shared resource

(Stahl et al., 2006). The study of computer-supported collaborative learning draws on a number of academic disciplines, and is related to collaborative learning and computer-supported cooperative work (CSCW; e.g., Hernandez-Leo et al., 2006; Stahl, 2013). It may be stated with full confidence that the use of information technology tools has entered the arena of educating and training individuals both on and off the professional field.

2.2 Roles of and in Teams in Information Systems (IS)

Many organizations have adopted organizing their production, even on a global scale, into teams (e.g., Brewer and Holmes, 2016; Cusumano, 2008; Mitchell et al., 2012). There are numerous benefits, such as flexibility in agile manner, in applying team-based operations (Boehm, 2006). The teams are said to be more productive and even more creative (Hackman, 2009). Also, enhanced knowledge gathering and improved knowledge sharing are seen as possible benefits in applying team-based operations (Haas, 2006). Thus, information systems project teams' performance is a topic of ever-growing importance to practicing managers as well as researchers (Keller, 2006; Morgeson et al., 2010; Thompson, 2011).

"Team" is such a common and widely used concept, that it is necessary to look at what teams are really about. Briefly stated, a team may be any organized group of people (Anderson and McMillan, 2003). To be more precise, it is usually a group of people with a set of mutually complementary skills required to complete a task, job, project, or maintain a process with a meshing of functions and mutual support (Marquardt et al., 2009; Maznevski and Chudoba, 2000). Teams are founded and set for a purpose; the tasks are defined in the implemented strategy of an organization. The team structure is a relatively permanent setting, or it may be for a shorter period. A team may be co-located and a stable structure or virtual and dynamic; both team forms are possible solutions for a corresponding, case-specific environment. Teams need to have a leader to answer questions and act as a figurehead (Edmondson, 2003; Goleman, 2003; Pauleen, 2003a), but as to the optimal size of a team there is no one answer. The team may work well with just two members or even with up to 20 individuals (Heathfield, 2016). When the team size grows bigger, it becomes increasingly likely that sub-teams, work groups, or the equivalent are formed to take care of the actual tasks as an answer to the demand of operability and manageability (Pauleen, 2003b). The size, and thus the staffing, of the team is dependent on the purpose for which the team is formed.

It may be concluded that in practice the defining features in teamwork are such that the team members (Stewart, 2006; Vanaelst et al., 2006):

- operate with a high degree of interdependence;
- share authority (to a degree) and responsibility for self-management;

- are accountable for the collective performance; and
- work toward a common goal and shared rewards.

A team operates ideally when its members become more than merely a collection of people. This may be observed when a sense of mutual commitment is able to create synergies, generating performance better and larger than just the sum of the performances of the team's individual members (Belbin, 2012). Equally important is to keep in mind the expectations the team and its members are burdened with, as well as the roles that the team members need to play as a team in order to reach the optimal performance on behalf on the organization. The team work needs to include a sufficient amount of cohesiveness and interconnectivity for the team members to be able operate effectively and to meet the organizational objectives (Stewart, 2006). As Microsoft founder Mr. Bill Gates states: ". . . I do know that if people say things that are wrong, others shouldn't just sit there silently. They should speak. Great organizations demand a high level of commitment by the people involved. That's true in any endeavor . . ." (Rensin, 1994, p. 63).

However, the team leaders' role is also changing; team leaders' managerial job is no longer only to execute an external control function upon the team members. The daily work is seldom now just monitoring and evaluating subordinates or selectively distributing and filtering information they might need to execute their tasks. Interpersonal skills are largely within the big picture in what constitutes successful leadership in the present but especially for the future (Kruchoski, 2016). In light of the changing work context, the role of a team leader as a manager is more often seen as a coach and facilitator who provides effort coordination and worker's orchestration based on their skills, talents, and motivation toward the task at hand (Ahearn et al., 2004; Balkundi and Harrison, 2006; Edmondson, 2003) to optimize the outcome of the team's performance. The newer role requires new competencies of managers and leaders (Buckingham and Coffman, 2014). Social, and even political, skills are needed of the team leaders to be able to effectively work with, through, and around others to promote the team's output for organizational objectives (Ahearn et al., 2004). Similarly, the role of the team members is changing. The team members are required, in addition to their more technical prowess, to more actively take part in the teams' work, including the planning and the development (e.g., Eckstein, 2013; Kearney et al., 2009; Leggat, 2007). However, in practice, this is highly dependent on the national and organizational culture under which the operation takes place (Eisend et al., 2016); to what degree is the autonomy in teams, also on the individual level, allowed to go on, and how does this affect the hierarchical structures and power structures within an organization?

2.2.1 The Discipline of Information Systems (IS) as a Context for Teamwork

According to the Cambridge Dictionary (n.d.), discipline is "a particular area of study, especially a subject studied at a college or university." That entails the corresponding research in the area. Interestingly enough, the parallel definitions and interpretations for the phrase in the dictionary are rather strongly connected to rules, control, and even punishments for not abiding by the ruling. Simultaneously, it issues the feeling of controlled boundaries for something with more than a hint of strictness to it. A discipline in research discourse means that there is a foundation for studies and research, but also for development, a disciplined approach to certain areas of operation, such as software engineering, a centric set of properties; that is, concepts and occurrences to define the area of interest and also to create its identity (Benbasat and Zmud, 2003). In the example, concrete methods for managing software development and maintenance need to be developed. These methods provide programmers and managers with specific steps they can take to evaluate and improve their software development capabilities. The variety of methods may be applied from the personal level to the organizational level, in order to assist software organizations and engineers to develop the skills and working practices needed to plan, execute, track, and analyze the projects (Humphrey, 1995).

IS as a discipline is "a boundary-crossing mixture of the technical and the social" (Ramage, 2004, p. 71) that has been around for a half a century and has been evolving ever since. IS developed from the connection of computer science, management and organization theory, operations research, and accounting (Davis and Olson, 1984, pp. 13–14). To be more precise and to underline the dual approach of the social sciences and the technical ones of the pragmatic view to the tasks of an information system, it may be stated that an information system collects, processes, stores, analyzes, and disseminates information for a specific purpose or function (Hirschheim et al., 1995). To interpret that into actions: information systems involve personnel to plan and later to execute and give the parameters for the data harvesting. The decisions need to be made beforehand on how various situations are to be handled. The human input is equally significant at every phase to use the technologies (i.e., tools) that are offered at each stage, as are the technologies themselves. Thus, it becomes intuitively understandable that IS, indeed, is inevitably an interdisciplinary activity and subject to study.

According to another definition, a system in an organization offers available information to support personnel striving to achieve a goal and to create meaning and value (Checkland and Holwell, 1997). There are various directions, forms, and stages of ambition that have led the discipline to a state which

Hirschheim and Klein (2003) describe as fragmented and riddled with *disconnects,* communication shortages. These circumstances prevent the discipline from having any general and productive discourse (Hirschheim and Klein, 2003). With its continuous developing nature, the expanding multitude of various aspects and more concrete skillsets, in addition to the vastness of the discipline, the nature of IS is not cut out for removing the prevailing vagueness. The more recent research on the discipline is equally centered around a more closely defined object of interest (e.g., Carver and Turoff, 2007; Jones and Karsten, 2008).

2.2.2 Various Types of Teams in IS (and elsewhere)

There are distinctions between different kinds of teams. In the organizational context, the appropriateness and suitability largely dictate the choice of the team format, which sometimes causes the borders between the types of teams to be flexible or non-existent. However, it is notable that as the labels on the teams are case-specifically elective, as are their compositions (Lyytinen et al., 1993), it is advisable to distinguish the meaningful and relevant features in them when considering the true meaning or the usability of each type of team.

Department teams are the oldest form of teaming. The team members have their know-how and knowledge based on a special field of operation on which they concentrate (Senior, 1997). The ultimate objective for these teams is to carry their weight in achieving the organizational goals as well as possible, and help to achieve the organizational goals for their part (i.e., meet their objectives). Practical examples of these sorts of teams are developer teams in software development organizations and sales teams in organizations that have a sales function. The tasks the department teams have are typically permanent or concern ongoing projects. For example, in software production projects, there are features such as early prototyping, running various tests on each of the builds, and doing frequent design reviews. They can accommodate a lot of change while still keeping quality and budgets under control if they are a well-functioning co-located team (MacCormack et al., 2003). Department teams are relatively permanent structures, having a direct connection to the organization's operation. The management of these teams is rather straightforward according to the organizational setting and hierarchical structures. As these teams are rather stable, they allocate expenses to training in their annual budgeting (Senior, 1997; Senior and Fleming, 2006). Thus, it is dependent on the organization's strategy and culture of how well and in which quantities the training needs are being taken into consideration. The stability may cause change situations to mean more uncertainties and insecurities.

Should an unexpected issue or larger problem emerge, an organization may consider setting up an interim problem-solving team to find a solution to the emerged issue (Rafoth and Foriska, 2006; Stough et al., 2000). Sometimes, if not often, the members of these teams are allocated to this taskforce in addition to their normal work routines without extra time being allocated to this teaming. Should this be the case, more attention from the management is required to oversee the proceedings and monitor the individual power supply and resource sufficiency of each member of the team. These kinds of "ad hoc" teams are sometimes needed, and they often perform well, but they may prove to be wearing for their members as they present them with an added workload. After the issue has been solved, the team is usually disbanded (Rafoth and Foriska, 2006). The managerial challenge may prove to be the fact that these "taskforces" have their managers and objectives also in the original position. Thus, organizations with these types of teams are to be executed with diligence, covering all the bases to prevent any conflicting interests. The learning in these endeavors adds to the individual's knowledge base; however, the challenge may be how to ensure the organizational learning.

A cross-functional team essentially means the situation in which the previously mentioned department teams are in need of assistance from other departments of the organization; that is, they need to collaborate with other teams and members of the organization (e.g., Bamber et al., 2003; Simsarian Webber, 2002). Occasions when this may occur are, for example, certain events for the organization, such as a new product launch. In such a case, the communications between internal departments is crucial in order to achieve the project objectives (Chen, 2007). The research on cross-functional teams case-specifically concentrates on various aspects regarding the team work or the areas where such teams might be used, for example, knowledge integration processes (Huang and Newell, 2003), the meaning of the team members' backgrounds (Randel and Jaussi, 2003), the actual working with various parties (Parker, 2003), and also innovations as they came into the big picture (Eisend et al., 2016; Liu and Cross, 2016; Love and Roper, 2009).

A virtual team can be any type of team or work group that prefers to communicate digitally rather than in person (Gibson and Cohen, 2003; Maznevski and Chudoba, 2000). The reason for this may be simply that the team members are not co-located. The separation does not need to be geographically remarkable; if the digital media offers better functionalities than the other tools, it becomes a natural choice (Eubanks et al., 2016). Virtual teaming is developing in step with the development of technical tools. For example, engineering teams are increasingly often geographically scattered and include participants from multiple disciplines and cultures. Organizations are increasingly adopting virtual teams and using a variety of information and communication technologies to support their team

interactions, both synchronous and asynchronous (e.g., email, videoconferencing, chat/instant messaging, group support systems, and forums; Rutkowski et al., 2008). Increasingly frequently, communication takes place without having any face-to-face contact.

Easier communication tools allow managers to form teams based on team members' strengths and know-how, and not just their geographical availability. Many studies regarding teams concentrate on their virtual aspect (e.g., Lewin et al., 2008; McDonough et al., 2001; Webster and Staples, 2006) or the team building (e.g., Hayashi, 2004; Nahavandi and Aranda, 1994). While virtual teams are said to have increased flexibility in setting goals as a feature but also the commitment to achieve them, the virtual context may prevent team members from coordinating their activities and influencing others (Carte et al., 2006). The available communication technologies and tools should match the various types of interpersonal interactions that may emerge. Among these interactions, the following three are the most conspicuous interpersonal processes: conflict management, motivation and confidence building, and affect management (Maruping and Agarwal, 2004).

Self-managed teams are the most empowered type of teams, as they are in a position to make decisions (Power and Waddell, 2004). Each team member brings a certain skillset to the team, much like in any other type of team, but in this type of team, the skillset needs to include decision-making capabilities. The team members have to be qualified, or at least able to take a stand on how to make informed decisions, complete assignments, and deliver services for their customer-base. The leadership in self-managed teams is sometimes divided into shared leadership and single leader as some kind of leadership still needs to be there (Solansky, 2008). Companies that have implemented self-managed teams say their employees tend to feel more ownership of the project (Liu et al., 2012), which in turn may mean significant commitment to the endeavor. It is not uncommon for the last two categories (virtual and self-managed teams) to be combined.

2.2.3 To Manage a Team in an Information Systems (IS) Environment

Team is a widely used concept in multiple environments (Brewer and Holmes, 2016; Cusumano, 2008). The basic management of a team in IS does not necessarily differ per se from the team leading in any other environment. What makes IS a unique environment is the nature of the field; the teams may combine the various aspects shown in Section 2.2.1. The variety within the field makes it even more challenging to define any general guidelines to the area of team management. The organizational culture dictates the team's internal working practices and power balance. On top of this comes the possible variations in the individuals' capabilities and experiences, especially when there is a cross-functional team being studied. In a team-based organization, often the team leaders manage their

team, but case-specifically, there may still be the management of the business unit, which is interested in the goings-on. Team leaders are in a centric position to create the working culture for a team and to define the way of working in a team. However, the team leaders are sometimes in a conflicting position in between their team and the management (Virtanen, 2013).

There are also challenges in teamwork, such as individual motivation. Different people are motivated by different things (Chen and Gogus, 2008). Some studies show that empowering the team members will motivate them to be more active and better team members (e.g., Kirkman and Rosen, 2001; Srivastava et al., 2006; Xue et al., 2011). A sense of belonging to something, a group, an ethnicity, or otherwise, is yet another factor that may motivate and affect the performance of a team member (Kirkman et al., 2004). The previous factor includes the effects of both well-organized and functioning team communications and the possible conflicts. As there is an abundance of methods and tools, those chosen from the array and their fit to the tasks influence the performance of the team (Goodhue and Thompson, 1995). Should the toolset offered be unsuitable for the job, the eagerness to get on with the work is lessened, compared to a situation where the work equipment is appropriate. This does not only involve the actual technological solutions, but also the way they are allocated and used. However, with time, the teams innovate and adapt to the prevailing state and adjust their actions accordingly; thus, the significance of task-technology fit becomes less critical with time (Fuller and Dennis, 2009). It is advisable to encourage the teams and show appreciation for their efforts, especially if the initiative is a pioneering sort of action (Boehm and Turner, 2005), as it often is with change initiatives.

It seems that team empowerment is positively related to (virtual) team performance: process improvement and customer satisfaction. However, it also seems like teams will hold onto their autonomy; teams that are monitored more closely do not perform as well as teams that are granted more freedom, and after commencing, relied upon (Kirkman et al., 2004). Some research is centered on the experiences gathered from virtual teams, as they are being used in more effective ways as technologies and tools develop (e.g., Choi et al., 2010; Reed and Knight, 2010; Robert et al., 2009).

2.3 Change in Working Practices and Modus Operandi in Software Development and in Team-Based Operations

In the following, change is described with its multiple manifestations and effects. However, due to the fact that change is a contextual phenomenon (Corden and Millar, 2007; Pinnington and Morris, 2003), statements are rather descriptive than exclusive definitions. Change is an event or an occurrence that may be observed in which something is made or becomes different (William, 1991). The actual level

of change is not relevant, as long as the change is visible and somehow observable. It is said that change is the only constant there is (e.g., Kitchen and Daly, 2002; Xie et al., 2012). The phenomenon has been around for quite some time and it has puzzled thinkers through time. This may at first seem like a slightly frivolous statement but there lies a truth within.

The difference may be observed happening over time in the form, state, or quality of an organizational entity (Van de Ven and Poole, 1995). Van de Ven and Poole (1995) created a model in which four types of change, or theories of change, are described: life cycle, teleology, dialectic, and evolution. Later, these basic theories, aiming to explain the processes of change in organizations, were transformed into process models of change (Figure 4; Van de Ven and Sun, 2011). The process models differ in terms of unit of change (i.e., whether they apply to a single entity or multiple entities in or between organizations), and in mode of change (i.e., whether the change follows a certain order or whether it is constructed as the proceedings develop; Van de Ven & Sun 2011).

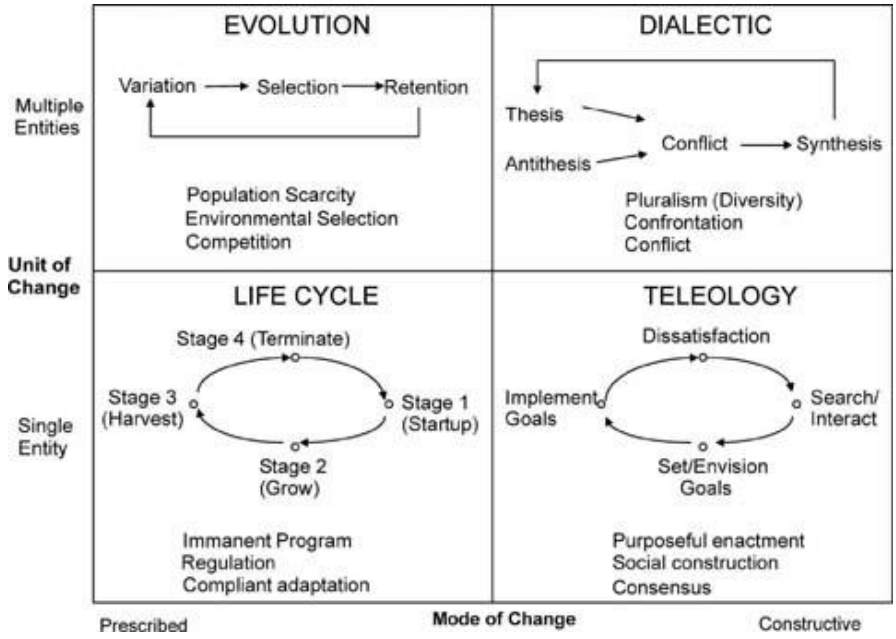

Figure 4. Process Models of Organization Change (Van de Ven & Sun 2011)

The life cycle model (strictly regulated change) illustrates change as a succession of stages and activities given by natural, logical, or institutional routines (Van de Ven & Sun 2011). Change is impending. The evolutionary approach adds ambiguity and human agency to the life cycle model to register the built-in uncertainty (March et al., 1976; Poole and Van de Ven, 2004). An organization may be defined as an ecosystem (e.g., Danter et al., 2000; Glenn and Malott, 2004); thus, the change events in a life cycle model may be described as a logical sequence (Van de Ven and Poole, 1995), and a

controlled life cycle model is appropriate for managing frequent organizational changes. The change process fails in the event that the instructions are falsely designed or when involved organizational members manifest resistance to change (Van de Ven and Sun, 2011).

Teleological and dialectical models are not necessarily competing with the previously mentioned models but rather complement them (Aldrich, 1999). The teleological approach is a systematic and planned change in which development is regarded as a recurrent sequence of setting the objectives, implementing measures, evaluating the proceedings, and modifying the end state according to lessons learned (Van de Ven and Sun, 2011). The teleological approach entails the actants working in unison towards a commonly acknowledged goal. Should this not be the case, the model is inoperative, and similarly, should there be biased results (Van de Ven and Sun, 2011).

The dialectic model is a conflictive change, which places opposing and mutually competing propositions side by side and the resulting synthesis acknowledges the original thesis (Van de Ven and Sun, 2011). In organizations, the various teams may have such. In a project type of operation, such a situation may be faced when the various parties involved have their objectives accordingly individually set (e.g., Le Roy and Fernandez, 2015; Putnam et al., 2016). In an organizational context, the dialectic model may depict the friction between the existing organizational culture and the novelty that is required to implement a planned change (Ke and Wei, 2008; Robey et al., 2002), such as in IS/IT-enabled work practices. The dialogue is needed to execute the proceedings; omitting this makes this way of operating void.

Change may happen on various levels and scales (Childe et al., 2001). The change may present itself as incremental and iterative development, which is sometimes referred to as continuous improvement (Bessant et al., 2001; Choi, 1995), which is actually very near to the original Japanese phrase of Kaizen[3] (e.g., Freedman, 2016; Jyothi and Rao, 2012) in the production environment. The improvements are not confined to organizations' technical improvements, but they include the personnel as well; each individual is subject to change as well as the organization and its processes (Manos, 2007; McNichols et al., 1999). The other extreme is to introduce a radical change upon the organization all at once (Burnes, 2004a). The basic idea behind this is that the overlapping work by using two ways of doing things in the organization is avoided and discontinuance remains as short as

[3] Originally and literally, this Japanese philosophy of continuous improvement of working practices translates to *improvement*, according to the Oxford Dictionary of English. It underlies the once megatrends total quality management and just-in-time business techniques.

possible; thus, the disturbance to the operation should be kept to a minimum. This requires much from the organization as the preliminary work for the change should be carefully planned, tested, and performed with simultaneous training for the all of the organization's employees (McNabb and Sepic, 1995). The obvious problem here is that the employees usually have their daily routines to take care of simultaneously; thus, another factor to plan for is the time resource.

According to Drucker (2011), change may simultaneously be seen as a challenge and as a creator of possibilities/success. Change presents discontinuance in organizations. The change itself need not only be a success; the management is advised to take the opportunity to evaluate the organizational behavior also in cases of problematic change situations (Kanter, 2003). When such an opportunity presents itself, the management may use it to break existing patterns or structures, such as the organization's departmental order or an unofficial shadow organization. The first one, old organizational structures, may have caused disturbances in operation merely by the fact that "something has always been done this way", thereby slowing down the developments in operation. The structures may not be compatible with the plan the management has for the future; thus, there is a need to change something. The latter one, the unofficial organization, may be of such a strong build, for example, that this may cause even stronger resistance to change, as the unofficial organization provides security for its members within the group. (e.g., Burke and Noumair, 2015; Leonidou, 2004; Porras and Hoffer, 1986)

2.3.1 Context and Background to Knowledge and Its Management in Organizational Change

The role of knowledge is yet another phenomenon in change situations in organizations. The basic idea in knowledge management (KM) is to transfer elsewhere existing knowledge and experience to locations where they are novel (Ainamo, 2001). As this premise is central to this thesis, its inception and appropriateness merit a comment. Knowledge is recognized as a factor of production already in graduate studies (e.g., Haverila et al., 2005; Hintikka, 1993), alongside the three other factors that are workforce, capital, and natural resources (Varian, 2014). The KM strategies are often divided into two main categories: codification (i.e., the knowledge is explicit and coded according to the organization's needs) and personification (the knowledge of the people, whereby the organization is advised to take appropriate actions to attempt to capture it; Mukherji, 2005)

Before the value of knowledge was fully acknowledged, the reigning theory was the *resource-based view of the company* (RBV; Penrose, 1995). The RBV defines the resources available to a company and which of those can be described as strategic. The RBV's basic principle is that a competitive advantage of a firm is mainly based on the application of the collection of resources at the firm's disposal (Rumelt,

1997; Wernerfelt, 1984). The longer-term advantage of these resources, instead of them being momentary aids, requires that they are heterogeneous by nature and not easily replaced (Barney, 2000; Peteraf, 1993). These resources are not easily copied by another actor nor are they easily substituted with something else (Barney, 2000; Hoopes et al., 2003). A firm's collection of resources can aid the firm's success if these prerequisites are kept.

The RBV was followed by the *knowledge-based view* (KBV) of the firm. The KBV extends Penrose's initial thoughts and concentrates on knowledge as a centric resource (Barney, 2000; Conner, 1991; Wernerfelt, 1984). The KBV advocates that the RBV sees knowledge as a generic resource without any particular or specific characteristics; thus, various knowledge-related and knowledge-based features and capabilities are left out. Due to the nature of the knowledge-based resources that are usually complex and extremely difficult to copy, various multifaceted knowledge storages and bases in organizations as well as expertise and capabilities are the focal elements in creating a competitive advantage and better corporate performance (e.g., Carayannopoulos and Auster, 2010; Curado and Bontis, 2006; Grant, 1996; Kogut and Zander, 1992). Knowledge is embedded and demonstrated in employees, routines, documents, systems, organizational culture, identity, and policies. This also means that they are subject to change. According to the KBV, information technology may play a significant role in creating systems for composing, improving, and advancing even large knowledge management systems, be they within one organization or between multiple organizations (Alavi et al., 2006; Alavi and Leidner, 2001). The management of knowledge is centric for success.

2.3.2 Change and Its Manageability

Change management tries to systematically control the altering circumstances or happenings (Todnem By, 2005). To try to predict the outcome of a newly implemented plan or strategy is the sum of multiple factors, and thus, nigh impossible to tell how a situation is going to turn out (Courtney et al., 1997). However, management has no option but to try to control the settings and procedures connected to the change. It is important for management to keep both perspectives in mind when planning the change and implementing it; that of an organization and the individual level – the macro level and the micro level (Anderson and Anderson, 2010; Robey et al., 2013). Change management is a somewhat ambiguous term, for it is used to mean at least three different phenomena: adaptation to change (e.g., Herold et al., 2007; Paton and McCalman, 2008); controlling change (e.g., Burnes, 2004b; Kotter, 2008); and affecting change (e.g., Kavanagh and Ashkanasy, 2006; Kumar et al., 2008). A proactive approach to dealing with change is centric for all three aspects. The true meaning of any measures taken by management is to be pre-emptive for any difficulties and mishaps (El Kharbili et al., 2008). For an organization, change management means defining, planning, and implementing

procedures and/or technologies to deal with changes in the business environment and to try to profit from changing opportunities.

The more successful the change management is, the better the organization will survive (Piderit, 2000). Organizations and the persons in them inevitably encounter changing conditions that are beyond their power to control. The more effectively one deals with change, the more likely one is to be successful, and in case the adaptation does not take place, threatened by defeat (Goodman, 1987). Adaptation may involve planning and implementing a structured methodology for responding to factors of change in the business environment, such as a threatening competitor or economic fluctuations, or establishing survival mechanisms for responding to changes in the workplace, such as new technologies or implementing new policies (Anderson and Anderson, 2010). Adaptation is as crucial within an organization as it is in the natural world. After all, "it is not the most intellectual of the species that survives; it is not the strongest that survives; but the species that survives is the one that is able best to adapt and adjust to the changing environment in which it finds itself" (Megginson, 1963, p. 4).[4]

Resistance to change is a human phenomenon and inevitably exists in an organization that wants to implement a change (Ford et al., 2008; Watson et al., 1967). It is important to acknowledge that there is no organizational resistance to change, but the resistance is always with the individuals (Bailey and Raelin, 2015). Behind the individual sentiments, there is often the fear of losing something (e.g., Ford et al., 2008; Kiefer, 2002). The feeling of losing control caused by organizational change may lead to individual experiences of vulnerability and anxiety. It is proposed that the resistance is not towards the actual change per se, but rather towards the possible unwanted effects caused by it, such as individual uncertainties about one's employment (Dent and Goldberg, 1999). These sentiments may point to other problems in organizational change management, such as incomplete communication of the change. One centric task of change management is to dispel such reservations. Management can scarcely completely avoid nor remove it; resistance to change can only be dampened or minimized. There are arguments that one could try to make the best of it, but how?

In one sense, all management is change management, since a steady process flows, but whenever people are involved, there are always circumstances that are somehow altering. There are numerous guidelines and instructions (e.g., Anderson and Ackerman-Anderson, 2010; Anderson, 2000; Drucker,

[4] After an amount of research, it is apparent that this quote exists indeed because of and based on Darwin, but not by him. (https://www.darwinproject.ac.uk/people/about-darwin/six-things-darwin-never-said-and-one-he-did)

2011; Senior and Fleming, 2006) that try to explain what to do and when. However, there is hardly one silver bullet over all the other solutions. Kotter (1996) describes eight possible reasons for failure of the change. In reverse, they form the following normative steps to avoid this:

- Acknowledge the urgent need for change;
- Create a coalition powerful enough to back the change;
- Develop a sharable vision;
- Communicate the vision via all channels all the time;
- Commit and empower others to act;
- Make sure that there are short-term successes;
- Do not stop too soon, build on the successes; and
- Incorporate the change into the culture. (Kotter, 1996)

Before the actual change process takes place, management has to make the members of the organization understand the necessity of the change and preferably accept it (Dent and Goldberg, 1999; Miller and Rollnick, 2012). If the overall attitude in the organization under inspection is overly satisfied with the existing situation, the organization would be hardly willing to implement any change save for minor adjustments. Thus, management should point out the flaws in the plan and make the rest of the organization see that the future is better with the proposed changes. Sometimes, there are no actual mistakes or direct faults present. In this case, management should point out the possible threats caused by the fact that there were no preparations made for the future, and show that with due precautions, these risks are not likely to occur. The bottom line is to make the organization see that the change is a necessity (Kotter and Schlesinger, 2008). These circumstances have resulted in proverbs such as “in business one has to run for even to retain one’s position.”

Earlier, resistance to change was briefly introduced. The organization needs a counterweight for resistance to change, which is a human feature in all of us, if it wants the change to succeed (Dent and Goldberg, 1999). It is important that the team responsible for the change carries enough weight to make decisions and carry out the necessary tasks (Eby et al., 2000). The change must have a representative in the organization’s top management, a sponsor who leads by example and supports the actions with his/her authority (Young and Jordan, 2008). The members of an organization are reluctant to alter their accustomed ways of working, and they are trying to preserve what they can (e.g., Ford et al., 2008). This, however, cannot be allowed unless the reasons for such actions are very thoroughly inspected and acknowledged. This rigor in implementing the newer mode results from the fact that remnants of previous ways of working are always reminding the workers of the change

situation. Thus, as critical in a nature the change is, it tends to gild the memories of the old and criticize the novelties for which personnel has not yet built a routine to use them (Cummings and Worley, 2014; Longbotham and Longbotham, 2006). In addition, the possibility for various side effects such as self-interests or ill-willingness needs countermeasures.

Management and the change agents must have a vision of the better operation after the implementation of the change (Carnall, 2007; Zaccaro and Banks, 2004). The proverb, "*where there is no vision, the people perish"* (Book of Proverbs 29:18) holds true also in this context. The vision must be communicated to and through the organization. The vision gives the change a general direction, something to strive for. It is well worth noting that without a vision, the change is merely a collection of separate actions and steps that, in the worst case, are pulling the operation in multiple directions, creating confusion, disintegration, and disorder (Hayes, 2014). The vision also functions as a trigger for procedures that are aimed to benefit the organization in the future, directly or indirectly. The operation is easier to direct and control when the whole organization is in accordance of the vision. According to Kotter (1996), a lacking vision of a better future state is one major threat for the successful implementation of a change. A well-chosen and formulated vision is an asset (Cameron and Green, 2015). The vision must be simple and it has to be communicated. However, there is more than one option to interpret the proceedings; the terms *philosophy*, *values*, *mission*, *vision*, and *objectives* have been used interchangeably by academics and practitioners (Bartkus and Glassman, 2008).

In spite of the notion in the previous paragraph, there are distinctions in the phrases presented. An organization's philosophy is a permanent statement of its core values and beliefs explicated and reinforced by top management (Byars and Neil, 1987). An organization's philosophy gives guidelines on how the operation is to be taken on with and to various stakeholders. Should this not be explicated, the staff will individually interpret the aims and actions, thus creating a diffuse image of the entity and diminishing the organizational clarity. An organization's values of this kind are sometimes divided into terminal and instrumental values (Rokeach, 1973) so that a person is in opposition to an object. Terminal values are something a person tries to achieve independently, and a final state of being (e.g., wisdom, easy living) that have a worth of their own and are, therefore, worth pursuing. The instrumental values are seen as ways of conducting oneself (e.g., unselfishness, truthfulness, fairness; Meglino and Ravlin, 1998). A summarizing interpretation of the values might be that the terminal values are strived at through the instrumental values. Mission is a strategic tool, in which the organization clarifies the rationale for operating and its actions as well as the target markets (Campbell and Yeung, 1991). The organizational culture and strategy are condensed into one concise mission

statement. Mission defines the organization's reason for existing, its identity, and its character. Mission should reflect down to measures by which the organization evaluates its operation, to ascertain that the actions taken are moving the organization in the right direction (Kaplan, 2002). Vision is somewhat similar with the distinction that it is more of a desirable image of the future state of the organization, lacking the need for the meticulousness of a mission statement.

Communication and communicating come up on multiple occasions in conjunction with change management. However, these are largely omitted in this study, as they are both such large themes that they deserve and have their own discourse. Nevertheless, it needs to be acknowledged that the theme includes both communication and communicating. The change is well off if the vision is internalized by key personnel, but if the whole organization has taken in its meaning, the power of the vision is great (Simpson, 1994). Even the best of visions is no good if the employees do not know it. The communication must be delivered on multiple channels and multiple levels (Lewis et al., 2001). Human nature makes its own interpretations and assumptions of the communications it receives (Åberg, 2002); thus, repetition and control over this is well placed. One challenge with communication is the fact that it may be interpreted differently by different persons (Nielsen and Randall, 2013). The change agents may rely upon the fact that they have delivered knowledge in a meeting. However, there is no guarantee if and how the attendees listen. In a situation where top management takes part in the communication, it is important that they also act the way they speak. Few things undermine a message worse than a bad example (Seeger and Ulmer, 2003). The possible obstacles, psychological or physical, need to be removed. If the organizational structure is hindering the development, then it must be taken down and renewed (Benner and Sandström, 2000). It is important that the employees are enabled to achieve what is required of them. The physical obstacles are easier to remove (Kotter 1996); as there may also be mental structures to be altered, achieving this requires significant time and effort to change the organizational culture with the value structures (Schein, 1992). These details, however, are outside the scope of this study.

To make the change happen, the organization needs to get the commitment of its employees (Bird, 2014). To accommodate such commitment, the organization may find it useful to implement a symbolic change in addition to the actual, substantive one (Cameron and Quinn, 2005). The new symbols are to be identified with newer working practices (i.e., the change), thus aiding both the individual interpretations of the proceedings and the organizational systems to better adapt to it (Cameron and Quinn, 2005). To commit the subjects to the ongoing change, the organization needs to clarify the objectives to show its commitment towards the employees (Astin and Astin, 2000). The

subjects for the change need to see how the change will affect her/his duties. The commitment may still require empowering the subjects to really get them behind the change and to give their utmost to the endeavor (Bird, 2014). Both committing the personnel to back the change and empowering them to take part in making the change happen are important parts of managing the change, as they are its direct subjects, but they are also the determining factor in the making of the change.

The process of change requires short-term successes. These successes are needed for the motivation of the change. Successful subprojects act as testimonials and references for the rest of the organization in favor of the change process, and may be used simultaneously to dampen opposing remarks (Boehm and Turner, 2005). A successful pilot project has at least three features (Hosman, 2010; Kotter, 1996; Kotter and Schlesinger, 2008):

- Firstly, it is well known; the members of the organization see it happening.
- Secondly, it is true; there are no possibilities to plausibly deny the success.
- Thirdly, the successful tale is related to the change project.

These short-term successes may be used by the change agents to test the vision in practice. However important these short-term successes are, it is of utmost importance that the final success is not declared too soon nor by wrongful reasoning. Eventually, there comes the stage where a feeling of celebration caused by an achievement takes over the people involved and an achievement is indeed celebrated. In such cases, the management should be extra careful that the process continues after the festivities, because such occasions easily cause slackening or over-relaxing, and the old way of doing things is more easily reinstated than the change pressing ahead (Kotter, 1996). There actually is no last phase of the change. Perhaps the closest feature to this is when it can be said that the changed way is looked upon as the normal way, instead of the new way, of doing things. Similarly, the various approaches to change (Van de Ven and Poole, 1995; Van de Ven and Sun, 2011) affect how the change is embraced.

Schein (2004) defines the organizational culture as the way to get along and survive in an organization, and also for an organization, “the way things are done” (Deal and Kennedy, 2000). The organizational culture changes, but it is rather difficult to actively and deliberately alter. Culture is so deeply rooted in the procedures of individuals and those of the organization that it cannot be changed straight away or light-heartedly, nor should it be tried. Understanding the organizational culture makes the planning of the vision easier. If the organizational culture is understood by the change agents, it also eases the management of the change project and the guidance of the process of change. In general, the change has happened when there is no need to mention that the change ever occurred. There may still be the

need for communication in the later phases as well, since the people involved may prove to be rather reluctant to admit that the new way could be, or is, in any way better than the old one. What matters is that the changed working practice is "business as usual."

In conclusion, to the theme of change management it may be said that the groundwork for any change situation is to be done well before the actual change. Studies show that important features affecting the success of a change are indeed employees' work satisfaction, employee commitment to their organization, and employees' possible intention to seek new challenges (Hill et al., 2012; Mowday et al., 2013; Oreg, 2006). This may be interpreted by the fact that whether the change is introduced to a highly content organization or to a highly dissatisfied one, the results correspond. The management is well advised to take care of their organization and the employees therein throughout their employment. All this serves as preparation for possible future change endeavors. Motivated and committed personnel are willing to see the need for change more clearly, but they also acknowledge the measures taken by their trusted management more easily and positively.

2.3.3 Change Related to Information Technology

Change has always been a part of information technology developments, as technological developments by definition evolve, and thus, always present organizations with something new. It is not quite as straightforward as just applying managerial know-how to IS/IT (Markus, 2004). All change processes in organizational contexts bear uncertainties and tensions (Salmimaa et al., 2015a). In the literature, the phenomenon has been observed from various angles. Markus and Robey (1988) and Orlikowski (1993) studied organizational change, Robey et al. (2002) studied change in information systems, and Lyytinen and Robey (1999) did ground breaking studies in learning in the IS context. A little later, the actual management of change became interesting (e.g., Alaranta, 2005; Nandhakumar et al., 2005), as did the technical change, later labelled socio-technical change (Avgerou and McGrath, 2007; Lyytinen and Newman, 2008), in which the sociological aspects are seamlessly included. Even if the research may appear somewhat broad-scoped, the significance of the field is largely acknowledged (Hirschheim and Klein, 2003; Markus, 1999). Heterogeneity and fragmentation of the area, together with the fact that the business organizations were running down and off- and outsourcing their IT departments, led to reevaluating the field. Further to this, when the discipline was now in the curricula of universities, which were increasingly migrating IS to other disciplines, Hirschheim and Klein (2003) were led to the extent of proposing the question of whether the discipline was in crisis and in need of a re-definition (i.e., change). The field is still reinventing itself as newer technologies and working practices emerge.

Whenever organizations are developing their information systems, specific characteristics of organizational change are present. When an organization introduces a new information system to its operation, it typically needs to somehow change the existing structures, processes, and tasks so that the operation is improved and the operational effectiveness is increased (e.g., Markus and Robey, 1998). Even though and because there is an abundance of ever-developing technologies and systems offering multiple alternatives with a diverse set of features for information processing and storage capabilities for various business needs (e.g., Da Xu, 2011), it may prove to be a challenge to find the most suitable combination of technologies and tools, and to execute and support the organizational processes needed for an individual need (Bhatt, 2001; Chen, 2001). In addition, numerous internal and external factors in an organization influence the change process. The challenge is to understand and manage this complex process.

The overall importance and the hierarchical level needed for the decision making of such organization-wide development schemes often causes a phenomenon that Salmimaa et al. (2015b) describe as *organizational inertia*. Organizational inertia means that the organization tends to move rather slowly. The personnel required for the decision-making are simultaneously engaged elsewhere, and to be able to discuss the decisions, the associated matters need to be conferred (i.e., decisions take time). Similarly, the various phases or stages in which the various actants find themselves entail the viewpoint to the change accordingly; on some occasions, the change is seen as an inevitable development of proceedings according to the life-cycle theory (Van de Ven and Poole, 1995). On other occasions, the objective, the goal of the change, is such that it is needed to trigger the change alone as proposed by the teleological view (ibid.).

Organizations are seldom able to keep up with the changing technological environment that surrounds them (Pfeffer, 1997). The rate in which the organizational reforms take place is simply slower than that of the technological developments. The organizational needs and possibilities to renew the repertoire are limited compared to the offerings and the needs of the organization doing the development. Organizations need management procedures and mechanisms on both the higher organizational level and the smaller scale (i.e., business units and even projects) to address the inconsistencies caused by the imbalance between the development of technologies, the development of the organization and its operation, and the need for organizational renewals (Lyytinen and Newman, 2008). As a result of the organizational sluggishness, the organizational development (i.e., the change) seeks to adapt to the newer context in a way that would support organizational learning (e.g., Schein, 2010). Quite logically, these measures are affected by the previously existing

organizational conditions, such as the existing architecture, the target for the innovation causing the change, and the organizational culture (Lyytinen and Newman, 2008).

IT-enabled organizational change has stirred a lot of consideration (e.g., Cha et al., 2015; Markus, 2004; Martinsons et al., 2009; Piccinini et al., 2015; Tong et al., 2016), where the focal point is IS/IT's linkage to the employees, their tasks, organizational structures, and managerial and leadership processes. The adoption of IT artifacts carries much weight in IS literature (e.g., Carvalho, 2012; Le Roux, 2015; Shoib et al., 2009). IT as the initiator and driver for change has been a popular angle for studying changes in organizational functions (e.g., Radeke, 2011; Sauer and Willcocks, 2003; Wurster et al., 2009). Technology is still the engine for business processes, but more than that, it is the centric source for renewals in organizational functions when it comes to organizational design (e.g., Radeke, 2011; Sauer and Willcocks, 2003).

2.4 Summary of the Related Research

The literature on supporting teams and teamwork in organizations where major changes are taking place is limited (e.g., Childe et al., 2001; Drucker, 2011; Manos, 2007). There are articles on various aspects related to this theme, touching upon it as presented in this thesis. The more specific themes cover pre-planning and training (McNabb and Sepic, 1995) and learning from challenges in change after the proceedings (Kanter, 2003). The connection to IS/IT similarly concentrates on various aspects that are more detailed. This thesis observes radical organizational change more as a business managerial issue than a technological challenge. Prior research acknowledges each individual aspect as presented earlier in this chapter; the constructivist views are recognized as suitable ways to let the employees work on the issues that the change brings along. The newer working practices and the change they require from the employees are easier to accept and adapt when they are elaborated by using the constructivist approach. Equally well known are the features that are unique to IS/IT as a discipline or field. However, even if recognized, often everyday life, the projects, the workload, etc. override the ideas of development. There is also a gap in the scientific knowledge regarding the suitability of the constructivist approach for making the best of IS/IT-related change situations in organizations.

Change is a vast theme and unique in each case. Thus, it is nigh impossible to define it exclusively. Only some general level features can be listed and some noteworthy pointers mentioned regarding the highlighted features. To bring the three areas together, to show how the teams and their work under the stress of major organizational change could be supported by using the constructivist approach, is the objective of this thesis. This thesis aims to understand the circumstances the teams

are under in such situations, how they function, and to draw conclusions in the case where solutions were tried.

Furthermore, this thesis observes change as an on-going activity in organizations, albeit obviously not the same project. Change is a constant feature in any modern organization, as there is bound to always be some innovative actions taken. Thus, appropriate acceptance and adaptation of change as a phenomenon will bring significant benefits to an organization compared to its previous state and its competition, as the same short-comings are still being repeated in organizations when they deal with change situations (Lyytinen and Robey, 1999). This thesis brings out some centric features of change and its implementation, and provides new insights into which steps are possible and beneficial when introducing changes in the organization and how they should be undertaken.

3. Methodological Approach and Research Design

This chapter of the thesis presents the research process and the use of case study as a research method. Firstly, the research questions will be revised. Secondly, the background of research will be described to explain the basic choices made in the research. Thirdly, the research approach will be elaborated to fit this thesis. Then, the research settings, the cases and their organizations will be defined and presented. Finally, the collection of empirical material will be presented as well as how the method was used, and how the analysis of the empirical material was conducted.

There are many research paradigms and traditions and, similarly, scientific approaches. The purpose of this chapter is to position this study among them. The strategy of the research characterizes the conducting thereof. The chosen research (i.e., the purpose of the study) and the results the researcher is after dictate the research questions, which in turn define the choice of research strategy (Benbasat et al., 1987; Hirsjärvi et al., 2004). The research strategy designates the fundamental beliefs and expectations affecting the whole study, and gives indications on how and why the study has been done (Myers, 1997). Following in this chapter, the research paradigm, research approach, methods for empirical material collection, research questions, and empirical material analysis are presented.

3.1 Revising the Research Questions

The overarching features in the two research projects[5] are the centerpiece of this thesis: IS/IT-related change in team-based organizations. The sub-research questions form in the intersections of the previously presented areas as depicted in Figure 5. Firstly, the intersection of the constructivist approach and the context-related issues studies *why the constructivist approach is well-suited for the IS/IT environment.* This observation bears in mind the constructivist approach in relation to the features that signify the IS/IT environment. The context is dynamic and it is seldom possible to invest abundant time or other resources in the change. Instead, the more traditional command-and-control approach is more readily and easily applied. However, this thesis shows that as there are numerous specialist features and capabilities involved, this approach offers benefits over the others in this context.

Secondly, the thesis sheds light on *how the constructivist approach may be used in change situations.* As shown, change is an ever-present phenomenon encumbering organizational resources. Change has always been with organizations; thus, one might be tempted to raise the question, *why have we not*

[5] Behind this thesis are two research projects depicted later in Section 3.6. One studied the renewal of working practices in software production. The other was conducted on IS acquisitions both in the private and in public sectors.

learned to cope with it? Change presents all organizations with some degree of discontinuity and built-in uncertainty and instability, thus affecting the operation. By answering these questions, this thesis will confirm the hypothesis that the constructivist approach suits the change situation well, as it takes account of the human side of the operation and uses the human approach to make the change more successful for the organization and for the employees.

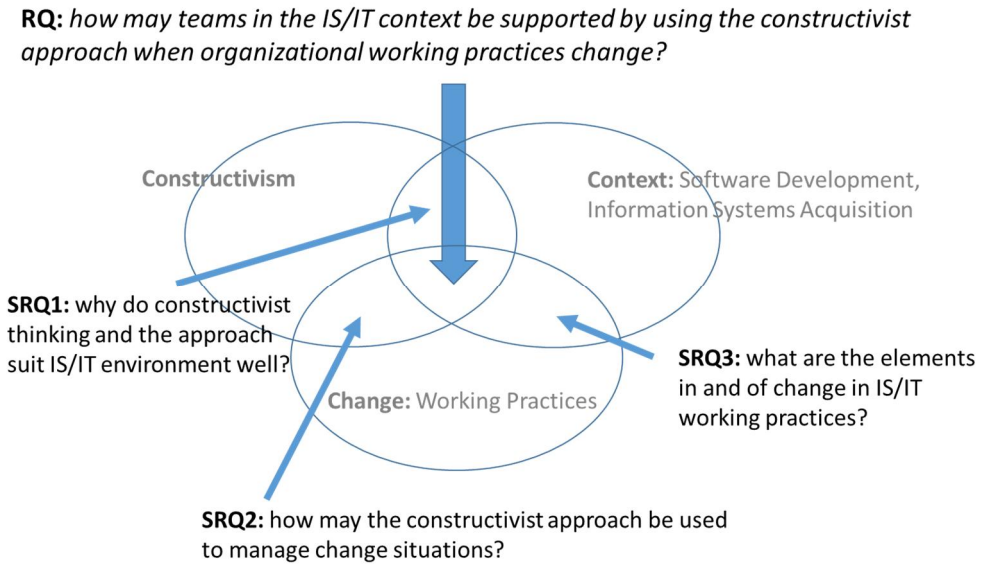

Figure 5. The Research Questions in This Thesis

Thirdly, the intersection of change in the particular context of IS/IT environment will be exemplified. In Chapter 2, the unique nature of the context and the features that manifest this uniqueness were illuminated. In Section 2.4, the summary of the related research showed gaps that this thesis will fill by answering the sub-research questions depicted in Figure 5. The primary research question, *how may teams in the IS/IT context be supported by using the constructivist approach when organizational working practices change,* becomes simultaneously answered. The result is a synthesis of contemplation of the features of actants in the domain and their requirements and possible solutions.

3.2 On Research Philosophical Approach in General and in This Thesis in Particular

A researcher will be bordered by the choices s/he makes subconsciously or knowingly regarding the areas of research. First, the researcher needs to realize the ontological and epistemological aspects in how s/he observes the phenomenon, what can be studied about it, and indeed known of it (Snape and Spencer, 2003). There are simultaneous implications to what is the expected outcome. The ontological approach defines whether the phenomenon under observation is really a matter capable of this passive task (Orlikowski and Baroudi, 1991). The epistemological view helps to define in a more precise manner what it is that may be discovered from the subject and at least some of the consequences of these findings.

Scientific approaches are usually divided into two main areas: natural sciences and social sciences (Larivière et al., 2006). The difference between these two lies in the angle from which the researcher observes the phenomena, which is objectively (generally seen to relate more often with natural sciences) or subjectively (generally seen to relate more often with social sciences; Porter, 1996). The objective approach relies on measuring facts or fact-like features of the subject of the study, whereas in the subjective approach, the researcher's input in interpreting the findings is centric.

In contrast to the natural science, social science has few limitations of this kind. Social science is said to be hermeneutic by nature, which may be interpreted as aiming for a deeper understanding of the phenomenon rather than based on an objective. It is also usually quantitative, meaning that facts are measured in or of the research subject (e.g., Outhwaite, 2010; Rabinow, 1987). This divides the research into rather self-explanatory quantitative and qualitative research (e.g., Firestone, 1987; Onwuegbuzie and Leech, 2005). These are sometimes divided correspondingly into positivistic[6] and hermeneutic[7] research (Outhwaite, 2010). Quantitative and qualitative philosophies may be combined into a mixed-methods approach, which is also able to produce prolific results in valid research (e.g., Creswell, 2013; Teddlie and Tashakkori, 2009).

Another partition in various research approaches may be made in the division between formal and empirical sciences (e.g., Sax, 1968; Swamidass, 1991). Mathematics and logic are typical examples of formal sciences where there are set rules of conduct and forms (Guba and Lincoln, 1994). One main feature of this group is their "theoretical" nature. The empirical and humanistic sciences rely largely on the actual observed proceedings (ibid.). Empirical science includes parts of the natural sciences, such as areas in biological research, and exact natural sciences.

The field of research seems to consist of a number of pairs dividing the various areas into angles and viewpoints (Myers, 1997). These pairs include theoretical vs. empirical, qualitative vs. quantitative, descriptive vs. normative, and explorative vs. hermeneutical. The individual selection expresses for the scientific community how the research was conducted and why it was conducted in a specific manner.

The descendant of ontological and epistemological decisions is the methodological choice (Laughlin, 2004). It is the answer to the question of how it is possible to derive information and knowledge about the subject. The methodological choice includes a variety of *isms* and ways of doing research. The

[6] According to positivism, positive knowledge is based on natural phenomena, their properties, and relationships, and all valid knowledge is derived from sensory experience interpreted with logic and reason (Macionis and Gerber, 2010).

[7] Hermeneutics refers to the concept in which the researcher does not immediately understand the data or its meanings; instead, interpretative efforts are needed (Gadamer, 2008).

methodological decision leads the researcher to use certain methods, which defines how information and knowledge are actually drawn from the research subject. The multitude of methods includes tools and technologies, such as surveys, interviews, measuring devices, etc. It is also possible to use multiple methods in data gathering to further enhance the triangulation, that is, the reliability of the study.

The researcher makes choices regarding the approach of her/his research when starting a study (Hirsjärvi et al., 2004). These choices define and determine the kind of research it is going to be. In this thesis, the philosophical scientific background, the paradigm,[8] lies within the view that there are a few closed, stable systems in organizational settings. The majority of various systems are open, and thus, are under the influence of the various effects and impacts that factors surrounding them present to them. The organizations we generally consider independent are seldom able to operate without taking the outside world into consideration. In this thesis, the objective is to understand people and change in the social and cultural contexts within which they live (i.e., the research is empirical by nature), and thus, the qualitative research methods are called for as they are designed to help researchers accomplish this (Myers, 1997). The choices made for this thesis are demonstrated in Figure 6 below. The philosophical aim of gaining an understanding enables the researcher to take a certain approach, inductive instead of deductive. Induction in this context means to study the cases in the organizations and draw conclusions based on them. As the cases were studied over an extended period, the time horizon stretches to be more of a longitudinal than a cross-sectional study. The nature of the studies required a deeper understanding and, therefore, dictated the use of interviews as an empirical material collection method (Saunders, 2011).

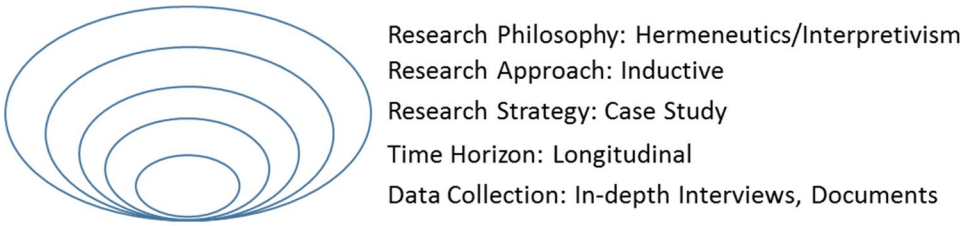

Figure 6. The Research Onion (adapted from Saunders 2009)

This qualitative research can be categorized as descriptive and hermeneutic. However, in the conclusion, some normative suggestions will arise in order to give some recommendations for future actions to prevent the most common pitfalls. As this thesis aims to gain a deeper understanding of the

[8] The research paradigm means the basic beliefs and/or worldview guiding the researcher (Burrel and Morgan, 2006; Goles and Hirschheim, 2000). Two main research paradigms dividing the views of researchers are the positivistic and hermeneutic paradigms (Olkkonen, 1993), but there are also more closely defined paradigms in various areas.

phenomena surrounding teamwork in change in IS/IT-related situations in order to justify the use of the constructivist approach, case study research was seen as the best approach to accomplish this. Benbasat et al. (1987, p. 370) stress the match of case study research and IS/IT as they state that "the information systems area is characterized by constant technological change and innovation . . . shift from technological to managerial and organizational questions . . . ." Despite its hermeneutic nature, the research interests also fulfill the more positivistic case study requirements as the purpose of the study is to investigate a contemporary phenomenon in its natural environment, and the actual boundaries between the phenomenon and the context are not clearly evident (Yin, 2008). The objective is to accomplish this by collecting empirical material from the entities that are in direct contact with the phenomenon as suggested by Benbasat et al. (1987).

Case study may be used to describe the research method but also the unit of analysis. In this thesis, the case is the change. The research method is a collective case study as the case, or unit of analysis, is the dynamics of the change situation (c.f. Baxter and Jack, 2008; Stake, 2005). This is due to the fact that this is a "phenomenon . . . in a bounded context" (Miles and Huberman, 1994, p. 25) to be studied. In each case, the empirical material is collected in the breadth and width that are deemed necessary to gain a sufficient understanding of the goings-on in each particular case. Seven change instances (Figure 7) are studied in order to gain an understanding about a situation where there is change taking place and it is causing effects upon the organization. The first of the cases was studied more thoroughly to gain an understanding of the area and the overall dynamics and relationships. The empirical material from the first case is rich and serves the purpose well. In the first case, numerous teams, functions, and individuals are affected by it. To dissipate any case-specific bias, the study is extended to multiple cases. The latter cases serve to deepen the observations and understanding as well as shed extra light on various angles to the whole (Stake, 2005). The chosen research method, collective case study research, is suitable to study the phenomena in question.

The cases in this thesis are different yet similar. The cases are a large software house altering its working practices, sections of a city acquiring new software, a business enterprise renewing its HR software, and intermediators for business ideas and relationships. The unifying features are that, in all instances, a radical change is being made and a team-based operation is making the changes with the involvement of IS/IT (c.f. Stake, 2005). The comparability stems from the unifying elements. The knowledge intensity is a feature the interviewees share. Even though SW production does not appear to have many shared features with the welfare sector of a city, they both faced a change in their working practices. In both instances, the people needed to learn new ways while attending to their

normal duties. The same applies to all the cases. Equally, the cases are associated by the fact that, according to the interviews, the constructivist approach served well where it was utilized and would have been needed where it was not. The professionals when facing a major change needed to be treated as assets but also as individuals, and such nurturing has to be done, taking both into consideration. Similarly, an important notion is to acknowledge the division of plans and procedures as well as objectives and effects into macro level and micro level proceedings and not to treat everything as one.

Interviews were planned as the main empirical material collection method to offer answers and to form a solid base for further interpretation, but other materials were also used, such as various written documentation from and about the case organizations, annual reports, various commercial and technical materials, records of the organization, etc. This approach complies well with thoughts concerning case study research by, for example, Benbasat (1987) and Myers (1997). The interviews are the primary source for the research, and the written materials are to be observed as secondary sources to support the contents gathered through the primary source.

3.3 Collection of Empirical Material for This Thesis

There are various methods for empirical material gathering in case study research. These methods include studying documentation, archived material, and records, interviewing personnel, observing the target of the study, and studying the physical artifacts (Yin, 2008). The objective of empirical material gathering is to get a set of empirical material rich enough to enable not only the interpretations of the phenomenon under study, but also the descriptions of the contextual complexity (Benbasat et al., 1987).

The chosen approach is an interpretative collective case study. It was decided that the best way to gain a deeper understanding of the phenomenon was to ask the people involved in the projects. The options for an interview are *structured*, *semi-structured*, and *unstructured* (Gill et al., 2008). *Structured interviews* are questionnaires with predetermined questions asked with no possibilities to follow up on anything nor vary the questions (ibid.). The third type, *unstructured interviews* are open-ended conversational interactions without a previously chosen theory or idea (Gill et al., 2008). *Unstructured interviews* are sometimes referred to as *qualitative research interviews* (King et al., 1998). Should the interviewee be reluctant or challenged in answering, there are no supportive questions to ease the proceedings. The benefits and usefulness of these types of interviews lie in their exceptional depth. Neither of these seemed to cater perfectly for the needs of this research.

Semi-structured interviews are a hybrid of the previous types. There may be key questions to help to define the area to be studied, but there are possibilities to explore an interesting subject more deeply when needed or add sidetracks to the existing thematization (Gill et al., 2008). *Semi-structured interviews* also allow related themes to emerge that the researcher did not come up with, but the interviewee deems relevant or the interviewer connects to the area during the interview. This choice was used in this thesis. Based on the literature, the key themes and more specific questions thereof were formulated. As the interviews were decompressed after each interview, the questions were refined after the first few interviews. This was done to ensure the interviewees were given the opportunity to express their own views, thus maximizing the richness of the material. The goal was to meet the interviewees with a neutral and curious manner in an effort to reach a state that may be described as the "non-judgmental form of listening" (Zuboff, 1988). As the theme was covering the views, sentiments, and feelings of the interviewees, the interviewers needed to remain as impartial as possible.

For the majority of the interviews, two researchers were present, both of whom took notes. As soon after the interview as possible, the notes were compared and the interview was then decompressed by the researchers to reach a consensus over the proceedings and the matters discussed. This consensus was done in writing for future reference to offer support for the transcriptions of the individual interviews when later analyzed.

3.3.1 Empirical Material from the First Research Project

In the first research project (see Figure 8) included in this thesis, the organization was chosen because it was about to take on a major organizational change project. The organization was introducing a change in its working practices concerning the software production teams; the teamwork was to be altered to a radically new form, starting from the unification of the used programming language. The research team received the first interviewees, the architect team, appointed by the organization in late spring of 2006. The architect team were not software architects per se, but change architects who were responsible for implementing the change. The team leader of the architect team released the interviewees who were team leaders and members from the different teams. Later, further interviewees were appointed in a similar manner according to their suitability and availability. Altogether, 44 interviews were conducted. Top managers and the entire architect team were among the interviewees to lift the interviews off the operational level and triangulate the findings (see Table 2). The interviewees were from various hierarchical levels to give a comprehensive and in-depth picture of the phenomenon.

Table 2. The Interviews in the First Research Project

Interviewees	Architects	Management	Teamleaders	Programmers	Other	Total
Site A		2	2		1	5
Site B	3	1	4	1	1	10
Site C			4	4		8
Site D		1	2			3
Site E	2	1	1	4	2	10
Site F	1		1			2
Site G	2		1		1	4
Site H			2			2
Total	8	5	17	9	5	44

The architect team of eight persons together with top management were interviewed to give their picture of the change process and its expectations. Seventeen team/unit leaders followed. Some interviews of the first two groups were temporally aligned. Some were interviewed twice with temporal intervals to give longitudinal strength to the empirical material about the proceedings. Furthermore, a combination of 14 programmers and salespersons were interviewed to gain more insights and to see whether their views would support the findings. The anonymity of the individual interviews was assured.

3.3.2 Empirical Material from the Second Research Project and for Publication VI

The empirical material in the second research project was collected in a similar manner as the first project. The interviews were planned ahead both in terms of schedule and in the execution level. Semi-structured interviews were the chosen method. The handling was the same as in the first research project as the devised functionality was established and appreciated.

First, key persons for the IS procurement project were suggested by the contact persons in related organizations in the spring of 2015. Further interviewees were invited on their suggestion (i.e., snowball sampling was used; Atkinson and Flint, 2001). This meant that should the need arise, additional interviews were possible. Thus, the originally anticipated and planned number of interviewees per case (i.e., four: a person in a supervisory position, a system user, a person with an understanding of the technical requirements, and a vendor's representative) differ in some cases from the realized number; up to 13 interviews were conducted in one organization. Twenty-three interviews (Table 3) were conducted in this project, covering cases two to four during the years 2015 and 2016. The interview themes covered issues related to initiating the change, available resources,

stakeholders, contracting, the procurement process and communication, and evaluating the change success.

Table 3. The Interviews in the Second Research Project and Publication VI for this Study

Organization	Interviews
Case 2	6
Case 3	13
Case 4	4
Case 5	5
Case 6	5
Case 7	18
Total	51

Publication VI (cases five to seven) is an independent compilation of three projects. The projects each had their own individual research approach; however, the approaches were all qualitative by nature and aimed at understanding the phenomena in their organizational settings.

Cases five and six also included participatory observation in the organization where the working practices were changing. Case seven includes 18 interviews conducted in 2008 to 2010 to offer empirical material for the study. The empirical material of cases five and six consists of five interviews conducted in 2006 and 2008 and additional written materials along the lines described. The interviews were conducted according to guidelines introduced earlier.

3.4 Modes of Analysis of the Empirical Material

Data or empirical material is gathered and then analyzed. However, drawing a clear distinction between the empirical material gathering and its analysis may be difficult in qualitative research (Myers, 1997), because the two may occur simultaneously (Baxter and Jack, 2008). This is justified through a simple example; the researcher determines the answers already to a degree by formulating the questions. Thus, the researcher's presumptions have an effect on the empirical materials. Furthermore, the empirical material has a corresponding effect on the analysis.

As the objective of this thesis is to find answers to questions that aim to understand the phenomenon, and the primary material to determine this is transcribed empirical interviews (in some cases supported by written documents), the question is to fathom the meaning of the textual data. Thus, hermeneutics is the appropriate approach as it is best for answering questions of *how*, *why*, and *what is the meaning of something*. Hermeneutics may be used for both underlying philosophical thinking and for the mode of analysis (Bleicher, 1980). Should hermeneutics be used in a philosophical capacity,

it lays foundations for the interpretative approach as a philosophical perspective, or paradigm, towards research work in general (Boland, 1985).

Pragmatic[9] hermeneutic analysis (Butler, 1998) is used in this study; that is, the object of the interpretive effort becomes attempting to make sense of the organization as a text-analogue (Myers, 1997) through the interpretations the researcher makes based on the interpretations of the interviewees (Walsham, 1995). In the organizations, the employees or members (i.e., stakeholders) had confused, incomplete, and contradictory views on the studied issues. Thus, the objective of the analysis is to make sense of the whole – the relationships and the effects between people, the organization, and information technology, as suggested by Taylor (1976). The sense-making is done by the researchers making their presumptions and the formed picture of the whole having a dialogue with the interviews as suggested by Gadamer (2008). In this dialogue, the presumptions become verified or falsified and the "big picture" is a dynamic, evolving structure until the very end when the researcher(s) make the conclusive remarks. In practice, this means that the researchers had thoughts based on the literature and previous experiences of how the proceedings went in the case organizations, and based on the empirical materials, the researchers conferred and discussed the insights and compared them anew to the findings from the literature. Even then, the results are debatable by the science community. This debate is the very force that makes the discipline progress. The process is depicted below in Figure 7.

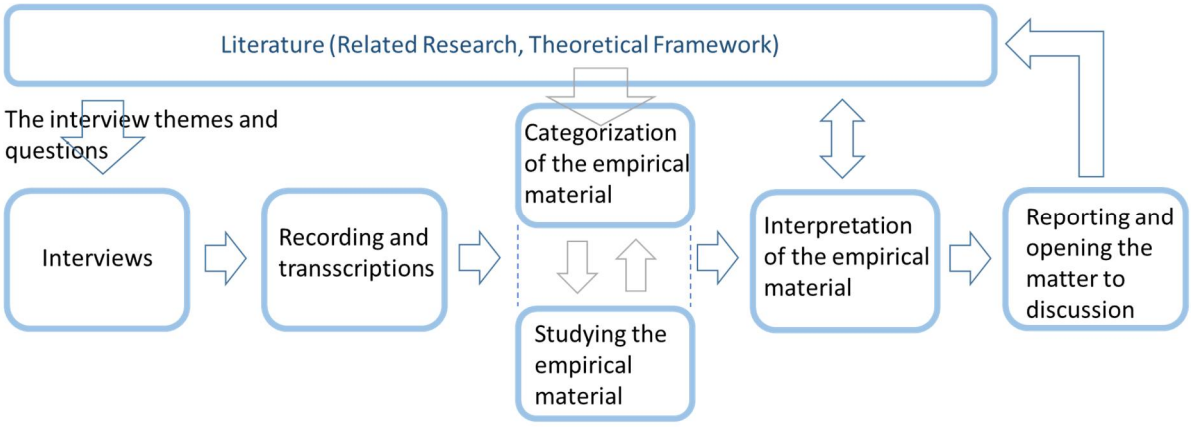

Figure 7. The Empirical Material Analysis Process

The aim of the study is to describe and understand what was going on in the cases. The analysis is, therefore, trying to seize the most distinctive elements of each case. The intention of this thesis is to

[9] As opposed to a conservative, critical, and radical perspective of hermeneutics as listed by Butler (1998)

increase the knowledge base on such matters by molding a consultable record with a meaningful and clear picture of the goings-on in the cases.

The presumptions of the researchers formed a basis against which the results were compared starting from the very first interview. The same continued during the rest of interviews; analysis took place while the interviews were conducted with the researcher making notes, and in the following decompression discussion as the interview was discussed. Yin (2008) describes five types of analysis: pattern matching, linking data to propositions, explanation building, time-series analysis, logic models, and cross-case synthesis, whereas Stake (1995) classifies categorical aggregation and direct interpretation as types of analysis.

Despite the epistemological differences in notions in the viewpoints of this thesis, the positivistic Yinian (2008) explanation building is combined with Stake's (2005) hermeneutic direct interpretation. Each case, every change situation, was first analyzed as its own entity (Miles and Huberman, 1994) and then later compared. First, the individual cases were dealt with according to the following order: the empirical material was carefully studied after which centric themes and keywords were identified. Then, the themes were further elaborated and finally grouped (Alasuutari 1995; Eskola and Suoranta, 1999).

Analysis began by reading through the empirical material (i.e., interviews) multiple times and comparing the transcriptions to the notes to obtain a sense of the whole and to become familiar with the content. Then, the parts of the interviews that were related to change, learning, supporting the teams, and context-specific features were recognized and acknowledged as interesting (Seidman, 2013). The objective of these actions was to find the sections in the empirical material that were related to the phenomenon of interest based on previous and related research and according to the research questions (Eskola and Suoranta, 1998). One centric point was to be alert to noticing the kinds of actants that did not come up in the previous and related research but emerged in the empirical materials.

After having dealt with individual cases, drawing the "big picture" started. The aim was to form a comprehensive description of the proceedings by taking the processing to a higher abstract level above the details and attempting to form a generalization of the proceedings. In this phase, the researcher strived to form an interpretation of the proceedings based on the empirical material as to whether certain features had a positive or negative relationship to promoting the change in the

organization. How the organization responded to the issue and the claim of the constructivist approach were also studied (i.e., were these types of features observable in certain phases of the studied cases). After having interpreted the goings-on, the outcomes were compared with the findings in the literature.

3.5 Research Settings and a Description of the Cases

The claim of the thesis is based on the research publications, not the individual interviews. The entity behind the thesis is compiled from multiple parts to form a rich base of empirical material around the centric features of the phenomenon (Figure 8). There are two independent research projects behind this thesis, which form a centric piece of empirical material for the thesis. In addition to them, publication VI is based on three separate research projects. Publication VI is included to shed light on an angle of the phenomenon otherwise undisclosed.

The projects deal with changes in working practices in the IS/IT-related environment. The organizations were chosen based on their state at the time of the studies; that is, they were all involved in major changes and had an ongoing change project or they had just finished one. The connection to information systems and technology varied among the organizations; two of the business enterprises used and produced software and the rest of the instances acquired, implemented, and used IS/IT.

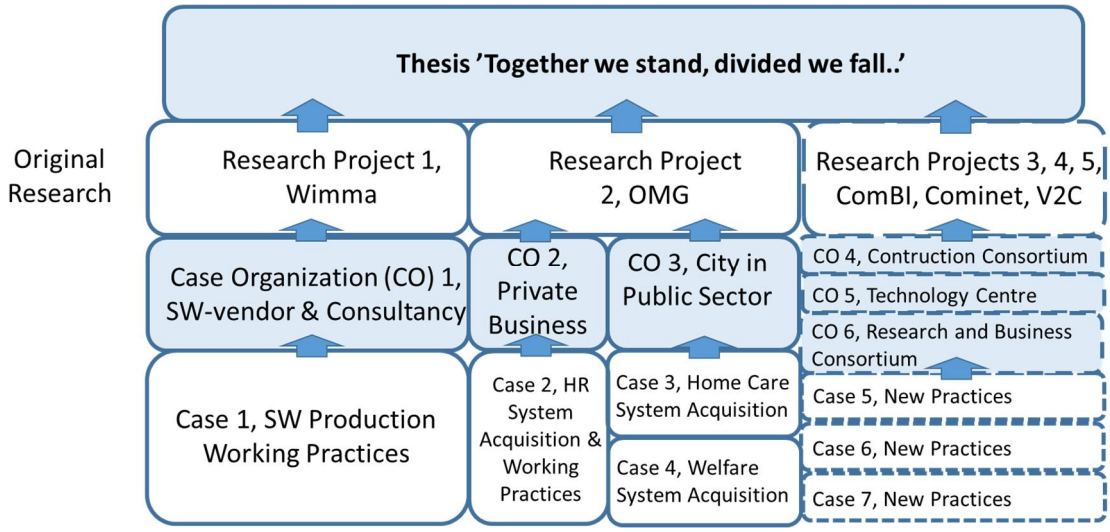

Figure 8. The Background for the Thesis "Together we stand, divided we fall . . ."

The aim of the study in the first two research projects was to gain a deep understanding of the phenomenon, the dynamics, and actants of the change in working practices in team-based organizations in the IS/IT context. To ensure this, the organizations from which the empirical material was to be collected were preferably to be information rich; thus, purposeful sampling (e.g., Palinkas et al., 2015; Patton, 2005; Suri, 2011) was chosen to be used when searching and selecting the cases. A similar justification is presented by the fact that the research objective is to explain and learn, rather than gain direct statistical generalizability (Flyvbjerg, 2006). Information rich cases enable the researcher to "learn a great deal about issues of central importance to the purpose of the inquiry" (Patton, 2005, p. 2).

When searching and selecting the organizations, the focal aim was to have them meet the criteria of having a large-scale and/or significant software-related change at hand. The combined empirical material from the two research projects for this thesis was gathered from three large private sector businesses and four public sector organizations or instances.[10] However, not all of these are included in this thesis; the entire first project (case one) and selected cases from the second one are included (cases two to four, cases five to seven are regarded in publication VI; Table 4). The selection is based on the contents of the publications to form a unified whole for the purposes of the thesis. The rest of the instances are not represented here. The cases and the organization summaries are presented after the tables in Section 3.5.1.

Table 4. Research Cases

	Case 1	Case 2	Case 3	Case 4	Case 5	Case 6	Case 7
Department Teams	x	x	x	x	x	x	x
Cross-Functional Teams	x	x	x	x	x	x	x
Virtual Dimension	x	x	x		x	x	x
Multiorganizational Dim.		x	x		x	x	x
New IS		x	x	x			
New Working Practice	x	x	x	x	x	x	x
New Techn. Introduced	x	x	x	x	x		x
Software Production	x						
CIO Office Involvement		x	x	x			
3rd Party Consultancy		x	x	x	x	x	x

The projects align well; the first one is conducted with one organization with multiple teams, resulting in 44 interviews. This helped to determine the appropriate area and unit of study, marking the field and the team-based in-depth view of the proceedings, and finally, familiarizing the researcher with

[10] The public sector empirical material is gathered from three separate organizations (cases) from the administration of a city and the fourth one is from another area of another public sector organization

the phenomenon in its natural context as suggested by Benbasat et al. (1987). To further describe the proceedings, to design the research (Benbasat et al., 1987; Bonoma, 1985), and to offer further depth in certain areas of interest, the second research project was conducted in different organizations; in the domain of this thesis, five organizations enabled the study of six cases. One private business was using IS/IT and now changing it, one public sector organization was implementing change, and one private business from the vendor side shed light on the proceedings from that perspective. Each organization in the second research project came up with two cases concerning their operation, increasing the number of case studies to six and resulting in 43 interviews. Out of these six, three cases and the corresponding 23 interviews are included in this thesis. The second research project served well to deepen the understanding of the dynamics and the factors of the change in organizational working practices in multiple team-based organizations.

The business enterprises that took part in the studies behind this research are large. They have a team structure in their operation, and two of the three have virtual elements in their operation. The variation in the organizations was seen to offer more angles and depth to the phenomenon. The public sector organizations selected in the study also operated based on a team structure. In the public sector cases, the CIO office was a centric co-actant as the expertise based there was crucial. In addition, the administrative modus operandi and structure in the organizations dictated this.

Publication VI is an independent work of a pool of researchers combining their experiences and studies from individual research projects (see Figure 8). This publication studies the role of an intermediator organization in changing the working practices as in forming a network for further value co-creation in three cases. As this illuminates the mentioned role otherwise left undiscussed, it needed to be included in the thesis. The publications are presented and summarized later in Chapter 4.

Publications I and II form a detailed base, describe the context, and also underlay the challenges and problematics of the phenomenon (Figure 9).

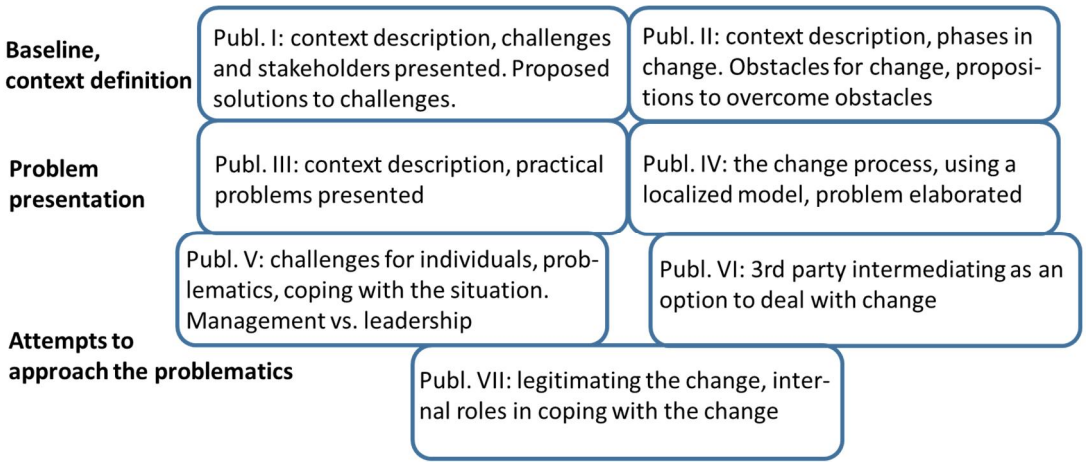

Figure 9. The Publications in This Thesis

Publications III and IV present the problematics innate in such change initiatives. In addition publications III and IV present attempts to remedy the situation. Publication III is based on the second research project and publication IV on the first research project. The last three publications in this thesis, V, VI, and VII, shed further light on the challenges and problematic situations that may emerge whenever an organization is facing a change that reflects upon the organization also to a larger extent. They also report models and attempts to mend the arisen situations. Publications, V, VI, and VII in a way summarize the findings in all the cases included in this thesis. Next the cases and the organizations in which they were studied are described and summarized.

3.5.1 Case 1 and the Organization

The first case is about changing the way the software is produced to be more effective and profitable. The organization decided to harmonize its software production and improve the software development processes. The case company wanted to tackle the problem by introducing decentralized component-based software engineering (CBSE), instead of the more traditional way of doing software development. This meant radical changes in working practices for both the teams producing software and the individuals in the teams as well as the whole organization.

The organization is a large software company operating in business-to-business markets (Hoch et al., 2000; Kakola, 2003). It is a supplier of complex ICT solutions. Due to acquisitions and mergers, the operation at the time of the research was based on 50–60 autonomous teams on eight sites. The teams differ in various ways: they possess different organizational backgrounds and culture; they use different technologies; and they produce various products for various customers.

The teams were autonomously responsible for their software development, production, and sales. Thus, extra costs were created by teams doing overlapping work. The organization reviewed its

software development process to eliminate redundancies and to improve productivity. To accomplish that, full use of the organization's knowledge was required. The information flows needed to be improved and inter-team collaboration and amongst individuals therein were necessities. The centric assets were the team leaders. The change entailed that, in addition to the daily routines, the teams were expected to identify potential components (i.e., products or features of and for products that could be used by other teams). The team leaders have the best overview of what is going on and they are crucial to aid the change; thus, they were in a key position to scout for the suitable component candidates. To plan for the change and to support the teams in their change, the management formed yet another team of professionals, called the architect group, to act as change agents and promoters. When approved as a component, a feature was stored in a component repository in the company's intranet. Once in the repository, components are accessible for the organization.

The structure of the organization did not support the types of interactions CBSE requires, as the company was a project-based one. The challenge in transforming the organization to a more holistic thinking software development-oriented process was vast. As an example of the procedures introduced, the management decided to choose one shared technology to be used in order to ease the component making; that is, unify the programming language and environment in the division in addition to the change in the organizational structure. The chosen new technology was used by a few of the teams, but was novel to most. In time, the teams accepted the renewals and started to make progress with the new working practice.

3.5.2 Case 2 and the Organization

Case 2 is about acquiring and implementing a cloud-based organization-wide human resources (HR) system. Here the change is multidimensional; the acquisition process has to do with the system to be acquired from a vendor in the cloud instead of the traditional local version, diminishing the role of the organizational IT department. This case is actually a twofold change: the renewed information system and the changes within that initiative; and secondly, the way to acquire the system (i.e., a cloud-based solution). The change from the previous mode of HR operation is significant. The previous information system was out-dated and the processual procedures needed to be equally revised. The new way of working unified the previously more diffused HR processes, such as recruiting or rewarding schemes, on the locations worldwide. Despite the project's tight schedule, the first phase was done in due time, and it seems that the project was a success as the users are using the system and the new working practice is being implemented simultaneously.

The organization is a globally operating industrial company. The announced aim of the organization is to help their customers improve their operational efficiency, reduce risks, and increase profitability. The organization is almost 20 years old result of multiple fusions of organizations. The difference in the organizational backgrounds is still visible in some features of the organizational structures and culture. The turnover[11] is formed by various tangible products and equipment, information systems, and services. A variety of services and a global network of service centres support the customers. The organization employs over 12,000 persons in more than 50 countries.

3.5.3 Case 3 and the Organization

Case 3 made a drastic change in working practices from the analog to the digital world by implementing an optimization system/resource management system. The change bore within entry to digitalized operation management by implementing an application to help the operational planning of work, and individual customer-related planning to route planning, instead of the old sheet-of-paper–based way. The new way of working involved, for example, hand-held devices for the operational staff, instead of reporting at the end of the day at the office. Management's possibilities to monitor and follow-up the operation were vastly improved.

The organization in this case was a social welfare sector of a city of over 200,000 inhabitants. The Homecare Unit lists over 830,000 visits and treatment cases a year with over 2,000 clients with various needs both content-wise and frequency-wise. The clients are scattered around the city (surface area 689.6 km² divided into four care areas). Similarly to clients, the employees have different limitations according to their qualifications and capabilities. The nursing staff is divided into mutually supplementing teams. The city uses a so-called purchaser/provider model in its acquisitions. An organization of health care, welfare and social service specialists define the nursing needs. They visit clients in their houses to observe and to define the circumstances and their specific care needs. They draw up a plan, and place an order for the care with the Homecare Unit, which then takes the matter further as a part of their routine. The complexity of the settings presents the management with challenges. It became apparent that modern ICT might offer a solution to these.

In addition to the social sector, there was strong involvement of the CIO office. Their expertise was needed to aid the acquisition and the implementation of the new information system. The CIO office has six to eight persons on various hierarchical levels who are in contact with this particular case, including the CIO. The persons include coordinators for the social sector with multiple projects to take

[11] EUR 2.9 billion in 2015, according to the homepage of the organization

care of and specialists in some specific technological fields, aiding all the projects in the city in that particular aspect.

The third party in this case is the city's office for tendering (i.e., "the Logistics"). They take care of the tendering formalities and take little stand on the content. The Logistics monitor the conformity to law when the different operators in the city administration are procuring or acquiring above the specified threshold value, bringing the acquisition into the area where the tendering EU legislation applies. In IS/IT acquisition, this is relatively often the case, as was in this case, too.

The acquisition in the case was ruled by the market court to be unlawful, and there were numerous obstacles along the way. Some of the negative sounding occurrences were caused from the business point of view of the losing party in the tendering, which then reflected on the operation. Nevertheless, according to the city officials, the case was deemed a success as the systems and the new working practice are in place, up and running.

3.5.4 Case 4 and the Organization

Case 4 was similar to case 3, which was changing from a paper-based operation to digitalized. Previously, applying for income support was a time- and paper-consuming process. There were numerous details and things to remember both for the applicants and for the receivers in the former way of working. The details in the new model are still there, but now they may are better controlled and monitored. The variety of enclosures from various sources could now be handled as attachments to the electronic application in their due positions. The acquisition and the following implementation changed the operation completely. The applications were henceforth delivered and handled electronically. The change was significant for all the parties involved.

Case 4 was from the same city as case 3. Thus, the CIO office's and the Logistics' parts apply in this case in a similar manner. The case, however, was somewhat different. The acquisition was deemed to be an update rather than a new acquisition, thus making the process significantly lighter and easier to accomplish. The tendering was not compulsory, thus eliminating that part. The function in question has clearer boundaries to neighbouring departments than in the Case 3 and was supervised by one person. The operation was more independent from surrounding departments than the social sector case. The change was based on asking the inhabitants, and the legislation helped to justify it, too. The new system was introduced and the employees were indeed committed and empowered to take part in the proceedings. Despite slight delays, the project was deemed a success as a whole.

3.5.5 Case 5 and the Organization

The change in case 5 is about newly formed business relationships. In addition, the procedures the organizations employed to approach the collaborations were completely new to them. The change involved facilitating a more comprehensive and free-form collaboration between the network members than before. The change was to make the new partnerships happen, introduce the enhanced knowledge flows, and guide the participants to do all that.

Seven large operators in the field of construction and a university department's research team introduced the new working practices in order to enable, enhance, and improve the interplay, knowledge creation, and knowledge sharing between network members. The primary case organization's personnel had multifaceted expertise on business intelligence, knowledge, and experience from former similar collaboration projects and ways of working, the workshop concept and its conduction, as well as administrative coordination.

3.5.6 Case 6 and the Organization

Case 6 is a change in a business and research setting. The innovating was a centric theme in this case. The intermediator was to create business relationships, opportunities, and ideas, but also to locate funding for the initiatives. It was to step outside the familiar and habitual working practices and generate something new.

The primary organization centric to the study is a technology centre with over 40 employees with a mission to develop new business activity and expertise in pivotal high-technology industries in the area and to improve competitiveness in the region's key clusters. The case organization helps to form new relationships, enhances the idea creations, and finally helps to look for outside funding for the newly formed endeavours. The main function of the case organization is to be aware of and search for suitable cases in the area. After having recognized, or otherwise discovered, suitable candidates and their need for co-operation, the organization links the organizations together, and seeks public funding opportunities and coordinates public funding applications for networking and development efforts in the organizations. The organization had just recently started to operate also on the national level.

3.5.7 Case 7 and the Organization

Case 7 is very similar to case 5 in that the foundation of the operation is to bring parties together that would not have found each other, or it would have been time consuming to do so, thus creating new partnerships. In addition, the mediating function was clear in the process. The change in this instance

refers to the change in the immediate organization where the operators, while themselves learning, created almost a self-sustaining machine also to the subjects of the operation, who received new partners and learned new working practices.

The case organization is a researcher group in a university department with expertise on growth company research and contacts to the field on a national level, and the actants in this case were three research organizations and four business mediator organizations. The core personnel in the case organization was formed by three senior researchers, three researchers, and two research assistants and an extended organization of approximately 10 experts. The centric personnel had the role of methodological and conceptual experts; the roles of the remaining members of the organization varied. The extended organization members served as gatekeepers as they provided contacts to different actors outside the domain of the actual research organization. As the development schemas and the research were somewhat delicate, the discrete issue of access was emphasised. The main function of the case organization was to act as a gatekeeper (i.e., enabling and maintaining collaboration in different research ventures), thus linking organizations and their actants, and forging new operational alliances. Moreover, in delicate situations, it was important that there was a mediating party involved.

4. Compiled Research Publications

Chapter 4 presents the summaries of the research papers. The publications are reflected upon the sub-research questions (Table 5). Combined, they answer the main research question.

Table 5. The Publications and Their Relationship to the Sub-Research Questions

Publication / Sub-Research Question	SRQ1	SRQ2	SRQ3
I. KM in renewing SW development processes (HICSS 2008)	x	x	x
II. A KM view to a strategic change in a high-tech company (IJSCM 2011)	x	x	
III. Three positives make one negative: Public sector IS procurement (eGov 2015)	x		x
IV. Why SPI initiative failed: contextual factors and changing software development environment (HICSS 2013)			x
V. Team leaders' perceptions in the renewing of software production process (CPR 2013)	x	x	x
VI. The role of intermediator organization in collaboration: how can an intermediator enhance value co-creation (IJASS 2011)	x		x
VII. Why do we need this? Roles in the IS acquisition legitimation process (ECIS 2016)		x	x

The included publications indicate that organizational change is not a straightforward IT project, but a complicated and multi-dimensional challenge. Change is an endeavor concerning multiple stakeholders and parties within the organization on various levels. The acknowledgement of multiple aspects of the whole is the starting point. The first two publications concentrate on describing the context and mention some of the problematics associated with this (Figure 6). Publications I and II complement each other by providing parallel and complementary viewpoints to the topic.

Publications III and IV illuminate the problematics in more detail. Publication III presents ground-laying problematics to the theme. The connection to the constructivist approach is proposed, as it may be regarded as a suitable way to address issues reported in the publication. Publication IV sheds light on the more human side of the change with its multiple transitions. The publication enables further discussion on the possibilities the constructivist approach may bring for both understanding the phenomena in this area and offering some possible ways to solve these issues.

Publication V reports on one case where attempts were made to handle a change. The publication illuminates the proceedings and gives lively examples on the successfulness of the chosen approach. If the team leaders had been committed and empowered with a more appropriate approach, the results would have been different. Publication VI observes business networks and an intermediator

organization's role there. Networks are formed by actors, activities, and resources that are linked together (Håkansson and Johanson, 1992). Publication VI contributes to this thesis by illuminating the role of a third party acting as an intermediator in optimizing the operation of the separate parties, as in business networks or team-based operations. The problematics of such settings are introduced and the benefits of this type of solution are presented. Publication VII offers a view to an IS acquisition project by pointing out the stakeholders in such a situation and their position and stance in implementing the new way of working that is required by the acquisition and a direct consequence thereof. The relationships between the involved parties are illuminated in a way that shows the complex nature of the legitimation of the new system and the course of action required by it.

4.1 Publication I: *Knowledge Management in Renewing Software Development Processes*

Publication I describes the context of the IS/IT-centered organization. The research is based on an 18-month qualitative case study of a large software company that has a team-based operation, consisting of teams from various organizational backgrounds as a result of numerous mergers and acquisitions. The change in this organization is about renewing the software development processes towards reuse of the software code, that is, component-based-software-engineering (CBSE). The research is conducted from the business and management perspective.

Publication I identifies the stakeholders or actants who are present in an organizational change process as the working practices change. We bind the themes of technological renewal and knowledge management; we recognize the kinds of knowledge management (KM) challenges that are typical in the renewal of software development processes involving large organizational change (Table 6).

Table 6. Knowledge Management Challenges in Different Phases of the Renewal Process

	Design and preparation phase	**Implementation phase**
Technology-oriented challenges	› Different kinds of teams and demands ×Finding a viable common technology that meets the needs of different teams ×Usability and exploitability of the component library	› The fit between the initial and new technology ×Lack of competence of a new chosen technology ×Component interfaces that are general enough ×Lack of time for training and experiment-ing
Human-oriented challenges	› Prejudices towards new technology ×Fear and uncertainty caused by not knowing the future	› Information and knowledge flow between teams ×Social interaction between the teams ×Attitude problems towards change ×Attitude problems towards a new technology

We identify a *design and preparation phase* and an *implementation phase* seen from the change's point of view in the proceedings. In this publication, we propose solutions to the challenges (Table 7).

Table 7. Solutions to Knowledge Management Challenges in Different Phases of the Renewal Process

	Design and preparation phase	**Implementation phase**
Technology-oriented solutions	› Plan the implementation and the schedule of the implementation of the new technology properly ×Approve the parallelism of old and new technology in some situations for some time ×An expert pool to find a "right" technology ×Designing the component library with experts and representatives of different teams	› The new technology must be agile enough to accommodate the needs of the teams ×The new technology must be adaptable by organization members ×Resources and possibilities for training of the new technology ×Clear architectural design and structure
Human-oriented solutions	› Proper communication of the change ×Training for the chosen approach	› Pilot cases to act as an example ×Creation of formal and informal communication places and spaces between the teams

The centric actants in the case are the management, the change team, and the teams doing the software development. The SW development and the change may be observed as additional actants in this case. There are challenges that are technology oriented, but even they have the notion of the organizational aspects and managerial implications within.

The results of Publication I present a detailed analysis by carefully utilizing the perspectives of different organizational levels (management, middle management and operative level) involved in the renewal process. The heterogeneity of the teams makes it nigh impossible to find an overall solution that would cater for all purposes. The nature of each team and their objectives should be taken into consideration on a more individual level when such measures are taken. The results of the study support the KM studies, even though the KM approach was applied in the specific context of software business and CBSE, thus fortifying the claim that KM and the constructivist approach would be a strong option. The organizations operating in technological environments are equally able to apply and benefit from identifying and acknowledging both the human side and the perhaps more obvious technological side in their change initiatives.

Renewing their software development processes towards CBSE would benefit a great deal from applying KM practices already at the design and preparation phases of the renewal process. Thus, KM practices should already be considered in the design phase of the change to ensure smooth progress of the change. Another significant issue to be brought up is that both technological and human perspectives of KM are needed in the renewal of the software development process. Technology is needed for making things easier and more efficient

4.2 Publication II: *A Knowledge Management View to a Strategic Change in a High-Tech Company*

This paper constitutes further understanding of the organizational surroundings, but also the challenges that an organization may encounter when establishing a significant change upon the organization. Identification of the phenomena is based on a previous literature analysis and a case study in a business enterprise. The empirical material was analyzed after and during its collection. Some of the organizational issues were identified before the empirical material collection period and were manifested throughout the case study. Thus, the issues from the literature were verified. Some issues emerging during the study were recorded and validated in the analysis stage.

Publication II presents the software firm implementing a strategic change in its R&D and production functions. The publication describes it altering its project-oriented software development processes. The publication studies the changing demands of the external environment and answers this by using existing knowledge more effectively. The publication recognizes the aim to release more resources to the development of new innovative ideas. The objective of this paper is to highlight the major obstacles in this kind of strategic change from the KM perspective, which is a highly relevant viewpoint for knowledge-intensive companies such as those operating in the IS/IT environment.

We were able to identify several obstacles of change in the renewal process from the viewpoint of KM (depicted in Figure 10). It can be said that KM is also a key to help this change go forward. By recognizing KM challenges, these obstacles may be eased. We also suggest in the paper how the identified obstacles of strategic change can be tackled by building a functional toolset based on prior literature on the high technology industry and knowledge management.

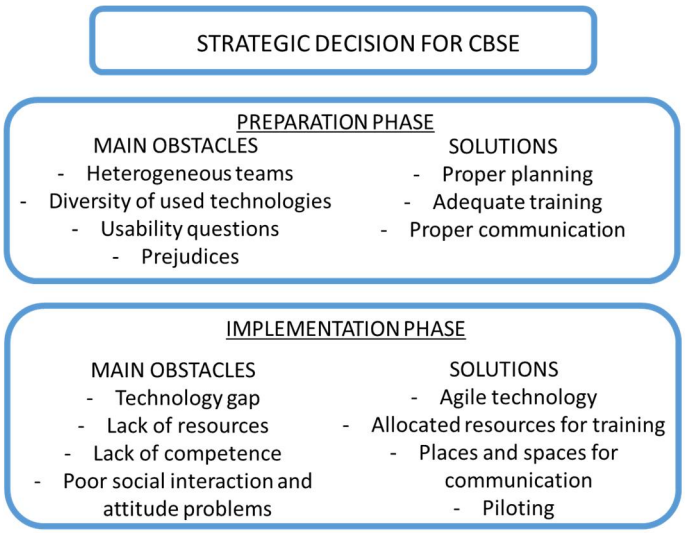

Figure 10. The Obstacles and Solutions in and to Strategic Change

KM practices should already be considered in the design phase of the change to ensure smooth progress of the change. The organizations renewing their software development processes would benefit from applying KM practices already at the preparation phases of the renewal process. Another significant issue is that alongside the technological issues, the human perspectives of KM are needed in the changing of processes. Technology gives the framework, but it is important to have the right attitude towards knowledge sharing, which is the key element. This has already been stated in many KM studies; for example, Desouza (2003, p. 85) stated: "The biggest obstacle to effective knowledge management is not implementing a cutting-edge IT solution, but getting people to talk and share their know-how."

The managerial implications of such a change are significant. Recognizing and acknowledging the obstacles and their root causes is difficult. Qualifications and features required from supervisors and leaders in this kind of situation are not easy to meet even after having recognised them. To master the technological side of the whole change process is one aspect, but the organizational and human side are at least equally important. It is challenging to plan which organizational changes are needed and it is even harder to figure out how these should be implemented. As the meaning of human issues was emphasised in the results and as there are signs that maybe the 80/20 relationship of KM strategies is not necessarily the right one (Mukherji, 2005), it would be interesting to conduct further research on the balance between the two KM strategies

4.3 Publication III: *Three Positives Make One Negative: Public Sector IS Procurement*

Publication III formulates the field of studies in further detail and presents one of the centric problems of the theme of this thesis. For this paper, we conducted a single case study on an IS acquisition

situation in a mid-sized city as a part of a research project concentrating on organizational changes and requirements caused by IS/IT acquisitions. The questions regarding and insights of the upcoming change are: How to prepare for it? How to tackle it? What if the preparations and/or their execution are not a perfect match? In this case, there were three parties to the change endeavor: the function itself into which the change was to be applied, the CIO's office (helping with their expertise), and the Logistics (the team to help with the tendering formalities). All three parties were convinced that the project was to run its course smoothly. Quite the contrary; the project failed on one level, as a project, rather badly. The interesting point is the function of the project and change management.

The acquisition project concerns multiple parties in an organization over a period of time. The organization subject to the change still needs to manage its normal routines and take care of its duties. The simultaneous responsibility of the project management may prove to be hard to handle in practice. It may move from one party to another, it may even dissipate. The significance of the project management is clear and present. Zest and energy are essential for a successful project manager. In addition, the ability to maintain the big picture is a matter of significance. The network of stakeholders affected is such a complex weave that it presents the project manager, and the personnel, with an arduous task to keep everything clear. The individual capabilities in such an initiative are yet another challenge. Not all the included persons possess the required skillsets or abilities, such as the flexibility to react correctly to emerging issues. To the degree that there is not even a shared language with which the communications could be handled on various emerging issues. The question arises, what could be done?

The requirement specifications are centric in the IS acquisition process also in public sector. In addition to the regulatory factors, multiple stakeholders are often involved in the procurement process. Yet their expertise varies and is often limited to a narrow sector or a specific field. The publication shows how the project manager, CIO office, or Logistics, with little if any prior expertise of other domains, will perform poorly. Each having specialized in a particular field, the other areas become inevitably omitted. All three parties argued that their requirements specifications were good. We observed how such a trident, having reported successful completion of their duties, still missed the point. The tendering resulted in a disaster; two projects were contested and subsequently lost in the market court.

4.4 Publication IV: *Why SPI Initiative Failed: Contextual Factors and Changing Software Development Environment*

Publication IV continues to present and set the challenges ahead when one commences organizational projects that bear significant changes in them. This publication reports the importance of the contextual demands in software process improvement (SPI). In the paper, a framework is presented through which the software improvement process can be better understood and studied. The framework (Figure 11) offers a view to understanding the change process by describing eight change paths (Päivärinta et al., 2011) that may be observed regarding software process improvement.

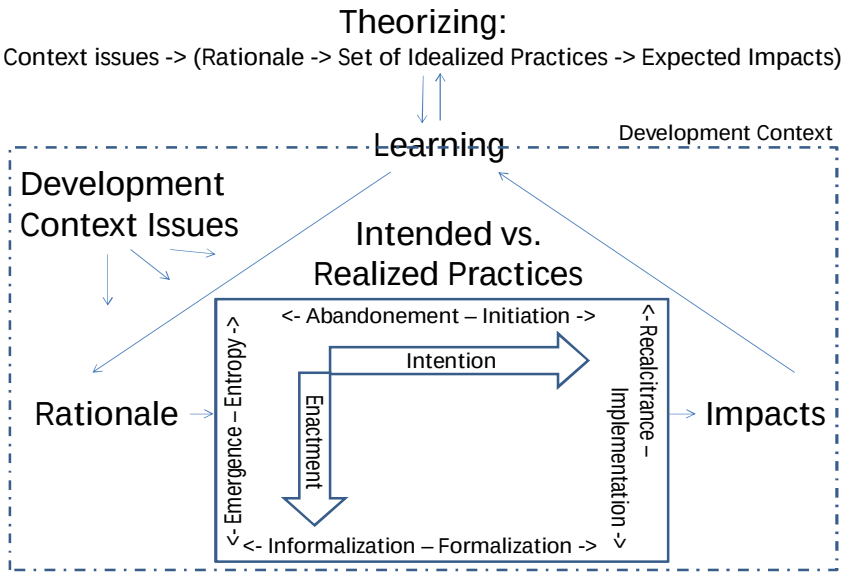

Figure 11. Theoretical Lens Used to Analyze and Learn from Practice Implementation Descriptions

Software process improvement plays a significant role in the software business and to its productivity. Organizations that produce software face challenges with the productivity and effectiveness of their operation. The literature lists numerous methods to make the operation better. Critical success factors are defined in order to make the successful improvement procedures more certain. However, these methodologies need to be adjusted to match the organizational context. All organizations and their environments are different; thus, the solution that is most suitable for individual needs must be modified or localized to fit the case-specific contextual demands. We studied the case via the lens presented (Figure 12).

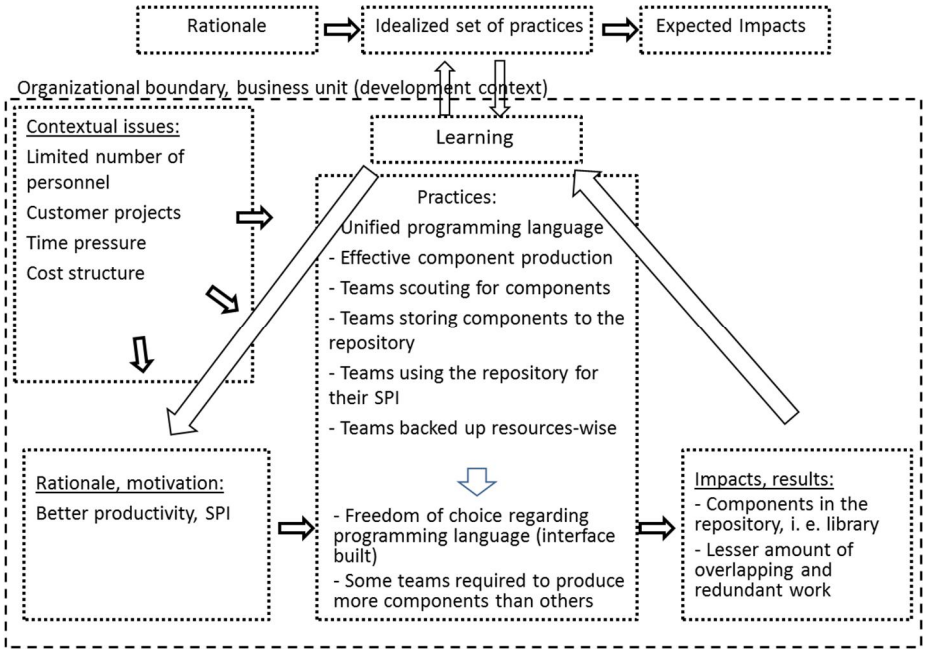

Figure 12. Theoretical Lens with Features from the Case Organization

Even though the rationale and objectives behind such initiatives are clear and the personnel are behind them unanimously, when the realization and execution starts, there may be differing views among the affected people. There may not be a consensus on the methods being used or there may be no resources to act. To ease the situation, the organization is advised to take some precautions; the backrest provided by top management support is essential, as is adequate communication. The communication should be continuous and via multiple channels. To even the variating levels of expertise the management should provide opportunities to update the individual capabilities. This needs resources: time and money. These should be allocated from the start. Again, rather easily said, but the organizational reality may prove the plans void, which in turn may make the change equally void. The use of critical success factors (CSF; Niazi et al., 2006) is one way to approach the proceedings, but by no means allows concentrating on only a few of them if this means omitting the rest. There may be emphasis on some, but to omit the others is shortsighted and may lead to dire consequences. The secondary result from this publication is that the lens used to study the phenomena was validated as a functional model to use on such occasions. The use of formalized methodologies is addressed also; there rarely is no intrinsic value in it; it is as it should be – only a means to an end. Thus, the chosen methodology may be localized if need be and the outcome may still be valid. Such localization is to be executed skillfully and in an organized manner.

4.5 Publication V: *Team Leaders' Perceptions in the Renewing of Software Production Process*

The aim of publication V is to identify and show the roles and functions of team leaders in implementing a procedural change in software-producing business enterprises. The study offers some solutions to the challenges that team leaders face when implementing change in their teams. Change means new ways of working. For example, a change to a unified programming language for the teams to use. The research in this study is a qualitative case study of a large software company that is renewing its software development processes towards component-based-software-engineering (CBSE; case 1). The research observes the phenomenon from a software engineering management point of view, and thus combines management with leadership issues.

A contemporary software company is often based on mergers and acquisitions resulting in a number of organizational cultures and ways of working within the mother company. The inconsistencies between teams cause friction and ineffectiveness, adding to the need to improve one's competitiveness in the ever-toughening competitive situation. The streamlining of the operation is often felt the strongest on the operative level. Publication V identifies the roles and functions of team leaders in implementing a procedural change in software producing business enterprises. The study offers some solutions to the challenges that team leaders face when implementing change in their teams. Here, change means new working practices.

The team leaders are in a crucial position to make or break the change between the management to the upstream and the team members to the downstream. This puts them in front of a rather tall order to act in their position. The justification needs be there to give acceptable grounds to the change; communication about the initiative and resource allocation must be properly planned in order to succeed. The rationale for the change was there, and the employees on all levels were in unison about the appropriateness of the need for change. However, the claim, and the result, is that the change must first and foremost happen on a mental level; that is to say that the individuals must adjust their thinking to the changing operation. The mental change will need a vision to strive for. In the case, this was a part that failed. Equally, the communication left much to be desired.

4.6 Publication VI: *The Role of an Intermediator Organization in Collaboration: How Can an Intermediator Enhance Value Co-Creation*

Collaboration brings synergy to organizations and leads towards superior value co-creation. However, successful collaboration and value co-creation face several challenges. We state that these challenges

can be addressed with the help of an intermediator organization (IO), and that it subsequently has a positive effect on value co-creation. Publication VI analyses the IO's part in value co-creation in a collaboration network. Based on theoretical and empirical research, the activities and consequent value-creating benefits an IO brings to a collaboration depend on the role or roles it plays in the network. According to our findings, an IO can act as a creator, coordinator, facilitator, node, and a resource. An IO facilitates the creation, development, and maintenance of network relationships during collaboration. The value an IO creates is mainly indirect and intangible by nature, and thus, difficult to measure.

A third party may well enhance the contacting and the relationship-building when introducing alterations upon the working practices. The members of the organizations are sometimes filled with anticipation that may prove to be hard to overcome. A third party may approach these situations without any prior prejudices. Also, maintaining these relationships during the change alongside one's daily routines is harder than it is for a third party who is more dedicated to this sort of activity. Equally, the third party may be able to recognize the core capabilities and their significance more effectively and perhaps better than the incumbent team members. Thus, the value creation is expedited and the newer avenues for operation opened by recognizing new fits of organizational actants. When taken to the team-based environment, the intermediator organization may be for example an outside consultant, or an allocated and empowered member of their own organization sufficiently relieved from other duties to accomplish this.

All the organizations in the three analyzed cases were able to create several kinds of benefits for the collaboration network members facing new circumstances in their operating context. This was despite the fact that the main role of the organizations differed from each other from the collaboration initiator to the collaboration facilitator. The analysis of the main value functions also revealed that in each of the cases, the studied case organization was especially good in enabling indirect value creation – innovation and access value in each of the cases. In some of the cases, the case organization also enabled value creation through what we called market and scout functions. It is noteworthy that, at best, the intermediator organization enhances indirect value creation; thus, the network members should not even expect the intermediator to be the creator of direct value in the network – that role the network members should keep for themselves.

4.7 Publication VII: *Why Do We Need This? Roles in the IS Acquisition Legitimation Process*

In information system acquisition, one of the major challenges is to carry out required changes in the organization. In this publication, we state that major problems in organizations' renewal endeavours are the lack of organizational support, user participation, and competence. The process of gaining organizational support behind the acquisition process has been presented as the legitimation process. In this publication, the legitimation process is elaborated; it includes the actions taken by a legitimation seeker to gain legitimation from legitimation providers and those of the legitimation providers. In IS acquisition, the individuals' behavioural patterns can be perceived as representing specific roles. Published studies combining these roles and actors in the legitimation process in IS acquisition are rare. Consequently, we explore the roles in the IS acquisition legitimation process in two cases. As a result, we illustrate how legitimation appears in practice and provide a deeper understanding of how different roles act in legitimating IS acquisitions.

In this study, we identified different roles in the IS acquisition legitimation process. We noticed that different actions and arguments depend on the legitimation seeker's role in the acquisition. It was evident that in case 2, the acquisition project would have failed without the project manager replacement and without the new project manager's active contribution to repair and maintain the legitimation among users. Thus, the project leader role is emphasized as a legitimation seeker throughout the acquisition project. However, other roles are also significant. The innovator seeks initial legitimation for the IS acquisition and maintains and repairs the legitimation among users. When the innovator is also a user, the role also provides immediate legitimation. The sponsors seek legitimation through top management support, especially in the beginning stages of the acquisition. The gatekeeper ensures the flow of information and, thus, seeks, maintains, and repairs legitimation while encouraging appropriate communication among the involved parties. The implementer's actions are emphasized in the implementation phase where the actions are crucial in maintaining and repairing legitimation.

In cases where there is an obvious need for the new IS, the legitimation seeking is relatively easy. Should this not be the case, the publication provides a deeper understanding of the legitimation roles and activities in IS acquisition and a larger inclusion of the actors in the legitimation activity model. Understanding the legitimation process helps practitioners in IS acquisition. With that understanding, they may be better equipped to answer the simple and legitimate question of "Why do we need this?"

4.8 The Path of the Publications

The seven publications presented in this chapter form a path showing the features of IS/IT-related change. The experiences give a base for making further conclusions on how these situations were addressed and how they might have been addressed better. The change is always a discontinuity, and a discontinuity presents the employees with uncertainties regarding their imminent future. The uncertainties affect the overall performance of the organization as well as its efficiency and productivity. The technical issues all have their human side. To acknowledge this, a variety of possible approaches are presented to address the issues in the need for development.

The findings in publications I and II pave the way for the constructivist approach, as already the need for other than purely technological solutions becomes evident. The knowledge management perspective enables the study to consider this. It also becomes evident that there are numerous challenges that may be more beneficially responded to with a broader mindset, including both sides of the setting. However technical the issue seems to be, such as a system acquisition or SW production process renewal, the managerial side overrides the technical aspects. The technological side may be engineered to meet the requirements as long the more human side has executed its part sufficiently. However, it would be overly optimistic to assume that the professionals could set their humanity aside and act in a near machine-like manner. Hence, the challenges and the solutions emphasized the need for the constructivist approach in making the change.

5. Discussion

Publications I and II describe the environment for this study. They formulate a foundation to study the change of working practices in the IS/IT context. The first two publications also shed light on the problematics present in changing working practices. Each of the other five publications adds to this study of the phenomenon by expanding the understanding of a certain aspect of it. Moreover, publications III and IV describe in more detail the problematics on the practical level in the area of interest and show how the proceedings may turn out. The last three publications, V, VI, VII, illuminate attempts of solving the issues and their outcomes. Together, publications III, IV, and V form an understanding of the change in working practices and the relationship it has with the constructivist approach by observing different aspects of this relationship in detail, thus simultaneously forming a more detailed comprehension of the actants that should be taken into account when planning, introducing, and implementing an organization-wide change in working practices.

The overall idea was to contemplate change in covering each case individually from the planning to the point where new working practices were up and running. The working practices in each case were unique, and the needed proceedings and measures to implement the change vary in each case depending on the organization and the details of the change. However, the basic elements are largely the same; the context of IS/IT, as presented, has its distinctive features that makes it what it is, such as its origins, which entail a mix of the technical and the social (Ramage, 2004, p. 71). IS/IT as a field has developed based on computer science, management and organization theories, operations research, and accounting (Davis and Olson, 1984, pp. 13–14), resulting each time in a unique composition. The problematics, even if in detail, are each time unique, but bear the same hallmarks, and on a general level, the same type of characteristics and attributes. Thus, the comparison gives depth to the analysis. In addition, the people dealing with the change have their humane features and qualities. It has little significance whether a person is employed by a business enterprise or a public sector organization; the operating parameters stay generally the same. The organizational structures vary, the team structures differ each time, but people are people. Therefore, this combination proved to be a prolific research subject and context.

In this chapter, the three sub-research questions are processed through the cases, and finally, the main research question will get its answer.

- SRQ1: why do constructivist thinking and the constructivist approach suit the IS/IT environment well?
- SRQ2: How may the constructivist approach be used in change situations?

- SRQ3: What are the important elements in and of change in IS/IT working practices?
- RQ: Why would the constructivist approach support teams well when organizational working practices change in the IS/IT context?

The context for this thesis and the research is IS/IT. In this area, research "examines more than just the technological system, or just the social system, or even the two side by side; in addition, it investigates the phenomena that emerge when the two interact" (Lee, 2001, p. III). However, in practice, easier said than done. In IS/IT, there are numerous divisions, parts, and sub-areas of the whole. The IS/IT professionals usually have held their technical skills paramount (Bassellier and Benbasat, 2004). As a definition that is fine, but still the versatility of the target combined with the versatility of the subject results in a vast variety of possible approaches, and as a consequence, outcomes. Mechanical problem solving does not necessarily bring about a successful change. The managerial literature is based on the findings in particular cases, thus their generalizability varies, too (Stake, 2005). Thus, to look for methods based on their technical features and blindly take one method and bring it on regardless of the implementation will not necessarily guarantee success. Should one subscribe to Peschl's (2007) view of third loop learning, it becomes obvious that to affect the deeper rooted sentiments, values, and attitudes of the members of the organization who need to adapt to change, this kind of affecting is not possible with a purely mechanistic approach. One needs to commit the persons to accepting the change and try to remember that they all are individuals. Also, the higher-level learning needed in organizational changes requires social interaction (Guk and Kellogg, 2007), a fact that brings yet another angle to the phenomena in question.

Another angle to the phenomena of interest is the division of the levels in such endeavors. Markus and Robey (1988) claim that the level of analysis is to be divided into two: micro and macro levels. The inclusion of the micro level is defended by the claims that only individuals act in organizational settings and the collective bodies are incapable of this (Pfeffer, 1997), and furthermore, the organizations comprise individuals. The macro level as an appropriate level of analysis is endorsed by stating that the major changes, such as the implementation of information systems, have effects on the organizational level in its structure, culture, and working practices (Leidner and Kayworth, 2006). In order to be able to study the organizations and the change therein, a researcher needs to take a step back and observe the larger entities. There are recommendations of mixed-level observations and analysis, in which both levels are acknowledged as important and both are studied (e.g., Markus and Robey, 1988; Priem et al., 2010), which seems to be the rational way of approaching the subject as the arguments presented above are hard to dispute.

The division of micro and macro levels has been further refined to the individual, group, and organization levels. Sometimes larger entities, such as societies, are also added to the observation (Molloy et al., 2010). How the purposeful division is made and how far and wide the scrutiny can justifiably be extended depends on the phenomenon being studied. In this thesis, the organizational change in each case occurred within the organizational boundaries with no significant interaction with societal-level actors. Thus, the division of levels in this thesis based on the empirical findings is trisectional: individuals, teams, and organization. In addition to those levels, there are also projects to be concerned with (Grudin and Poltrock, 1997), which do not align with the other levels. An individual belongs to one or more teams aligned under the organization. Projects are under the organizational umbrella, but there are no teams; yet, they have individuals allocated to them. Teams may be involved in one or more projects. Thus, the projects are depicted as perpendicular to the horizontal organizational levels (Figure 13).

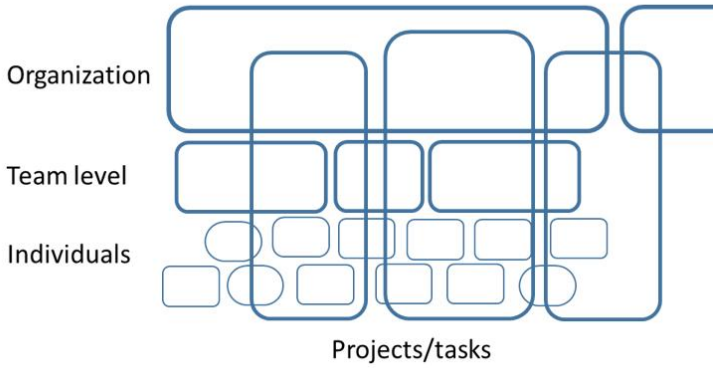

Figure 13. The Levels and Operators in Organizational Change

How may these proceedings be explained and grasped? Stakeholder theory (ST; Freeman, 2010) offers a viewpoint of seeing past the shareholders and their interests as a theory for approaching strategic management and organizational proceedings in the midst of change (Freeman and McVea, 2001). According to ST, it is not only the financial outcome with a mechanistic observation of the organizations producing the outcome that is of significance. ST brings forward the other individuals and groups (employees, customers, investors, suppliers, government, trade unions, etc.) that are to be distinguished in an organizational context in addition to the traditional view of a business enterprise and its relationship with its customers (Freeman and McVea, 2001).

ST states that every person or group taking part in the activities of a firm do so to obtain benefits and that the priority of the interests of all legitimate stakeholders is not self-evident (Donaldson and

Preston, 1995). Thus, managerial decisions also fall under this umbrella-like term, as do their consequences. ST is descriptive and instrumental, and fundamentally, a normative approach that concerns only individuals and groups formed by them (Sternberg, 1997). In addition, the stakeholder approach is concerned and centered on the business managerial viewpoint (i.e., the business decisions and their consequences; Parmar et al., 2010).

Stakeholder theory's strength is its breadth of interpretation (Phillips et al., 2003); the term *stakeholder* means different things to different people. ST is a theory of organizational management and ethics (Phillips et al., 2003). Thus, the use of the theory is contextual. ST might have been used to argue that the older working practices should indeed be abolished as the managerial decision was made to renew the practices, and the managers were simply to put their emotions aside regarding the relationships and cultural aspects. To study the morals and proceedings, ST would have been sufficiently suitable. Regarding the theme of this thesis, however, the explanatory power of ST is simply not enough to cover all the ends, even though it showed the importance of a variety of individuals and groups. In the example of change and resistance to change, the explanation for the proceedings would have been something like "the managerial decision based on the overall business and competitive situation." Further, the employees just needed to adapt themselves to the instructions and managerial decisions made by the management (i.e., the change). That would still offer no explanation as to what could be done, and how to remedy the situation or learn for the upcoming new change.

This research needed view the change in parallel with other factors in the proceedings. The change is clearly there but it is also relational to each individual as they sense it differently. Actor-Network–theory (ANT) is used to explain the parallel understanding between the human and non-human actors in change situations. It may be justifiable to use ANT to answer questions of *how* and *why* lifeless entities, such as the change or information systems, are paralleled with human actors. The human actors or stakeholders engage in various actions that cannot be sufficiently explained by any other means than applying the ANT perspective; that is, in the cases offering the empirical material, the mere change was enough to cause various phenomena within the organizational members. There were expressed feelings of doubt, suspicion, anxiety, and even fear of the future. The connections to any individual actor could not be made; thus, the ANT-based term *actant* was taken into use.

Actor network theory (ANT) is a constructivist approach in that it avoids essentialist explanations of proceedings or artifacts (Grint and Woolgar, 2013; Mitev, 2005). That is, ANT explains a phenomenon

by understanding the interactions of elements and their combinations in it. ANT leaves the success to be assessed separately rather than saying that something is *good* and something else is *not good* (ibid.). According to ANT, the effects are more important than the causes (Munro, 2009). The effects, such as resistance to change, may be credited to something other than a particular individual. ANT enables exploring the connections in relationships within a network.[12] The entities that have an effect on proceedings are called actants, a term that entails both human and non-human causes of effects (Law, 2009; Mützel, 2009). Objects are equal parts of social networks. The ANT approach was chosen to be adapted as a theory to support the assumptions made regarding the various features having an effect on each change and their organizations' proceedings, and to enable the studying of the phenomenon. In this thesis, the explanatory power of ANT was used to take the change into its focal position. Through the ANT approach, the phenomena related to change in a given context can be studied.

5.1 Findings Regarding the Types of Changes on Organizational Levels

In all cases, the need for change was acknowledged, and after preparation, presented to the top management, which approved the initiatives with sound operational and organizational justifications, thus legitimating the initiative. The management assessed the pros and cons of the initiative from their point of view – the benefits received after having implemented the change and which resources the change would require. The benefits included operational streamlining, improved productivity and profitability of the whole organization, and also improved customer service. The benefits were themes familiar to the top management in their daily work routines. They related strongly to these. The cases are similar yet not identical by their nature. In four of the seven cases, there were features typical for teleological change (Van de Ven and Sun, 2011). Table 8 illuminates the cases and their corresponding change theories (ibid.). The cases are thought to have a main type and a secondary theory applying to them. Teleological change interprets a state where the organizations have a clear vision of a better way of working and/or a solution that is consciously strived for. Thus, organizations need to assess their current state of affairs before they proceed with the goal setting. Once these tasks of assessing the current state and goal setting are done, they plan how to implement the change. Another feature more common in the cases is the life cycle theory of change. According to life cycle theory, the change is imminent and strived for by following a single sequence of phases or stages (Van de Ven and Poole, 1995).

[12] In this context, network needs to be understood more broadly than consisting of just individuals; rather, it is a multitude of different things (Latour, 2005).

Table 8. The Cases Presented as a Type of Change According to van de Ven and Sun (2011)

	Life Cycle	Evolution	Dialectic	Teleological
Case 1	x			x
Case 2	x			x
Case 3	x			x
Case 4	x	x		x
Case 5		x	x	
Case 6		x	x	
Case 7		x	x	

Teleological change, as it has a specific vision of the proceedings to come, requires a different kind of support than, for example, a life-cycle type of change, such as the selling of the idea. The difference is that in the teleological change, the chosen outcome causes the need if not in assessing the current state of operation, at least in the drawing up of the transition plan towards the desired future and the implementation of the plan. These actions are significantly aided if peer support and other features of the constructivist approach are present, as there cognitive incongruity (i.e., need to learn) is tackled by using the more knowledgeable peers to coach the employees through the change, simultaneously placing communications in an important role in the endeavor with the organizational support to learning. This would have been needed more in case 1, in which the change could have been supported more. Case 4 had this kind of support and the change was implemented more successfully.

In the life-cycle mode, the change follows a certain series of actions or stages in which the change is implemented. In case 2, the temporal requirements dictated the stages, which followed promptly. The need for support in various parts of the change process are somewhat different from teleological change. Life cycle sees the change as inevitable development and a kind of continuum for the past way of working, but the actual outcome may not be so clearly envisioned. This was visible similarly in cases 3 and 4 where there were aspirations for improvement without exact knowledge of how this would happen. This format means to take the historical aspects into consideration but differently than in the teleological mode. The sequence and development are more important; thus, the constructivist approach is able to assist in these cases, too, as it considers the existing knowledge and expertise to be important in the change. The constructivist support in case 3 would have been most beneficial for the outcome: mutual expertise could have saved a lot of time and effort for all.

Both modes of change need to apply the new knowledge into the actions but the approach is almost contrary to one another. In project-type organizations, one significant detail is the learning for the next project. The constructivist approach has as a fourth cornerstone the reflection of the proceedings

(Baviskar et al., 2009). This is the very feature to enable and enhance learning. The change project needs to be dealt with after having finalized it. Case 2 entailed a kind of debriefing of the proceedings, keeping in mind that the organization is set for a sequel of the newly implemented system. It would be most interesting to hear how it succeeded.

In cases 5–7, the approach was more of an evolutionary type, even if the improving actions did not just emerge but were more a result of a plan. The cases consisted of continuous improvement of the relationship. Features were tried and retained if they proved be suitable for their purpose. After having done that, another variant for the way of working was thought of. As a secondary mode, the dialectic theory describes the juxtaposition of the setting of whether or not to have the co-operation in place.

The required resources were harder to estimate; the personnel to involve in the change, how many of them, and how much of their time was needed. At best, a rough estimate was decided upon. The discussion remained on a level belonging to the top management's domain. Equally, the organization's structural changes were assessed. The management cannot afford to be immersed in details too deep, as that may obscure the clarity of the big picture. For example, the new knowledge the employees needed to learn received little attention. The change agent(s) were discussed and empowered to make the change happen, the detailed planning included. Top management needs to promote and support the change with their actions. The actions became visible through the technological choices they made and functional guidelines they released.

The team levels received their objectives after top management had discussed their part. The top management made the decision from their point of view and released the new way to be implemented by the middle management with and for their subordinates, aided by the change agents if need be. The objectives on the middle level were goals such as enhanced work allocation, improved productivity and profitability, but on a different level than with the top management as the level of analysis is different. Middle management needed to support the change whilst executing it. However, the opportunities, such as in case 1, to discuss the matters with their peers proved to be limited at best. The feedback middle management was able to receive was equally limited. In cases where these features were better taken care of, for example, cases 2 and 3, the results were also better, thus underlining the significance of interaction and feedback, reflection of the proceedings. Middle management felt the pressure of the change the most; they received their objectives from the organizational upstream, and they needed to make their subordinates to execute it. At the same time,

the daily work routines and life and the business objectives had to be achieved. There were clear indications that middle management felt for the subordinates, and when in doubt, the development was temporarily sidelined or even disregarded, as was evident in cases 1 and 4.

Regarding the subordinates of the middle managers, the conclusion is the better the communications the better the results. They were informed about the upcoming change; if it was elaborated according to the constructivist approach, the acceptance was significantly better than in the opposite instance. To a degree, this group did as they were instructed, but when the instructions were insufficient or unclear, the actions were equally unclear concerning the change. Employees tend to prefer stable operations with few intrusions. The findings show that they were curious and even anxious about the change. The change was thought to alter the ways of working, and if there was no further concrete information available as to how, the void was filled with unproductive speculation. The employees on the lowest hierarchical level are more interested in their part in the whole; should the working practices change, how and when are more pressing questions than the why. The *why* is not an unnecessary question to be answered as it lays the essential foundations to the acceptance and commitment, but it is secondary to the other two. Essentially, the change on this level is the mental state, coping with it after the new way of working has been announced and implementing the practice in to action. These are both alleviated by using the constructivist approach of informing, relating the novelty to this information, and having peer support during the proceedings.

5.2 The Findings in Cases on Various Levels of Change

Different levels on which the change happens in organizations (macro, team, and micro) are sometimes regarded as one: organization (Markus and Robey, 1988; Molloy et al., 2010). Planning action only for *organization*, however, does not offer enough detail to proceed optimally with the change initiative (ibid.). Change may affect individuals who form the organization and the organizational culture. Thus, such change initiatives are to be regarded neither solely as micro nor as purely macro level endeavors. As neither approach is quite sufficient alone, fluctuation between them is required to fully comprehend the phenomena of large organizational change (Robey et al., 2013; Rousseau, 1985).

Another angle to study and understand change in organizations is the type of the change. The types of change – life cycle, teleological, evolutionary, and dialectic – differ from one another by their nature (Van de Ven and Poole, 1995). Thus, they manifest themselves differently on the pragmatic levels.

5.2.1 Teleological Change

In teleological change, the objective is clear to its initiators (Figure 14). In case 1, the macro-level decision was made on an organization-wide change in working practices into a certain new mode. Top management made the decision and had the clarity of the future for the whole organization. This was communicated to the change agents in the organization. They, too, saw the need for change and took on the idea of initiative as they heard the motivation directly from the planners. The change agents deemed the middle management the key actants in implementing the change as they supervised the teams that were to change their ways of working. The team leaders and members were unaware of the change until they were informed about this. After having been informed, they all formed a perception of the proceedings and the effects on them individually. The information is crucial at this stage. The change required a plethora of communications to ensure the delivery of the correct information.

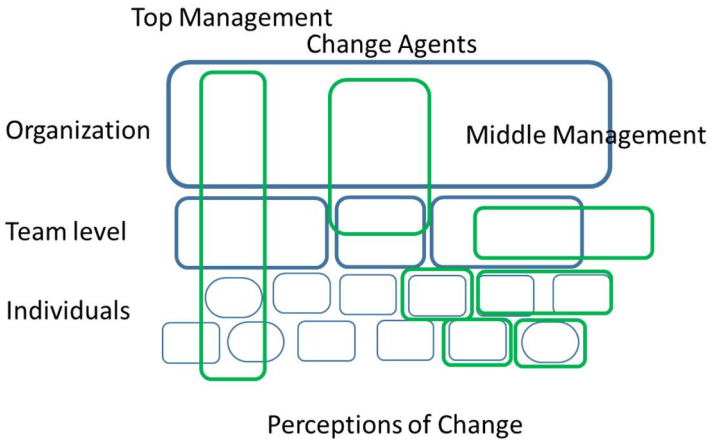

Figure 14 Perceptions of a Teleological Change

Both theories, stakeholder (ST) and actor-network (ANT) theories were used to fathom this case. Various individuals and groups were identified. There were stakeholders, but also some factors could not be included in this classification (i.e., the change and individual features therein that had an effect on the organizations' members). They required a broader view. The objective, the desired state of the operation after the change, was also one such factor that needed to be taken into account when studying the case. These were recognized and labeled actants by taking on the ANT approach. Additional features that affected the proceedings of making the change happen included planning, resourcing, communicating, executing, and willing to apply the change. The handling of these features and their application to the personnel as well as their reception were focal for this study.

The organizational management recognized the macro-level need to change its processes. The profitability of the business needed to be improved. Management sensed the pressure of the markets and from the stockowners. The management came up with the idea of component-based software production. The objective was to be able to use the wisdom and know-how present in their organization, complying roughly with the guidelines of the value-creating network approach (Helander, 2004). Here, the perceived customer value was based on and formed by co-operation of the organization exploiting all the possible competencies present, and thus able to concentrate on the core matters. This was a case of teleological change as described by Van de Ven and Sun (2011) as there was a ready-thought vision of the future and an end state envisioned. The fundamental will to develop was there, in so far that when interviewed and asked for the objectives for the initiative, all the interviewees gave roughly the same description of the motives – to improve the productivity, to cut the production times, and similar production improving features.

The change agents stood firmly behind the endeavor and were very convinced of the suitability and "goodness" of the initiative, as they had had the motivation from the designers of the change. The team consisted of seasoned professionals who had a history in the organization; that is, they had the working knowledge of the organizational culture and of the parts of the organization that were going to be affected by the change. They were committed to the change and empowered to suggest, make, and execute decisions.

> ". . . Problem is that they [the other members of the organization] have another model embedded in their minds . . . intelligent people understand the justifications . . ." (Architect in Case 1)

The change agents had a clear picture of what was going to happen next. It may now be concluded that the format of the proceedings was done very much like constructivist approach, even though it was not specifically labeled as such. The change agents were given the task of planning the change according to broader guidelines, as suggested by Bruner (2009). As professionals in the area, they could relate the task to the reality of software production and the technologies therein, but also to the organization and its mission, supporting the guidelines earlier proposed by Dewey (1986) and later reformulated and refined by Piaget (2013). They could reflect the new format of operation that was planned on their earlier experiences, elaborate the thought, and after that, draw up a plan of how it could be implemented and how it would turn out. In addition, most of all, they were empowered to do all this. They also conferred with each other, thus receiving valuable feedback on the proceedings and on the lessons learned, reflecting the thoughts to reality. In the end, it may be claimed that as the change agents were concerned, there was triple loop learning in progress.

The entire operation in case 1 got involved in the change, some teams less severely (e.g., the ones who were already familiar with the programming language) and some to a larger extent. There were numerous teams doing the software production. The teams were not well aware of the overall situation of the organization's markets, when understood in larger terms, let alone on the individual, micro level. Thus, the clarity of the need for the change was clearer to the management with the view of the "big picture" than to the rest of the organization.

In comparison to the change agents, the micro level, team leaders and the team members in particular received their change plans as given. They were simply told that, henceforth, in addition to their normal duties and routines, they were to scout for components. The meaning of the components, the existence of the repository where the components should be stored and retrieved from, as well as the actual use of the components were announced to people in teams, but the depth in which "the selling" of the idea took place was quite different. As one team leader puts it:

> ". . . in general our team is not that well aware of how the components should be made, so we continued our old practice . . ."

This, of course, undermined the change. In addition, other measures related to this change, for example, the change of the programming language, created a stir in the teams. There were teams using older programming languages in their work, some of which were self-invented. The new unifying thinking dictated that all the teams were to start programming with a specific, designated programming language created by a commercial vendor who also provided whom the platform. This action, as necessary it may have been deemed, contradicted Baviskar's (2009) features for the constructivist approach – the utilization of prior knowledge. Even though the action was necessary, the implementation did not proceed in the best possible way. With the language being new to some of the teams, support to acquire this lacking expertise was promised. The support was planned, meaning extra resources to relieve people so they could go for training and educate themselves, or personnel to assist during the transitional period.

It seems as if the change was implemented only halfway through. The change agents received the full treatment and they bought the idea as described earlier, but when the team leaders and their teams were up, the constructivist approach was sidetracked for the more traditional approach of command and control, and basically only single-loop learning capable of only solving the immediate problem was applied (Kolb, 2014; Peschl, 2007). There were no particular possibilities of getting regular feedback on how to apply the new knowledge nor reflect the learning with more knowledgeable peers

(Baviskar et al., 2009). The closest the project got to the second loop (e.g., Argyris, 1976; Argyris and Schön, 1996) was in the interviews where the personnel came to reflect on the proceedings. There they recognized some hindrances that were affecting the proceedings; however, there was little to be done about it.

The execution of the chosen procedures was not a success either. The promised support was effectively left at a mention. No particular guidelines or instructions were issued to the team leaders on how to get access to the promised support nor where to seek it. Neither was there any significant support or guidance on how to elaborate the theme of componentization with their teams. The organizing party was thinking that should the need for support arise, the teams will come asking for the support, and the teams waited for the support to come while working towards their organizational objectives.

One centric feature behind the compromising features for the change was simply the workload. The teams had their ongoing projects. In addition to them, they were supposed to study the components, learn new technological capabilities, learn the philosophy of the organization's internal component-related thinking, and all along, keep an eye on the possible components. The organizational goals set earlier were unyielding regarding organizational performance and production. Now the teams received new objectives concerning the components on top of the existing targets. The individual teams were given objectives to find, create, and use a certain amount of components in their production. The features more closely related to triple-loop learning (Peschl, 2007) were there in the plans but still overrun by the everyday business.

There is no unison on how the communication, which is a centric part of change management (e.g., Chen, 2007; Liang et al., 2010), was executed. The change agents reported having done the communicating thoroughly, and the team leaders and members reported having heard of it, but the clarity still left something to be desired:

> "I've been to these meetings regarding this theme . . . There it was spoken about what it is that is meant by this componentization." [Team member, Team T]
>
> "There were discussions what it really means, this componentization . . . it is a concept that can be perceived as one will." [Team leader, Team L]

At least, this is partly due to the fact that communications are interpreted by the person receiving the communications (Nielsen and Randall, 2013). This makes it even more important that the party responsible for the communications does not rely on only one way of communicating, but uses

alternate media and channels in the execution. Thorough planning is to be applied before commencing and not just trusting one's own instincts. The effectiveness and overall results of the communications need to be surveyed. To be executed this, would require allocating even more resources. Yet, another practical fact was that there was no certain way to ensure that all team members were present in the meetings nor that they understood what was going on. Without going any further into the communication research area, we may state and stress the fact that the responsibility of the communications making their point is on the communicator (Åberg, 2002; Wiio, 2000). The communication studies also guide the communicators to do as much communicating as they can by using all the possible channels and media (Lewis et al., 2001), and still the communications are bound to fail unless they succeed by mistake (Wiio, 2000). In essence, the application of the new knowledge did not have the feedback and reflection it required (Baviskar et al., 2009) in order to take its full effect. The higher organizational levels were reasonably well informed about the change, but the execution for and with the individual and team levels still left still something to be desired.

5.2.2 Life-Cycle Type of Change

The life-cycle type of changes are different from the teleological ones in that a certain path is acknowledged towards a certain goal, but the desired end state is not clear. As a basic change management feature, the need for change is acknowledged, and each level forms their own perception of the change (Figure 15). Similarly, the change needs are different for each level. The macro level prepares the organizational matters to meet the challenge of change, and so do the middle and micro levels.

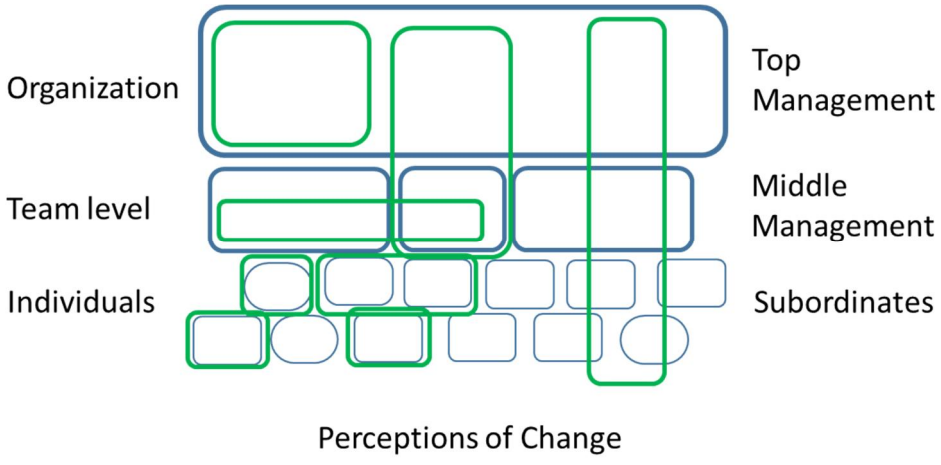

Figure 15 Perceptions of Life-Cycle Type of Change

The challenge for managing this type of change is to ensure that the different levels share a vision of the direction of the actions, and that they are informed of the actions needed in order to strive for a common goal.

Case 2 followed unknowingly the guidelines of the constructivist approach. Top management made the decision to renew the outdated HR system and unify the HR procedures for that part. However, in this case there was no clear vision of the one solution above all others, making this a life-cycle type of change with a single sequence of actions taken (Van de Ven and Poole, 1995). The decision was negotiated, objectives agreed upon, and the project was set in motion in due order on the macro level. The organization found and appointed the personnel to take care of the initiative. The individual employees allocated for the change did utilize their existing knowledge base to the fullest when receiving and using the new knowledge and implementing the change into practice. The HR people needed and were able to confer with the IS/IT people regularly to solve issues created by the cognitive incongruity, the features, and the procedures that were required by the HR function, which were related to the possibilities of making them happen in the HR's new system. The IS/IT people did the very same with their third party representative regarding the way to acquire the system, besides the fact that the actual system was novel to them. IS/IT were familiar with the process of acquiring local instances but a cloud-based solution was a novelty to them. This case entails a twofold change; first, the actual information system and the changes within that initiative; and second, the way to acquire the system, (i.e., a cloud-based solution). All the parties on all organizational levels could use their existing knowledge together with the new one to solve the cognitive incongruities. What makes this a well-working practice is the fact that they all got feedback on their proceedings. The communications did work in this case. Similarly, the parties were able to constantly reflect on their learning. This enabled the first two loops of learning, to say the least, and simultaneously applying new knowledge with feedback, and reflecting on their learning with each party involved.

The tight schedule drove the initiative towards hardships. The first month was lost due to personnel and working practice issues with the third party consultant, IS/IT, and HR, which made the proceedings even harder. After the initiative really took off, the two central persons in HR had to carry a significant amount of the burden caused by the change. They had to put in a significant number of hours to make things proceed according to the specifications and regarding the training of the eventual users. The fact that they resided in considerably different time zones did not make the change project any easier. The last detail goes to show that even though the result would be fine, as it was, it is advisable to take

the well-being of the personnel and their coping at work into consideration when assessing the initiative and its need for resourcing.

In case 3, the need for the change stemmed from the micro level (i.e., function in question). The old working practice was outdated. Paper and marker are no tools for a modern-day operation. This was how the initiative was at least partly justified to the macro level, which agreed with the proposition. The need for development was acknowledged; as no set solution was in sight, the change was a life-cycle type of an event. The objectives presented were such that they could be enforced. Thus, the go-ahead decision was made. The project manager was appointed rather than allocated, as she still had part of her daily routines to take care of. In case 3, the three representatives of various organizational functions were professionals in their own areas, but the organizational border crossing was a little too much. The social sector person was not a seasoned professional in IS/IT and vice versa. In fact, the knowledge was not even superficial. The tendering office involved remained aloof and aided only when asked to. The problem proved to be that seemingly nobody knew the questions. The overall control went a little astray. McKinley (2015) proposed that human development is socially situated and new knowledge is constructed in co-operation with the effects of the others. The people in this case may have gotten their share of elicitation of prior knowledge so that there was cognitive incongruity to make them want more information and knowledge. However, the everyday working life took its toll, prevented the dialogue between the parties, and thus prevented elaboration of the initiative. The opportunities to apply new knowledge and get feedback for the actions was limited to say the least. Thus omitting the perspective exchange with others which would have further cemented the learning of these individuals when reflecting the learning on the proceedings (Piaget and Inhelder, 2008; Vygotsky, 1980). Concisely, the new knowledge was received, but the related feedback and the reflection on it was non-existent. Should there have been a more knowledgeable project manager or equivalent, the proceedings may have had a better outcome.

One major factor to affect the modest success was the resource allocation, which caused a lack of dialogue and prevented the double- or triple-looped learning on the micro level. With extra time invested in the initiative, the results would surely have been better and the personnel more satisfied with the project. Case 3 is a public sector organization, which means political aspects and aspirations were included. In practice, there were a number of working groups that were required to take a stand on various issues regarding the initiative. To arrange such meetings would take time and would not support the speedy execution of the endeavor. In hindsight, the CIO office observes the proceedings on the macro level and declares the initiative as a success, but according to the interviews the micro

level (i.e., the users) is not entirely happy with the project as of yet. There are still some technical matters to be solved, but change as such is well on the way. However, they freely admit that the operation has improved vastly.

In case 4, the macro level objectives were clear from the start, dictated by the legislation and the city's administrative directives, and the will to change was fortified by a poll made for the clientele. The micro level, the employees, was in unison in that the working practices could be improved by a more modern approach in the form of a developed IS/IT use. The change bears the hallmarks of a life-cycle event but also something of an evolutionary change, depending on whether the change is viewed as a single sequence or a part of multiple sequences (Van de Ven and Poole, 1995). In any case, there is a hallmark of teleology as there was no clear end state to aspire to (ibid.).

The supervisor of the function knew the counterpart in the CIO office well, and they worked seamlessly as a team of two. In addition, the previous knowledge of the supervisor was supporting the acceptance of the idea and the recognition of the possibilities in light of the new information about the technological solution. There was also other peer support available for the employees. The CIO office's representation was aware of the practices in the department in question, and the counterpart in the function filled in the rest. The information exchange was functioning between the two as it was with the rest of the organization. The rest of the organization was included in the initiative as needed, and all of the employees were committed to the endeavor. Some employees were chosen to work in the change team, where they worked on the requirements and had their say in matters concerning the proceedings. The members of the change team were empowered to inform the rest of the organization about the proceedings as they happened. In addition, the employees' trainings took place in an equally orderly manner. Case 4 carried the weight of the constructivist approach well. The organization's size was smaller than in the previous case, which may have had an influence on matters. However, this requires further investigation to say whether the organization size affects the implementation of the constructivist approach.

5.2.3 Evolutionary Change

Cases 5, 6, and 7 are the innovations in forming business relationships, new business, or research co-operation areas by using intermediator organizations. These cases are evolutionary changes. In an evolutionary change, there is a progression of repeating, accumulation, and probabilistic variations, choices, and keeping features (Van de Ven and Sun, 2011). In this type of change, the challenge is to make do with the resources at one's disposal in a multiparty context. The ideas emerge, get improved,

and are chosen. Then the same cycle happens again. The management challenge is to enable generating and ensuring choosing the right ideas and retaining the right ways of working. In the cases, the conversations were held mainly on the macro level, omitting the micro level observations. The change in individual organizations would have to be regarded on a case-specific basis.

The studied parties were clearly aided by the intermediator. There were new business models innovated and procedures within the new working practices, but also the existing ones received valuable input from the outside looking in. The use of an intermediator required opening up from the parties involved. They needed to assess their operations and describe it to an outsider. By doing this, they reminded themselves of their core values and brought their knowledge base into newer surroundings, observing and reflecting on it in a new light. The objectives were sometimes laborious to define on the macro level, but after negotiating this, they were agreed upon. Due to this negotiation, the change falls into the category of evolutionary change, as the change took place with multiple sequences.

In some instances, the sides of newly formed relationships would not have found each other without the facilitating features provided by the intermediator. It seems reasonable to deduct that an outside party is able to add value in an existing relationship by proposing changes in the business parameters or suggesting entirely new working practices. The neutrality of the intermediator is there to ensure the equal handling of matters, which enables the actual sides to concentrate on the more important matters. It also seems that the use of an intermediator presents the relationship with some kind of intangible value, serenity, and manageability, which would otherwise be harder to come by. At the same time, using the intermediator relieves administrative resources for other uses, affecting the proceedings also on the tangible micro level. It is plausible to claim that there are requirements for the intermediating party, but should the professional proficiency be there, the possible benefits are notable.

5.3 General Findings and Notions

Top management is the party that makes the major decisions in any organization. However, the original idea for operational renewals may also stem elsewhere. In the IS/IT context, the users of the systems have the most business/operation-related view to the systems and the possibilities therein, so this is sometimes the source for the development schemes. It becomes evident that the users should be encouraged to express their sentiments regarding the possible developments in the operation. Thus, it seems plausible to claim that a procedure to receive the ideas would be beneficial

for the organization. Even if the idea comes from the management as a business development, it would still be good to have a project portfolio or similar to collect the possible projects to be assessed in due course and to choose the eligible ones. Similarly, the overall awareness of the operation by all parties is important. The third sub-research question about the important elements in IS/IT change is answered by listing as follows: management with broad views of utilizing technology and the developments for it with a keen sense of the operation; well-led and able personnel striving for clearly set objectives; and making founded and well-communicated changes when necessary.

Sub-research question 1 was about justifying the suitability of the constructivist approach in the IS/IT context. The constructivist approach is well suited to be applied to managing change in IS/IT, as in that environment, knowledge and competencies are highly valued. In IS/IT, it is customary to rely on the competencies of one's peers, and the teams have various members for various aspects of the whole. This complies with the constructivist approach. Similarly, another feature of IS/IT is the cumulative knowledge that resembles the ideas of the constructivist approach in that the novelties are often learned based on the existing ones. However, in this respect, there are instances when changes are made that are more drastic, as in the cases in this thesis. Then, the constructivist approach is needed even more as shown.

The change situations are often unclear, and frightening even, for the employees who have little knowledge or understanding of the proceedings. There are frequently such dynamics involved in change that even if the change management was well planned, surprises, delays, and changes to change occur along the way. In such instances, the constructivist approach may benefit an organization in the midst of a change initiative as it takes the individuals into account and the leadership plays a significant role. Peer support is an invaluable asset in changes; a person explaining the change in understandable form is just what a change needs to become accepted. The novelties are presented as tied to the previous way of working and operation, presenting the possibility to simultaneously relate and reflect the old and new proceedings to one another. Thus, the answer to sub-research question 2 is that the constructivist approach in very suitable for presenting and implementing change.

Why Will the Constructivist Approach Support Teams Well in Organizational Working Practices Changing in the IS/IT Context?

The constructivist approach supports teams in the turmoil of change well simply because it relies upon the existing knowledge, which is something a human likes to use. This is also a proponent for knowledge management, as the existing knowledge is brought to use in order to create or implement

new knowledge. The constructivist approach lets people build upon the existing knowledge by adding the new knowledge on top of it and reflecting on the two. Simultaneously, this commits employees to the change initiative as they are working their way through the change in a way they understand. Also the basic idea of having someone more knowledgeable to assist and/or coach during the change is an invaluable asset. The uncertainties present in a change are alleviated when they can be discussed and reflected upon, especially if this is being done with someone who possesses founded opinions on the matter. This should be a peer who offers not only easy solutions but also challenges one to think for oneself. This also creates the cognitive successes in finding and deducing matters correctly by oneself. Moreover, IS/IT is an area where there are numerous abilities and capabilities that individuals possess. This feature makes the basic leadership a bit more difficult as mutual respect often requires more than mere position-based authority. The difficulties may be relieved through interactions and dialogue with the experts in their professional relationships. The interactions entail both reflecting the new and the existing knowledge, and giving and receiving feedback on the proceedings.

6. Conclusions

The inevitable changes in working practices in the IS/IT context, with or without the acquisition of an information system combined with the related renewals, present organizations with a discontinuity (Drucker, 2011). This idea was fortified in the study. For the organization, the length and the depth of this discontinuity are of importance. The realized features and the success of a change are often unforeseen. The cases revealed that there were unexpected occurrences. The normal, manageable state is one in which an average organization expects to be working. For profitability and even survival, such unexpected discontinuances are hazardous. The success of the change, the speed with which it is executed, and its effectiveness are essential in the context of IS/IT and any knowledge intensive environment. The discontinuity of change may be seen as a threat, but also as an opportunity to learn (ibid.). This is something that the organizations are still struggling with – how to make the best of it in the crossfire of the organizations' production-related (i.e., financial objectives and the development schemes) concerns.

The challenge in managing change lies in its "extra" nature; it is often done in addition to normal routines. Thus, the needed adequate resourcing is difficult to assess. Questions such as *what*, *who*, *how*, and *when* are to be answered; yet quite often, the organizational objectives are defined earlier and elsewhere, and the change initiative comes on top of that. It is not often that change projects are taken into consideration well in advance, and even if they were, it remains to be seen whether the resourcing could have been done right. The change management in IS/IT differs from other types of managerial actions in that it is usually somehow surprising, in temporal intervals, and erratic (Lyytinen and Newman, 2008), and the innovation to be presented is usually something of an equally surprising nature.

When approaching the change, it is advisable to acknowledge the differing levels in the operation, the organizational macro level and the micro level (Markus and Robey, 1988). On occasion, it may prove necessary to distinguish a level in between the two to cater for the team/group level separately. They are such different entities that they require a dedicated way of approaching. Peer support on all occasions is a positive factor. Being able to confer on matters will more successfully bring the proceedings to the desired outcome. This also conveys the essential mental support.

To make a point, it is not always necessary to have a large amount of data, according to Yin (2008, p. 21). It is possible to make generalizations about theoretical propositions even based on a single case. Bhaskar (2014) wrote about the scientific process having three phases in the natural sciences:

identifying the phenomena; constructing the explanations for the phenomena and then testing them; and finally, describing the generative mechanisms at work. In the social sciences, which are very close to this thesis' area of interest, one is advised to acknowledge that the structures are not separated from the actions and conceptions of the actants. In addition, the generative mechanisms are highly dependent on the time and context. This means that the generative mechanisms are essential in explaining the observed proceedings, but are not necessarily able to predict future events with precision (Bhaskar, 2014). The aforementioned presents the guidelines to treat the findings as explanations ofthe studied phenomena but not necessarily as certainties. However, they may be regarded as contributions as they may be valuable in other organizations and contexts.

6.1 Theoretical Implications

This thesis discusses the suitability of using the constructivist approach in the professional environment for change initiatives and to ease the transition period towards the novel working practice necessary in all changes. Acknowledging the existing knowledge within the organization and within the individual employees, and reflecting the new proposed change on that is essential for committing the members of the organization to implement the change. Similarly, through this thesis, it may be stated that even in changes of a more technical nature, it is advisable to consider the human aspect; it is possible to benefit greatly or lose valuable assets. Should the commencement be executed correctly, the employees won over by committing and empowering them, the change is more likely to start well and have outcomes that are more beneficial sooner, as witnessed in case 3 in which the organization really welcomed the change. The actual initiative will also proceed well if the allocated employees and the affected personnel are advised and guided to use their existing knowledge to build upon new knowledge. The latter was visible in case 1 where the change agents were concerned. They were won over and they subscribed to the change. Thus, it seems safe to assume that the discussions between the more knowledgeable peers and the employees affected by the change benefit the endeavor significantly. Interaction and feedback are needed to adjust the proceedings to the optimum level.

The literature handles the constructivist approach as one entity. However, the constructivist approach needs to be addressed differently on various levels of an operation. The macro level plans and procedures are deducted from the business-oriented objectives. Their application and implementation is done upon the organization. The unique features of various parts of the organization are taken into consideration where applicable and appropriate. However, when the implementation is applied to the lower hierarchical levels of the organization, it is advised to take

these distinct features better into account. The micro level approach cannot be the same as the macro level approach. Middle management requires a different approach to the change than top management. When middle management introduces the change to their teams, yet another approach is needed. As shown, the levels are not equal; thus, they need to be taken into consideration when addressing the change and the organization implementing it.

Similarly, the different types of change (i.e., life cycle, evolutionary, teleological, dialectic) need to be addressed equally dedicatedly. Even though a change appears to be a straightforward action, it may prove to be advisable to scrutinize and study what type of change one is dealing with. However, it may sometimes be hard to distinguish what type of change is really at hand; thus, proper resource allocation is needed within the project planning. Based on the scrutiny, the study may take a closer look at the proceedings and have more specified findings accordingly. For example, the life-cycle type of event requires clear setting of the higher-level rationale, even if the exact future state is not entirely clear. The employees need to acknowledge the need for change and the aspirations for a better future. In case 4, this was clearly the situation; the need for the renewal was so evident that the personnel were well behind the change, even if they did not know what specific system would fill their need.

The findings add to the literature concerning change (c. f. Burnes, 2004b; Childe et al., 2001; Manos, 2007; Van de Ven and Poole, 1995; Van de Ven and Sun, 2011) by showing the manifestations of different types of changes. Acknowledging that the differences are to be considered differently when the change is implemented is also to be regarded as a supplement to the literature mentioned before. The aforementioned means that in order to make the best of the change as promptly as possible, the managerial approach needs to be adjusted according to the change and to the organization. Similar complements are made to the literature regarding IS/IT and change together (e.g., Avgerou and McGrath, 2007; Lyytinen and Newman, 2008; Markus, 2004). Even the seemingly technological initiatives all also concern the people as they are affected by the change. People tend to react differently to stimuli and this has an effect on organizational performance.

6.2 Practical Implications

The literature covers change in many areas (c. f. chapter 2.3). Change is a vast theme as it may be just about anything. IS/IT is covered in multiple angles as well. IS/IT as a context is not only technology or its management; it goes beyond them, as it covers their interactions and their consequences. Constructivism is originally a theory of learning and, as such, a somewhat newer area, but there are studies on learning that have been there for some time. However, bringing the three aspects – the

change as a phenomenon, the context of IS/IT, and the constructivist approach as a tool that brings these together and makes things happen – is a new way of approaching organizational change. Even though SW production does not seem to have much in common with the welfare sector of a city, both of them faced a change in their working practices. In both instances, the people needed to learn new ways while attending to their normal duties. The same applies to all the cases. Equally, the cases are associated by the fact that, according to the interviews, the constructivist approach served well where it was utilized and would have been needed where it was not. This is also something that may have been regarded as contribution of this thesis.

The practitioners may benefit from acknowledging the power the constructivist approach possesses; it commits employees and enables the utilization of their best abilities and energy. In instances where there is a new IS/IT to be acquired or working practices are to be altered without system renewals, projects tend to always be a little surprising and even threatening to the employees. To alleviate these sentiments and to promote achieving the organizational objectives, the constructivist approach will offer a worthy medium. The constructivist approach calls for acknowledging the previous intellectual capital of each individual as it is required in order to be able to answer to the challenges set ahead. The challenges are presented in a way that encourages the employees to think. As they are the ones who make the change happen and they are the ones affected by the change to say the least, they are advised to also be presented with this challenge to think. The new knowledge related to the change is reflected upon the existing knowledge, thus creating the sensation of connecting the two. The approach stresses the need for peer support and feedback. This is to be delivered by a peer with superior knowledge to coach the individual in question to conclude him/herself that the change links the existing to the coming state of affairs. This brings the proceedings to a level that is more easily accepted and implemented.

Implications for practice and policies may also entail a re-shaping of the thought patterns – values and attitudes that not only personnel have, but equally the management. This re-shaping is needed so that actions in the context can be changed: change implies learning to realize actual and durable change. Middle management as well as the floor-level employees need guidance and knowledge from upper-management about what is expected of them, and clearly expressed roles and tasks during a strategic change process. The various roles that employees play during a change process require different leadership styles that can be adapted to actual needs, circumstances and situations, while there is also a need for a balance amongst the dimensions of leadership.

Another practical notion is that the resourcing needs to be appropriate. The change and manifestation of the procedures to implement the change are immediately affected by the resourcing. Haste, underfunding, and under-manning are features that endanger the initiative. The employees, if adequately motivated, will pull through the initiative but at what cost? In case 2, the key actants toiled for unsustainably long hours, consuming their personal resources. The management is advised to monitor the employees' coping and well-being during the change, as these assets are valuable to the organization.

6.3 Validity, Reliability, Generalizability, and Limitations of this Study

The validity of qualitative research needs to be assessed to dispel obscurities regarding the conduction of the research (Maxwell, 1992). Validity may be further divided into descriptive, interpretive, and theoretical validities. Descriptive validity concerns the factual accuracy of the research. The interviews behind this thesis were recorded and transcribed to ensure their accuracy and also to ensure that, should the need arise, facts could be double-checked. Similarly, in the first and second research projects, the interviews were conducted as much as possible in teams of two researchers, who then after the interview compared supporting notes to form a consensus on the proceedings. Notes were compared once again when the transcript was dealt with. Another feature to support the descriptive validity is that the interviews were made with multiple persons concerning the same case to offer triangulation of the findings.

Interpretive validity concerns the researcher's interpretation of the empirical material and the findings, and whether the details provided by the interviewees are understood correctly (Maxwell, 1992). The triangulation of using multiple researchers and interviewees was performed in order to minimize the misconceptions. That is, more than one researcher analyzed the empirical materials and evaluated their meanings, and multiple interviewees were interviewed about the same case to give more than just one perspective to the theme of the interview.

Whereas the descriptive and interpretive validities concern the interpretations and their accuracy, theoretical validity is about the linkage to the theoretical constructs, their accuracy and appropriateness to the research (Maxwell, 1992). This was tackled by discussing with co-researchers how their personality may affect the proceedings, and collectively going through the materials and findings (Kaplan and Maxwell, 2005). The experiences regarding the questioning were taken into account as well as those of the reviewers of the publications already during the research and when the thesis was beginning to form.

Reliability is a concept that needs to be taken into consideration when evaluating qualitative research; that is, if another researcher took up the same research, would the results be similar (Cassell and Gummesson, 2006; Yin, 2008)? The collection of empirical material is described and the path to the conclusions is illuminated in the publications and in the introductory part (Easterby-Smith et al., 2012). The way to the conclusions is presented, thus making it possible to assess whether similar outcomes would be the result should another researcher perform a similar study.

The research was conducted as a collective case study in which interviews were used as the primary material acquisition medium. These do provide an in-depth view of the activities in the given cases and an understanding of the phenomena related to the object of the study. However, should larger generalizability be aspired, that is more difficult to achieve. Thus, it may be concluded that, even if the objective for this study was reached, the understanding is limited to these particular cases. This qualitative research describes and studies people in their environment. Thus, it may not offer generalizability in the traditional sense, but it still meets the scientific objective of offering novel insights and an understanding (Flyvbjerg, 2006; Lee and Baskerville, 2003; Myers, 2000). In addition, the gained understanding shows that the proceedings are as described on the cases studied, but whether they are able to transfer to other cases seems plausible based on the similarity of the features (Lee and Baskerville, 2012). It also seems plausible to assume that the case organizations under similar circumstances could benefit should they heed the contents of this thesis.

The question arises whether the depth and even breadth in understanding might have been better if the concentration had been solely on either the public sector or on business enterprises. The answer to the question remains unanswered and is a matter of discussion. Similarly, the use of a survey to give quantitative support and, indeed, breadth after the first research project might have offered a more solid foundation for further conclusions. However, as this was also something that was not attempted nor accomplished, it is debatable whether this would have added value to the research.

The cases were all in Finnish organizations. The Finnish organizational culture has its idiosyncrasies as do many national states (Naor et al., 2010). If there had been cases from other countries in Scandinavia, elsewhere in Europe, or from other continents, the results might have looked different, such as the effect of cultural differences or the hierarchical structures. However, this we cannot but assess here, in the limitations section. This would have brought another dimension to the study and would have diverted it in a slightly different direction, giving another area of focus to the research. As

it is, the concentration was on Finnish organizations, and as such, it may be stated that the research reached its objectives.

The organizations in which the studies were conducted are all large on the Finnish scale. The organizational culture, and moreover the organizational processes, such as the chain of command, are different in small- and medium-sized enterprises (SMEs) and, thus, change is different in that context. For example, a flatter hierarchy or a smaller number of co-workers affect the change and the communications thereof. That would have been interesting to look at, but under these circumstances, impossible.

6.4 Final Concluding Remarks and Recommendations for Future Research

Walsham (1995) classifies four types of generalization from interpretative case studies: the contribution of rich insight; the drawing of specific implications; the development of concepts; and the generation of theory. The analysis in this thesis does not produce theories nor does it develop concepts per se. Those are possible avenues for further research. However, the drawing of specific implications is rather clear based on the evidence gathered from the cases. There are circumstances and outcomes of certain types of actions deducible following this study. Those, in turn, may give propositions for actions in organizations under similar conditions in their operation. This thesis is able to give the contribution of rich insight. The problematics and the dynamics in an IS/IT context operating in an organization that is going to introduce and implement a game-changing innovation becomes thoroughly illuminated. There are individual aspects to these kinds of proceedings, but the guidelines or possible ways to proceed with one's endeavors are obvious after having absorbed this thesis.

One must assume that the decisions behind an individual change are right from the start, and the change is about to take the organization in the right direction. If this is not the case, the proceedings to rectify the situation should be carefully considered. The decision-making concerning IS/IT is a prospective and ambitious theme in which further research would be most interesting. In this field, there is still work to be done. Decision making differs between the private and public sectors, so this aspect is yet another theme open for future studies. For example, it seems that in the private sector, the resource allocation is easier if the will to do so is there. The basic idea of conducting comparative studies covering both the private and public sectors or concentrating on either the private or public sector seems to be worth consideration.

Similarly, the organization's size is a matter that would perhaps require more attention in terms of whether it has an effect on the proceedings, and if so, how it manifests itself. There are also multiple angles to the size-related approach. It requires further investigation to say whether the organization's size indeed affects the implementation of the constructivist approach or the acceptance of the approach. Similarly, the various types of change would bring the proceedings to another level in a study, but that also sounds immensely interesting. Could, for example, teleological change be such a delineation to be made that would prove to be prolific for the research and, consequently, add to the general knowledge base?

The objective for this thesis was to gain an understanding of the dynamics related to change in working practices in the IS/IT context, and how the constructivist approach might help in ensuring the success of the change. The questions in the Introduction have been answered. With its limitations considered, I conclude that the set goal has been reached. Ugh.

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Original Publications

Nr. 1

Knowledge management in renewing software development processes

by

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Knowledge management in renewing software development processes

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Abstract

In this paper, we aim to identify what kinds of knowledge management (KM) challenges are typical in the renewal of software development processes, and to propose solutions to the identified challenges. The research is a qualitative case study of a large software company renewing its software development processes towards reuse of software code, i.e. component-based-software-engineering (CBSE). The research is carried out from business and management points of view, not from the software engineering point of view.

1. Introduction

In software business the pressure to continuously develop business processes in order to stay competitive is great. The productivity of companies is heavily founded on the effectiveness of their software development processes. It has been stated that component-based-software-engineering (CBSE) is one way to increase the effectiveness of software development [see e.g. 20] in several technically oriented studies, as it decreases the amount of overlapping work.

However, the renewal of software development processes towards CBSE is not only a technical issue; it is very much a general management problem, too. In this paper, we study the renewal of software development processes from the business point of view, concentrating on knowledge management (KM) perspective. We argue that KM is a highly relevant perspective to the phenomenon, as a software development process is typically characterized as knowledge intensive and also the outcome of the process, software, is very much a knowledge intensive product. Furthermore, the renewal of software development processes is usually a rather extensive organizational change, in which the role of effective flow of knowledge and sharing knowledge is essential [see e.g. 7; 31].

The objective of this paper is to identify the central KM challenges in the renewal of software development process. By presenting possible solutions to these challenges, we aim to provide some helpful insights for managers dealing with the challenge of renewing software development processes. Furthermore, we aim to contribute to KM literature by empirically examining typical KM challenges in a specific research context, the software business. However, as we deal with a qualitative case study, the results of the research are not directly generalizable in other contexts.

The central issues in this study are software business and the software development process as representing the specific context of this research. The renewal of software process means in this study an intended shift towards CBSE. Theoretically this paper is based on business and management literature, especially on KM literature. The main idea of KM is to make the reuse of existing resources effective [29].

The paper is structured as follows: The introduction of the research context, i.e. the software business and special characteristics of component-based-software-engineering, starts the paper. It is typical of a case study that the borders between the phenomenon and its context are hard to define, thus the context-bound nature of this study is highlighted by this order of discussion in the paper. Furthermore, the context of the study also directs the theoretical discussion, which follows right after the presentation of the context. In the theoretical discussion, the application of KM thoughts in the context of componentization is emphasized. After this, the research methods and the case study are presented. The paper ends with presenting the results of the study and some conclusive thoughts.

2. The research context

Software plays an important role in our modern society [19]. Many of our everyday tasks are based on the utilization of software. However, it is not always clear what can and cannot be labelled as a part of the software industry and what cannot. Thus, measurements regarding the software industry and its size, importance, and growth rates are not easy to make.

One possible way to better capture the essence of the software industry is to divide the software industry into smaller segments. This helps to understand more clearly the different ways of doing business related to software and the position of the services in relation to them. One rather commonly used way to break down the business is to consider embedded software, professional software services, enterprise solutions, and packaged mass products as involving separate types of business, as suggested by Hoch et al. [15].

Embedded software refers to programs integrated as inseparable parts of system products that include also hardware other than standard computing platforms. Professional software services refer to the work of the software project business [see e.g. 2] or to tailored software [see e.g. 28]. Software products that are provided as they are to several customers are typically called packaged mass-market software. Software that is produced for the quite specific needs of customer organizations, and usually based on general technological solutions and often also on standard application frameworks, is referred to as enterprise solutions.

The case organization of this study mostly represents the segment of enterprise solutions, although it also has characteristics of professional software services (e.g. customization of the software for specific customer needs is typical of the company) and of software products (e.g. there are "product categories" visible to customers).

It can be argued that the ideology of reusing software code is easier for software product companies to adopt than for professional software service companies or even for enterprise solution companies. This is due to the pressure of customer specific needs and customization demands that are typical of professional software service and enterprise solution companies, but not so much of the product companies. However, the professional software service and enterprise solution companies would benefit a great deal from CBSE, too. This is noticed also in the case organization of our study.

Decentralized and centralized component based production are two main ways to organize componentization. In the centralized production, component creation and component use are separate things: component creators and component users are different, specialized people [16], [6]. There is often a dedicated unit responsible for the creation and production of components. Instead, in the decentralized way of componentization anyone can be a creator or user of components in addition to their normal job responsibilities. The organization of componentization can also be a mixture of these two [16]. The exchange of resources and interaction between the people developing and using reusable software is an important factor in enabling the componentization in any chosen model [23].

3. Theoretical insights

3.1. Knowledge management

According to the knowledge based review of the firm, knowledge is a critical element in many organizations' success [see e.g. 8]. As knowledge is a focal component in organization's success, critical knowledge should be recognized and utilised effectively. Still, one of the challenging questions for organizations is the difficulty to recognize what knowledge is needed in which situation (Lave 1988, Reeves and Weisberg 1994, Thompson, Gentner and Loevenstein 1998 according to [13]). It is typically a big problem that employees do not know about all the available knowledge already existing in the organization. Therefore, they cannot look for it or utilize it in their own work. However, the creation of new ideas would be most effective if old knowledge could be attached to new situations and in this way be cultivated and developed [13; 12; 14]. After reflecting the aforementioned aims of knowledge management it can be said that the idea of reuse is very close to the idea of knowledge management.

Knowledge management tries to overcome the aforementioned challenges. To move knowledge and experience in the organization from its origin to places where they are novel can be seen as a purpose of knowledge management [1]. Basically it can be said that the main idea in knowledge management is the effective diffusion and promotion of the reuse of existing resources [29]. Administration and goal oriented management of knowledge, skills, competence and communication are essential things in knowledge management [25]. Knowledge management comprises of carefully designed operations to channel and govern the human capital and intellectual property of an organization [24] to maximize the performance. The management of knowledge sharing and application as well as the improvement of knowledge creation can be seen as the aims of knowledge management [18].

It has been stated that in organizations an attitude of wisdom (members of an organization are willing to search for knowledge inside their organization and also willing to share their own knowledge) is needed for knowledge management to work well [11]. However, getting people to talk and share their knowledge could be considered to be the biggest obstacle to effective knowledge management [4].

Knowledge flows inside the organization can be increased by social interaction. Through social

interaction organizational units have more opportunities to share their resources and ideas. [26] Despite this, in many companies there is a lack of attitude of wisdom. Still, it would be needed for knowledge to flow efficiently. One reason for this might be that, besides the fact that different organizational units are expected to collaborate with each other, they also still quite often compete with each other [26]. Social interaction promotes trust and reduces uncertainty [26]. So it can be said that social interaction is indispensable while creating attitude of wisdom, which is needed for sharing knowledge between different units. As benefits of interunit knowledge sharing have been presented for example innovativeness [27] and efficiency in project completion times [9].

A quite commonly known way to put knowledge management into practice is to apply either the codification or personalization strategy [10]. The main idea in the codification strategy is to concentrate on codified knowledge and information technology. The purpose is to codify knowledge carefully and store it in databases. Through this anyone in the company can access and use the knowledge easily. While implementing the codification strategy, the focus is on technology-oriented issues. The other perspective in executing knowledge management is to take the personalization strategy into use. There the main idea is to concentrate on tacit knowledge and person-to-person contacts. Information technology is used to help people network and communicate. [10] In the personalization strategy the emphasis is on human-oriented issues.

It has been stated that an organization should make a choice between these two strategies. When choosing one strategy the other should not be totally neglected. The balance between these two strategies has been suggested to be 80/20. [10] In spite of this some suggest that the balance could be something else than 80/20 in software companies. The suggestion is that codification and personalization strategies should go more hand-in-hand and there should be a dual process of codification and personalization. [22]

Whatever the balance between the two strategies is, they create a good perspective to view a software company's shift to componentization. Through this division it is quite easy to recognize the important elements from knowledge management perspective. No matter what the knowledge management strategy is, both technology and human oriented issues should be taken into consideration. By this division it is easier to consider all the important elements.

3.2. Knowledge management in renewing software development processes

While the goal of knowledge management is the effective reuse of existing knowledge, KM can be seen as an integral element in the shift to componentization. The choice to renew software development towards componentization can be seen as a choice towards a codification strategy of knowledge management. Despite the emphasis on codification strategy, it should be still remembered that the personalization strategy should not be forgotten totally. Only by noticing both of these aspects (despite the fact that the emphasis is on codification strategy) proper knowledge management approach to software development can be seen.

Componentization is a wise choice to do software development, when representing the segment of enterprise solutions. Componentization can help to meet the challenge of combining specific customer needs, and general technological solutions and standard application frameworks at the same time. Through componentization existing knowledge can be used effectively. In componentization the emphasis is typically on codified knowledge. Still, to be able to create unique solutions to meet the specific customer needs, the human side (tacit knowledge) of knowledge management should not be neglected. The flow and usage of tacit knowledge should be ensured.

In a research on implementing software reuse by Morisio, Ezran & Tully [21], it was found that third of reuse cases fail. The lack of processes dedicated to reuse and the adaptation of existing processes were the main reasons for the failure. In such case the processes do not support reuse, i.e. there is no means or time for reuse and componentization. In order to work componentization requires careful planning and adjustments in an organization. [21] It has also been stated that often componentization projects fail because it is thought that they fit the existing structures with little motivation and technical training [9]. The human factor has also often been neglected [21]. Typically also the pressure coming from the customers and financial goals takes the attention away from componentization.

It is possible that independent or physically dispersed units even compete with each other (Lynex & Layzell according to [17]) and this leads to a situation where there is no willingness to share software code. There is some evidence that social interaction enhances interunit knowledge sharing [see e.g. 26]. Thus the role of social interaction might be crucial when introducing componentization, as its point is to get people to share knowledge in the form of components which are creations of other person's knowledge.

4. Introducing research methods and the case organization

4.1. Research methods

This paper presents a qualitative case study. Case study [30] was chosen as the research strategy to ensure the achievement of an in-depth and holistic understanding of the research phenomenon [5] that is strongly tied to its context, the software industry. The study is a single-case study of a large software company that is renewing its software development processes.

Data gathering and analysis were carried out by using qualitative methods [3]. In gathering the data, altogether 32 theme interviews were made. The themes utilized in the interviews were developed based on a careful theoretical review. Thus, the reversion between the theory and the empirical data, which is typical of case studies, was already visible in the phase of gathering the data.

The interviews were done on various hierarchical levels – the levels of management (the steering group and the architect group members), middle management (team and unit leaders) and operational level (software programmers and sales people). The reason for selecting the interviewees from different hierarchical levels was to get an extensive picture of the phenomenon.

The architect group consisted of managers or specialists that were responsible for planning and implementing the renewal process. All the members (6 persons) of the architect group were interviewed. Few of the architects were also members of the steering group. Through these interviews the aim was to get a picture of the renewal from the management level.

Also all of the team/unit leaders (15 persons) were interviewed. Through these interviews the aim was to get a picture of the renewal from middle-management's/superiors' perspective. Furthermore, 11 persons from the operative level (programmers and sales persons) were interviewed to get a picture of the renewal also from the operational level.

All of the interviews were tape-recorded. Also all of the interviews were typed as detailed interview memos. Qualitative analysis of the data was done by using both theoretically driven categories and categories generated from the data [3].

Due to the confidentiality reasons, the case organization is presented as anonymous in the following case description. For a qualitative study, the utilization of direct quotes of the interviewees would have been recommendable to justify our conclusions drawn up from the empirical data. However, due to the limitations in space, we are not able to use direct quotes in this paper.

4.2. The case organization

The case organization is a large software company operating in business-to-business markets. In the segmentation of the software industry, the case organization stands mostly in the segment of enterprise solutions. It provides large and complex ICT systems and solutions for its organizational customers.

The company is quite dispersed. The operations of the company are based on independent teams. The teams differ in many ways. They have different organizational backgrounds, different technologies in use, different products and customers and also very different compositions. Each of these teams is responsible for their own software development, production and sales. In addition to this, they can be quite separated from each other even physically. This makes it difficult to know what others in the organization are doing. Even the team leaders do not mostly know what the others, on an equal level in the organization, are working on. Due to this, the teams are making the software from scratch fairly often. This also leads to a problem that too often the teams do overlapping programming and software development work. This unnecessary overlap in the software development process naturally causes extra costs for the company.

The toughening competitive situation is forcing the company to renew its software development process to a more efficient way of working. The aim is to root out redundancies and to improve productivity. To get to that point the full utilization of the knowledge inside the organization is needed. Thus, improvements in the knowledge flows and closer collaboration between teams and individuals throughout the organization are necessities.

The organization tries to tackle the aforementioned problem by switching to decentralized component based software engineering. In addition to doing their day-to-day tasks as before the teams must try to identify potential components, i.e. products, subparts or features that could also be used in other teams and environments. This should be done by all the employees, but especially by the team leaders. After being approved as a component the component should be entered into the component library to be available for the others in the organization.

In the case organization work has been strictly team- and project-based. Thus, the current organizational structure does not support the interactions required by componentization. There has not been either time or motivation to make software code for the public good.

Hence the transition from a team-oriented way of working to a productized, more holistic software development process is a great challenge for the whole organization. In addition to a change in the organizational structure, the case organization has decided to take an advantage of using one shared technology, i.e. programming environment and language, across the organization. This technology is already in use in a few teams, but is new to the most.

5. Empirical findings

5.1. Organizing the renewal

Two stages of proceeding were identified in the renewal process: the design and preparation phase and the implementation phase. The design and preparation phase includes the preliminary assessment of the available, thus possible technologies; the analysis of the current process; the remodelling of practices; the division of responsibilities; a preliminary allocation of resources and finally the technological decisions.

Already in the preparation of the componentization shift, a dynamic, functional cross-team group of specialists, the architect group, has been set up. The task of the architect group is to critically monitor the actions and needs of the teams. The architect group will scrutinize and decide whether a suggested part is suitable as a component for the component library. This is based on the suggestions of the team leaders. From the library each entitled member of the organization can use and reuse components. To be fully usable and even further developed for and by other teams the component must be well documented. Due to this, carefully planned specifications for the documentation have been made.

The planned practices are put into action and anchored into the organization in the implementation phase. In this phase they should monitor the process and support the correct actions. The aim of these two phases is to ensure the proper implementation of new practices and technologies.

5.2. KM challenges in the renewal

The renewal of software development process by introducing componentization comprises many challenges from knowledge management perspective. The fundamental idea in the renewal to componentization is to share knowledge effectively to be able to reuse it. Before getting to that situation several knowledge management challenges can be seen in the case organization.

As renewing the software development process by introducing componentization, the case organization is emphasising technology-oriented KM strategy. The focal element is the component library where the knowledge is explicated.

Besides the utilization of components from component library the programmers still need a lot of their own and others' expertise and tacit knowledge to effectively develop and produce software. Thus the human side should never be neglected in the case organization. Due to this the knowledge management challenges (and solutions) of the renewal are described by dividing them into technology-oriented and human-oriented challenges (and solutions). The knowledge management challenges in the renewal of software development process in the case organization are introduced in table 1.

Table 1. KM Challenges in different phases of the renewal process

	Design and preparation phase	**Implementation phase**
Technology-oriented challenges	· Different kinds of teams and demands · Finding a viable common technology that meets the needs of different teams · Usability and exploitability of the component library	· The fit between the initial and new technology · Lack of competence of a new chosen technology · Component interfaces that are general enough · Lack of time for training and experimenting
Human-oriented challenges	· Prejudices towards new technology · Fear and uncertainty caused by not-knowing the future	· Information and knowledge flow between teams · Social interaction between the teams · Attitude problems towards change · Attitude problems towards a new technology

The great diversity of the teams in their initial situation is one of the main sources of knowledge management challenges in the renewal of software development process in the case organization both in

design and preparation phase and in implementation phase. Both technology-oriented and human-oriented challenges can be seen to derive from the diversity of the teams.

In the design and preparation phase the heterogeneous nature of the teams makes it challenging to find a right common technological solution that could fit the technological demands of all the teams. It is a difficult and trying task to find a technology to support the existing software produced and maintained by the teams because of the different nature of the software developed in the different teams. A challenging question is also how the component library should be structured so that it is really usable and exploitable by the members of the organization.

In the implementation phase there is a great challenge of making the chosen technology fit with the initial technologies used in different teams when the initial technologies are in use. There is an aim to make a transition to the new chosen technology throughout the organization. This creates a challenge as there is a lack of competence on the new chosen technology. The challenge to make the component interfaces general enough when the components are created can also be considered a technology-oriented challenge in the implementation phase. There is also a lack of time for training and experimenting related to the new technology. When there is not enough time to train and experiment the new technology the members of the organization do not have enough knowledge to utilize this new technology properly. Overall there are quite demanding technology-oriented challenges in the shift to componentization.

In the design and preparation phase there are also human-oriented challenges. There are prejudices towards new chosen technology. People have questioned the superiority of the chosen technology and there is also a challenge as many people would like to continue with the old familiar technology which they are used to. Typical to a change situation, also in the case organization it is recognized that some members are frightened as they feel that by the change the future is unknown.

Also in the implementation phase there exists the challenge of getting the information and knowledge flow between the teams. The heterogeneous nature of the teams in the case organization also has an effect from the human-oriented aspect by adding some contradictory or controversial notions to the knowledge sharing between the members of different teams. The members of different teams are not used to sharing knowledge with the members of other teams. The social interaction between the teams is weak. Prejudices and attitude problems such as lack of trust and "love" towards the own code are significant reasons for this. Overall, there are attitude problems towards the change. Questions have been arisen related to, for example, the whole idea of componentization and the technological decisions being right.

6. Proposed solutions to KM challenges

There are many possible solutions to the aforementioned KM challenges. The possible solutions to KM challenges were created through the ideas of codification and personalization strategy. The interesting feature of knowledge management practices is that the effects of the actions taken are multiple and sometimes even difficult to point out. This is the reason why the solutions to KM challenges introduced in Table 2 cannot all be matched to a certain challenge introduced in Table 1. The purpose is that by applying the suggested solutions, the organization creates the right circumstances for meeting the challenges. The possible solutions are represented in table 2.

Table 2. Solutions to KM challenges in different phases of the renewal process

	Design and preparation phase	Implementation phase
Technology-oriented solutions	· Plan the implementation and the schedule of the implementation of the new technology properly · Approve the parallelism of old and new technology in some situations for some time · An expert pool to find a "right" technology · Designing the component library with experts and representatives of different teams	· The new technology must be agile enough to accommodate the needs of the teams · The new technology must be adaptable by organization members · Resources and possibilities for training of the new technology · Clear architectural design and structure
Human-oriented solutions	· Proper communication of the change · Training for the chosen approach	· Pilot cases to act as an example · Creation of formal and informal communication places and spaces between the teams

In the design and preparation phase one of the main issues from technology-oriented perspective is to plan well the implementation and the schedule of the implementation of the new chosen technology. Experts and members of different teams should be involved in this process. In addition, as early as in the design and preparation phase, it would be wise to consider letting some teams to use old technologies as long as they are required for maintaining software that are made with old technology and that will not adapt to new technology. This should be allowed only in situations where the integration of old and new technology is impossible and only if it is truly necessary. When choosing the new technology the knowledge of the experts inside the organization should be utilised to make sure that the choice is right from a technological perspective (and from different teams' perspective) and so also to rationalize and justify the choice. The experts should also be involved in the designing and preparation of the component library. This helps to build a library where a usable and exploitable knowledge is found.

Choosing the new technology in the design and preparation phase has a direct effect on the implementation phase. Regarding the technological side to the whole change, it should be considered that the chosen technology is, and must be, agile enough to enable the continuance of the work of the individual teams. The new technology should also be such that it fits at least on some level with the old technology. Only this guarantees that old and new knowledge goes hand-in-hand and no knowledge is missed. When choosing the technology it should be also made sure that the members of the organization are either already familiar with it or have the ability to learn how to use it. When learning how to use the new technology there has to be different kind of training possibilities to meet people's different ways of learning. The managers should also budget time and money for the employees to adapt to the new technology. In the implementation phase the usage of the components is the main idea. Thus to ensure the usability of the components, clear definitions and guidelines for the components should be made. Through this it could be made sure that the component interfaces are general enough for everyone to use.

The human-oriented challenges of the design and preparation phase that are related to prejudices, fear and uncertainty could be met with proper communication. Through proper communication about the change the different gray areas may be elucidated and the uncertainties lifted. It is important to communicate the message of the renewal clearly all the way down to individual teams and groups within the organization. It is also wise to arrange training for the chosen approach already in the design and preparation phase. Through training different prejudices may be diminished.

To meet the challenges in the implementation phase successful try-out or pilot cases could be helpful in showing the employees that this kind of new way of working is possible, functional and typically helps everyone. To make sure that information and knowledge would flow between the teams in the implementation phase, different kinds of places and spaces where people could meet and create mutual trust would be useful. Examples of this are job rotation between the teams, formal and informal meetings of team members, regular team leader meetings, shared coffee rooms and game rooms and visits of a team member to the meetings of other teams. To put it simply, if the people know what is going on, they are less concerned and more confident and trusting for a better future. Also the team leaders' meetings could be (at least occasionally) visited by a member of the top management to do the promotion of the process. In turn the team leaders could promote the message of the management to their own team members. In these middle level meetings various training needs could also be discussed and developed.

7. Discussion

In our case organization the main idea behind the componentization was, in fact, an attempt to avoid overlapping work and to utilize the existing knowledge better across team and project boundaries. Thus, the role of effective knowledge sharing was recognized in the case organization. However, there were still several knowledge management-related challenges that should have been considered more carefully. Based on the empirical results, we argue that by recognizing these challenges more proactively already in the design and preparation phases of the renewal process, the movement to CBSE would have happened more effectively in the case organization.

It can be said that leading the change systematically is critical in this kind of an endeavour. The individual teams in the case organization all have their own business as usual -modes. In the renewal process they are expected to renew them. A major adjustment can be seen on a mental level. All teams and individuals need to adjust their functions and even change the technology that is being used. Some must learn and adapt to an altogether new technology and way of working. To achieve these changes a new way of thinking and readiness to adapt to change are needed. Thus the attitude of wisdom is needed, as it has already been stated in previous studies. This can be achieved properly and in all functional levels only if leaders create the right circumstances and provide all the

necessary resources. This also supports the existing theory as it states that without means or time reuse typically fails. Hence it can be said that leading and leadership in this kind of undertaking and setting are crucial for a successful outcome.

What is essential in the beginning of this kind of a renewal process, is short-term success. A counterforce to the human resistance to change is needed. The organization and its members need to see positive examples to overcome the difficulties. Successful pilot cases should be promoted on the company level (i.e. via intranet). Also communication of the renewal should be done well. This way a better and more thorough picture of the process would be given to the employees. The opinions and notions should be better taken into account as well.

Monitoring and guiding the componentization is extremely useful. As the future of monitoring and guiding was blurry, it has to be said that some control is needed or even vital for a successful result of a renewal process and especially for the new fashion to actually become the usual way of working. This is also due to the fact that this kind of change needs promotion through well-executed organization-wide communication. Promotion is more likely to be taken care of and be functional if done by dedicated personnel, even if their main tasks would lie elsewhere. It is also wise that a known and appreciated person inside the organization would be nominated to be a leading person in the change.

As it has been stated, the chosen technology should be agile enough to meet the needs of individual teams. Still, as the teams and their products are so variable, there may be unexpected challenges or even difficulties in finding such a technology. Another alternative is to make compromises in the way the new chosen technology is implemented and in the length of the transition period.

The ultimate goal of the whole operation in the case organization is a permanent change in the ways of working. This can also be seen as taking knowledge management practices as an everyday functions inside the company. In this kind of situation it is typical that this kind of a procedural change may well take time up to two to three years or even be continuous, a sort of on-going change.

8. Conclusions

This paper has discussed the knowledge management challenges on the basis of a case study. We analysed a renewal of software development process of a large software company representing the segment of enterprise solutions, from KM perspective. The aim was to track from the empirical data KM challenges that appeared during the renewal process and based on KM literature, to propose possible solutions to the identified challenges.

Based on the empirical data, we were able to identify several challenges related to the renewal process from the viewpoint of knowledge management. Still, it can be said that knowledge management is also a key to help this renewal to go forwards. By discovering knowledge management challenges these challenges can be faced and handled.

This paper has presented initial results of our research, which will further continue by a more detailed analysis of the empirical data by utilizing more carefully the perspectives of different organisational levels (management, middle-management and operative level) involved in the renewal process. However, already at this point of our research, it clearly seems that the results of the study support the previous KM studies, even though the KM approach was applied in our study in the specific context of software business and CBSE. For example, it can be argued that software companies that are renewing their software development processes towards CBSE would benefit a great deal from applying KM practices already at the design and preparation phases of the renewal process. Thus, KM practices should already be considered in the design phase of the change to ensure smooth progress of the change. Another significant issue to be brought up is that both technological and human perspectives of KM are needed in the renewal of software development process. Technology is needed for making things easy and efficient. Still, it is more important to have a right attitude towards knowledge sharing, and in this, reuse is the key element. This has already been stated in many KM studies as for example Desouza [4] has stated that "The biggest obstacle to effective knowledge management is not implementing a cutting-edge IT solution, but getting people talk and share their know-how."

The managerial implications of such a reform can be considered significant. Qualifications and features required from leaders in this kind of situation are not necessarily easy to meet. To master the technological side of the whole change process is one big thing, but the organizational and human side may be even a bigger one to handle. It is very challenging to think which organizational changes are needed and it is even harder to figure out how they should be implemented.

As the meaning of human issues was emphasised in the results and as there are signs that maybe the 80/20 relation of KM strategies is not necessarily the right one [22], it would be interesting to conduct further research on the balance between the two KM strategies.

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Nr. 2

A knowledge management view to a strategic change in a high-tech company

by

Helander, N., Kukko, M., Virtanen, P., 2011

A knowledge management view to a strategic change in a high-tech company

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Abstract: This paper presents a qualitative case study of a high-tech company, a software firm implementing a strategic change regarding its R&D and production functions. The company is changing its project-oriented software development processes towards re-use of software code, i.e., component-based-software-engineering (CBSE). By this decision, the company tries to conquer the ever changing demands of external environment by using existing knowledge more effectively. With this, they also aim to release more resources to the development of new innovative ideas. The objective of this paper is to highlight the major obstacles of this kind of strategic change from knowledge management perspective, which is highly relevant viewpoint for a knowledge intensive company like high-tech companies. We also suggest in the paper how the identified obstacles of strategic change can be tackled by building on prior literature of high technology industry and knowledge management.

Keywords: strategic change; high-tech company; knowledge management; KM; R&D; obstacles of change; change management.

Reference to this paper should be made as follows: Helander, N., Kukko, M. and Virtanen, P. (2011) 'A knowledge management view to a strategic change in a high-tech company', *Int. J. Strategic Change Management*, Vol. 3, Nos. 1/2, pp.76–89.

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1 Introduction

In high-tech business, software production included, there is a significant pressure to continuously develop one's business processes in order to stay in line with the competition. The productivity of companies is heavily founded on the effectiveness of their software development processes. Despite the previous fact, to dramatically change one's processes is often seen to be so great an effort that it is usually postponed or even left undone. Instead of renewing their processes the companies typically rely on their learned practises. However, the ever changing demands of external environment often forces high-tech companies to seek more efficient ways to work in order to stay competitive and to stay in business. In technically-oriented studies component-based-software-engineering (CBSE), which basically means the reuse of existing resources, has been stated as one way to increase the effectiveness of software development (see e.g., Meyers and Oberndorf, 2001), as it decreases the amount of overlapping work and redundancies. With CBSE company can operate more effectively and also aim to release more resources to the development of new innovative ideas. Seen like this, CBSE may be seen as a basic knowledge management (KM) function in software development context (see e.g., Wah, 2000).

At the first glance, this kind of change of transferring one's software development processes towards CBSE seems like a technical problem. However, it is really not only a technical issue; it is to a large extent a general management problem of strategic significance. In this paper, we study the change implementation after a strategic decision to change ones R&D and production functions to CBSE. The study is conducted from the business point of view, concentrating on KM perspective and the strategies involved within. In this study, we claim that to this kind of endeavours KM is a highly relevant issue. This is the case since software development and production process are typically knowledge intensive and also the results of the process, software and programmes, are knowledge intensive products. Furthermore, the strategic changes in organisations, such as renewing one's basic production philosophy, are usually a rather extensive operations, in which the roles of effective flow of knowledge and knowledge sharing are essential (see e.g., Galpin, 1996; Yukl, 2002).

The objective of this paper is to highlight major obstacles of this kind of strategic change from KM perspective. We also suggest in the paper how the identified obstacles of strategic change can be tackled by building on prior literature of high-tech industry and KM. From a practical point of view, this paper aims to provide some helpful insights for managers dealing with strategic change. Theoretically, we aim to contribute especially to high-tech industry specific knowledge, where the application of KM approach can bring more understanding on the question how strategic level changes within the organisation could be better handled.

The structure of this paper is following: The paper starts with introduction of the research context, i.e., the software business and special characteristics of CBSE. According to the contingency theory, it is typical for a case study that the borders between the phenomenon and its context are hard to define (Vroom and Yetton, 1973; Morgan, 1996), thus, the context-bound nature of this study is highlighted by the order of the paper. Moreover, the context also directs the theoretical discussion, which follows right after the presentation of the context. After this, the research methods and the case study are presented. The paper ends with presenting the results of the study and conclusive thoughts.

2 The research context

High-tech industry, software included, plays an important role in modern society (Cusumano, 2004; Messerschmitt and Szyperski, 2003; Hoch et al., 1999). Increasing number of our everyday tasks is based on the utilisation of software. However, it is not always clear what can and cannot be labelled as a part of the software industry. Thus, measurements regarding the software industry and its nature, size, importance, and growth rates are not easy to make. To divide the software industry into smaller sub-segments is one possible way to better capture the essence of the software industry. This helps to understand more clearly the different ways of doing business related to software and the position of the services in relation to them. One rather commonly used way to break down the business is the suggestion of Cusumano (2004) to consider software products and software projects as involving separate types of business (see also Hoch et al., 1999; Tähtinen, 2001; Alajoutsijärvi et a., 2000). Between these two different business types there is also the 'hybrid' software business, i.e., business that includes both product and project-oriented strategies (Cusumano, 2004).

It can be argued that the ideology of reusing software code is easier for software product companies to adopt than for software project companies. This is due to the pressure of customer specific needs and customisation demands that are typical of software project companies, but not so much of the product companies. However, the software project companies would benefit a great deal from CBSE, too. This is noticed also in the case organisation of our study.

In software companies, R&D and software production processes are typically the core elements of the company. If changes to these are planned, these changes usually change the whole mode of doing things in the company. Decisions related to high-tech companies software development and production are typically strategic by nature. There are changes in technologies used, like in the case organisation, but the effects of these changes are such by nature that they cause and need major adjustments in the strategy of the whole company or business unit (Burke, 2002).

Componentisation is a wise choice to do software development, while it can help to meet the challenge of combining specific customer needs, and general technological solutions and standard application frameworks at the same time. Through componentisation existing knowledge can be used effectively. Decentralised and centralised component-based productions are two main ways to organise componentisation. In the centralised production, component creation and component use are separate things: component creators and component users are different, specialised people (Frakes and Kang, 2005; Jacobson et al., 1997). There is often a dedicated unit

responsible for the creation and production of components. Instead, in the decentralised way of componentisation anyone can be a creator or user of components in addition to their normal responsibilities. The organisation of componentisation can also be a mixture of these two (Jacobson et al., 1997). The exchange of resources and interaction between the people developing and using reusable software is an important factor in enabling the componentisation in any chosen model (Sherif et al., 2006).

While one of the goals of KM is the effective reuse of existing knowledge, KM can be seen as an integral element in this kind of strategic change to shift the way to develop and produce software from one way of doing to other. In a research on implementing software reuse by Morisio et al. (2002), it was found that third of reuse cases fail. Typically, the pressure coming from the customers and financial goals takes the attention away from componentisation. The lack of processes dedicated to reuse and the adaptation of existing processes were the main reasons for the failure. In such case, the processes do not support reuse, i.e., there is no means or time for reuse and componentisation. In order to work componentisation requires careful planning and adjustments in an organisation. It has been stated that often componentisation projects fail because it is thought that they fit the existing structures with little technical training and motivation (Kunda and Brooks, 2000), thus, it may be stated that the human factor has often been neglected (Morisio et al., 2002).

3 Theoretical insights of strategic change and KM

Change is widely studied phenomenon as are its consequences. According to the Collins dictionary to change means to make or to become different, to alter (McLeod, 1987). According to Burke (2002), strategic change is something that concerns the whole organisation, so the outcomes or procedures involve total system events. The complexity of strategic change is also explained by the fact that strategic change has effects on various levels and areas, such as technology, economics, psychology, sociology to name but a few (Cummings, 2004). There are said to be two angles to observe organisational change: those of facilitators and managers (Beitler, 2006). The first ones guide and consult the organisation to and through the change and the second ones lead the actual efforts. This categorisation leaves out the organisation which is the actual subject to change. However, it is to be remembered that due to the fact that change is always a contextual phenomenon, such statements are rather descriptions than exclusive definitions.

Change is an event or an occurrence that may be observed in which something, as in this paper, an organisation, is made or becomes different. This difference may be observed happening over time in form, state or quality in this organisational entity (van de Ven and Poole 1995). The needs this kind of endeavour presents in an organisation contain at least the following: the analytical skills to assess the environment the change affects, judgement skills to point out from the environment the facts that are most critical for the implementation of the change (Balogun, 2001). The party that is responsible for the implementation of the change learns surely to value if there are also skills for handling interpersonal situations. That is to say influence people to take on the important and seemingly not so important tasks included in the process. Also, to be taken into consideration is the relation the organisation has with its external environment. This together with the state of the organisation also defines the strategic change. Strategic

change may be triggered by the change in the external environment in which case the changes outside the organisation require the organisation to adapt to the external changes; as a result, organisation changes its strategy in response to the environmental changes. For example, organisations tend to adopt and renew their strategies in the case of financial distress for the purpose of overcoming the critical situations.

According to the knowledge-based view of the firm, knowledge is a critical element in many organisations' success (see e.g., Grant, 1996). As knowledge is a focal component in organisation's success, critical knowledge should be recognised and utilised effectively. Still, one of the challenging questions for organisations is the difficulty to recognise what knowledge is needed in which situation [Lave (1988), Reeves and Weisberg (1994), Thompson et al. (1998) according to Hargadon (1999)]. It is typically a big problem when employees do not know about all the available knowledge already existing in the organisation. Therefore, they cannot look for it or utilise it in their own work. However, the creation of new ideas would be most effective if old knowledge could be attached to new situations and in this way be cultivated and developed (Hargadon, 1999, 1998b; Hargadon and Sutton, 1997).

KM tries to overcome the aforementioned challenges. Administration and goal-oriented management of knowledge, skills, competence and communication are essential things in KM (Suurla, 2001). KM comprises of carefully designed operations to channel and govern the human capital and intellectual property of an organisation (Ståhle and Grönroos, 1999) to maximise the performance. The management of knowledge sharing and application as well as the improvement of knowledge creation can be seen as the aims of KM (Marchand and Davenport 2000). To move knowledge and experience in the organisation from its origin to places where they are novel can be seen as a purpose of KM (Ainamo, 2001). Basically, it can be said that one of the main ideas in KM is the effective diffusion and promotion of the reuse of existing resources (Wah, 2000).

A quite commonly known way to put KM into practice is to apply either the codification or personalisation strategy (Hansen et al., 1999). The main idea in the codification strategy is to concentrate on codified knowledge and information technology. The purpose is to codify knowledge carefully and store it in databases. Through this company members can access and use the knowledge easily. While implementing the codification strategy, the focus is on technology-oriented issues, e.g., different kinds of knowledge repositories and data bases. In personalisation strategy, the main idea is to concentrate on tacit knowledge and person-to-person contacts. Information technology is used mainly only to help people network and communicate (Hansen et al., 1999). In the personalisation strategy, the emphasis is on human-oriented issues such as face-to-face communication.

It has been stated that an organisation should make a choice between these two strategies. However, when choosing one strategy the other should not be totally neglected. The balance between these two strategies has been suggested to be 80/20 (Hansen, 1999). In spite of this, there are suggestions that in software companies the balance could be something else than 80/20. The suggestion is that codification and personalisation strategies should go more hand-in-hand and there should be a dual process of codification and personalisation (Mukherji, 2005).

Whatever the balance between the two strategies is, they create a good perspective to view a software company's shift to componentisation. Through this division makes it easier to recognise the important elements of strategic change from KM perspective. No matter what the KM strategy is, both technology and human-oriented issues should be

taken into consideration while implementing strategic change. By this division, it is easier to consider all the important elements.

In componentisation, the emphasis is typically on codified knowledge and the choice to renew software development towards componentisation can be seen as a choice towards a codification strategy of KM. Despite the emphasis on codification strategy, it should be still remembered that the personalisation strategy should not be forgotten totally especially when regarding the knowledge intensive nature of these high-tech companies with highly skilful experts. To be able to create unique solutions to meet the specific customer needs, the human side (tacit knowledge) of KM should also be still regarded as important part of doing things in high-tech company. Only by noticing both of these aspects (despite the fact that the emphasis is on codification strategy) proper KM approach to this strategic change of software development and production process can be taken.

4 Introducing research methods and the case organisation

This paper presents a qualitative case study. Case study (Yin, 1994) was chosen as the research strategy to ensure the achievement of an in-depth and holistic understanding of the research phenomenon (Eisenhardt, 1989) that is strongly tied to its context, high-tech industry, specifically the software industry. The study is a single-case study of a large software company that is renewing its software development and production processes.

Data gathering and analysis were carried out by using qualitative methods (Alasuutari, 1995). In gathering the data, altogether 32 theme interviews were made. The themes utilised in the interviews were developed based on a careful theoretical review. Thus, the reversion between the theory and the empirical data, which is typical of case studies, was already visible in the phase of gathering the data.

The interviews were done on various hierarchical levels – the levels of management (the steering group and the architect group members), middle management (team and unit leaders) and operational level (software programmers and sales people). The reason for selecting the interviewees from different hierarchical levels was to get an extensive picture of the phenomenon. All of the interviews were recorded. Also, all of the interviews were typed as detailed interview memos. Qualitative analysis of the data was done by using both theoretically driven categories and categories generated from the data (Alasuutari, 1995).

The case organisation is a high-tech company, a large software company operating in business-to-business market. The case organisation provides large and complex ICT systems and solutions for its organisational customers. The company has grown rapidly in the last years, mostly through acquisitions. After the acquisitions, the company has become quite dispersed. Typically, the companies that have been bought have remained to work as separate companies/teams inside the mother company. Also, the mother company's original operations have crucially been based on working in separate teams. The teams differ in many ways. They have different organisational backgrounds, different technologies in use, different products and customers and also very different compositions. Each of these teams is responsible for their own software development, production and sales. There is also often physical distance between different teams. These distances make it difficult to know what others in the organisation are doing. Even the team leaders do not mostly know what the others, on an equal level in the organisation,

are working on. Due to this, the teams are making the software from scratch fairly often. This also leads to a problem that too often the teams do overlapping programming and software development work. This unnecessary overlap in the software development process naturally causes extra costs for the company.

The toughening competitive pressure of external environment is forcing the company to renew its software development and production process to a more efficient way of working. The aim is to root out redundancies and to improve productivity. To get to that point the full utilisation of the knowledge inside the organisation is needed. Thus, improvements in the knowledge flows and closer collaboration between teams and individuals throughout the organisation are necessities.

The organisation tries to tackle the aforementioned problems by switching to decentralised component-based software engineering. By this strategic decision, the organisation aims to use existing knowledge more effectively. With this they also aim to release more resources to the development of new innovative ideas. CBSE means that in addition to doing their day-to-day tasks as before the teams must try to identify potential components, i.e., products, subparts or features that could also be used in other teams and environments. This should be done by all the employees, but especially by the team leaders. After being approved as a component, the component should be entered into the component library to be available for the others in the organisation.

As already mentioned, in the case organisation work has been strictly team- and project-based. Thus, the current organisational structure does not support the interactions required by componentisation. There has not been either time or motivation to make software code for the public good. Hence, the transition from a team-oriented way of working to a productised, more holistic software development process is a great challenge for the whole organisation. In addition to a change in the organisational structure, the case organisation has decided to take an advantage of using one shared technology, i.e., programming environment and language, across the organisation. This technology is already in use in a few teams, but is new to the most. These means major changes in everyday work of every employee. To get all these changes work, a lot of planning and internal marketing of the strategic change should be done.

5 Empirical study

Next, we will discuss the empirical findings and results through two different phases of the change process: preparation and implementation phases. Both of the phases happen in time after the strategic decision to move to CBSE was made by the management of the case organisation. However, the preparation phase is more focused on analysing the current situation and choosing the appropriate tools, processes and technologies to support CBSE. The implementation phase, on the other hand, is the phase where the planned practices are put into action and anchored into the organisation. In this phase, the process should be monitored and the correct actions should be supported. The aim of these two phases is to ensure the proper implementation of new practices and technologies during the major organisational change.

The change of software development process by introducing componentisation comprises many obstacles (see Figure 1) from KM perspective. The fundamental idea in the shift to componentisation is to share knowledge effectively to be able to reuse it and to release more resources to the development of new innovative ideas. As renewing the

software development process by introducing componentisation, the case organisation is emphasising technology-oriented KM strategy. The focal element is the component library where the knowledge is explicated. Before getting to that situation several KM challenges of change can be seen in the case organisation.

The great diversity of the teams is one of the main obstacles of change in the renewal of software development process in the case organisation both in design and preparation phase and in implementation phase. Both technology-oriented and human-oriented obstacles can be seen to derive from the diversity of the teams.

The diversity of teams leads to many 'smaller' obstacles of getting the change implemented. In the preparation phase, the heterogeneous nature of the teams makes it challenging to find a right common technological solution that could fit the technological demands of all the teams. It is a difficult and trying task to find a technology to support the existing software produced and maintained by the teams because of the different nature of the software developed in the different teams. Still, a decision of one common technology was made. A challenging question is also how the component library should be structured so that it is really usable and exploitable by the members of the organisation.

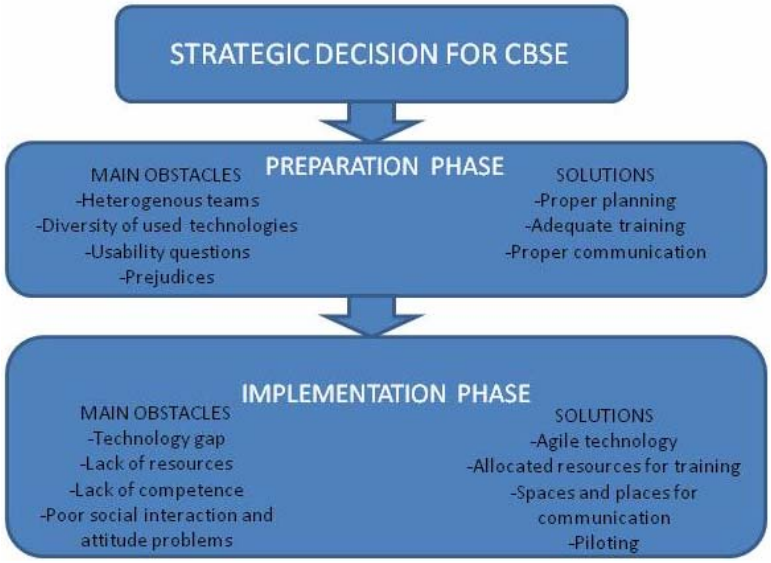
In the preparation phase, there are also human-oriented obstacles of change. There are prejudices towards new chosen technology. People have questioned the superiority of the chosen technology and there is also an obstacle as many people would like to continue with the old familiar technology which they are used to. Typical to a change situation, also in the case organisation it is recognised that some members are frightened as they feel that by the change the future is unknown.

In the implementation phase, there is a great obstacle of making the chosen technology fit with the initial technologies used in different teams when the initial technologies are still in use. There is an aim to make a transition to the new chosen technology throughout the organisation. This creates an obstacle as there is a lack of competence in some parts of the organisation on the new chosen technology. The obstacle to make the component interfaces general enough when the components are created can also be considered a technology-oriented obstacle in the implementation phase. There is also a lack of time for training and experimenting related to the new technology. When there is not enough time to train and experiment the new technology the members of the organisation do not have enough knowledge to utilise this new technology properly. Overall, there are quite demanding technology-oriented obstacles to get the change implemented.

As it has been stated in many studies, an attitude of wisdom – that is members of an organisation are willing to search for knowledge inside their organisation and also willing to share their own knowledge – is needed for knowledge to flow well in organisation (Hansen et al., 1999). However, getting people to talk and share their knowledge can often be considered to be the biggest obstacle to effective KM (Desouza, 2003). This is also the case in the case company. Also in the implementation phase there exists the obstacle of knowledge sharing; obstacle of getting the information and knowledge flow between the teams. The heterogeneous nature of the teams in the case organisation also has an effect from the human-oriented aspect by adding some contradictory or controversial notions to the knowledge sharing between the members of different teams. The members of different teams are not used to sharing knowledge with the members of other teams. It is possible that independent or physically dispersed units even compete with each other [Lynex and Layzell according to Kunda and Brooks (2000)] and this

leads to a situation where there is no willingness to share software code. Overall, the social interaction between the teams is weak in the case company. Prejudices and attitude problems such as lack of trust and 'love' towards the own code are significant reasons for this. Overall, there are attitude problems towards the change. Questions have been arisen related to, e.g., the whole idea of componentisation and the technological decisions being right.

Figure 1 Obstacles and solutions in and to strategic change (see online version for colours)



There are many possible solutions (see Figure 1) to the aforementioned obstacles of change. The possible solutions to these obstacles were created through the ideas of codification and personalisation strategy of KM. The interesting feature of KM practices is that the effects of the actions taken are multiple and sometimes even difficult to point out. The purpose is that by applying the suggested solutions, the organisation creates the right circumstances for implementing this major strategic change.

In the preparation phase, one of the main issues from technology-oriented perspective is to plan well the change and the schedule of the implementation of the new chosen technology. Experts and members of different teams should be involved in this process. In addition, as early as in the preparation phase, it would be wise to consider letting some teams to use old technologies as long as they are required for maintaining software that are made with old technology and that will not adapt to new technology. This should be allowed only in situations where the integration of old and new technology is impossible and only if it is truly necessary. When choosing the new technology, the knowledge of the experts inside the organisation should be utilised to make sure that the choice is right from a technological perspective (and from different teams' perspective) and so also to rationalise and justify the choice. The experts should also be involved in the designing and preparation of the component library. This helps to build a library where a usable and exploitable knowledge is found.

The new technology chosen in the preparation phase has a direct effect on the implementation phase. Regarding the technological side to the whole change, it should be considered that the chosen technology is, and must be, agile enough to enable the continuance of the work of the individual teams. The new technology should also be such that it fits at least on some level with the old technology. Only this guarantees that old and new knowledge goes hand-in-hand and no knowledge is missed. When choosing the technology it should be also made sure that the members of the organisation are either already familiar with it or have the ability to learn how to use it. When learning how to use the new technology there has to be different kind of training possibilities to meet people's different ways of learning. The managers should also budget time and money for the employees to adapt to the new technology. In the implementation phase, the usage of the components is the main idea. Thus, to ensure the usability of the components, clear definitions and guidelines for the components should be made. Through this, it could be made sure that the component interfaces are general enough for everyone to use. To get the change going it is also wise to arrange training for the chosen approach already in the preparation phase. Through training also different prejudices may be diminished.

One way to meet the human-oriented obstacles of the preparation phase that are related to prejudices, fear and uncertainty is a proper communication. Through proper communication about the change the different grey areas may be elucidated and the uncertainties lifted. It is important to communicate the message of the renewal clearly all the way down to individual teams and groups within the organisation. These kinds of obstacles can also try to be tackled by increasing social interaction. Through social interaction organisational units have more opportunities to share their resources and ideas (Tsai, 2002). Social interaction also promotes trust and reduces uncertainty. As well, there is some evidence that social interaction enhances interunit knowledge sharing (see e.g., Tsai, 2002). So, it can be said that social interaction is indispensable while creating attitude of wisdom, which is needed for sharing knowledge between different units. Thus, the role of social interaction might be crucial when introducing this kind of strategic change, as its point is to get people to share knowledge in the form of components which are creations of other person's knowledge. As benefits of interunit knowledge sharing have been presented e.g., innovativeness (Tsai and Ghoshal, 1998) and efficiency in project completion times (Hargadon, 1998a).

To meet the obstacles in the implementation phase successful try-out or pilot cases could be helpful in showing the employees that this kind of new way of working is possible, functional and typically helps everyone. To make sure that information and knowledge would flow between the teams in the implementation phase, different kinds of places and spaces where people could meet and create mutual trust would be useful. Examples of this are job rotation between the teams, formal and informal meetings of team members, regular team leader meetings, shared coffee rooms and game rooms and visits of a team member to the meetings of other teams. To put it simply, if the people know what is going on, they are less concerned and more confident and trusting for a better future. Also, the team leaders' meetings could be (at least occasionally) visited by a member of the top management to do the promotion of the process. In turn, the team leaders could promote the message of the management to their own team members. In these middle level meetings various training needs could also be discussed and developed.

6 Discussion

In our case organisation, the main idea behind the componentisation was, in fact, an attempt to avoid overlapping work and to utilise the existing knowledge better across team and project boundaries and to release more resources to the development of new innovative ideas. However, implementation of this kind of major strategic change raised some obstacles to this change. Based on the empirical results, we argue that by recognising these obstacles more proactively already in the preparation phases of the renewal process, the movement to CBSE would have happened more effectively in the case organisation.

It can be said that leading the change systematically is critical in this kind of a major endeavour. The individual teams in the case organisation all have their own business as usual modes. In the change process they are expected to renew them. A major adjustment can be seen on a mental level. All teams and individuals need to adjust their functions and even change the technology that is being used. Some must learn and adapt to an altogether new technology and way of working. To achieve these changes a new way of thinking and readiness to adapt to change are needed. Thus, the attitude of wisdom is needed, as it has already been stated in previous studies. This can be achieved properly and in all functional levels only if leaders create the right circumstances and provide all the necessary resources. This also supports the existing theory as it states that without means or time reuse typically fails. Hence, it can be said that leading and leadership in this kind of undertaking and setting are crucial for a successful outcome, as it typically is in such strategic change.

What is essential in the beginning of this kind of a change process is short-term success. A counterforce to the human resistance to change is needed. The organisation and its members need to see positive examples to overcome the difficulties. Successful pilot cases should be promoted on the company level (i.e., via intranet). Also, communication of the change should be done well. This way a better and more thorough picture of the process would be given to the employees. The opinions and notions should be better taken into account as well.

Monitoring and guiding the componentisation is extremely useful. As the future of monitoring and guiding was blurry, it has to be said that some control is needed or even vital for a successful result of a change process and especially for the new fashion to actually become the usual way of working. This is also due to the fact that this kind of change needs promotion through well-executed organisation-wide communication. Promotion is more likely to be taken care of and be functional if done by dedicated personnel, even if their main tasks would lie elsewhere. It is also wise that a known and appreciated person inside the organisation would be nominated to be a leading person in the change.

As it has been stated, the chosen technology should be agile enough to meet the needs of individual teams. Still, as the teams and their products are so variable, there may be unexpected obstacles or even difficulties in finding such a technology. Another alternative is to make compromises in the way the new chosen technology is implemented and in the length of the transition period.

The ultimate goal of the whole operation in the case organisation is a permanent change in the ways of working. This can also be seen as taking KM practices as an everyday functions inside the company. In this kind of situation, it is typical that this kind

of a procedural change may well take time up to two to three years or even be continuous, a sort of ongoing change.

7 Conclusions

This paper has discussed obstacles of strategic change on the basis of a case study. We analysed a renewal of software development process of a large high-tech company from KM perspective. The aim was to track from the empirical data obstacles that appeared during the change process from KM point of view and based on KM literature, to propose possible solutions to the identified obstacles.

Based on the empirical data, we were able to identify several obstacles of change in the renewal process from the viewpoint of KM. Still, it can be said that KM is also a key to help this change to go forwards. By discovering KM challenges these obstacles can be faced and handled.

It clearly seems that the results of the study support the previous KM studies, even though the KM approach was applied in our study in the specific context of high-tech company and CBSE. For example, it can be argued that software companies that are renewing their software development processes towards CBSE would benefit a great deal from applying KM practices already at the preparation phases of the renewal process. Thus, KM practices should already be considered in the design phase of the change to ensure smooth progress of the change. Another significant issue to be brought up is that both technological and human perspectives of KM are needed in the renewal of software development process. Technology is needed for making things easy and efficient. Still, it is more important to have a right attitude towards knowledge sharing, and in this, reuse is the key element. This has already been stated in many KM studies as, e.g., Desouza (2003) has stated that "The biggest challenge to effective KM is not implementing a cutting-edge IT solution, but getting people talk and share their know-how."

The managerial implications of such a change can be considered significant. Qualifications and features required from leaders in this kind of situation are not necessarily easy to meet. To master the technological side of the whole change process is one big thing, but the organisational and human side may be even a bigger one to handle. It is very challenging to think which organisational changes are needed and it is even harder to figure out how they should be implemented.

As the meaning of human issues was emphasised in the results and as there are signs that maybe the 80/20 relation of KM strategies is not necessarily the right one (Mukherji, 2005), it would be interesting to conduct further research on the balance between the two KM strategies.

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Nr. 3

Three positives make one negative: Public sector IS procurement

by

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Three Positives Make One Negative: Public Sector IS Procurement

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Abstract. The requirement specifications are centric in the IS acquisition process, also in public sector. In addition to the regulatory factors multiple stakeholders are often involved in the procurement process. Yet their expertise varies and is often limited to a narrow sector or a specific field. For this paper, we conducted a single case study on an IS acquisition in a middle-sized city. The function nominated a project manager for the project, with little if any prior experience of IS or of their acquisition. The counterpart in the CIO's office had that knowledge but had little domain knowledge about the requirements. The third party involved was the Procurement and Tendering office. Having specialized in serving the variety of functions in that particular field, the specific areas become inevitably omitted. All three parties argued that their requirements specifications were good, if not great. We observed how such a trident, having reported successful completion of their duties, still missed the point. The tendering resulted in little short of a disaster; two projects were contested, and lost in the market court.

Keywords: Public sector procurement · Information systems procurement · Case study

1 Introduction

Public procurement refers to the acquisition of goods and services to the public sector organizations [1]. In IS context, public sector organizations differ fundamentally from private organizations [2]: they have to simultaneously acquire the best possible IS and comply with public procurement regulations (Moe et al. [6]). This is not, however, easily accomplished [3].

In the public sector, a major hindrance in the way to successful IS acquisition is the lack of know-how in the acquisition process [4]. It can cause severe consequences. For example, the vendor might not be knowledgeable what the customer really wants and/or needs, while the customer might assume the vendor is offering a strange solution, creating ungrounded mistrust towards the vendor. Incompetent, inexperienced, or careless preparation and construction of the requirements result, most likely, foreboding tendering and procurement [5]. Even though the acquisition process is successfully completed, there might be repercussions and unexpected consequences.

E. Tambouris et al. (Eds.): EGOV 2015, LNCS 9248, pp. 321–333, 2015.
DOI: 10.1007/978-3-319-22479-4_24

For example, it is not uncommon that the party having lost in the competition may use these obscurities to complain about the proceedings to the market justice. This may halt the entire procurement process, so that no organization is able to reach its goals or gain desired advantages.

These simple examples highlight that IS procurement is a complicated process. Studies focusing especially on public sector procurement have also pinpointed the challenges. In addition to "typical" challenges of exceeding schedules and budgets or failing the objectives, public sector specific challenges such as specifying the requirements early on for tendering [4, 6], and coping with the conflicting needs and objectives of different stakeholders [7–10] are common. Even though these problems are well known, IS literature on public procurement seems to be lacking theoretical foundation and empirical evidence [3, 5]. In the literature, the process of public sector IS procurement is often described in rather simplified fashion, or the focus is on one particular task, not on the process on general level [4]. Similarly, with few exceptions, the stakeholders involved are considered often on organizational level – even though there may be several distinct parties within each organization, or the focus has been one specific stakeholder group [11]. As Moe and Päivärinta [3] put it: "*more research is needed on issues such as stakeholder management and on balancing different goals without asking for more than is needed. The interplay between procurers and vendors in public procurement has not previously been much researched.*" (p. 318).

To answer this call, we conducted a qualitative, in-depth case study [12, 13] of a public procurement process where multiple stakeholders are participating in the procurement process in its different phases. The project personnel were very confident that they had one of the best requests for tenders they have ever made, yet the case resulted in a disaster. We will thus answer to following question: "How stakeholders participating in the public procurement influence the tendering?" In this paper, we will thus reveal the complex process behind public procurement and identify the stakeholders and their roles. This allows us to better understand the challenges, analyze the issues leading to the problems and potential success, and explain how those emerge in practice.

The paper is organized as follows. First, related research on public procurement, its challenges, and stakeholders is shortly illustrated. Second, research settings, methods, and findings are presented. Finally the findings are discussed and conclusion drawn.

2 Related Research

Public procurement refers to a process of acquiring goods or services for government or public organization through buying or purchasing [1]. It differs from the private sector procurement, even though the differences may not always be radical [2, 7]. For example, the ownership of the private business lies within a limited number of entrepreneurs and/or shareholders while the public organizations are collectively owned by members of political communities, individuals in the society [7]. Furthermore, public organizations are typically funded mainly by taxation. They are thus less likely to be affected by the changing market forces than, for example, stock listed private organizations [14]. Similarly control mechanisms vary between public and

private sector. While the economic system defines the constraints for private organization, public organizations are affected by rules imposed by political means. In addition, public organizations seldom have direct competitors offering similar services [7].

Information systems as the subject of procurement is different than more standardized goods or services [3]. The organization acquiring the system must often consider alternatives that may not be simply comparable or their differences easily evaluated. Also a standard system seldom fits with the public organization's needs so customization is almost surely needed. Outsourced development obviously stresses this issue, and calls for intensive cooperation and communication as the external stakeholders may not be familiar with the context. This nevertheless applies to internal parties as well. For example CIO's office may not be able to understand the use context. Consequently systems requirements may neither be clear at the beginning or in early phases of the procurement, e.g. in tendering, yet the scope and requirement related decisions must already been made [15].

The procurement process itself, payment model and standard government contracts holds several pitfalls and limitations. If those are too rigid, they will limit the vendors' interests to make tenders, and further to engage in the projects. This would, in turn, reduce competition, and provide less viable options for the customer organization. In other words, this will not allow the procurer to get the optimal price or quality [6, 16].

Procurement process itself and tendering are highly regulated. For example, in EU and EEA countries the call for tenders must be publicly, either nationally or EU wide, announced when certain threshold values at the acquisition are exceeded. Particularly public sector related problems are the lack of in-house experience and competence about the acquisition in general, poor understanding about the IS or technology, or the lack of resources to create high-quality and valid specifications [6]. Especially in IS procurement, the requirement specification is a crucial element, which is nevertheless very challenging to compose. Due to the regulations and pre-determined procurement process, the requirements need to be specified before announcing the request for tenders. Under the circumstance they are often done without a clear idea about what are the possibilities of different alternatives [3]. This makes it possible that the acquisition or its' scope are incorrect. The result may even prove to be that a wrong system is acquired [6]. This proactive determination of the requirements and scope causes difficulties in finding a suitable assessment and evaluation criteria [3]. In the words of Moe and Päivärinta [3], "*transparency for ensuring fair competition between vendors is clearly a public-sector-specific challenge; private firms can be more pragmatic on these issues*" (p. 316).

In the public sector, multiple different stakeholders with divergent and conflicting objectives are often involved [17, p. 4]. This makes the procurement inherently complex. Abovementioned characteristics frame this; numerous stakeholders have a variety of wishes, needs and objectives, all waiting to be satisfied [7]. Stakeholders participating in the public projects are, however, case-specific and unique, or only partly the same to each situation. This makes the application of general frameworks for analysis difficult. This has been a motivation for different stakeholder studies [9, 17]. Still it should be noted that public organizations often have other identical entities to cooperate with, e.g. other municipalities [3].

The number and variety of stakeholders within and across the organizations make public procurement challenging. Their demands and objectives may be in conflict with

each other. Satisfying all of them may not be possible, or at least requires much additional effort. In addition, public organizations themselves tend have more ambiguous goals, practices and responsibilities [7, 9]. Consequently different IS features may be treated differently, as the parties may understand their work tasks, divisions of labor, and responsibilities dissimilarly, or even the objectives or focus points may differ between the supplier and the buyer. For example, the parties may not have a unified view on organizational boundaries and related responsibilities. In addition, there are at least three types of organizational goals to consider, namely regulatory, commercial, and socio-economic. Pursuing all these may lead to conflicts, while overemphasizing one at the cost of others may have adverse effects [8, 18].

The accuracy and level of detail of the requirement specification is also linked to the stakeholders' conflicting interests. For example, the procurer side prefers and strives for a complete and clear specification, while the vendors would like to have more freedom in order to present their qualities and possibilities not mentioned in the request [3, 19]. Technically speaking, the procurement gets difficult and complicated when the target system needs to fit with the customer's current IT portfolio. The integration and compatibility of different systems has been identified as a challenge as public organizations have multiple systems bridging a wide range of sectors and services [3] and little knowledge how to articulate this [20].

Defining project success is challenging. There is no universal definition for success, but the evaluation of different features varies between the viewpoints [21]. For example, the features denoting success include the project's timely delivery or staying within the budget frames. However, these features judge whether the project is successful only in a simplified manner by observing the procedure and effects of procurement [22–24]. The success may also be defined by using other measures. For example, improved organizational information integration, better decision making, and improved inter-organizational communications and/or decreased operational bottlenecks (ibid.). The question remains whether the absence of any one of these factors is enough to declare the project a failure. There may be distinguished different levels of success [25] or, according to a more pessimistic view, an inevitable failure [26].

Despite previously mentioned studies on stakeholders, much work is still to be done. Moe [4] suggests that there is a need for research on how different stakeholders manage and cope with potentially conflicting interests. Flak et al. [17] conclude that the dominant approach of putting the focal organization, i.e. the service procurer, in the nexus of stakeholders is insufficient when the conflicts are addressed. Future work should thus incorporate the relationships between all stakeholders involved in the project. On the other hand, due to lack of research, more focus should also be put on the vendor in the procurement process, for example in its tendering phase [4].

3 The Research Method and Settings

The single case study [13] behind this paper focuses on a social welfare sector of a city of over 200 000 inhabitants. The sector of social services, Home care unit, lists over 830 000 visits and treatment cases a year with over 2000 clients. The clients have various needs; some need attention only in delivering the medication whereas others

need more concrete assistance such as heavy lifting, cooking, and handing out medication. Some clients need multiple daily visits while others require less attention. The clients are scattered around the city (surface area 689,6 km^2 divided into four care areas). Similarly to clients, the employees, i.e. the nursing staff, have different limitations. Some are entitled to hand out medication while others may not be permitted to do heavy lifting. The employees are divided into mutually supplementing teams. The complexity of the settings presents the management with challenges. It became suggested that modern ICT might offer a solution to these.

Before the procurement process started, at the beginning of every work shift, the nurses had to visit the central office to receive the latest information about the route of the day, the clients to be visited, keys to their houses, etc. During the home care process, the nurses may receive urgent calls, so they adjust the route accordingly. The shift ends by visiting the office to leave the keys and to report the day. Until recently, a person has been employed to monitor the daily situation and to plan the route and activities. As IT was perceived to ease the planning and execution of these tasks, the CIO's office decided to act. The procurement project begun.

The city uses a so-called purchaser/provider –model in its acquisitions. This model means effectively that the actual provider of the services, i.e. Home care unit, does not concern so much whether and how much care is needed for their individual clients as there is an organization to define the needs. This consists of health care, welfare and social service specialists. They visit the possible client in his/her house to study and to define the circumstances and the specifics of the need for care. When they have drawn a plan, they place an order for the care, and leave it with the Home care unit, which then takes the matter as a part of their routine.

The qualitative data was collected by semi-structured interviews. First the key persons for the IS procurement project were suggested by our contact person. Further interviewees were invited by their suggestions, i.e. snowball sample was used [27]. In total eleven interviews, listed in Table 1, were conducted face-to-face at the case organization premises. All the interviews were recorded and transcribed. The interview themes covered issues related to initiation of the project, available resources and stakeholders, contracting and legal agreements, procurement process and communication, and the evaluation of the success.

The data analysis followed interpretive research approach [28]. Two researchers went through the material several times to gain an overview of the procurement process, stakeholders involved, and different challenges, and to gather all relevant details. Process diagrams and stakeholder maps were drawn to visually aid the interpretations. These visual maps were further iterated. Due to the size of these visualizations and space limitations, they are omitted from this paper. Finally the findings were compared to the literature.

4 Findings

As a public sector organization in European Union, the case organization has to obey the Act on Public Contracts declaring that all acquisitions exceeding the sum of 30 000 Euros, a call for bids is to be placed in a public forum. Then all interested parties are

Table 1. The interviewees and their organizational positions.

Interviewees organization	Interviewees position
CIO's office	Agreement specialist
CIO's office	Coordinator
Home care unit	Project manager
Home care unit	Care person
Home care unit	Supervisor
Home care unit	Supervisor
Home care unit	Work organizer/care person
Procurement and tendering office	Procurement specialist
Social welfare sector	Process manager
Supplier/vendor	Project manager
Supplier/vendor	Supplier project manager

able to inspect the bids, and a place a tender if found appropriate. The process how the procurement is initiated and how the proceedings happened is described next.

The procurement project roughly follows the generic public procurement process [4]. The project was initiated by a business unit (see Table 2). An initial project idea was proposed to the city's CIO's office. The initiative was stored in a centralized repository for initial projects and project ideas to be evaluated later. Each year, after the city's annual budget is released, the repository is reviewed. The projects were assessed and graded according to several criteria, such as criticality and cost-benefit analysis, and the number of citizens affected when the system would be in use. The evaluation was done by the development and steering group for the welfare services. The group constituted members from CIO's office and stakeholders from different functions related to welfare services.

CIO's office decided that a pre-study is needed before final proposal acceptance. A third party consultant was hired to conduct it. CIO's office reviewed their report, and development and steering group officially sanctioned the actual project. A coordinator from the CIO's office, and a steering group were thus appointed. The steering group consisted of the coordinator from the CIO's office, and decision makers from both the purchaser and the provider functions. A project team was also set. In addition to the project coordinator, a person from the Home Care Unit was appointed as a project manager.

> *".. they set off to find a project manager, while the CIO's office's project coordinator was already working on the project plan.."* [Project manager, Home care unit]

The project manager from the Home Care Unit was a civil servant with no prior experience of IS outside the actual use or their acquisition, who, in her own words, "*hopped onto a moving train*". With some support from the CIO's office, the project manager started to write a detailed requirements specification document for the call for bids.

> *"..as the pre-study was there.. with some preliminary requirements.. We started the actual project hastily with the requirements matrix.."* [Project manager, Home Care Unit]

Table 2. The actions in the project

Actions	Participants
1. Original idea of the solution	Home care unit
2. Proposition of the idea	Home care unit supervisor
3. Filing the proposition	Coordinator, CIO's office
4. Preliminary evaluation of the solutions	Outside consultant appointed by the CIO's office
5. Initial assessment of the ideas	CIO's office
6. Assessment of the various propositions	Development and steering group, Welfare sector
7. Go-decision for individual projects	Development and steering group, Welfare sector
8. Coordinator appointed for project	CIO's office
9. Requirements matrix created	Coordinator at CIO's office
10. Project manager appointed from Home care	Development and steering group, Welfare sector
11. Requirement specifications written	Project manager from Home care (with coordinator and agreement specialist (CIO's office))
12. Redefining the requirements	Project manager, coordinator (CIO's office), specialist, (procurement and tendering office)
13. Opening the call for bids	Specialist, (procurement and tendering office)
14. Tenders	Vendors
15. Initial, formal assessment of bids	Specialist, Procurement and tendering office
16. Assessing the bids	CIO's office, Home care unit
17. Making the decision	Development and steering group, Welfare sector
18. Receiving the complaint	Procurement and tendering office
19. Formulating the rejoinder	Procurement and tendering office, agreement specialist (CIO's office), Project mgr. from Home care unit

The requirement specification work proceeded. The project was first divided into two sub-projects; a system for workflow optimization and tasks related to division of labor, and secondly an electronic door opening system to grant the nursing staff entrance into the buildings without bunch of physical keys. Even though the projects were treated separately, they were tightly connected as the systems were supposed to be integrated. An agreement specialist with a good grasp of tendering from the CIO's office was then consulted if his/her expertise was needed. The tendering specialist argued that sometimes, in some projects, the process and the outcome of the tendering competition is clear from the beginning:

> *"..sometimes it is possible to know already at the beginning that a complaint will be filed as qualitative measures are not easy to define in a manner that they leave no room for argumentation or objection"* [Agreement specialist, CIO's office]

In this case, no such possibility was deemed likely, although there were signs that should the decision not favor a certain party, there might be repercussions.

> *"..plaintiff's contract in another area was discontinued. We knew that if this vendor does not get chosen now, they will file a complaint no matter what. And so they did."* [Agreement specialist, CIO's office]

The call for bids was published in a public forum. In due course, the bids were received, and an acquisition decision was made. A small company (50 employees, in September 2013), claiming to be able to provide the features in the needed scope for the best price, was selected as an enterprise system provider. However, a complaint was filed in market court due ambiguity in requirement specifications. Similarly an electronic door system provider was chosen. However, the timing was unfortunate as there was a shift in the dominant design [29, 30] of the handheld appliances and the technologies used for this type of operation. It turned out that the technology (Symbian) upon which the applications were designed for, was becoming obsolete.

> *"Providers had not developed software for any other system but Symbian and both of the providers announced how long it will take to develop them.."* [Project manager, Home Care Unit]

Both sub-projects were consequently put on a hold, one for the complaint and the other for technology change, until new directions were identified and assessed. The providers evaluated the significance of the technological change to their products (the optimization and electronic door system), and expressed their will to develop their product further as alternative technologies were recognized.

The negotiations continued. The door opening system provider announced that they could not be able to deliver the systems for the agreed price nor with required features.

> *"..we didn't have a glue that then the providers don't actually know how to count all their expenses for a fixed price, and then compete so brutally that they, on a way, give underpriced tenders so that they are not committed to the win tendering.."* [Agreement specialist, CIO's office]

The original winner declined to sign the contract. After lengthy negotiations with the winning party no solution was found. The city thus signed a contract with the second runner-up. However, then the original winner filed a complaint. For the door opening system, the city appealed to higher legal assistance about the decision. However, due to time pressures, a solution was needed immediately. Again the door opening systems was promoted with the second runner-up on a provisional agreement. Later also this received sentence in favor of the plaintiff declining the city the possibility to continue with the provisional actions.

The enterprise system tendering would have needed to be re-opened. However, as the city owned shares of National Centralized Purchasing organization (NCP), this gave the city a chance to evade public procurement process as the NCP had done the competitive bidding in forehand on behalf of the municipalities. They were thus able to acquire the system through the NCP from the original winner, the one they preferred, without tendering and violating the procurement ruling.

However, its optimization solution did not meet the city's needs and requirements. NCP is an integrator of various services offered to all public sector organizations.

NCP's expertise and experience is on procurement in general with offerings based on general level specifications, not on any particular field of operations. Even inside in a municipality, there are dissimilar processes, practices, needs, and requirements. For example even though the work of Home care unit is controlled by the law and is basically the same in every municipality, the cities have different process models and needs for route optimization. Obviously also the size of the municipality and the number of the users and customers of the future system varies. In our city, the system was expected to optimize the routes, users, and customer incidents well beyond the number of cases which it was tested and found suitable. The optimization algorithms were not entirely on a level that was needed and advertised by the producing company. In other words, the complexity of the optimization and the systems requirements differ significantly between the cities.

> *"Depending on the geographical features of the city, route optimization and logistically reasonable route is, for some cities, more important issue in planning a care person's day than for others. For some cases, the most important feature is the person's primary care person. Between the boundaries, there are various whishes depending on the city's operations ideology and how efficiently they want to use their resources"* [Project Manager, Supplier/Vendor]

The process in public bidding turned out to have unexpected outcomes; market court interpreted the law and declared both cases for unjustified and unlawful for the city. The interpretation is not always unambiguous, but leaves room for individual reading of the situation. This skill of preparing for the tendering is to be trained, but seldom can it be fully obtained without having paid the dues.

5 Discussion

There were several challenges in the project. The most significant ones are: lack of individual skills and knowledge about the acquisition, the complexity of the acquisition network and the number of participating stakeholders, difficulties in allocating the most suitable resources for the project, and the ambiguity of the overall tendering process and legislation.

The *number of stakeholders* in the city alone was large. Three main entities were Home care unit and the project manager, CIO's office and the coordinator, and the Procurement and tendering office. The project manager knew the work of home care unit and their needs by heart. Yet she was not knowledgeable about IS in general or its acquisition. Meanwhile the coordinator knew IS, technologies, technical terms, and something about the procurement, but he was not the domain specialist. Procurement and tendering office knew how to run through procurement projects, but knew nothing about home care or dedicated IS. This means that although the participants had all vital *knowledge*, it *was scattered across the network of actors*. The *lack of individuals' skills* on different areas was expected to be compensated by the group work. But, the *lack of skills in cooperating* in this manner prevented knowledge sharing.

The problems in knowledge sharing and group work were multiplied by the *lack of resources.* All but one of the stakeholders were working in other projects, and even this person had duties from the 'real job', so they were running the acquisition project as

part-time. Hence, reviewing the documents, requirements, bids, and tenders was most likely done in hurry, with an extensive trust on others that they are able to spot possible mistakes and traps. Yet, as the comprehensive understanding about the acquisition process and its objectives was missing and fragmented across three parties, it was impossible to do this. The *lack of knowledge about the acquisition* was severe.

The *ambiguity of the tendering process and legislation* was also evident. Before the call for bids was out, even before the first call for market court, all the city's interviewees claimed that this would be a success case without any problems. Yet there were not only one, but two plaintiffs, one for both areas of acquisition. Why such surprises? Retrospectively speaking, as no one had a holistic understanding about the case or how it will proceed, all the city's participants believed, from their individual viewpoints, that this is a clear, easy assignment. External incidents, such as technological change or a cancellation of earlier contract, resulted in urgent and unexpected pressures to readjust and change the acquisition process one way or the other. Due to time pressures and lacks of knowledge and skills, the parties were not able to prepare and react appropriately and accordingly.

These findings are not novel in general level. Earlier literature review points out that all of these have been identified earlier [3, 4, 6–9]. Yet, as the case illustrates, there are finer level of details here. Instead of generalizing the customer as one organization, there are several smaller sub-organizations within the customer-organization. Similarly to customer-vendor relationship, also these sub-organizations have their own skills and resources, perhaps even objectives, which evidently have an impact on their collective work. In this case, although the coordinator, the project manager, and the Procurement and tendering office, among other stakeholders, were all working together towards a common goal, their inadequate cooperation and knowledge sharing led to fragmented views on the acquisition project. Three positives became one negative.

Some lessons can be drawn:

- The project manager's role is crucial to the success of the outcome. The zest and energy the person makes or breaks the case.
- Acquiring appropriate knowledge and skills is not an evident or easy task. It is not enough just to gather the expertise together, but to utilize it in a manner that different areas complement each other comprehensively, without forgetting the overall picture.
- The stakeholders form a complex network. Understanding and exploiting this network and its skills and expertise requires special attention. Very easily some essential party is forgotten or ignored, making it difficult to gain the essential understanding or resources.
- The acquisition project has to be prepared for external incidents. This means change management, in all possible forms, and risk management practices have to be in place. Change management is particularly problematic in public sector procurement where legislation steers the process.
- Benchmarking the technology needs to be done in identical situation. Although this is easier to say than do, the use of optimization algorithms in smaller scale situations did not reveal the scalability problems.

There are some limitations there. First, this is a single case study. This means that our findings are context specific. In different cases these issues may emerge differently. More research is thus needed. Second, the study was conducted in Finland which is known for its strict attitude for following the rules. Hence, in some other countries, pending the Act on Public Contracts and making the corners straight may ease the situation. However, this would most likely create new challenges. Nevertheless, cultural and country specific issues cannot be ignored.

6 Conclusion

We have presented a case where it is believed that nothing could go wrong, and all goes wrong. Our point is not to tell yet another failure story, but to show that good intentions could result in bad outcomes if the intentions are not properly executed. This execution is not an easy task. In public sector procurement the number of stakeholders and the network they form complicate knowledge sharing, communication, and collaboration. Without purposeful activities, it becomes impossible to gain a holistic view from different fragments. Very easily three positive opinions become one negative outcome. The complexity of the situation is thus emphasized. Even though all the actions when writing the call for bids were done by-the-book, latter external incidents and their unexpected outcomes were not in that book. No one was prepared for them.

The paper makes a theoretical contribution by focusing a little studied situation: public sector IS procurement and groups of stakeholders. By illustrating how they cooperate, or actually lack the cooperation, results in unsatisfying outcomes. This has not been studied before. Practitioners benefit the paper by learning these mistakes and issues.

Future work could benefit from adopting a stakeholder approach as it has been proven useful both in private sector and in e-government studies [14, 31].

Acknowledgements. Special thanks to our interviewees at the municipality and friends and colleagues for their constructive comments. The study was partly funded by Tekes - Finnish Funding Agency for Innovations and participating organizations, partly by Academy of Finland, grant #259831.

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Nr. 4

Why SPI initiative failed: contextual factors and changing software development environment

by

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Why SPI Initiative Failed: Contextual Factors and Changing Software Development Environment

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Abstract

For today's software business and its productivity, software process improvement (SPI) plays a significant role. Organizations that produce software face challenges with the productivity and effectiveness of their operation. The literature lists numerous methods to make the operation better. Critical success factors are defined in order to make the successful improvement procedures more certain. However, these methodologies need to be adjusted to match the organizational context. All organizations and their environments are different, and thus the solution that is the most suitable for individual needs must be modified or localized to fit the case-specific contextual demands. This paper studies the importance of these contextual demands in SPI. In the paper, a framework is presented through which the software improvement process can be better understood and studied. The framework offers a view to understanding the change process describing eight change paths that may be observed when software process improvement is regarded.

1. Introduction

Various systems and software development activities and practices take place in software organizations. The diversity of software development and its practices has resulted in the topic being widely discussed in the literature [17,30,33,37]. The field is, however, still far from being complete. For example, productivity and quality still present problems that need to be solved [15]. Fitzgerald [11] identified factors that have an impact on system and software development practices that range from political and organizational to personal and contextual. The diversity of the field creates several practice-oriented problems that are, for instance, directly related to the implementation of the development method [2], to the development project [19], to the understanding of the user [16], and to learning from earlier mistakes [22]. These problems made Goldfinch [13] suggest that in general a pessimistic attitude should be assumed rather than overt enthusiasm and optimism.

Attempts are made to improve software development and its practices by different means and activities that are often referred to using the concept of software process improvement (SPI) [37]**.** SPI practices are usually aimed at improving software quality, increasing customer satisfaction through better responses to changing needs, and reducing risk by the improved visibility and predictability of the project [14,26]. This is, however, not an easy task. Niazi et al. [26] identified 30 success factors that each have an impact on the instantiation of SPI practices. These factors are similar to the factors that affect the instantiation of information systems methods in practice (c.f. [11]).

Fundamentally, the aim of SPI is to standardize the development practices so that it is easier to assess the current and future state of the project [37]. Another question in SPI is whether the benefits are put into practice on a more permanent basis, i.e. are lessons really learned from the experiences gathered [22]. In short, SPI means that developers (ideally) use a predefined practice or method in a way that is intended by the method engineer. In our research, the case organization tried to change their software development practice towards componentization in order to fulfill the task of implementing SPI within the organization, and thus defining componentization as a means to implement SPI. However, the instantiation of this new practice was not successful because developers continued their own "build-from-scratch" approach instead of developing standardized components that could be used by others. Furthermore, they did not use the components made by others.

In this paper, an attempt to change to component-based software development was studied. The aim of the study was to exploit two frameworks that may also be described as theoretical lenses [27,28] to analyze how the change took place and why the implementation of the practice deviated from the intended results. The research question considered in this study was the following: *why did the SPI initiative fail?*

The following section summarizes our theoretical background. In section three, the theoretical lenses are introduced. Section four presents the case study description and the research settings, and section five presents the results of the case study. The discussion in section six binds the results of the study with the theory.

2 Theoretical backgrounds

The success factors for software process improvement have been widely studied. One of the most cited studies was carried out by Niazi et al. [26]. In the study, 30 critical SPI success factors were identified from the literature and through empirical study. The most important success factors identified are top management support, training and the allocation of resources, staff involvement, staff experience, and well-defined SPI implementation methodologies. Of lesser importance, but still influencing the final outcome are communication, project management, tailoring improvement initiatives, company culture, and creating process action teams or external agents. From these 30 success factors, they "suggest that organizations should focus on [the 6 most] common CSFs to successfully implement SPI programs, because […] a factor […] have an impact on SPI implementation if it is critical in both [literature and empirical study]." However, even though Niazi et al. [26] pragmatically argue for a limited focus in SPI initiatives, the other factors cannot be left totally aside as different organizations may have different issues that are caused by their development context, content, and culture (c.f. [8]). There are similar studies in the literature that further confirm these findings, although they may observe the phenomenon from a slightly different angle of organizational aspect [9] or they study more the action itself [29]. The actual expansion of SPI has been studied less than the individual parts of the phenomenon [24].

These SPI success factors are also quite similar to Fitzgerald's [11] framework for the information system development (ISD) process. He argues that the use of an ISD method is shaped by the political roles of methodology such as the comfort factor, the legitimacy factor, the audit trail, the confidence factor, and the power of individual departments/actors. This is in addition to the intellectual roles of methodology such as project management, reduction to variety and complexity, economics, and communication facilitation, as well as the profile of the development environment that comprises the number of developers, project duration, responsible autonomy, productivity/rigor trade-off, and by the developers and their personal factors such as skills, domain knowledge, commitment, motivation, and trust.

However, none of these factors and frameworks emphasizes the role of individual actors in these SPI activities or in the success of new system development methods. Both Niazi et al. [26] and Fitzgerald [11] approach the topic at an organizational level, largely omitting the roles of individuals. Their findings do, however, provide a basis for contextual factors that effect on individuals. Individuals and their roles are usually seen through management commitment [1] or motivators [3,4]. Teamwork has been studied to some extent including various aspects such as multi-locational teams [6] and their productivity [5]. The importance of individual agents in these SPI endeavors or in ISD is rarely studied. The exceptions include, for example, Myers [25] who described briefly the difference between IS professionals and non-IS professionals and Choudrie & Selamat [7] who studied individuals in continuous IS development from the viewpoint of the organizational learning process. They assembled a framework that may be used to manage and monitor knowledge sharing. The latter study contributes more to knowledge management discourse than IS research.

In this paper, we will analyze an attempt to standardize software development methods by using component and componentization as a means of change. Componentization, i.e. the use of ready-made components, is often seen as a way to cut costs and as a base for mass-customized products [21,35]. Component-based software engineering (CBSE) and production is also seen as a way to increase the effectiveness of software development in several technically oriented studies (e.g. [23]). Traditional, "built-from-scratch" software development often contains a lot of unnecessary work [31]. As Fitzgerald [11] argued, the use of methods introduces discipline into the production process. If an organization moves from a "build-from-scratch" approach to a rigorous method-based development approach, the development process becomes more efficient because redundancies between components and their development are reduced, and the working practices are standardized by formalizing the development method. Consequently, at least in theory, the software development process can be improved.

Component-based software development may be further divided into centralized and de-centralized production [12,18]. In centralized component-based production, component creation and component use are separated from one another: component creators and their users are not the same [12,18]. There is a dedicated unit responsible for the creation and production of the components delivered for the actual production teams to use in their projects. In decentralized component-based production, anyone can be a creator or user of a component. The latter production method requires a repository of some kind for the components as well

as a method for searching for and locating the required components. In addition, a compromise between the two is possible [18]. The effective use of resources and intra-organizational communication concerning the development and use of reusable software is an important factor in enabling the componentization in any chosen model [32]. In the next section, the theoretical lenses are used to observe the case and to illustrate the theoretical settings as well as the way the findings were analyzed.

3 Analysis frameworks for understanding change in software development practices

We used two theoretical lenses to analyze how the target organization changed its software practice towards componentization, and why the implementation of the practice deviated from the intended results. Firstly, we adopted the theoretical lens of eight potential change paths that have an impact on the actual implementation of any software development practice in the organization [20,27,28]. Secondly, we developed some local theories that affected this implementation by using a framework for theorizing from practice descriptions, as suggested by Päivärinta et al. [28].

Figure 1 integrates the above-mentioned models by forming a theoretical framework for our case analysis. In the following, the framework is briefly explained.

It is assumed that descriptions of software development methods and practices on a general-level actually represent some kind of attempt to theorize [28]. Consequently, any particular generalized idea of a practice that guides software development actions (such as agile or structured methods, particular project management principles, etc.) will involve assumptions that concern the development contexts in which it would be useful to adopt the practice, the rationale behind the practice, the actual description of the idealized set of practices in question, and the expected effects of implementing the practices [28].

However, as denoted by the plethora of systems development literature, the actual practices, when implemented in the development contexts of organizations, may deviate greatly from the idealized method descriptions and "best practices" [10,11,17,19,34]. The stakeholders working in a particular development context may study existing literature on methods and "best practices" and adopt them to their organizations. This necessitates that their contextual rationale for adoption matches "well-enough" with the "idealized" methods and best practices. Many issues in the actual development context may intervene in the realization of a particular practice – even if its adoption has been largely intended. For example, Larsen et al. [20] identify the many different pressures on a development organization to change existing practices in their multi-case study. The examples, which confirm the theoretical issues identified by Fitzgerald [11], include the experiences of developers, particular management goals and strategies of the organization, the resources available for development, and customer preferences, etc. However, Larsen et al. [20] takes this one step further and argues that pressures to change existing practices may cause eight change paths when we analyze how certain practice has evolved in the organization: initiation, implementation, emergence, formalization, recalcitrance, abandonment, informalization, and entropy.

For example, while an organization may have a ra-

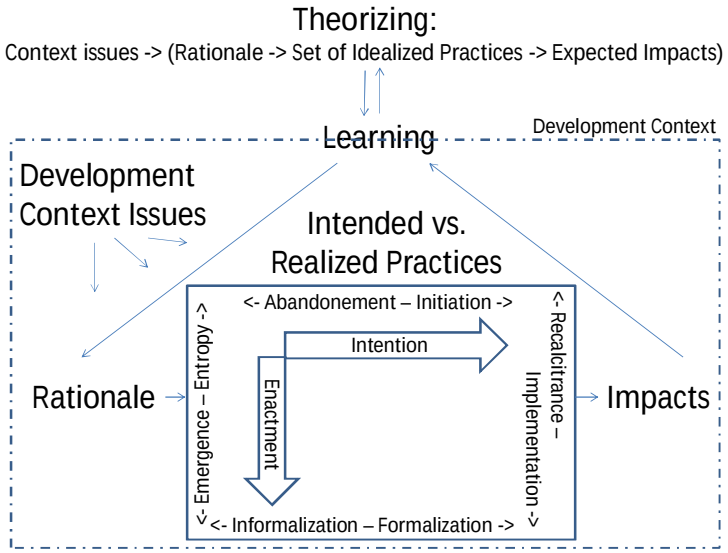

Figure 1. A Theoretical lens used to analyze and learn from practice implementation descriptions.

tionale to initiate and implement a common practice for managing software projects, other issues such as customer preferences may first cause recalcitrance that causes individual projects to ignore the practice, and ultimately the organization as a whole to abandon the initial idea. On the other hand, some practices may emerge implicitly through the learning-by-doing of individual developers or project managers and be formalized later on, after a project or even by the whole organization. Larsen et al [20] presents examples of the informalization and entropy of practices that may take place without managerial or developer intentions. From the viewpoint of the analysis framework, it is thus important to note several issues in order to understand a practice and its change history in context:

What was the rationale to implement a particular development practice?

What contextual issues had an impact on the rationale?

What contextual issues had an impact on the practice implementation, and how?

Finding answers to these questions helps us to form local theories concerning particular practices (and to make practice descriptions of systems and software development in organizations):

Contextual issues à Rationale for adoption/intention à Actual implementation of a practice à Realized impacts

Figure 2 below presents the framework with the findings observed in the case study. Such local theorizing gives us answers to the following types of research questions:

How do contextual issues affect rationale to adopt a practice?

How do contextual issues affect the actual implementation of a practice?

And finally – how do contextual issues affect the impact from the more or less successful implementation of a development practice in question?

The local practice descriptions [36] become interesting when they reflect the lessons learned from practice. The lessons learned are particularly interesting when they are brought back to the level of more general-level theorizing of the types of practices in question.

For example, we can now discuss about the differences between the assumed contextual issues in idealized descriptions versus the actual issues in the development context under analysis; the differences between generic versus local method adoption rationales; the differences between the ideal versus the instantiation of the practices in question; and the differences between the assumed versus realized impacts. Hence, the understanding of local practice descriptions becomes valuable from the research viewpoint when those lessons learned are analyzed in relation to more generic ideas and assumed ideals, often materialized in the form of method textbooks and "best practices" in a particular field of interest. The next section presents the case organization and features of the study.

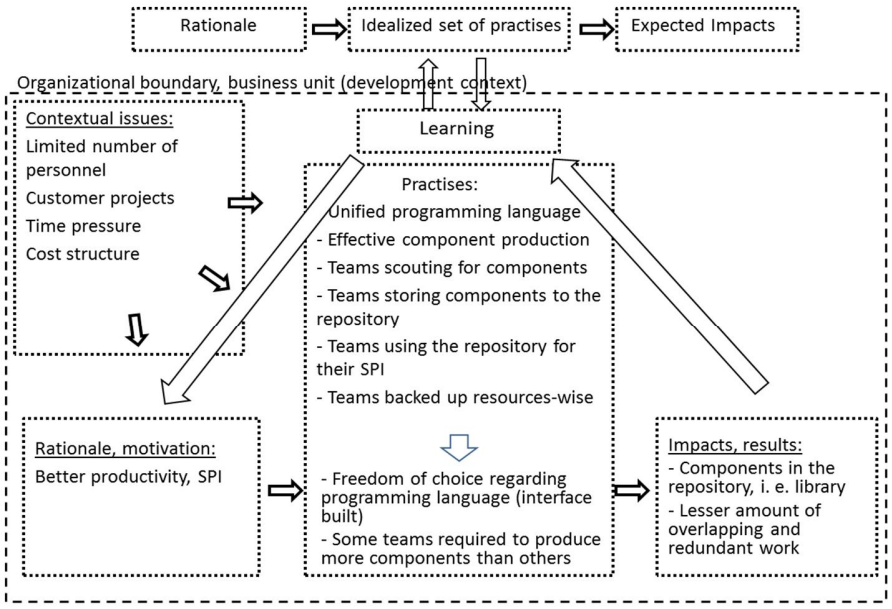

Figure 2. The theoretical lens with applied features from the case

4 The case organization and the research methods

The case organization is a business unit of a multinational software company with over 3200 employees that operates in business-to-business markets.

The organization provides large and complex ICT systems and solutions for its organizational customers. The company has grown rapidly in recent years, mostly through acquisitions and mergers. These acquisitions have made the company rather dispersed. Typically, the acquired companies have not been merged at the practical level. Instead, they have continued to work as separate teams, even in a company-like manner, inside the mother company. The mother company's original operations are also based on working in teams. Consequently, all the teams differ in many ways. They have different organizational backgrounds, technologies and tools in use, practices, products and customers, and have very different compositions. Each team has been responsible for its own software development, production, and sales. The teams are also geographically dispersed.

This study took place on eight sites. The geographical dispersion makes it difficult for the teams to know what the others in the organization are doing. Even the team leaders do not necessarily know what the other teams are working on. Due to this, the teams are usually, if not always, building software from their own premises, and often from scratch. This leads to situations where the teams do overlapping programming and software development work. Consequently, very similar features are being produced at different sites. This overlap in the software development creates extra costs and inefficiency for the company.

Among the interviewed personnel from various hierarchical levels in the case organization, there was a clear consensus that something should, and could be done to improve the organization's operation. There was little to be done with the business environment, the operational practices of personnel was the only thinkable target to look into. The competitive situation would not improve, so productivity came into focus.

Increasingly fierce competition has put the company under pressure to search for newer and more efficient ways of working in its software development and production. The aim was to eradicate redundancies, increase productivity, and improve innovativeness in order to create better and more effective solutions for their customers. The organization realized that they needed better use of knowledge. Improvements in knowledge flows and closer collaboration between the teams and individuals throughout the organization were thus perceived as essential.

The organization tried to tackle the aforementioned problems by changing their development approach to decentralized component-based software engineering where the components are distributed through a centralized component repository. By implementing this strategic decision, the organization aimed to exploit their knowledge base more effectively. With this, they aimed to release more resources from the development of standard components to the development of new, innovative ideas. This meant that the teams, in addition to doing their day-to-day tasks, had to identify potential components, i.e. products, sub-parts or features, for the possible use of the whole organization. After being approved as a common component, it was intended that the component would then be entered into the component repository to be available for the others in the organization.

However, the situation turned out to be tricky as the teams did not change their working practices. To study this phenomenon, 44 people were interviewed in two rounds of interviews. Table 1 below illustrates the interviewees and their distribution both geographically (by sites and teams) and professionally. A plus sign indicates in which round of interviews the person was interviewed.

Table 1. Summary of the Interviewees

Interviewees	Architects	Management	Teamleaders	Programmers	Other	Total
Site A		1+1	2+0		1+0	5
Site B	3+0	0+1	2+2	1+0	1+0	10
Site C			4+0	3+1		8
Site D		1+0	1+1			3
Site E	1+1	0+1	1+0	3+1	2+0	10
Site F	1+0		1+0			2
Site G	1+1		1+0		1+0	4
Site H			2+0			2
Total	8	5	17	9	5	44

The first group of interviewees comprised architects. They were change agents responsible for making the change from "build-from-scratch" to components happen. The architects were not software architects per se. Their job was to monitor and manage the standardization process and try to ensure that the harmonization could and would happen. They were also distributed to and operating at different sites. The second group included the rest of the organization, as illustrated by different columns in Table 1. After the first round of interviews at the beginning of the organizational change, another round was conducted two to three months later, after the busiest change period was over. In the second round of interviews, there were fewer participants, as they were perceived both as a backup and as a supplement.

This division was performed in order to stress the special role of the architect team in this project. The team leaders were experienced IS professionals who were specialized in the business. Even though their level of participation in the actual software development varied, they were often as active as any other member of their team.

The interviews were anonymized, transcribed, and analyzed by thematization. The themes under which the transcribed data were classified were identified from the success factors listed in the literature [11,26]. The themes included phrases such as software development, project management, and resource allocation. After having found confirmation or falsification for the alleged success factors, the contents of the findings were assessed. Based on the assessments, interpretations of their meaning were made. These are presented in the following section.

5 The results

The interviewees were in agreement with the general-level rationale to implement the new componentization practice. They agreed on the intended benefits of componentization as a way to increase the effectiveness of software development. Theoretically, CBSE is meant to decrease the amount of overlapping work as features may be downloaded from a centralized repository. In the case organization, all stakeholders more or less agreed on the theoretical benefits as a rationale to change the effective practice. However, they also saw the need for actions to improve productivity and competitiveness, as their competitive situation was getting more difficult. They shared the unanimous opinion that their current practices and operations were far from optimal, as the amount of overlapping and redundant work in the organization had increased. This chaotic situation was acknowledged to be partly due to merged technologies and products and teams, as well as being partly due to the geographical distribution to multiple locations. Management made a strategic decision to focus their efforts on the improvement of the software development process operation through the componentization of software. Hence, in light of the analysis framework, the organization adapted the general-level ideas of componentization from the literature, taking lessons learned and best practices from the existing body of knowledge. The implementation phase was then launched.

The organization decided to adopt the decentralized approach to componentization. The architect team defined the components and their repository in addition to the component library. The architect team set the guidelines as to what was to be regarded as a component and how the component ought to be built while at the same time offering advice and consultancy to the teams. This feature was thus initiated by the architect team. As the teams were mostly developing software, they were supposed to evaluate whether various parts of their outputs could also be used as components by other teams and products.

However, in our case organization, this practice was never widely adopted. A team was formed to introduce and to help the implementation in other teams. This architect team was also supposed to promote the new way of doing software development, and to define both the concept of a component and the storage facility of the components for the organization. The first attempts to reach beneficial impacts failed. Some issues on this shortcoming emerged already during the implementation process, even though some remedial actions with positive forces for definition and adoption were taken. For example, the management declared that only one specific programming language was to be used. The architect team itself declared that they carried out their part, the perhaps sometimes-unpopular task of informing the teams about the change. According to the architect team, they had arranged meetings, built a website for the company intranet, and they had informed all the personnel on various occasions about the new ways of developing software. However, their customers, i.e. the software development teams were reluctant to change. In the words of a member of the architect team:

"Then we may talk about the communications media, that is Confluence [Intranet application, authors note] at this time. It withholds terms completely strange to some people […]"

The software developers, project managers and other stakeholders who were supposed to obey these instructions, disobeyed. There were several issues that

caused recalcitrance and non-adoption of the intended practice. For example, it was said that the message was not clear enough, and that the frequency of these informative meetings and briefings was not sufficient.

"*I've been to these meetings regarding this theme [..] There it was discussed what it is that is meant by this componentization*." [team member, Team T]

"*There were discussions what it really means, this componentization, as it is a concept that can be perceived as one will*." [team leader, Team L]

This reluctance may have been caused by the fact that there were insufficient resources allocated to the change project. The teams were kept busy maintaining their level of production with ongoing customer projects. They had to concentrate on multiple things simultaneously.

"*Naturally everybody has had other things as well, apparently I've been the one who could disengage from other duties* [..] [team leader, Team T]

"*Well, I suppose that they've been able to allocate much less time than intended* [..]" [team member, Team L]

The least successful action was the attempt to standardize the programming language. The teams that were already using that language in their software development were logically more satisfied with this decision. Unsurprisingly, the teams unfamiliar with the new programming language did not welcome this decision at all. They were, however, promised support in the form of training and manpower. Some teams acknowledged the possible need for change and modernization, but still the actual change was too much for them. In addition, the training needed and promised was found to be too laborious to schedule as there were no extra resources allocated to the teams and the teams still had to keep up with their preordered software development work. Therefore, these contextual factors hindered the successful implementation of the componentization practice despite there being a match between the general rationale and between theory and the context.

6 Discussion

In the literature, the numerous factors that affect the success of SPI projects and processes have been identified. It is acknowledged that the support of top management is essential [9,26,29]. This was also found in the case organization. The announcement by company management was seen as a kick-off for the change project. A number of interviewees acknowledged that the CEO was behind this endeavor. Similarly, the architect team felt that they carried a mandate from top management, and thus they were empowered to do their job.

Training is another often mentioned feature of the success factors [26,29]. In the case organization, it was planned that training would be provided when needed. Since the first objective was to standardize the programming language, training was seen as important. However, the provision of training turned out to be poorly executed. This was because practically no one had the extra time to request, plan, arrange, or participate in the training sessions.

This final problem illustrates the importance of adequate resource allocation. Niazi et al. [26], Rainer & Hall [29] and Munk-Madsen & Nielsen [24] all list the adequate allocation of resources as a major factor in making SPI successful. The teams had to meet their everyday goals as well as to search for components with the manpower they had. There were simply no extra resources; neither manpower nor time. The deadlines of the customer projects were tight and a first priority. The teams in the case organization were promised the support they needed. However, this promise remained on an abstract level, as it was not clearly stated what this meant. It may be concluded that clear communication is also of the upmost importance as well as a real will to invest in the effort.

Moreover, the experience of personnel is a critical success factor in SPI projects [26,29]. Both architects and production team leaders were experienced professionals with track records. They continuously balanced the needs of their teams and the demands of both the project management and general management. The team leaders managed to start the production of components while simultaneously delivering their customer projects. This was not a small achievement. This, however, resulted in modifications to the initial process as predefined SPI practices had to fit in with the individual needs and context. This was contrary to the literature where the implementation of the predefined SPI methodology, and sticking with it, has been listed as one prerequisite for a successful SPI project [26,29]. The failure to follow this recommendation is one example of the "localized" implementation of the set guidelines and "idealized practices" as depicted in the theoretical framework earlier. In general, the know-how of the personnel involved is almost as critical as their commitment to the cause itself. For the management of the project, it is advisable to leave some room for contextual alterations with regard to the guidelines.

Another CSF for SPI implementation is staff involvement [26,29]. On this matter, there were diverging opinions among the architect team and the production team leaders and the team members. The architect team felt that they had carried out their tasks by informing those who were affected by the organizational change. The personnel saw their role, involvement, and commitment rather differently. It became evident that those employees who had closer contacts with the architect team were better informed about the project than those without such contacts.

In general, there are a number of ways to improve and enhance the SPI process. Methodologies and methods can be found in abundance. However, special attention should be paid to selecting the appropriate measures to be put into practice, as not all measures are suitable for all situations. The same also applies to the presentation and implementation of these measures. As has been shown in this case study, there are a number of different factors that influence the implementation of SPI practices. This paper, therefore, has presented an analytical framework that also helps to form a picture of how the SPI process really proceeds. The framework helps to clarify lessons learned and to compare them to the theory and previous practices. The framework also gives an opportunity to assess organizational learning and the obstacles to its successful outcome.

In addition to social factors, the characteristics and psychological factors of individuals have a great impact on SPI. In the case organization, for example, the teams were not pleased when they were told that they would have to give up their learned practices. Doubts were also raised about the decisions taken to shift to the unification of the programming language – even though the benefits of such a shift were acknowledged in the interviews. The resistance to change may be more than just a negative phenomenon. It may initiate discussion and point out flaws in the plan.

As is often the case, no matter how active the communication about the change process is, the recipients still feel they would have preferred more and clearer information. The alleged shortcomings in intraorganizational communication effected the success of the reform significantly, i. e. the varying opinions of how much and what kind of information was communicated and how. A reluctance to change the ways of working was emphasized by the fact that employees felt they had been given too little information on the whys and the hows of the change. Eventually, management realized there was a problem and they revoked the decision regarding the programming language, as long as the interfaces enabled black-box thinking and the basic idea of the use of components remained. This satisfied the team members to some extent and the successful prototypes of the components and their use catered for the rest. This clearly shows that management should be aware of the general attitudes and happenings among their subordinates. In the case of concessions, the main principles must remain clear.

Retrospectively, in the case organization, some of the centric SPI requirements were met and some were not. When the case organization and the realization of the componentization are considered, it seems that some of the prerequisites, mentioned for example by Niazi [26], for a successful SPI project are case-specifically more important than others and few of them are entirely meaningless. This means that it is advisable to find the main features and ensure that they are properly addressed. This does not, however, justify the neglect of the others. Furthermore, based on the case organization, it appears that the contextual factors have a very significant role in implementing SPI. This would require more and deeper study. Also, from the analytical framework's point of view, it is evident that idealistic methods and practices are, and are required to be, altered when they are instantiated. The case study shows evidence that, as Larsen et al. [20] and Päivärinta et al. [28] theoretically argue, realized practices turn out to be quite different from those intended. Some intended practices and principles may even be abandoned because of recalcitrance, entropy, unproductiveness, or simply because no one has the resources to consider or implement them. Our case study showed this as management realized the problem and altered their approach. They still maintained the idea of a component-based operation that would improve productivity and the effectiveness of the software development process. Yet, it remains to be seen whether this intention lives long enough to become institutionalized practice.

7 Conclusions

Why did the SPI initiative fail? To put it bluntly, the initiative failed because top management prioritized ongoing projects over process improvement. This meant that resources such as time and money were not adequately allocated to teams to improve their development practices. The teams were left with little chance to succeed with the renewal of their modus-operandi as mundane project-related details overruled the contextual factors and larger-scale development needs and requirements.

This paper has contributed to research in multiple ways. Firstly, we have illustrated how and why realized development practices deviate from what was intended. Although these are not novel issues, their illustration and conceptualization in relation to the

literation helps one to understand and ground the findings to contextual issues and the literature. Secondly, we have provided more evidence for the Larsen et al. [20] framework in how the methods evolve in organizations. Thirdly, we showed that the SPI factor prioritization by Niazi et al. [26] is highly contextual and focusing only on some success factors may not guarantee ultimate success. Instead of focusing on a subset of factors, one should take a much broader view and analyze the whole context. The Larsen et al. [20] framework may make this challenging task easier. A practical contribution is the notion that contextual factors are far more important than were previously realized. There are managerial issues that may seem to belong more to the human resources department than to SPI. The latter stresses the need for management to conceive the whole picture rather than the separate and individual details. It becomes vital that management realizes that the adequate allocation of resources must be assured in order to achieve the expected results. These resources entail both temporal and financial leeway where customer projects are concerned.

The conclusions may be summarized on a practical and theoretical level. On the practical level, prior frameworks may provide a model to follow up on and that there are methodologies worth applying if implemented correctly: suitable under the circumstances and fitting to the context. There are so many methodologies that it implies that perhaps some are modifications to various contexts. There is no reason why things could not be done again in a similar way in another company. That is to say that the use of a methodology has generally no value as such, only as a means to an end. If there is a methodology found in the literature that suits the case, according to the experiments observed in this company, it may be implemented. Sometimes it is necessary to concede an unsuitable solution for a certain purpose. If need be, the methodology may be modified to fit the needs and the outcome can still be functional.

This paper is based on a qualitative study. The study aimed to increase understanding of the change process in software production and the factors that influence change adaptation. The authors acknowledge that the data consists of single case study organization and the opinions of certain personnel therein. This calls for consideration when making generalizations based on the data. Due to the uniqueness of each case study, more research in definitely needed.

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Nr. 5

Team leaders' perceptions in the renewing of software production process

by

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Team Leaders' Perceptions in the Renewing of Software Production Process

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ABSTRACT
A contemporary software company is often based on mergers and acquisitions resulting in a number of organizational cultures and ways of working within the mother company. The inconsistencies between teams cause friction and ineffectiveness adding to the need of improve one's competitiveness in the ever toughening competitive situation. The streamlining of the operation is often felt the strongest on the operative level. The aim of this paper is to identify the roles and functions of team leaders in implementing a procedural change in software producing business enterprise. The study offers some solutions to the challenges that team leaders face when implementing change in their teams. Here change means new ways of working, including a change of used programming language. This study is a qualitative case study of a large software company that is renewing its software development processes towards component-based-software-engineering (CBSE). The research observes the phenomenon from a software engineering management point of view, and thus combines management with leadership issues.

Categories and Subject Descriptors
D.2.9 [**Productivity; Programming teams**]

General Terms
Management, Human Factors, Standardization.

Keywords
Organizational change, team leaders, software production development

1. INTRODUCTION
Some organizations still use the same approach to working that was used when the IT sector was first formed. The approach was derived from the then prevailing conditions, i. e. based on the way an industrial enterprise was managed [26]. In order to maintain their sustainability, IT businesses need to rethink their practices [23, 39]. In contemporary business, software companies are often the result of the merger of two or more companies [22, 27, 46]. Mergers take place for a number of reasons: to acquire the products of a company, to acquire channels through which a company operates, or to acquire the technology of a company, to name just three. Despite the change in ownership, the operations acquired often remain the same, as do the teams. As a result, the management of the company will face many future challenges, especially when making changes at an organizational level.

Management in the IT sector has to deal with a shift in the business logic. The majority of software companies are currently leveraging their operations towards a service-centered ideology from the old product-oriented approach [3]. The organizations need to draw more from innovation and creative uses of information technology to create holistic solutions for their customers' needs. This is a positive development from the customer's and market's point of view [10]. These developments, however, present the challenge of how to renew the processes and business models of the companies. The challenges vary from implications for the career paths of the IT workforce and skills and knowledge, to human resource strategies.

Input from teams and team leaders is essential for the success of the change process [8]. The team leaders are both the object and the subject of the change. The team leaders must balance the needs and requirements of their superiors with those of their subordinates. Top management expects obedience and the swift implementation of the renewals according to their instructions, but at the same time they also expect the performance and the level of operation with the projects to be maintained. The team members, on the other hand, want improvements in the way tasks are carried out and in the working environment. The team leaders are between the rock and a hard place trying to comply with both parties.

The research question: "What is the role of team leaders in the renewal of a software production process?" is studied through answering the questions: what does the management expect from team leaders? What does the team expect from its leader? How do team leaders place themselves into the equation?

This paper is a case-based qualitative study that identifies the challenges team leaders face during the change process of a software company. The case is a multi-site software and services producing company. The study was carried out in one of the divisions of the company that comprised multiple business units. In total, 44 interviews were carried out in the study. By mirroring these challenges with the literature, suggestions can be drawn on how to cope with the challenges. The paper contributes to both information system development and software process improvement field by bringing together personnel-related challenges in a technical research context.

SIGMIS-CPR'13, May 30–June 1, 2013, Cincinnati, Ohio, USA.

The next chapter presents the theoretical background. The blurry borders between the context and the phenomenon itself are highlighted by the paper's order of discussion. The case study and the research methods are presented in section three. The paper concludes with the results of the study and a summary of the points raised.

2. THE RESEARCH CONTEXT AND THEORETICAL INSIGHTS

2.1 Component Based Software Engineering

An IT company's productivity is based on the effectiveness of its software (SW) development teams and processes. In several studies, component based software engineering (CBSE) has been acknowledged to be a way to increase the effectiveness of SW development, as it decreases the amount of overlapping work and procedural redundancy [see e.g. 35]. The overlap is caused by the fact that each team programs more or less similar features in their products. In CBSE, the software features are components that are connected to each other through different kinds of interfaces.

The components are stored in a repository by their maker. The components are freely sought and acquired from the repository according to the needs of SW design and production.

CBSE is organized into centralized and decentralized component production. Centralized component production means that component creation and its use are two separate things [16, 25]. In centralized component production, a specialized unit is responsible for the creation and production of components for SW-teams to use. In decentralized component production, anyone can be a component creator, producer, or user. The organization of component production can, however, also be a hybrid of both centralized and decentralized component production, having features from both modes [25]. Interaction and communication between the people developing and using reusable software are crucial factors in enabling the componentization in any chosen model [40].

CBSE is more easily adopted in companies that are involved in the SW product business where the production process remains largely the same as opposed to enterprise solutions where the product is tailored according to the needs of the customer [31]. The change towards CBSE is not only a technical problem; it is also a managerial problem, as it involves the sharing of one's own code and the use of the code of others. On the technical side, the definition of what makes a component and the repository are relatively easy to accomplish. To alter the mindset of the people involved may prove to be trickier. Team leaders are in the position to make this change happen [9, 17, 49].

CBSE is a challenging organizational change: a third of all CBSE cases fail [36]. CBSE requires proper planning and adjustments according to the objectives set to the initiative and to the needs of teams involved [36]. Sometimes, CBSE projects fail because the projects are made to fit with existing structures without enough motivation and technical training [18]. At other times, pressure from customers and projects with financial objectives take attention away from the CBSE initiative and the project fails.

2.2 Change Management

Change management, as a subject, is a well-studied field [6, 7, 38, 42]. There are those who claim that the phenomenon should be studied as a transformation rather than as a mere change in ways of working [2]. Kotter [28] describes eight reasons for the failure of change (Figure 1). Their negations, the avoidance of mentioned features, show how to avoid the failure. The list of features is used here to illuminate the complexity of change.

1. Satisfaction to prevailing situation
2. Under-powered change sponsors
3. Vision underestimated
4. Vision not sufficiently communicated
5. Obstacles in the vision's way
6. No short term successes
7. Change gets claimed a success too soon
8. Change not embedded in the organizational culture

Figure 1. Kotter's Eight Change Preventing Factors

According to Kotter [28], management needs to first make the organization understand and accept the necessity of the change. The are many managerial skills needed in successful change management [5]. Management must make the rest of the organization see a better future with the advanced change. Management must point out the threats caused by an ill-prepared future and show that, with precautions, these risks can be avoided.

To plan countermeasures for side effects such as self-interests or a lack of willingness, the change promoters should first assess the resistance they are likely to meet [30]. The organization then needs a counterweight against any resistance to change. The team promoting the change must be powerful enough to make decisions and must be supported by top management [28].

Management must have a vision of the new operation, and this vision must be communicated repeatedly and effectively to the organization. The vision gives the change a goal. Without a vision, the change amounts to merely a set of separate actions that are all pulling the operation in multiple directions. These separate actions create confusion and disorder. When the whole organization agrees to the vision, the change is easier to direct and control. A lack of vision, therefore, is a threat to successful change [29, 41], and the power of a well-formulated vision should not be underestimated.

Even the best visions are no good if the employees cannot see them [33]. Communication of the vision must, therefore, be delivered to employees via multiple channels and at multiple levels. One common communication-related problem is that different individuals interpret the communication differently. The human mind makes its own interpretation and assumptions of the communications it receives [50].

If the organizational structure of the organization hinders the development, it must be renewed. The obstacles to development may be psychological or physical. Structures are the easiest obstacles to deal with. To deal with mental obstacles, more time and effort are required [34].

Change needs short-term motivation. Successes are needed to show that the change is do-able. Successful pilot projects can be used as testimonials to motivate the rest of the organization. At the same time, these success stories can also be used to silence opposition to the change. A pilot project must have three features: it must be known, it must be true, and it must be related to the change. However important the short-term successes are, it is

crucial that the final success is not declared prematurely. The closest thing to last phase of the change is when "business as usual" is the new way of doing things.

2.3 The Role of Middle Management

The team leaders are the middle managers, and as such they are the interface where the strategic level converges with the operational level [15]. One of the tasks of team leaders is to implement strategy [9]. The team leaders are responsible for four types of activity: committing to the change, assisting others through the change, implementing change related procedures in their teams, and keeping the business going [4]. Despite the importance of middle management, there seems to be little research concerning their role [4].

One of the tasks of the team leaders is to implement the strategy in the teams in order to meet the required objectives. This places the team leaders into the role of change intermediaries. They are the subject implementing the change onto their subordinates but also the object for the change as far as they themselves are concerned [4]. The team leaders, knowing their teams' potential, assess the capabilities of their teams. Team leaders know their peers, and thus they operate as informants of the organizational knowledge. The team leaders encourage and promote an attitude of wisdom (willingness to search for and share knowledge) that is required to succeed [19]. This responds to the requirement of having experienced staff implementing the change [37], as experience means insightfulness and wisdom. Social interaction enhances knowledge sharing between units [43]. Social interaction that promotes trust and reduces uncertainty is needed when creating an attitude of wisdom. Social interaction is vital when introducing CBSE, as it gets people to share knowledge and components. Well-executed, inter-unit information flows benefit innovativeness [44] and efficiency in project completion times [18]. The opposite of this may exist when teams are overly independent or physically dispersed. In such cases, they may compete with each other [Lynex & Layzell according to 32]. This may lead to a proprietary view of the components and the code.

If the team leaders were included in the strategy formation, their expertise would aid achieving the goals [47]. This is in contradiction to the arguments that claim that if the strategy is exposed to managers whose work will be affected negatively, it may cause conflicts [47]. The mind-set suggesting that the strategy should be kept vague fits better with the more traditional way of managing. In such bureaucratic environments, middle management is more dissatisfied with the operation [45]. Individual situations are to be assessed case-specifically, but in general it seems that benefits of including the middle management in strategy work outweigh possible negative outcomes. Increased visibility is advocated widely in the management literature. Managers that are skilled in a participative management style are less likely to resist the change, as they feel more assured in the situation [13]. This is, however, a culture-related issue.

Knowledge is appreciated as a critical element for a successful organization [see e. g. 18]. It is often a problem when employees are not aware of the knowledge of an organization. The creation of new ideas would be easier if existing knowledge could be applied and iterated onward [20, 21]. Considering the objectives for information flows, the team leaders have a central role in achieving the goals and making the change happen. Their role is to guide and monitor the actual process improvement.

3. THE CASE COMPANY AND THE RESEARCH METHODS

3.1 The Case Company

The case company is a large software company operating in business-to-business markets [24, 27]. It is a supplier of complex ICT solutions. Due to the company's acquisitions and mergers, the operation is based on 50 - 60 independent teams located at eight sites. The teams differ in many ways: organizational backgrounds and culture, procedures and processes, technologies used, products and customers.

Each team is responsible for its own software development, production, and sales. Thus, the teams are doing overlapping work that causes extra costs. The company reviewed its software development process to eliminate redundancies and to improve productivity. To accomplish this, the full use of the organizational knowledge is needed. The information flows must be improved and closer collaboration between teams and individuals throughout the organization is a necessity. The key persons to accomplish these tasks are the team leaders.

The case company made a decision to harmonize its software production and to improve the software development processes. They aimed to tackle the problem by implementing decentralized CBSE. This meant that in addition to their routines, teams were required to identify potential components, i.e. products or features that could be used by other teams. As the team leaders have the best overview of what is really going on, they are in a centric role in scouting for suitable component candidates. For support, the management formed a team, the architect group, of professionals to act as change agents and promoters. When approved as a component, a feature is stored in a component repository on the company's intranet. In the repository, components are accessible for the whole organization.

The organizational structure did not support the interactions componentization requires, as the company had earlier been a project-based one. The main challenge was to transform the organization into a more holistic thinking SW development oriented process. The products had been programmed on Java, Progress, VB6, X-language (own design) and Microsoft tools, on platforms including Java/Oracle. To make component making easier in the division, the management decided to use unified technology which was .NET and C#. The technology chosen was already used by a few of the teams, but for most it was new.

3.2 Research Methods

The object of this qualitative case study [12, 48] is a software company. Theme interviews were used to study the renewal of the software production processes of the company. The interviews were recorded and transcribed as detailed interview data. The interview data were then analyzed by thematization to form a picture of the events. The themes were created by using both theoretically driven categories and categories generated from the data [1]. The themes under which the data were classified were identified from the success factors listed in the literature [14, 37]. The themes included phrases such as *software development*, *project management*, and *resource allocation*. Having found confirmation or falsification for the success factors, the contents of the findings were assessed. Based on the assessments, interpretations of their meaning were made.

The organization appointed the interviewees; 44 interviews were conducted. Because the focus of the study was on the team leaders' role, the majority of the interviewees were from this group. Top managers and the whole architect team were among the interviewees in order to lift the interviews off the operational level and also to shed light onto the expectations laid upon the team leaders (see Table 1). The interviewees were from various hierarchical levels that also included programmers and sales persons in addition to the previously mentioned groups, to give a comprehensive picture of the phenomenon and to triangulate the findings. The interviewees were assured of their anonymity for reasons of confidentiality.

Table 1. Summary of the interview data

Interviewees	Architects	Management	Team leaders	Programmers	Other	Total
Site A		2	2		1	5
Site B	3	1	4	1	1	10
Site C			4	4		8
Site D		1	2			3
Site E	2	1	1	4	2	10
Site F	1		1			2
Site G	2		1		1	4
Site H			2			2
Total	8	5	17	9	5	44

The architect team that comprised six persons and top management were interviewed to record their views on and their expectations of the change process. Seventeen team/unit leaders were also interviewed. Some were interviewed twice with temporal intervals. Furthermore, nine programmers and sales persons were interviewed to get more insight but also to see whether their views would support the findings.

4. EMPIRICAL FINDINGS

4.1 Expectations of the Management

The team leaders get their instructions from the branch manager who is second in seniority only to the managing director. The team leaders have the responsibility of organizing the work of their team. Most of the time, the task in hand is a specific-customer project based on a certain type of technology. The management expected the team leaders to carry out their plans and to also carry on with the projects that were on going:

> [..] basically, they [team leaders] work as they have worked up until now, they just have to implement it. It just has to be prioritized high. [..] our highest BU-executive said that this is so important, that it will be coerced if nothing else works. (Architect 1)

The management's instructions to the team leaders were clear: a said number of components must be produced according to the specific guidelines, in the given time. The team leaders were to suggest components from their team to the architect group that approved the components entered in the repository. Later the components were to be added to the repository in a more independent manner. The team leaders should regularly check the repository for components that they could use in their projects. The objectives were shared throughout the organization, and the objectives were expected to be met. Management support for the change remained minimal.

> [..] there is no extra motivation or resources [..] the target number of components is recorded in the team leaders' objectives for the year and they are considered achievable. [..] is not combined to sanctions nor rewards. (Branch manager)

The team leader is a communicator of the change whose task is to inform the team about the expectations of the management. Sometimes, there was a conflict of interest that needed to be dealt with. The architect team was optimistic about solving the conflicting situation because the team leaders were regarded as professionals with an understanding of the proceedings. However, sometimes there was still a choice that had to be made between the customer project and the change initiative.

> [..] componentization is a standard issue in the team meetings. Its meaning is communicated from the team's point of view [..] Problem is that they have another model embedded in their minds [..] intelligent people understand the justifications [..] the short term choice of rather make the money [..] (Architect 2)

The real motivation, besides learning opportunities, was discussed. For example, are compensations needed? In addition to contemplating the obvious monetary gratification for the compliant, the architect group had to also take reluctance into account. The feelings were, however, positive and coercion was seen only as the last resort.

> [..] contemplated rewarding both component engineers and users thereof [..] more important to spur the individuals wanting to reuse [..] Our ambition is strong, so strong we may have to adopt coercing if nothing else works [..] (Architect 3)

According to the architect team members, the communication of the project was well planned and executed. The management expected the team leaders to encourage their teams to adopt the new set of working methods. The trust in SW quality was not seen to present a problem. Furthermore, no problems were anticipated over the ownership of the code. According to the plan, there would be no problems for the teams to search, find, and use components made by other teams or in releasing one's own components to be used by others. All the questions that might have risen in these areas were seen as the responsibility of the team leaders to answer.

4.2 Team Members' Expectations Concerning the Role of Team Leaders

The team members regarded their leaders as information channels. The team members needed information about the trainings but also about the change as a whole. The team leader had to find the answers. However, there were some remnants of the times when the teams still belonged to individual companies.

> [..] you can develop yourself and your skills, but don't know exactly how [..] (Programmer 5)

> [..] he's the only way to get to know what's going on [..] (Programmer 1)

> [..] if they've been competitors, the chemistries don't work and the information doesn't get shared [..] some politicking might be there too [..] (Programmer 2)

Team members are in close relationship with the team's leader. It is in the corporate culture that the team leaders have intimate knowledge of the skills and interests of their team members. According to the task at hand, team leaders then allocate team members based on their skills and interests. There is mutual respect and understanding between the two parties. Team members trust the team leader to decide how their workload is best shared, according to their competencies.

> [..] it should be decided already when defining [the product] what resources are required and also allocated if we were to do a component (Programmer 3)

The team members acknowledged that there are overlaps and redundancies. The CBSE was recognized as a possible solution. The team members were sceptical about how they were supposed to become familiar with CBSE and still meet the set objectives. They put pressure on their team leader to solve the problems. A major obstacle was the unified programming language. If a team was without prior knowledge of this particular language, it had to be acquired. The acquisition of know-how was to be done either by training the existing personnel or lending a member from another team.

> [..] we cannot afford to change the programming environment [..] if we have to use [the chosen technology] the four preliminary components will die instantly, we simply don't have the time [..] (Programmer 4)

Team members expected the team leader to improve the working conditions and lead the team to complete the projects. The team spirit was strong and the members shared and expressed their concern about how their results were affected by the change.

> [..] team's result is rubbish if the team is ordered to do components for six months instead of doing projects they may charge [..] (Programmer 6)

The team leaders operate as filters and as support for their subordinates, but they also represent the organization to the team. Sometimes, this task is thankless and places the individuals under contradictory pressure from both sides.

4.3 The Team Leaders' Thoughts

The team leaders appreciated the need for change. A logical step in improving the processes was the reduction of the overlaps and redundancy. This meant extra work, in addition to the normal routines. The team leaders had also to monitor the company's intranet for any changes in the status of the component repository. The workload piled up.

> [..] the documentation [of components] takes more time [..] up to 50% [..] who are incredibly busy, everyone else is also working at nights [..] (Team leader P)

> [..] on average somewhat under 20 hours overtime a week [..] (Programmer R)

As a result, not all the team leaders could take part in all the meetings. The architect team reported that they had communicated the change project throughout the company. Still, there were feelings of uncertainty among the team leaders about the why's and how's.

> [..] in general our team is not that well aware of how the components should be made, so we continued our old practice [..] Team leader Y

The imbalance in the objectives and the thoughts concerning the resource allocation made the team leaders take sides, and, as a result, the goal-achieving measures were not enforced to the fullest. The concern of how the team members managed to cope was uttered.

> [..] the team is up to their ears with work, I didn't want to overburden them [..] (Team leader J)

> [..] we've had our share of problematic projects that have consumed people's time and coping [..] Team leader N

> [..] it should be systematically pointed out from where the extra 50% of time should be taken from [..] it is hard to find both the resource and the money [..] (Team leader P)

Motivation is affected because it is not rewarded. But even so, the workload was the feature that most concerned the team leaders. The team leaders saw themselves in the way the parties described them. They had to make a choice of how to respond to the call from both sides.

5. DISCUSSION

The idea behind the implementation of CBSE was to eliminate overlapping work and to use knowledge across teams and over project boundaries. The role of team leaders was to act as a two-way informant and effectively share the knowledge of their teams, also in form of components, as stated by Conway and Monks [8]. However, the technological uncertainties concerning the programming language and knowledge management–related challenges, such as communicating about the initiative and workload sharing within the teams, should have been considered more carefully and extra resources allocated to overcome them in accordance to Morisio et al. [35]. By recognizing the obstacles at the beginning of the change process, the change to CBSE could have happened more smoothly. The technical implementation of CBSE--the definition of components and the repository--was performed well as their definitions were to be found on the intranet.

The systematic implementation of the change is critical. The teams have their own ways of conducting everyday business they need to renew. Change must first happen on the mental level. Individuals need to adjust their thinking to the changing operation and future technology. They require solid and plausible justification for the need for change, as Kotter [27] describes. In this case, the hardening competitive situation provided the justification. The architect group operated under the mandate of the managing director, and thus the required support was also provided at least on some level.

The vision-related issues failed. The vision was formulated, but it was not excellent. The communication of the vision was adequate from the architect group's point of view. This was not the case, however, among those whom it affected most, the teams. The data shows uncertainty and a lack of clarity therein. The obstacles were removed as far as they could have been. There were components produced showing that they could be done. Sadly, there were again some miscommunications and the message remained somewhat blurred. The change was still under

way when the study finished, and thus this paper cannot take a stand on how the last two issues on Kotter's [27] list were addressed.

The team leaders are presented with a tall order. The pressure comes from both sides, from hierarchically above and below. The management requires completion of their customer projects and they are required to trim their teams to produce components for the whole organization. The team leaders appreciate the beneficial objectives of the change, but feel let down when it comes to how they are supposed to accomplish it.

This kind of change needs promotion through well-executed and organization-wide communication. The chosen technology should be agile enough to meet the needs of individual teams. Another alternative is to make compromises in the way the new way of working and the technology is implemented and also in the length of the transition period. The change can be achieved only if management creates the right circumstances and provides the necessary resources. This supports the findings in the previously published literature saying that without means or time reuse typically fails. Leadership in this kind of undertaking is crucial for a successful outcome. Skilled change management is needed for a successful harmonization initiative and especially if the new way is to actually become the "regular way" of working. In such a situation, it is typical that the procedural change may take years or may even be continuous.

As this paper is based on a highly culture-related case study, the outcomes are not directly generalizable in other contexts. The more democratic approach to middle management's use fits poorly in the authoritarian management culture. However, some features, for example the need for management support and the importance of middle management, are applicable over the contextual boundaries.

6. CONCLUSIONS

This paper has discussed the role of team leaders in organizational change. The management made strategic decisions and gave the team leaders the task to implement them. The expectations laid upon the team leaders were twofold: the expectations of management and the expectations of team members. The theoretical view of how to deal with the change is compared with the observed proceedings in the case company. This paper also suggests some solutions for the inconsistencies found.

The theoretical contribution is primarily meant to fortify the theories of change management but also to add the notion of the importance of communication. Further study, where the cultural aspect is dealt with more closely, is recommended.

The empirical contribution aims to illustrate theory through a practical case. The centric and knowledgeable position of the team leaders gives them a view of the operation that is hard to match or replace. Software businesses that are renewing their software production processes towards CBSE would benefit a great deal from appointing and empowering team leaders during the design and preparation phases of the renewal process. When implementing the guidelines, it is worth remembering that this cannot be done without the involvement of the team leaders. However, commitment is not enough; the change must be resourced adequately. Top management supported the initiative, but was not fully aware of the actual requirements. Money is needed, but most of all time. This is something that can only be assessed by the team leaders.

Another significant issue to be brought up is that both technological and human perspectives must be taken into account in the harmonization of a software development process. Technology is needed for making things easy and efficient. Still, it is more important to have the right attitude towards knowledge sharing, and in this, the team leaders are the key players.

Such a change process bears significant managerial implications. The features and qualifications required from leaders in this kind of situation are not necessarily easy to meet. These challenges are not only technological matters nor are they purely questions of a more human nature. It is a unique combination that suits each situation. To be able to master the technological side of the whole harmonization process is challenging, but the human challenges are surely no less challenging. The core of this study is summed up according to Desouza et al. [11] who state that: "The biggest obstacle to effective knowledge management is not implementing a cutting-edge IT solution, but getting people to talk and share their know-how."

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Nr. 6

The role of an intermediator organisation in collaboration: how can an intermediator enhance value co-creation?

by

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The role of an intermediator organisation in collaboration: how can an intermediator enhance value co-creation?

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Abstract: Collaboration brings synergy to organisations and leads towards superior value co-creation. However, successful collaboration and value co-creation face several challenges. We state that these challenges can be addressed with the help of an intermediator organisation (IO), and that it subsequently has a positive effect on value co-creation. This paper analyses the IO's part in value co-creation in a collaboration network. Based on theoretical and empirical research the activities and consequent value creating benefits an IO brings to collaboration depend on the role or roles it plays in the network. According to our findings an IO can act as a creator, coordinator, facilitator, node and a resource. An IO facilitates the creation, development and maintaining of network relationships during collaboration. The value an IO creates is mainly indirect and intangible by nature and thus difficult to measure.

Keywords: collaboration; value; value co-creation; intermediator; capabilities; business relationships; relationship parties; business networks; value network; network members.

Reference to this paper should be made as follows: Myllärniemi, J., Vuori, V., Helander, N., Ilvonen, I., Okkonen, J. and Virtanen, P. (2013) 'The role of an intermediator organisation in collaboration: how can an intermediator enhance value co-creation?', *Int. J. Applied Systemic Studies*, Vol. 5, Nos. 1/2, pp.3–21.

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1 Introduction

Organisations collaborate for many reasons, for example to get fresh ideas, to innovate, to learn from each other, or to save costs by performing functions together (Walter et al., 2001; Chetty and Blankenburg Holm, 2000). In all, the basic underlying motivation for collaboration is a shared belief that collaboration brings synergy, and thus leads towards superior value co-creation (Kothandaraman and Wilson, 2001). Due to this aim for superior value co-creation, the collaboration can take place in many areas of business and business processes, the most concrete one of which is probably product development and research.

The drivers and success of collaboration between organisations have been researched quite a lot in business research (e.g., Stabell and Fjeldstad, 1998; Daugherty et al., 2006; Laaksonen et al., 2008), whereas the first steps of successful collaboration relationships have received less attention. In addition, the research on the formation of collaboration networks has focused more on the material-resource aspect as a motive to collaborate and rather disregarded how social aspects and relationships affect the early stages of collaboration (Gulati, 1999). Many times the seed of collaboration, of course, is planted

when it is known that some other organisation is doing interesting things in a specific area and there might be an opportunity to cooperate. As core capabilities and ways of value-creation differ from organisation to organisation (Hamel, 1991), the opportunity to learn and benefit from others' capabilities is a motive to collaborate (see e.g., Gulati et al., 2000; Gulati, 1998). The challenges of getting forwards from this point are the lack of knowledge about whom to contact, how to get the other party or parties convinced that the collaboration is worthwhile and secure for all parties, and that the originator has no hidden agenda (see e.g., Gulati, 1999).

Even though these first obstacles can be tackled, there are still several challenges ahead complicating the way to successful collaboration. A collaboration network needs coordination to some extent. If one of the network members acts as a coordinator, several problems cramping the collaboration can surface. For example, in the beginning phase of the collaboration suspicions of hidden agendas of other network members can occur. Often there is also a risk of uneven distribution of responsibilities and workload. If one of the members is in charge of the coordination, suspicions that some other member is free-riding and collecting the fruits may rise (Gulati, 1998). Moreover, unstable dynamics between network members is possible, e.g., the coordinating member might know more about the others, which can be seen as a leverage factor by others and a temptation to behave opportunistically (Gulati, 1998). In many cases, organisation specific projects are difficult to execute without revealing too much information to other network members. Anonymous benchmarking, as important as it is, is hard or impossible to carry out. These problems are present especially in a co-opetition situation (Levy and Powell, 2005; Soekijad and Andriessen, 2003; Tsai, 2002) when there is a risk that by sharing too much information an organisation may bring leverage to the competitor.

This paper states that these complex situations can be eased with the help of an intermediator organisation (IO). An IO is usually an impartial and unbiased expert, e.g., a university, a research institute, or a government agency. In this paper, the objective is to analyse the part that an IO has in value co-creation in a collaboration network. Through conceptual and empirical analysis, this paper aims to answer the following research questions:

1 What roles does an IO play, what activities does it perform and what capabilities does it need to enhance value co-creation in a collaboration network?

2 What kind of value does an IO create for a collaboration network?

In other words, this paper focuses on the role of an IO in value co-creation. In this paper, the basic principle is that in a network setting the members aim to create value together, i.e., value is co-created. The members' motive for entering into the network is to collaborate with others in order to create more value. An IO supports this value co-creation on its behalf by facilitating collaboration between network members.

The contribution of this paper is a better understanding of what the roles and relevance of an IO in the value creation in collaboration networks are. The results benefit organisations that intend to collaborate or are already collaborating; with the help of the results their expectations of the collaboration are more realistic and they can better define the roles and activities they expect of an IO in the collaboration. The IOs can learn from the results and perform better in collaboration networks; they can better understand their alternative roles and, subsequently, the activities they can perform to enable successful collaboration and create value for the network members. For the academia, the results

enlighten the dynamics and mechanisms of collaboration from a viewpoint which has so far gained rather minimal attention in the research. However, the problematic of how to find and attract the IOs is seen as such a large and independent part of this phenomenon that it is deliberately left out of the scope of this paper.

In order to find answers to our research questions that encompass IO as an enabler of value co-creation, the viewpoints relevant to this problematic are first elaborated conceptually. The conceptual discussion is started by opening up the basic nature of networks and business relationships as their building blocks. After that the network is discussed in the context of value creation. The concept of value is not easy to understand and measuring it is even harder. However, in order to reveal what kinds of features and functions are needed from an IO to enable value co-creation, tools for analysing value are needed. For this reason, a framework for analysing value functions is presented. This framework is used in the empirical part of this paper as a tool for the analysis. The empirical part of this paper deepens the gained understanding through real-life examples. This paper uses multiple case studies consisted of qualitative data collected from different collaboration projects in which IOs have been involved.

2 Conceptual analysis of IO's role in value networks

2.1 The anatomy of a network

A business network can be defined as a bunch of business relationships between organisations that includes resources and activities which are controlled by network actors (see e.g., Ford et al., 1998; Ford, 1997). For studying the business relationships from the point of view of the actors of the networks, Håkansson and Johanson (1992) have created the actors-resources-activities (ARA) model, which can be seen as a basic theoretical background of industrial networks research (Tikkanen, 1998).

In the ARA model, a network is understood as formed by actors, activities and resources which are linked up together (Håkansson and Johanson, 1992). The actors can be individuals, groups of individuals, parts of organisations, organisations and groups of organisations which perform activities and control resources. The actors have five distinctive characteristics:

1 they perform and control activities

2 they have access to each others' resources

3 they are able to control the available resources

4 they are target oriented (i.e., the general goal of the actors is to increase their control of the network through getting control over activities and/or resources)

5 they have different knowledge about activities, resources and other actors in the network (Håkansson and Johanson, 1992).

The actors of the network control and use resources to perform activities. The anticipated resources available for an organisation through the network influence the potential partners' eagerness to join the network (Gulati, 1999). The resources can be very heterogeneous and depend on the network in question. They have attributes in many dimensions, which lead to their use. One characteristic is the utilisation of the resource in

activities. Activities occur when actors create, combine, develop or exchange resources. Activities, as well as actors, are linked together in multiple ways. It is common for networks, and important to notice, that new activities, changes in old activities, rearrangement of activities or changes in relationships between them can intensify networks (Håkansson and Johanson, 1992).

Table 1 IO as an actor in a network

Characteristics of actors in a network		*IO as an actor*	*A practical example: IO as a customer interface*
1	Performing and controlling activities	The collaboration network members define • the role of the IO (the activities that are to be performed or controlled) • the performing of the activities • the resources to be utilised when performing the activities • the level of control that the IO maintains over the other actors	The contacts to the customer go through the IO which it then relays to the network in the form of orders, etc.
2	Accessing each others' resources	The number of utilisable resources (network members' or the IO's) define the IO's role • is it an extra set of resources allocated for other members, or • does it have a direct access to their resources as well.	IO's knowledge and employee resources are used to satisfy the customer needs.
3	Ability to control the available resources	According to the specific needs of the end-user the IO controls and uses resources in the network • directly – resource control is based on ownership • indirectly – control is based on relationships with other actors	The IO, having the best view over the network and its resources, allocates suitable information and persons for a certain project.
4	Target orientation	An IO controlling the activities and resources enables the network members to • decrease their need for control over and in the network • focus on the substance issues.	The IO strives to find the optimal solution for the specific customer needs (from their own resources or from the resources of other actors). It finds out the most suitable execution for the task that needs to be done based on the resources allocated for this endeavour.
5	Possessing knowledge about the network	The IO's knowledge depends on, for example, experience and the actors' position in the network.	The IO is able to exploit the best suited resources for each customer need.

In all, networks are full of inter-dependencies which the actors within the network need to be able to observe and process in order to achieve success. It is possible to study inter-organisational and inter-individual relationships from a holistic perspective through

the ARA model. Actors, resources and activities form the structure of a network, and all these elements form relationships with each other and with other similar elements. Finally, these networks are bound together by several forces combining the whole network. According to Håkansson and Johanson (1992), the important forces are functional interdependence, power structure, knowledge structure, and inter-temporal dependence. These forces affect the evolution of the network.

Networks are often perceived as permanent but they are dynamic since continuous interaction changes the networks all the time. Environmental changes may change the needs and orientation of a network member, which, for one, has an effect on the whole network (Gulati, 1998). There are two dialectical processes that shape networks: the actors' competition for critical resources and benefits they get, and the actors' cooperation between competitors (Easton, 1992).

In all, the ARA model offers a tool for network analysis. The model can also be applied in the analysis of the IO's role in the network, as IO is one of the central actors in the network. This paper especially examines what kinds of features the IO should have and what activities it should perform in order to enable value co-creation. Table 1 concludes the ARA model discussion by examining the IO's role in the network through the actor characteristics identified by Håkansson and Johanson (1992). These features should and must be found in the IO as it belongs to the network as a central actor.

The role of an IO as an actor in the network differs from the roles of the other network members. The main difference is that the ultimate goal of the IO is to create best possible value from the collaboration for all the members, whereas other network members are in it for their own good. The IO can be seen as an extra set of resources for the network as well as the unbiased party controlling and allocating the network resources as a whole.

2.2 Creating value in networks

Organisations form relationships with specific partners which they feel are strategically significant for their business (Dubois, 1998; Gulati, 1998). The basic theoretical path to form a collaboration network suggested by Gulati (1993 in Gulati, 1998) relies on the organisation itself: first, the organisation identifies the need for collaboration; second, the organisation tries to identify the best potential partners; and finally, the organisation needs to choose a suitable contract to formalise the collaboration. This requires a lot from a single organisation, as it needs knowledge on who the potential partners with strategically significant capabilities are, as well as on the ability to persuade them to collaborate.

In practice, the creation of collaboration networks as well as their design, evolution and success are heavily dependent on the organisation's prior contacts and social networks (Arthur, 1989; Gulati, 1998). If an organisation lacks prior contacts and is unknown to the potential partners, getting their trust and motivating them to collaborate is a more difficult task. Therefore, using an IO gives access to its social network, which eases the first steps of forming a collaboration network. The ultimate motivation to collaborate is the hope of getting such value from the network that the organisation could not create by itself.

Value is a concept that is commonly used by both academics and actors in the field, but it is often rather unclear what is actually meant by it in different contexts (Ford and McDowell, 1999; Helander, 2004). Most often value is described as something that

should be measured as the trade-off between benefits and sacrifices that are not only monetary but also non-monetary. In fact, from a rather broad perspective, the concept of value can be regarded as the trade-off between benefits and sacrifices (Walter et al., 2001; Lapierre, 2000; Parolini, 1999; Slater, 1997; Berry and Yadav, 1996; Ravald and Grönroos, 1996). These benefits and sacrifices can be understood in monetary terms, but they can also be seen as including non-monetary rewards, such as competence, market position, and social rewards (Walter et al., 2001). Non-monetary costs can include, e.g., time, effort, and energy invested by the customer to obtain the product or service. In this study, value is understood in both monetary and non-monetary terms. In all, the definition of value as the trade-off between benefits and sacrifices is followed in the present study. It also needs to be emphasised that the benefits and sacrifices are in the end measured in the eyes of the actor itself, i.e., value perception is important to keep in mind.

When creating value by collaborating in networks – known as value networks – the question is not only about the organisations' own capabilities and competencies, but also their customers and customers' partners are taken into account (Helander, 2004). In value networks, value is formed through dynamic open network by actors who are directly or indirectly connected to each other. Value is created to end users as well as to actors themselves.

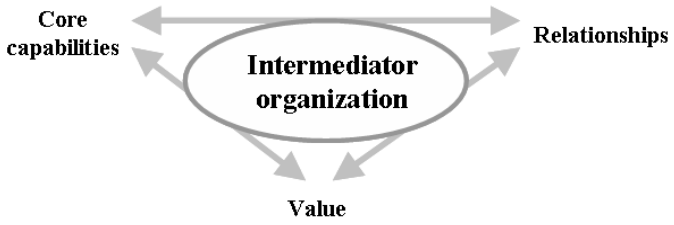
Value networks have been studied quite a lot: for example, the value net tool by Parolini (1999), the value system continuum by Möller et al. (2002) and the model of value-creating networks by Kothandaraman and Wilson (2001) offer interesting viewpoints to the subject. The original model of value-creating networks by Kothandaraman and Wilson (2001) is formed by three main concepts: core capabilities, superior customer value and relationships. These three building blocks are combined through reciprocal paths between each other. The model describes how superior customer value can be created in networks. Creating customer value depends on how well an organisation can perform in the areas the customers care about (Parolini, 1999), i.e., how well an organisation is able to integrate its resources and capabilities in order to deliver a product that satisfies the customers' needs at a competitive price (Kothandaraman and Wilson, 2001). In a network, superior customer value is created by utilising the more meaningful capabilities, the core capabilities, of all the members of the network, since a network of organisations can offer a wider set of core capabilities needed to produce superior value to the customers (Kothandaraman and Wilson, 2001). Core capabilities provide the means to deliver superior performance in a way that is important to the customers.

The model introduced by Kothandaraman and Wilson (2001) offers for the present study a solid theoretical background for understanding value co-creation in a network. The model is applied in this study with minor modifications (see Figure 1), by which the role of IO is emphasised in the network and the created value is discussed in more general terms than just the value created for the customer, as has been in the foci of the original model.

Since the resources and the capabilities shared within the network determine the value an organisation gets from the collaboration, the core capabilities constrain also the quality of the relationships between the organisations in the network (Kothandaraman and Wilson, 2001). In other words, the quality of the relationships facilitates the creation of value. The relationships keep the network together and thereby help the organisations' ability to maintain and improve core capabilities (Kothandaraman and Wilson, 2001). In

addition to having a great role in forming the network, an IO's contribution to maintaining and developing the network relationships during the collaboration is crucial.

Figure 1 The model of value-creating networks



Source: Modified from Kothandaraman and Wilson (2001)

Another important theme besides value creation is the analysis of the roles and relationships of the members of the network. Håkansson and Snehota (1989) point out that the network approach takes into account the relations between actors in the network. As networks are not transparent, the actors in the network cannot know it very widely. As an objective party an IO, having the administrative responsibility over the network and knowledge of the needs of all the members, may bring the needed transparency to the network and thus smoothen the collaboration efforts.

2.3 Value functions from IO perspective

When examining value creation from the viewpoint of an IO, the perspective of benefits and sacrifices is fruitful to be supplemented with a perspective of value creation through different functions. This kind of function-oriented viewpoint, introduced by Walter et al. (2001), offers us a more complete view on the types of activities that IOs could perform in order to create more value to the network members. This kind of function-oriented value analysis by Walter et al. (2001) has originally been developed for analysing the value created in customer relationships, but the model can be applied also in the IO setting.

According to the function-oriented value analysis an organisation may gain value from its customer relationship by both direct and indirect functions (Walter et al., 2001). Direct functions bring value that is easier to measure financially and to realise in the relationship between the company and the customer. Indirect functions, on the other hand, also require the input of third parties, and the outcomes are not as straightforward to measure financially. Table 2 illustrates direct and indirect value functions and their measurement.

Through the function-oriented value analysis the kind of value that can be co-created in business relationships and networks could be identified. This kind of list of value-creating functions is not exhaustive, but it gives a rather comprehensive view on the discussion of what activities and functions create value. Naturally, the managers of the network member organisations still need to think carefully which of the aforementioned functions are the most important ones to be followed up, and to define more precise measurements for each of the functions.

Table 2 Direct and indirect value functions and their measurement

Value function	*Description of the function*	*Measurement examples for IO relationships*
Direct		
Profit	The financial value of profits and direct yields a relationship generates	• Profit margin per produced service or product • Profit per customer relationship per financial period
Volume	Relationships guaranteeing a certain operating volume to the company	• Number of deliveries • Sales volume
Safeguard	Reliability of a relationship, e.g., during economic downshift	• Period and conditions of customer agreements
Indirect		
Innovation	Creating innovations through relationships	• Number of shared development projects • Jointly developed new technologies • Number of ideas received from partners
Market	Accessing new markets and getting contacts to new customers through existing relationships	• Number of customer references • Actualised new market entries
Scout	Creating value through information	• Number of received customer leads • Competitor knowledge received from customers
Access	Actor has information and contacts of certain networks concerning public authorities and public organisations	• The number of relationships with authorities recognised with the help of stakeholder analysis

Source: Based on Walter et al. (2001)

3 Empirical analysis: multiple case study

3.1 Purpose and structure of the cases

The empirical part of this paper consists of three case descriptions of different collaboration projects in which IOs have been involved. These real-life examples deepen and enrich the theoretical understanding regarding the IO's roles in value creation. Table 3 describes the empirical data, i.e., the cases.

The cases use qualitative empirical data that was collected from different collaboration projects. The data was collected in different points in time as the projects were conducted. Alpha took place in 2006 to 2008, the data from Beta was collected in 2010, and from Gamma during 2004 to 2007.

Table 3 Description of the empirical data

Case	*Purpose of the case*	*Type of IO*	*Data collection*
Alpha	To describe the methods provided by the IO to enhance collaboration and value co-creation	University	• Participative observation • Feedback from network members
Beta	To find out the expectations of the public sector stakeholders about the case organisation	Technology centre	• Interviews of the stakeholders • Interviews of the network members • Organisation's documents
Gamma	To describe how collaboration is promoted and how interaction is built between different actors	University	• Participative observation • Feedback

The case examples follow the same structure. They describe the actors in the case, the capabilities the IO brought to the collaboration, the activities enabled or performed by the IO, and the IO's contribution from the point of view of function-oriented value analysis (Walter et al., 2001).

3.2 Alpha

3.2.1 Actors

The IO worked with seven internationally operating construction companies. The IO was a university department with expertise on the subject, i.e., business intelligence.

3.2.2 Capabilities

Alpha's personnel consisted of one professor, one research fellow, two researchers and three research assistants. They had multifaceted expertise on business intelligence, knowledge and experience from former similar collaboration projects and ways of working, the workshop concept and its conduction, as well as administrative coordination.

3.2.3 Activities

The IO enabled different kinds of joint collaboration ventures within the project, such as acquiring market information as well as analysing and benchmarking the companies' business intelligence processes. The most appreciated and effective way of collaboration was, however, workshops arranged by the IO in order to facilitate a more comprehensive and free-form collaboration between the network members. The objective of the workshops was to facilitate interplay, knowledge creation and knowledge sharing between network members. The IO was responsible for the planning and the practical arrangements of the workshops. Each workshop was hosted by a different network member company. This way the companies got more involved and committed in the workshops and network, and they could present their modus operandi as well as get to know other network member companies' business operations.

Each workshop began with a keynote presentation that was given by external experts from the IO's social network, e.g., company representatives from outside the collaboration network, researchers or consultants. Next, the host company gave a short presentation reflecting its own situation to the current theme making it more concrete with real-life examples or bringing up challenges and open questions concerning the issue. After the presentations, the workshop participants were divided into small groups to discuss, share insights and reflect their ideas elicited by the presentations. The small group discussions deepened the theme of the workshop bringing company-specific and industry-specific perspectives as well as individuals' experiences to it.

Every group had an appointed moderator from the IO who was responsible for summarising and presenting the central findings, questions raised and insights of the group discussions to other participants in the end of every workshop. In addition to this, the IO delivered a written report including summaries of all group discussions to participants after the workshops. With the help of the reports, the discussions and insights emerged in the groups could be shared in a more effective manner.

3.2.4 Function-oriented value analysis of the IO's contribution

The IO brought mainly indirect value functions, since its role in the collaboration was to be more of a provider of intangible services, i.e., acts as a connector, facilitator and expert in the substance area:

- Innovation: The expertise and knowledge of the IO shared during the collaboration elicited new ideas concerning each company's business intelligence activities and enabled their development.
- Market: Some of the network members had a longer history and, subsequently, knowledge of certain market areas, whereas others were just planning to enter the markets. The IO enabled the connection (collaboration project) between members and arranged opportunities (e.g., workshops) for to discuss and share knowledge.
- Scout: As all the network members operated in the same industry, they had both interest in and knowledge of the actors in the industry and could share their insights and knowledge regarding, e.g., competitors.

The main advantage that the IO brought to the collaboration was the workshops that provided a chance to collaborate, discuss, share knowledge and experience, and generate joint learning and reflecting of issues. The workshops also enabled the network members to instantly benefit from the results of the project and to apply the ideas to enhance their own competitive position. Using workshops as a way to collaborate enabled the participation of several company representatives during the project. One benefit in this kind of approach is that when there are more than one participant from a company in the workshop they are able to examine and reflect issues from different perspectives. They can also discuss the issues elicited in the workshop together afterwards and disseminate the lessons learned in the company more effectively. The concept of these workshops was found effective and developed during the IO's former collaboration projects. The IO brought this way of working and its experience of organising the workshops into the collaboration project and thus enabled a successful form of collaboration from which the network members would not have been able to benefit without the IO's input.

3.3 Beta

3.3.1 Actors

The IO is a technology centre which employs 40 people. Its mission is to develop new business activity and expertise in pivotal high-technology industries and to improve competitiveness in the region's key clusters.

3.3.2 Capabilities

The IO brings its networking capabilities to the use of organisations in need of collaboration partners. Current main capabilities of the IO are project organisation capabilities and the capability of encouraging organisations to work together. According to the interviewees, its success as an IO depends on the relationships between people. The people working for the IO need to have the capabilities and knowledge of how to improve the business of individual organisations, and how to achieve this by networked collaboration. In addition to this knowledge, the IO – i.e., the people working for the IO – needs to be able to communicate the potential of collaboration, and get the organisations involved in the networks. No matter how great the idea, if it is not communicated properly it might not succeed.

3.3.3 Activities

The main mode of operation of the IO is to link organisations together, and seek and coordinate public funding for networking and development efforts in the organisations. The interviews revealed that the IO is responding quite well to the expectations that are set for it. Over the years, it has participated in the building of six strong networks of organisations in different industries.

3.3.4 Function-oriented value analysis of the IO's contribution

According to the interviews, the IO has been successful in linking organisations together and finding the right capabilities for the right needs. Public sector organisations expect the IO to be a trusted partner for companies, and according to them it has succeeded in this role. The IO is expected to work actively in building networks of organisations, and it has done just that. The networks are not built only for the ad hoc needs of one organisation, rather they are built for longer time collaboration among the organisations, which is in the interests of the stakeholders. The IO has worked actively in spotting the need and potential for different collaboration activities, and started to build the networks around them.

The value that the IO brings to the network actors is mainly indirect in nature:

- Innovation: The industry sector networks maintained by the IO enable companies to create new products and new uses for the products.
- Access: By joining companies together the IO enables access to new information and thus enables innovation.

An example emphasising the importance of communication from the IO is the case of a national technology programme that is funded by the government and coordinated by the

IO. In this programme, the IO has upgraded its role from a regional actor to the national level. This caused some problems in the beginning of the programme, since the IO was way ahead of the other network members in thinking and activities. The people of the IO were first too embedded in their own modus operandi and ideas of the network. To be able to coordinate the programme, the IO needed to take a couple of steps backward in thinking and adjust communication so that all the network members could catch up in the programme. The IO has since succeeded in adjusting its communication to the level needed.

3.4 Gamma

3.4.1 Actors

The key actors were three research organisations and four business mediator organisations. The IO was a researcher group in a university department with expertise on growth company research and contacts to the field on national level.

3.4.2 Capabilities

In the IO capabilities consist of core personnel: three senior researchers, three researchers and two research assistants and an extended organisation of c.a. 10 experts. The roles of different people varied, yet, the key personnel had the role of methodological and conceptual experts. The extended organisation members had a role of gatekeepers as they provided contacts to different actors outside the domain of the IO. Moreover, as the topic of research/development is somewhat delicate, the issue of access was emphasised.

3.4.3 Activities

The main mode of operation of the IO was to link organisations and actors together. The role was to be a gatekeeper, i.e., enabling and maintaining partnering in different research ventures. Moreover, in delicate situations, it was important that there was a mediating actor involved.

3.4.4 Function-oriented value analysis of the IO's contribution

The findings with the IO point to the importance of social capital when linking organisations together and accessing mutual networks. Public sector organisations, i.e., universities, acted as local hubs, yet the extended IO established most of the contacts with other actors in and during meetings, seminars, etc. Evidence of success is based on volume on research activities. The IO was expected to work actively in building networks of organisations, but most of the contacts were between individuals, i.e., without official contract of intentions. The networks were not built only for the ad hoc needs of one organisation, but merely to connect different parties sharing the same interest. Motivation to collaborate varied, i.e., the university parties shared the interest of research but other parties could also be seen as rent-seekers, i.e., they tried to promote their business. The IO worked actively in spotting the need and potential for different collaboration activities, and then started to build the networks around them.

- Innovation: The expertise and knowledge of the intermediator helped the participants to make contacts that initiated both research and business activities.

- Market: Most of the network members were not familiar with the modus operandi, thus bonding was required. As collaboration was built, and actors had mutual acquaintance, the collaboration was, at least to some degree, a success.
- Scout: Actors in domains could share their insights and knowledge of several issues, and this sharing was facilitated by the IO?
- Access: new knowledge and methods were distributed.

Table 4 The roles and relevance of an IO to the cases

	Alpha	*Beta*	*Gamma*
The roles of the IO in the collaboration	Coordinator, collaboration facilitator	Creator and coordinator	Collaboration facilitator
Activities	• Bringing the best practices from former projects • Conducting organisation-specific sub-projects and joint ventures • Planning and organising workshops	• Linking organisations together finding the right capabilities for the right needs • Spotting the need and potential for different collaboration activities • Building networks	• Acting as a mediator between foreign partners • Providing conceptual framework • Planning and conducting research activities
Benefits for collaboration enabled by the IO	• Confidential sub-projects tailored to the organisations' needs • Anonymous benchmarking • Workshops enabling a more comprehensive and free-form collaboration • Discussion, shared insight and experience • Generating joint learning and reflecting of issues • Interplay, knowledge creation and knowledge sharing between collaborating partners • Benefiting from its social network and expertise	• An unbiased IO communicating the potential of collaboration and getting the organisations involved in the networks • The IO has capabilities to build up networking projects and gain funding for them	• Better access to partners • Nurturing of social capital, i.e., mutual acquaintance enables deeper cooperation and motivation to cooperate
Main value functions	Indirect: innovation, market, scout	Indirect: innovation, access	Indirect: innovation, market, scout, access

As described above, the role of IO was based on voluntary action and partnership. As all parties funded their own expenses it was important to have an IO building collaboration and trust to hold the network together. Moreover, as the participants had different interests, the role of the IO was also to avoid conflicting interests, e.g., to ensure that all had equal access to the network and the material. That was partly due to the idea of a (semi)public platform, partly promoting the modus operandi.

3.5 Main findings of the cases

The main findings of the cases are represented in the form of Table 4.

As can be seen in Table 4, all of the IOs in the three analysed cases were able to create several kinds of benefits for the collaboration network members although the main role of the three analysed IOs differed from each other, from the collaboration initiator to the collaboration facilitator. The analysis of the main value functions also revealed that in each of the cases the IO was especially enabling indirect value creation – innovation and access value in each of the cases. In part of the cases the IO also enabled value creation through market and scout functions. It is noteworthy that, at best, the IO enhances indirect value creation, thus the network members should not even expect the IO to be the creator of direct value in the network – that role the network members should keep to themselves.

4 Conclusions and discussion

This study analysed the part that an IO has in value co-creation in a collaboration network. In the following, we answer the research questions based on both theoretical and empirical research.

1 What roles does an IO play, what activities does it perform and what capabilities does it need to enhance value co-creation in a collaboration network?

The role of an IO differs from the roles of other network members. The main difference is that an IO strives to create the best possible value from the collaboration for all the members, whereas other network members mainly focus on their own benefits. Based on both the theoretical and the empirical research conducted one can identify five key roles that an IO can play in a collaboration network. It can act as a creator building a collaboration network, understanding the partners' needs, finding the right partners and convincing them to collaborate. During the collaboration, it can adopt the role of a coordinator administrating, organising and planning collaboration as well as allocating the network's resources. At the same time, the IO can be a facilitator that organises settings for collaboration, e.g., enabling meetings, discussions and subsequent knowledge sharing between network members. As the quality of the relationships in the network has a central effect on the success of the collaboration (Kothandaraman and Wilson, 2001), the IO's role as a node in the network is especially important. As a node an IO links the network members during the collaboration and maintains, develops and nurtures internal relationships in the network. Lastly, an IO can also be seen as an extra set of resources for the network. The network members can utilise its capabilities, expertise and personnel

in different ways. Therefore, in the ARA model (see Section 2.1) an IO can be seen both as an actor and a resource.

In order to create circumstances for successful collaboration in a network an IO needs to possess certain capabilities. It should have good relationship building skills to be able to attract and link potential partners. A vast social network is needed to locate potential partners in the beginning and experts to be utilised during the collaboration. An IO should have the trust of the network members. In a network of multiple members organising skills completed with communication skills can make or break the collaboration. Expertise on collaboration processes and/or the substance area of collaboration affect how the IO succeeds in creating value for the network.

2 What value does an IO create for a collaboration network?

An IO aims to create value for the network as a whole and also for the members as separate organisations. In the function-oriented value analysis (Walter et al., 2001), the IO's main contribution lies in the indirect value functions. The value it creates for the collaboration network is mainly intangible and thus not easy to measure financially.

The biggest impact of an IO in forming a collaboration network is to find the strategically significant partners and to show the importance and benefits of collaboration to the potential partners to create a value network. According to Parolini (1999), differential value is very hard to define and measure because the expectations of the network actors are based on the alternatives available on the market. Having an IO locate and link potential partners increases the number of alternatives and thus affects the potential value created in the network. In addition, the network members can have access to an IO's social network during the collaboration enabling them to expand their own social network.

In addition to having a great role in forming the network, an IO's contribution in the role of a node in the network during the collaboration has a value creating affect. According to Kothandaraman and Wilson (2001), the quality of relationships facilitates the creation of value. As the IO has a salient role in creating, maintaining, developing and nurturing relationships it also has a central role in value creation in the collaboration network.

Outsourcing and centralising the administrative responsibility over the network and knowledge of the needs of all network members to an IO benefits collaboration in many ways. First, it eliminates the members' struggle over relational power matters, such as who has the power over resources and capabilities in the network. Instead, they are able to concentrate on the essentials of the collaboration, i.e., improving their own capabilities and utilising those of the network. Second, an IO as a coordinator can bring transparency to the network. As an objective and omniscient party it has an overview of the whole network and can clarify the processes and relationships. Third, it ensures the equality in the workload and dynamics between the network members. Fourth, through an IO the members can have customised projects within collaboration, i.e., there is no need for compromise or trade-offs between the members' needs. Fifth, from the viewpoint of resources and knowledge management, an IO can bring to the collaboration the advantage of the best practices from the earlier collaboration projects it has been involved in and provide the knowledge of an impartial expert. In all, it could be argued that an IO can bring many different kinds of value creating benefits to the collaboration network, depending on the role or roles it plays in the network. Table 5 summarises the central findings of this paper.

Table 5 An IO as a value enhancer in a collaboration network

IO's role	*Activities*	*Capabilities needed*	*Value creation*
Creator	• Building the network • Finding and connecting partners • Convincing them to collaborate	• Trust from other members • Relationship building skills • Vast social network • Communication skills	• Finding the strategically significant partners • Showing the importance and benefits of collaboration to the potential partners
Coordinator	• Administrating • Organising • Planning • Allocating resources	• Expertise on collaboration processes • Organising skills	• Equality in the workload and dynamics between network members. • Getting the advantage of the best practices from the earlier collaboration projects the IO has been involved in • Members can concentrate on developing and utilising core capabilities
Facilitator	• Organising settings for collaboration	• Expertise on collaboration processes	• Anonymous benchmarking is possible. • Transparency of the network
Node	• Linking members during the collaboration • Maintaining, developing and nurturing internal relationships	• Relationship building skills • Communication skills	• Better relationships • Stronger/tighter network • Committed members • Successful collaboration • Enabling the improvement of the members' capabilities
Resource	• Bringing its capabilities, expertise and personnel for the network to utilise	• Expertise on substance area	• The members can have customised projects within collaboration (no need for compromise or trade-offs between the members' needs) • Access to the knowledge of an impartial expert

This paper has analysed the role of an IO in collaboration networks, where the members aim at superior value co-creation. In the starting phase of this study, the choice was made to apply the models of value-creating networks (Kothandaraman and Wilson, 2001) and value function analysis (Walter et al., 2001) that originally emphasise supplier-customer relationships in the research setting concerning an IO's role in the network. This choice worked well and offered fresh insights to the rather scarce number of studies that

concentrate on the IO's role in the networks. In our future studies, the aim is to gather more empirical data from different kinds of cases involving an IO and further elaborate our research findings. In the future, the interest is to leverage the cases to networks where the network members are co-opetitors, i.e., they co-operate with and compete against each other simultaneously. In addition, the aim is to broaden the scope of the research to also include the phase where the network members are searching for the best possible IO.

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Nr. 7

Why do we need this? Roles in the information systems acquisition legitimation process

by

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Summer 6-15-2016

WHY DO WE NEED THIS? ROLES IN THE INFORMATION SYSTEM ACQUISITION LEGITIMATION PROCESS

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WHY DO WE NEED THIS? ROLES IN THE INFORMATION SYSTEM ACQUISITION LEGITIMATION PROCESS

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Abstract

In information system (IS) acquisition, one of the major challenges is to carry out required changes in the organization. One major problem is the lack of organizational support, user participation and competence. The process of gaining organizational support has been presented as the legitimation process. The legitimation process includes the actions taken by a legitimation seeker to gain legitimation from legitimation providers. In IS acquisition, the individuals' behavioural patterns can be perceived as representing specific roles. Published studies combining these roles and actors in the legitimation process in IS acquisition are rare. Consequently, we will explore the roles in the IS acquisition legitimation process in two cases. As a result, we illustrate how legitimation appears in practice and provide a deeper understanding of how different roles act in legitimating IS acquisitions.

Keywords: Information system, IS acquisition, legitimation process, roles, case study

1 Introduction

Information system (IS) acquisition comprises the procedures that must be taken to acquire IS (Lee, Huynh, Kwok and Pi, 2003). An acquisition, i.e., obtaining an IS for an organisation, is frequently coordinated through projects that follow general IS acquisition process guidelines (Moe, 2014). In the process, different actors, such as *innovators*, *project leaders*, *sponsors*, *gatekeepers* and *implementers* (Heikkilä, Heikkilä and Pekkola, 2008), take various actions to lead, support, transfer information, influence or coordinate the process. These roles provide lenses through which to study the social aspects of IS acquisition and the process of doing it. Legitimation, which is defined as the gaining and granting of approval for something, is emphasised by an often asked question: 'Why do we need this?'

Legitimation has been studied from the perspectives of organizations and society (Johnson, Dowd and Ridgeway, 2006; Ridgeway and Berger, 1986; Suchman, 1995). In the IS literature, gaining legitimation has been perceived as a process to obtain organizational support (Flynn and Du, 2012; Flynn and Hussain, 2004; Hussain, Taylor and Flynn, 2004). However, studies linking the legitimation process to IS acquisition are rare, even though one of the major challenges in IS acquisition is benefit realization—derived from the difficulties to evoke changes in the work processes with the new IS (Moe and Päivärinta, 2011). Through appropriate legitimation, different stakeholders, according to their role in the process, can be influenced. This alleviates the resistance toward the acquisition. The legitimation process can thus be perceived as a significant part of a successful IS acquisition.

As noted in the literature, there are two main actors in the legitimation process: legitimation seekers and legitimation providers (Hussain et al., 2004). Legitimation seekers are usually project authorities, e.g., project team or project leader, who seek support for the IS, whereas legitimation providers are the

IS recipients, e.g., business partners, users and top managers (Flynn and Du, 2012; Flynn and Puarungroj, 2006). In the legitimation process, legitimation seekers are treated as one regardless of how, when and by whom the legitimation is sought. Thus, in this paper, the actors in the legitimation process are viewed through the lenses of their IS acquisition roles. In the IS context, there are five roles*: innovators, project leaders, sponsors, gatekeepers* and *implementers* (Heikkilä et al., 2008). We adopt these roles and use them to understand how the legitimation process is perceived in IS acquisitions and which roles have an impact on the organizational legitimation. The paper considers the following research question: 'How do different roles appear in the IS acquisition legitimation process?' We examine two cases and identify the actors and their roles from the perspective of the IS acquisition legitimation process.

The paper is organized as follows. First, we present related literature and theoretical background information on the legitimation process and the roles involved in IS acquisition. Next, the research settings, including case descriptions and research methods, are reviewed. Empirical findings, discussion and conclusions are presented in following chapters.

2 Theoretical Background

The legitimation process ensures organizational support for upcoming changes. In this process, several actions are taken by the key actors. Next, we will present the legitimation process and roles in IS acquisition separately.

2.1 Legitimation and the Legitimation Process

Suchman (1995) defines legitimacy as *a generalized perception or assumption that the actions of an entity are desirable, proper or appropriate within some socially constructed system of norms, values, beliefs and definitions.* Thus, the legitimacy of an IS acquisition can be defined as the organization's general approval and favourable reception toward the acquisition, its target and the entity responsible for the acquisition. The legitimation process consequently seeks legitimacy for an IS by focusing on the social aspects of information system development (ISD) success (Flynn and Hussain, 2004). Suchman (1995) further argues that ensuring organizational legitimacy can be conducted with three different aims: gaining, maintaining and repairing legitimacy. Gaining legitimacy occurs at the beginning of the project, maintaining legitimacy when granted legitimation is damaged or weakened, and repairing legitimacy when the granted legitimacy is withdrawn (Flynn and Du, 2012).

Hussain et al. (2004) have constructed a Legitimation Activity Model (LAM) which describes the legitimation seekers' activities when seeking organizational legitimacy from the legitimation providers. Therefore, the LAM provides a description of the legitimation process. It is based on the Structuration Theory and the Activity Theory: The Activity Theory provides the processes of development carried out by human practices (Kuutti, 1995) while the Structuration Theory frames the social organization and its three dimensions of structure: signification, domination and legitimation (Giddens, 1984; Jones and Karsten, 2008). In this paper, we do not delve into the background details of the LAM, but examine different roles and their actions in the legitimation process to understand how different actors seek and provide legitimation for the various aspects of IS acquisition.

LAM has eight phases, and two are parallel with the others. The legitimation process can be seen as an interplay between the legitimation seeker and the legitimation providers (Flynn and Hussain, 2004), as illustrated in Figure 1.

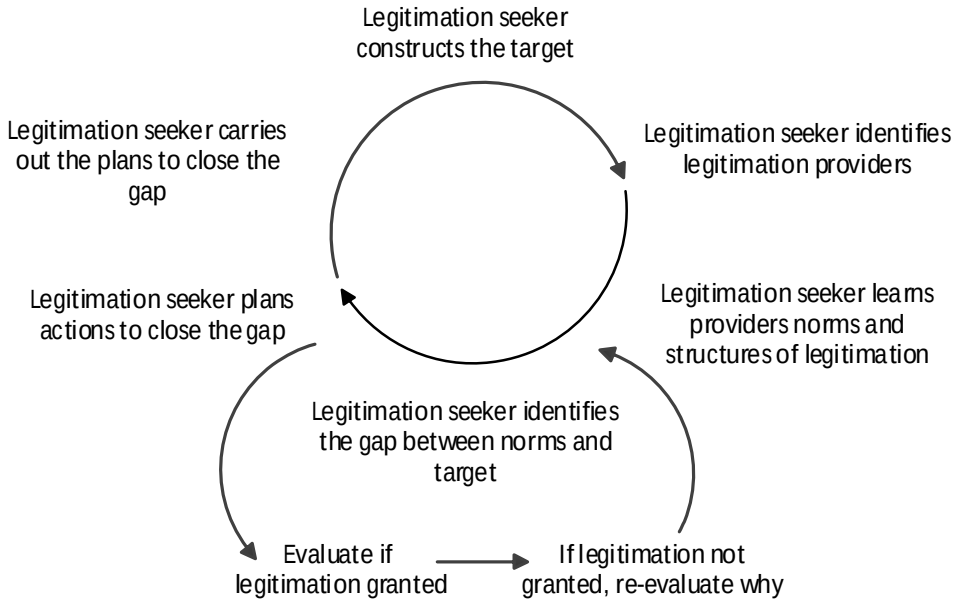


Figure 1. Legitimation activity model (Hussain et al., 2004).

In the LAM (Figure 1), the legitimation seeker is a person carrying out the legitimation seeking phases. The legitimation seeker constructs the target (Hussain et al., 2004), i.e., describes the IS characteristics and the predicted effects on the organization (Flynn and Du, 2012). By constructing the target, the legitimation seeker generates a desired legitimation structure, i.e., formulates the routines, beliefs, cultures and practices which underlie the target (Flynn and Du, 2012; Hussain et al., 2004). Then, the legitimation providers and their norms and legitimation structures are identified. The legitimation seeker explores the gaps in legitimation structures and norms between the target and the legitimation providers. Appropriate actions are planned and carried out to close these gaps (Hussain et al., 2004). Throughout the process, the legitimation seeker evaluates whether legitimation is granted by the legitimation providers, and if necessary, re-evaluates and corrects actions in the future rounds of the legitimation process (Flynn and Du, 2012). Strategies, legitimation providers and actions change among gaining, maintaining, and repairing the legitimacy. Although Flynn and Du (2012) have claimed that the LAM mainly describes the legitimation gaining actions, maintaining and repairing actions can be carried out simultaneously.

2.2 Roles in IS Acquisition

When examining roles related to IS, one must specify on which level the roles are discussed. Zhu and Zhou (2008) have identified multiple layers of roles related to IS, depending on the perspective: from the viewpoint of programming and modelling all the way to the perspective of human users. The highest layer in the hierarchy of roles is the layer of social roles, which relates to the role theory (Zhu and Zhou, 2008). Role theory defines roles as 'characteristic behaviour pattern' (Biddle, 1986). In this paper, the focus is on individuals playing specific roles that influence the IS acquisition, and thus the viewpoint is on social roles.

Procurement is another term used alongside the term *acquisition*. In some cases, the two words are used almost synonymously. Procurement means, in general, the technical process of actually getting a

needed service or product. Acquisition[1] tends, sometimes, to have a broader, more strategic meaning ('Procurement-Defense Acquisition Glossary [DAP]', n.d.). In this paper, we chose to use the term acquisition to emphasize the broader and more meaningful role of the IS for an organization and the significance of the process by which the system is obtained for an organization.

Individual actors' roles in innovations, implementations and new technology adoption influence the success of the action (Howell and Higgins, 1990; Kimberly and Evanisko, 1981). The most commonly identified role is *champion* (Beath, 1991; Esteves and Pastor-Collado, 2002). Champions are acknowledged in decision-making (Boonstra, 2003) and even as success factors in IS projects (Beath, 1991; Esteves and Pastor-Collado, 2002). However, other significant roles exist as well. Heikkilä et al. (2008) have identified five roles in the business networks: *innovators*, *champions* (divided into *project leaders* and *sponsors*), *gatekeepers*, and *implementers*. *Innovators* are creative individuals who act in innovative ways on behalf of the organization, not only in specific designated tasks (Welbourne, Johnson and Erez, 1998). *Gatekeepers* are boundary spanners who gather information and influence both internal and external actions for the organization (Nochur and Allen, 1992). *Sponsors* grant the top management support, and they help the project overcome difficulties (Heikkilä et al., 2008). *Implementers* coordinate the actual implementation but also influence the organization's expectations and perceptions of the upcoming implementation (Adam and O'Doherty, 2000; Heikkilä et al., 2008).

These roles and their main tasks in IS acquisition are found in Table 1.

Roles	**Main Tasks**	
	Business Networks	**Addition in IS Acquisition**
Innovator	Launches the basic idea	Ensures that the focus is on the big picture
Project Leader (Champion)	Organizes and enthusiastically promotes the project through critical stages	Leads requirement specification, tendering, vendor selection, agreement negotiations and implementation of project
Sponsor (Champion)	Grants top management support and helps the project overcome difficulties	Grants top management approval
Gatekeeper	Ensures information flow among various parties	Identifies needs, explores possible vendors and solutions
Implementer	Coordinates the implementation	Influences users' impressions of the acquisition and the new system

Table 1.Roles and their main tasks in business networks and IS acquisition (Heikkilä et al., 2008).

The importance of the *champion* in the IS context has been acknowledged (Beath, 1991; Esteves and Pastor-Collado, 2002; Roure, 2001). However, Heikkilä et al. (2008) divide the role into *project leader* and *sponsor* as *champions'* actions and responsibilities can be various. All these roles have to be

[1] 'The conceptualization, initiation, design, development, test, contracting, production, deployment, logistics support (LS), modification, and disposal of [..] systems, supplies, or services (including construction) to satisfy [..] (defined customer) needs.' ('Procurement-Defense Acquisition Glossary [DAP]', n.d.)

played by individuals for a successful outcome (Heikkilä et al., 2008). However, published studies related to IS acquisition roles are rare. This argues the need for further research and motivates our current study.

3 Research Settings

This case study includes two cases, one from a social services organization in the public sector and the other from a global industrial company in the private sector.

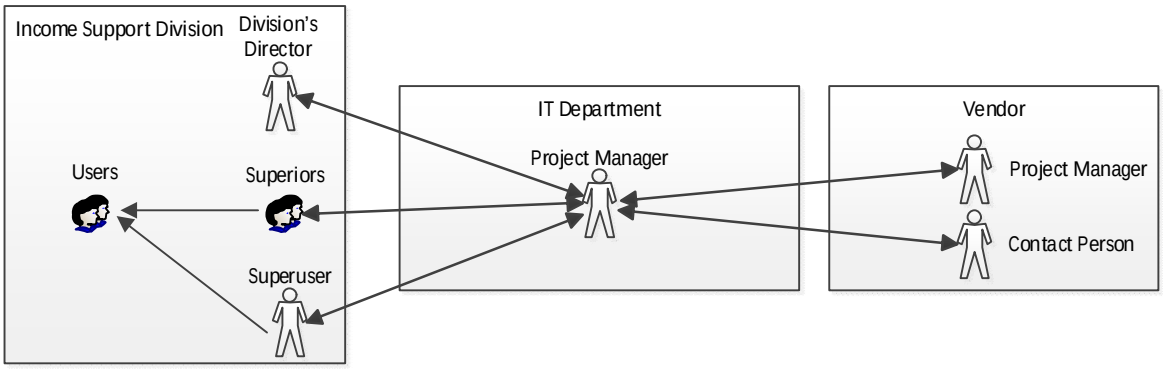
3.1 Case A: Social Services, Income Support Division's IS Acquisition

Case A is the income support division of a municipality. The division processes all the income support applications from a specified geographical area. Executive personnel consist of immediate superiors and application handlers. The division acquired, with the help of the municipal IT department, a system for submitting and handling electronic income support applications.

The IS acquisition originated from legislation that requires the municipalities to offer their services electronically whenever possible. Additionally, the municipal council committed to providing the services electronically. The division conducted a large survey of its customer base and discovered that most of the customers think positively about applying for income support electronically. The project manager stated that *'It is interesting that 91% indeed said that they are interested to patronize electronically.'* Furthermore, handling applications electronically was expected to create significant savings for the division.

The acquisition was launched by the division's director and the assigned project manager from the IT department. In addition, the project team included users and a superuser, i.e., application handlers. The

Figure 2. Case A Actors and Organizations.



selected vendor was well-known to the client as the previous system had been purchased from them. The actors and organizations are presented in Figure 2.

Figure 2 shows how the parties communicated. The project manager communicated with the division superiors and the superuser, and they communicated with the users. The project manager communicated with the vendor and transmitted the division's requests. *'He [project manager] does his own filtering and evaluates which development ideas could be implemented'*, stated the person assigned to work with the vendor. The vendor was not in direct contact with the users during the acquisition phase of the project.

3.2 Case B: HR Department's IS Acquisition

Case B is the human resources (HR) department in a large, global industrial company. The HR department includes multiple specialists who have been assigned to different groups according to their main focus, e.g., calculation of wages or bonus programs. The group managers are called *concept owners*. The HR department acquired a new global, cloud-based HR system from an internal IT department.

The IS acquisition was driven by the urgent need to standardize HR processes and to integrate numerous separate systems universally used in HR tasks into a single system. In addition, the existing systems were becoming obsolete and expensive to maintain.

The HR department launched the idea of acquisition under the leadership of the HR department's IS head. They explored the vendors and systems in the HR field and identified possible partners and systems. Before the acquisition was formally decided, the company encountered significant changes in their organizational structure. The HR acquisition was put on hold. Later, the IT department raised the idea of the HR system acquisition again and took the lead in the acquisition project. Based on the HR's annual task listing, the acquisition had a tight time frame to be implemented within six months.

Consequently, the IT department decided to rely on their close ICT provider partner. IT department employed a program manager outside the organization to lead the project. The acquisition was controlled by the IT department, but the development was done in cooperation with the HR department's different groups and the provider. The actors and organizations are presented in Figure 3.

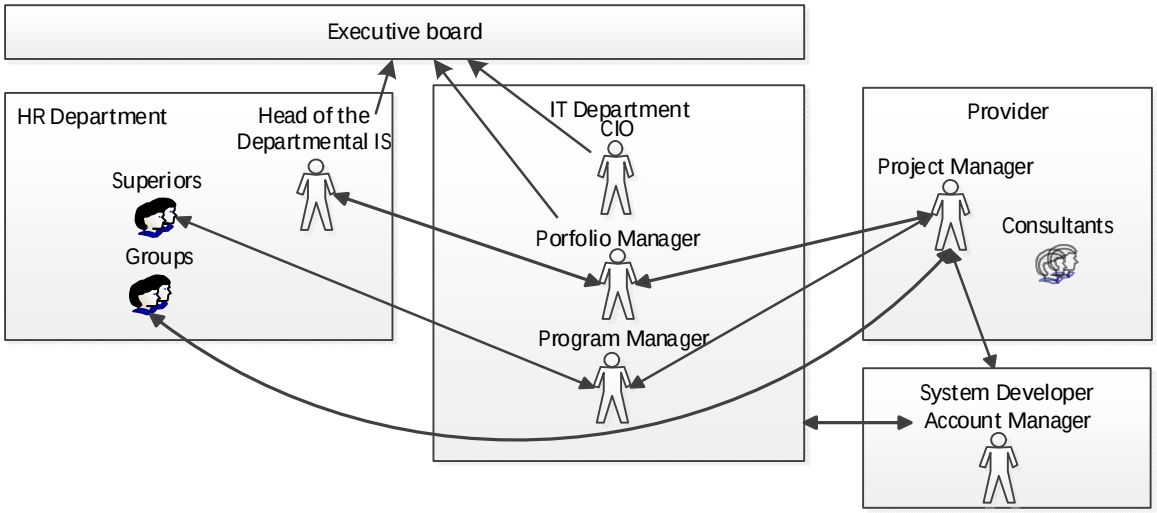


Figure 3. Case B Actors and Organizations

Figure 3 shows communication connections among the involved parties. Acquisition management was located in the IT department with the program manager. Technical configurations were done by the HR department's groups and the provider's project manager. *'Personally I have nothing to do with our IT people. But our [HR] project management has been discussing with them. So yes, this is in a way IT's acquisition. Our own IT has not been participating in these specifications and configuration related work,'* stated the concept owner. In fact, the HR department did not appear to have any ownership of the acquisition. This seemed challenging, especially from the provider's viewpoint. The client organization members also had other ongoing relations with the system developer. Thus, they had separate relations with the account manager with whom they agreed on system licenses. The provider act-

ed as an integrator. Inside the IT department, the CIO and portfolio manager were responsible to the executive board for the acquisition, and the program manager was employed by the portfolio manager to act as project manager.

3.3 Research Methods

The study is a qualitative and interpretive case study (Klein and Myers, 1999; Walsham, 1995) with two cases. The previously presented literature was utilized as a lens through which to view the roles and the legitimation processes of the cases. However, in parallel, we discerned emerging roles and actions in the process.

The data was collected via in-depth interviews. The interviewees were selected because they were the major actors in both cases. Initial interviewees were appointed by our contact person, and the following interviews were selected by purposive snowball sampling (Teddlie and Yu, 2007). The interviewees are listed in Table 2 by organization and position.

Case A	**Organization**	**Position**
	Division	Division's Director
	Division	User and superior
	IT Department	Project Manager
	Vendor	Person in charge
Case B	IT Department	Portfolio Manager
	IT Department	Program Manager
	HR Department	Concept Owner
	HR Department	Head of the Departmental IS
	Provider	Project Manager

Table 2. Interviewees according to organization and position.

The interviews, targeted to understand the cases in-depth, were at the point when both cases had progressed to the implementation phase. Thus, this study focuses retrospectively on the acquisitions. All of the face-to-face interviews were approximately one hour in duration, and they were recorded and transcribed for later analysis.

The data were analysed by using the interpretive approach as the literature supplied a method to detect the roles and legitimation actions. The data were coded when the roles and legitimation actions appeared. Both cases were first analysed separately by two authors. Later, the results were dissected jointly by all the authors.

4 Empirical Findings

Next, both cases are presented separately.

4.1 Case A: Social Services, Income Support Division's IS Acquisition

The acquisition of an electronic income support system was initiated by multiple needs and sources: the legislation required that *'There is an act on electronic services and communications in the public sector'*, (project manager); the municipal council had committed to it, *'The council members required*

us to take action in utilizing electronic solutions', (division director); the customers were demanding it, *'We had multiple customers who had been asking why they cannot send applications electronically'*, (a superior); and the income support division's director was IT-driven and interested in investing in it, *'I had been waiting for this, and I knew that this needed to be invested in. I was indeed enthusiastic'*.

The acquisition was launched by the division's director and a project manager from the IT department. Both were enthusiastic and motivated to carry out the acquisition. They benchmarked the possibilities of the electronic application handling system and contacted the vendor with which they had a close relationship. They informed the organization about the upcoming acquisition, ordered a system presentation and invited users to consider if the system would be helpful in their work environments. *'When the presentation was over, these workers, who were reflecting the system against their work practices, gave us feedback. And then we were like "Oh shoot! This won't work for us"',* stated the division director. Thus, the acquisition was halted until the system was redeveloped to correspond to the division's needs. *'We did not buy any chargeable development work. We perceived that this is a product, which the vendor is committed to develop',* the project manager explained. The vendor developed an appropriate system in a year and a half. *'[Municipal name] has been waiting for us to develop and finish all the needed features from their perspective, and then have taken the product on their procurement list,'* noted the person in charge on the provider side.

When the acquisition was reinitiated, the project team was composed of the same people previously involved. In addition, they assigned two civil servants (application handlers) to the project. The project also had separate steering and design groups. The steering group included the division's director, municipal management and representatives from the vendor. The design group, which was closer to the project work, included the division's director, project manager and the division's superiors. The Project manager was a strong project leader throughout the acquisition. He acted as liaison between the division and the vendor, and he had the resources and competencies to fulfil this role. *'In these [municipal] acquisitions, the project manager is always that kind of person, which you can really call not only a specialist of the substance but also of information systems,"* said the vendor representative.

Throughout the acquisition, the project manager and other design group members collected and shared information among all stakeholders. *'When they [workers] asked, I translated it to a plain language'* stated the division director. At the same time, they legitimated upcoming changes and engaged personnel to the new system. The division director explained: *'I engaged our units' superiors. In addition, I asked feedback from them: What does this look like, does this help, or does it just complicate the practical work, and what should be done?'* The superiors informed their employees and collected opinions. *'Of course they asked what is this supposed to be and why is it coming, but when I told the reasons, they were all okay, all right—I sometimes asked opinions of what they think and what should be taken into account. Even though they have not been in the design group, they had the opportunity to be involved and they knew what was going to happen',* said one superior. In the end, the whole organization was committed to the new system. The project groups were competent and active. *'For sure, some would have probably preferred to do something else, but they were still committed*', reported the division director).

However, the system was only partly implemented in time. Some features did not work properly in the customer environment. Their implementation was delayed. An application handler actively trained system users and ensured that everyone participated in the training. If not, she separately trained the ones who did not participate. She also acted as the primary support person when the actual use of the system was initiated. *'That this worked out this well was more or less due to the fact that we had this kind of application handler',* said a superior. *'On the perspective of implementation success, an important factor is, that right after the beginning, there is a support person available immediately when users are handling the customer process"*, the project manager pointed out.

The acquisition was launched by the division director and project manager from the IT department. These two individuals played the role of *innovators*. Even though the division's director did not partic-

ipate actively in the acquisition project, he was a member of the steering group ensuring that the new IS satisfied the initial needs. His position in the organization ensured the support of top management. Thus, he acted as a *sponsor*, too. The project manager actively led the acquisition and acted between the vendor and the users, i.e., he played the roles of *project leader* and *gatekeeper*. He shared information between the parties, but at the same time, filtered it appropriately. The superiors who participated in the project shared information with the users and gathered opinions, i.e., acted as *gatekeepers* between the project manager and the users. The project manager led the implementation phase, but the application handler trained and assisted the users. They each exerted a powerful influence on the implementation phase. In addition, the superuser influenced the way the users perceived the upcoming IS throughout the acquisition. Therefore, both played the role of *implementers*.

4.2 Case B: HR Department's IS Acquisition

The acquisition of a new global HR system derived from the obsolete and scattered existing systems. The organization was using outdated technology and local differences occurred. The IT department, which led the acquisition, argued for the acquisition by invoking the financial savings, uniform processes and the advantages to the superiors. The decision to invest in the company's HR systems had been made five years before the actual acquisition began. After the decision, the organization faced significant changes in its structure. Large investments were too expensive to carry out at the time of the relaunch. The portfolio manager put it this way: *'When listening to our general director or analysts who report how our industry is doing nowadays, I believe that this size investment, five to seven million, would have never been launched'*. The IT department, which had relaunched the idea of acquiring a new HR system, split the investment into three releases in order to gain the approval from the executive board. They negotiated investment approval for the first release and negotiated approval for the remaining two releases. The IT department demanded features which generated the most advantages to superiors around the organization in the first release. *'Five years ago, the roadmap was very IS specific. Now we showed with it the advantages to whole organization. With that we strived to prove to the contrarians that this is a big investment but also worthwhile for real'*, said the portfolio manager. The acquisition was approved by top management.

When the initial decision to invest in HR systems was made, HR outlined possible systems and vendors. When the acquisition was relaunched again a year later, the IT department took the lead. The acquisition had a very tight schedule, derived from the anniversary clock of the HR processes. Thus, the IT department perceived that the best chance for success was to rely on a close partner. *'The RFP [request for proposal] work was bypassed, which is certainly not the way a project generally heads off, especially if the customer has participated in the RFP round and is thus committed to the project. We were forced to choose a partner who had worked with us earlier because it allows us to start the project faster'*, explained the program manager. The HR department had mapped out and described all their processes. They assumed that the new system would be configured purely based on these documents. The head of the HR department's IS described the situation: *'We had expectations, because we had been doing it for so long, and for our part we were so damn ready. We had everything modelled, and we had all swim lines about who does what in processes in our PDFs'*.

The ownership of the acquisition was designated to the HR department. Yet the project was led by the IT department. In addition, the program manager was employed outside of the IT department. When the acquisition was relaunched with a tight schedule, the IT department requested the provider of the selected system to be their close partner. The IT department negotiated the agreements and requirements with the provider and system licenses with the vendor's account manager. HR expected to receive a complete system. They assigned no personnel to the project. However, the IT department assumed that the provider and HR department configured the system and acted in concert. The shortages in the information flow were especially challenging to the provider's project manager. *'I don't see that the messages have been transparent either for HR or for us. For instance, about what has been done or agreed in the agreement phase. Maybe that, for example, what is our responsibility, what is as-*

sumed to be the IT department's responsibility and what is HR's', the project manager complained. From the provider perspective, there did not seem to be a project owner, or somebody in charge of the entirety, in the HR department, although there was a person responsible for HR IS in the steering group.

The project was divided into three iterations. The first iteration started with the details. The provider project manager and consultants did not have a system prototype from which they could demonstrate the system's features and details. Instead, they had a list of potential features on a spreadsheet, which they went through point-by-point with the HR people. The customer side did not understand the list they were asked about, and HR personnel participating in the project got frustrated with the provider's project manager. *'HR was completely lost: "Now we are asked already what kind of tapestry we want, when we don't know is it a bathroom or living room"'*, according to the program manager. The relationship between the parties suffered greatly in this first iteration. HR employees refused to work with the provider and began to withhold information from his personnel. The program manager in the IT department received threats and was blamed for the work she had done. The IT department felt that the HR department was a very difficult partner for collaboration. The program directed stated it bluntly: *'I do not know what they were aiming for, but you can clearly see that "I don't know you, I don't trust you". It was shown in their behaviour'*.

Because of these conflicts, the IT department was forced to request a new project manager from the provider. The new project manager was a person whose working habits differed significantly from the previous one. *'He [project manager] has run those stairs back and forth, visited every room. It demanded personal devotion, what our other project manager couldn't do'*, said the program manager. The new project manager was familiar with the client organization and already knew some of the HR personnel from previous projects. He led the project in totally different manner. He recalled that '*We stated that, yes, this is in a way a message, as if in hockey changing the goalie. It was an awakening'*. The new project manager succeeded in getting the HR department to participate in the project again. Some strong individuals arose among them. *'If somebody does not take the flag as Jeanne d'Arc and leave for barricades, how do you get the masses with you? We had few rounds but eventually few big characters took the lead'*, the portfolio manager recounted. All this resulted in the project staying on schedule. Nevertheless, some personal relationships suffered and the willingness to cooperate in the future is unknown.

The idea for the acquisition was initiated in the HR department. However, the acquisition was relaunched by the IT department. Thus, both HR and IT departments, and more precisely the head of the HR department's IS and the CIO, played *innovators*. The project lead was firmly located in the IT department. Thus, *project leader* roles were played by the program manager and the portfolio manager. The missing ownership in the HR department was perceived as problem from the provider's viewpoint. It can be argued that there should have also been a project leader in the HR department. The program manager ensured cooperation between the HR department and the provider, but did not actively participate in the configuration work. She acted partly as a *gatekeeper* by ensuring the information flows, but was not active enough in sharing and collecting information. She, as well, coordinated the rollout and influenced how the users perceived the upcoming IS project. Thus, she also played the role of an *implementer*.

5 Discussion

In the beginning of an IS acquisition, the actions to seek legitimation are emphasized, as shown in the cases when the initial ideas were launched. Consequently, *innovators* and *sponsors* take actions to create and gain legitimation for the initial idea. *Innovators* use various strategies in seeking legitimation. In Case A, the need and legislative pressure provided strong arguments for the *innovators*. In Case B, the IT department *innovators* broke the large investment into smaller releases, thus gaining top management's support with financial arguments in addition to functional needs. In both cases, the target was constructed by taking into account the underlying assumptions and expectations. In Case B, the

innovators split the large investment into releases to decrease the investment costs in order to gain the executive board's approval. These actions can be perceived as constructing a target, identifying legitimation providers, understanding norms and closing the identified gap between the legitimation structures. *Innovators* are often users of the IS; thus, they seek, maintain, repair and provide the legitimacy for and from the line organization and other users. Additionally, in the later phases in IS acquisition, the *innovators* ensure that the focus is on general guidelines. They maintain the legitimation by concentrating on initial goals. This is evident in both cases, but in different ways. In Case A, the other *innovator* was the division director. He gained legitimation from a superior, whereas the superiors gained legitimation from the users. In Case B, the IT department's initial *innovator* did not maintain or take into account legitimation from the HR department; thus, the project was from the start heading to a dead end.

In IS acquisitions, *project leaders* and active *gatekeepers* are often designated to the acquisition after top management support is granted. Consequently, they are not as visible in the beginning of the acquisition. However, *gatekeepers* may also be self-determined. They might take major actions in seeking legitimation by sharing and collecting information outside the organization at the beginning of the acquisition process, as in Case A where the later designated project manager aided the division director gain municipality approval for the acquisition on behalf of the IT department.

The *project leader* leads and manages the acquisition project through challenges and obstacles by enthusiastically and aggressively promoting the project. Thus, the *project leader* maintains and repairs legitimation throughout the project after its initiation. The *project leader* maintains and repairs granted legitimation from every stakeholder: top management, line organization, project team and all business partners. For example, in case B, the *project leader* was seen to be a legitimation seeker. When the former project manager had weakened legitimation in the HR department, the new project manager had to actively contribute to repairing and maintaining it. The *project leader* can be perceived as an obvious candidate for a legitimation seeker. However, the *project leader* cannot act properly if the information flow among the parties is obstructed, as shown in Case B when the former project manager tried to lead the configuration. Thus, the role of *gatekeeper* appears significant. Legitimation seeking and management require appropriate communication among the participants, and a diverse set of techniques is needed to understand cultural and nonverbal meanings and meaning-laden actions (Suchman, 1995). Therefore, *gatekeepers*, who ensure that the information flows among the parties, are significant not only in legitimation seeking, but also in maintaining and repairing legitimation throughout the life of the project. In Case A, the *gatekeeper* role was designated to the project manager who filtered the information appropriately and ensured its flow among the parties to foster efficient cooperation.

The *implementer* is emphasized in the rollout phase of the new IS. The *implementer* maintains and repairs legitimation in parallel with the other roles. The *implementer* does not have as active of a role in the IS acquisition as is the case in other roles, but his or her influence cannot be ignored as is vividly shown in Case B. *Implementers* influence the ways the organization perceives the upcoming IS and required changes, but their actions are rarely visible or deliberate. Thus, the *implementer* may not be a significant actor in the legitimation process, but the role has influence, which is often accentuated or hindered by the other roles. Table 3 lists the legitimation actions taken by different roles.

	Innovators	**Project Leaders**	**Sponsors**	**Gatekeepers**	**Implementers**
Legitimation Seeker	Seeks legitimation for the initial idea Seeks, maintains and repairs legitimation for and from users	Maintains and repairs the legitimation throughout the project	Seeks legitimation for the acquisition from top management	Seeks, maintains and repairs the legitimation by ensuring information flow among parties	Maintains and repairs the legitimation throughout the rollout
Legitimation Providers	Provides legitimation from users		Provides top management support		

Table 3. IS acquisition roles and actors in legitimation process.

As shown in Figure 1, the legitimation seeker's actions are emphasized in the IS acquisition legitimation process. However, some roles may also appear as legitimation providers, in parallel with legitimation seekers.

The actions that seek to maintain and repair the legitimation process vary in the different roles. *Innovators* launch the initial idea which is often generated from apparent needs within the organization. The acquisition is launched almost directly after the need is identified if the *innovator* is high in the hierarchy and can provide top management support. Under the circumstances, the *innovator* plays the *sponsor* role simultaneously. Other *sponsors* reinforce the acquisition with financial arguments, organizational needs and by presenting streamlined processes to the top management. *Project leaders* use various arguments and actions for the IS acquisition success depending on the situation and context. The *project leader*, together with the *gatekeeper*, or the same individual playing these roles concurrently, ensures legitimation from the stakeholders by taking appropriate actions and sharing information among the involved parties. For example, in Case B, the *project leader* repaired the organizational legitimacy of the IS acquisition by making personal contact and communicating with all key users on the client side. The *implementer* maintains and repairs the legitimation primarily in the implementation phase of the new IS. The actions and results shown for the client organization are vital for the legitimation.

6 Conclusion

In this study, we have identified different roles in the IS acquisition legitimation process. We noticed that different actions and arguments depend on the legitimation seeker's role in the acquisition. It was evident that in Case B, the acquisition project would have failed without the project manager replacement and without the active contribution to repair and maintain the legitimation among users by the new project manager. Thus, the *project leader* role is emphasized as a legitimation seeker throughout the acquisition project. However, other roles are also significant. The *innovator* seeks initial legitimation for the IS acquisition and maintains and repairs the legitimation among users. When the *innovator* is also a user, the role also provides immediate legitimation. The *sponsors* seek legitimation through top management support, especially in the beginning stages of the acquisition. The *gatekeeper* ensures the flow of information and, thus, seeks, maintains and repairs legitimation while encouraging appropriate communication among the involved parties. The *implementer's* actions are emphasized in the implementation phase where the actions are crucial in maintaining and repairing legitimation.

Our study was conducted as a multiple case study with only two cases. The results should be viewed with certain considerations. Both cases are from the same country, which means that cultural aspects may vary in other contexts. Also, in both cases, there was an obvious need for the new IS. Legitimation seeking may have been easier than it would be in organizations where the upcoming change is refused. Consequently, the study should be replicated in different IS acquisitions and contexts.

We deliberately decided not to concentrate on specific strategies or actions in the legitimation process. These aspects indicate the need for further research. Especially in IS acquisitions, the user participation and information communicating and sharing are said to affect the success of adapting new technology (Lynch and Gregor, 2004; Orlikowski and Gash, 1994). It can be argued that these aspects are linked to the legitimation process as actions and strategies by the legitimation seeker. Therefore, specific actions and strategies in legitimation seeking argue for future research. Our focus has been on the legitimation seeker and was derived from the active roles contributing to seeking, maintaining and repairing legitimation. However, the legitimation process also includes legitimation providers, which have not been studied in the context of IS acquisition. Thus, future research could also focus on those who are the major legitimation providers in IS acquisitions.

In this paper, we have taken the actors in Hussain et al.'s (2004) legitimation process with seeking, maintaining, and repairing actions to a more specific level and context: IS acquisition. In the previous literature, the key actors in the legitimation process were limited to legitimation seekers and providers. However, in the context of IS acquisition, *innovators*, *project leaders*, *sponsors*, *gatekeepers*, and *implementers* act as legitimation seekers, thus expanding the legitimation seeker's actions. This expands the LAM to a broader set of stakeholders. Our theoretical contributions are twofold: a deeper understanding of the legitimation roles and activities in IS acquisition and a larger inclusion of the actors in the LAM. Understanding the legitimation process helps practitioners in IS acquisition. With that understanding, they may be better equipped to answer the simple and legitimate question of 'Why do we need this?'

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ISBN 978-952-15-4005-9
ISSN 1459-2045