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Coordination and Knowledge Creation in Public Procurement

Master's Thesis

Espoo, September 25, 2013

Supervisor: Professor Riitta Smeds

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Aalto University School of Science Degree Programme in Information Networks	ABSTRACT OF THE MASTER'S THESIS

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Abstract:

Operations of Finnish cities are increasingly based on procured products and services. The products and services are procured in procurement projects, guided by legislation. The public procurement projects are prepared in a collaboration of procurement expert and substance experts. Participation of the procurement expert is needed to ensure that the procurement project complies with the legislative requirements and participation of the substance experts is needed to understand the need for the product or service.

In this thesis, the collaboration between the procurement and substance experts in the preparation phase of the public procurement process is analysed using coordination and knowledge creation theories. The collaborative relationship requires coordination because the tasks of the experts are interdependent. The procurement experts and the substance experts have to work together to create product definitions that enable procurement of a suitable product or service, and that comply with the regulation. The collaboration between the experts requires knowledge creation and surpassing of the knowledge boundary between them.

The data collection was made in workshops, and in longitudinal interviews concerning three procurement projects. Based on the analysis of this data, three success factors of efficient coordination and knowledge boundary crossing in public procurement are identified: (1) recognition of the reciprocal interdependencies and pragmatic knowledge boundaries, (2) shared understanding between the experts and (3) continuous management of the procurement process. In addition, the thesis extends existing literature by presenting a theoretical construction, which connects the theories of coordination and knowledge creation.

Keywords: coordination, knowledge creation, public procurement

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Tiivistelmä:

Ostettujen tuotteiden ja palveluiden merkitys Suomen kaupunkien toiminnassa kasvaa. Näiden tuotteiden ja palveluiden ostaminen tapahtuu julkisen hankinnan projekteissa hankintalainsäädännön mukaisesti. Usein hankintaprojektin valmistelu tapahtuu hankinta-asiantuntijan ja substanssiasiantuntijoiden yhteistyössä. Hankinta-asiantuntijan tehtävänä on varmistaa hankinnan lainmukaisuus ja hankinta-asiantuntemuksen hyödyntäminen, kun taas substanssiasiantuntijoita tarvitaan tuotteen tai palvelun tarpeen määrittelemiseksi.

Hankinta-asiantuntijan ja substanssiasiantuntijoiden välistä yhteistyötä on tässä diplomityössä analysoitu koordinoinnin ja tiedonluonnin teorioiden pohjalta. Koordinoinnin teoria auttaa tarkastelemaan asiantuntijoiden tehtävien välistä riippuvuussuhdetta. Tämän riippuvuussuhteen takia asiantuntijat eivät voi kokonaan jakaa tehtävää, vaan joutuvat työskentelemään yhdessä muodostaakseen tarjouspyynnön, joka sekä tuottaa halutun lopputuloksen että on lainmukainen. Tiedonluonnin teoria puolestaan mahdollistaa yhteistyön tiedonluontiin ja tietorajaan liittyvien haasteiden tarkastelun.

Tutkimuksen empiirinen aineisto kerättiin työpajoissa ja haastatteluissa, sekä vuotta myöhemmin suoritetuissa seurantahaastatteluissa. Aineisto käsittelee yhden kaupungin kolmea hankintaprojektia. Aineiston analyysin perusteella tunnistettiin kolme koordinoinnin ja tiedonluonnin menestystekijää hankintaprosessin valmisteluvaiheessa: (1) vastavuoroisten riippuvuussuhteiden ja pragmaattisten tietorajojen tunnistaminen (2) yhteinen ymmärrys asiantuntijoiden välillä ja (3) hankintaprosessin jatkuva johtaminen. Lisäksi diplomityö laajentaa olemassa olevia teorioita esittelemällä teoriakonstruktion, joka yhdistää koordinoinnin ja tiedonluonnin teorioita.

Asiasanat: koordinointi, tiedonluonti, julkiset hankinnat

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This project started over two years ago. Back then I believed that the most valuable part of the project will be the end result, the thesis. During the project, it became evident that there is no way the thesis could reach the value of all the lessons learned during the project. Right from the start fantastic people at Enterprise Simulation Laboratory SimLab welcomed me with sincere support, friendliness, hilarious jokes and intellectually inspiring debates. The supervisor of this thesis, Riitta Smeds deserves great thanks for guidance, support and especially for forming such a great community.

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The extraordinary atmosphere of the SimLab community enabled me to reach for an ambitious goal. The most difficult part of the process proved to be to explain what the goal is, but still numerous people volunteered for helpful discussions and gave great help in the search of right theoretical background. I want to thank the team members for the research project that was much more fun than I could have imagined. Specifically, I want to thank Soile for her catching positive attitude toward life in general.

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Espoo, September 25, 2013

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I INTRODUCTION

1 Background and introduction

1.1 Background

Operations of Finnish cities are based extensively on procured products and services. This makes the operations interlocked with the procurement contracts. The contracts and the interface between the public organization and the supplier have a decisive effect on how the public organization is able to operate during the contract period.

Almost all procurement contracts of significant value have to be awarded through competitive tendering because of the legal regulation. The tendering process is laborious and requires detailed knowledge about the regulation. Moreover, the most commonly used procurement procedure, *the open procedure,* requires that all significant qualities are defined already in the request for tender, pursuing equal and non-discriminating treatment of the suppliers. Because the tendering process is laborious, several year contract periods are a common practice.

The need for internal development and changes in organization's operational environment make sure that the organization cannot ossify. As the operation of the public organization is dependent on and interlocked with its procurement contracts, there is a constant need for a considerate management of the procurement contracts and their preparation. This procurement management has become more vital as the value of procured products and services has surpassed the total staff costs in major Finnish cities.

The preparation of request for tender is an influential phase, where the products and services and related processes are defined for the forthcoming years of contract period. In addition, the regulation of public procurement adds further requirements on what kind of definitions are allowed. This preparation of request for tender often requires input from different specialists and the organization of their collaboration is a central challenge.

This thesis describes and analyses three cases with three different ways of organizing the specialist work in the preparation of requests for tender. The data collection was made in several rounds. The first rounds focused on understanding how the procurement work was organized in the three case projects. These data collection rounds were followed by

participatory process development intervention. An additional data collection round was done a year later to get a longitudinal view on the development of the case projects.

1.2 Phases of public procurement project

The tendering process requires detailed knowledge about the public procurement regulation. Many larger cities in Finland have a specific procurement unit for the execution of the procurement process, but the distribution of work between the procurement unit and departments varies greatly from city to city. The empirical data of this thesis is collected in a Finnish city which is among the ten largest cities in Finland by population. The procurement unit of the city is called *procurement centre* and the data collection focused on three procurement projects where the procurement centre was involved.

The simplified version of the public procurement process in Figure 1 illustrates its basic phases. The procurement project starts with the preparation phase, where a request for tender is written. The request for tender defines the product or service to be procured. Consequently, all the key decisions of the procurement project have to be made before the request for tender is published along with the contract notice, starting the tendering phase. Tendering phase ends when the contract becomes final. The actual product or service is delivered in the contract follow-up phase.

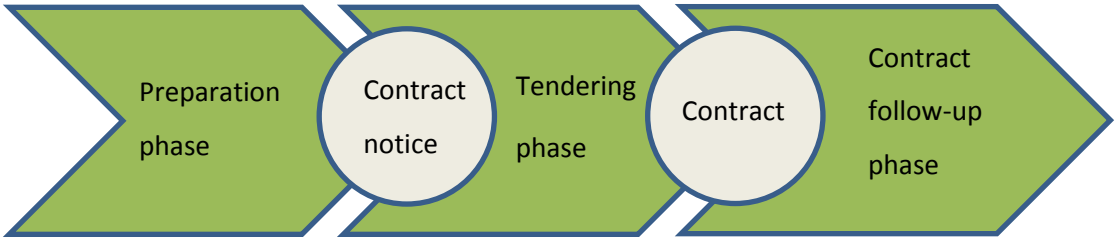

Figure 1 Phases of the procurement process

The procurement regulation tries to ensure the equality, non-discrimination, transparency and proportionality of the process. These requirements have to be complied in every step of the procurement process. Additionally, the regulation states quite accurately how the tendering phase has to be executed.

In this thesis, the continuum from the preparation phase to the tendering phase and to the contract follow-up phase is called *a procurement project*. The three cases of this study are based on data from the preparation phases of three procurement projects.

1.3 Theoretical positioning

The public procurement is heavily influenced by the legal regulation and public administration. In this thesis, however, the regulation and administration are seen only as characteristics of the studied case, not as a focus of the study itself. The viewpoint of this thesis is organizational. Organization theory is focused on the methods of organizing work in organizations and on the consequences of these methods. Even when the context and purpose of organizations differ, the ways of organizing may follow similar patterns and cause consistent consequences. This approach makes it possible to apply understanding and knowledge between different functions and different organizations.

An organization combines people to achieve a shared purpose when the achievement requires efforts of more than a few individuals. The shared purpose is achieved through a division of labour. The separated tasks that are interdependent with other tasks and therefore the interdependencies between the tasks have to be coordinated. (Galbraith 1977, p. 3) This coordination challenge is studied by coordination theory, which is also a central theoretical starting point for this thesis. Early attempts to make coordination more efficient focused on the job specialization and standardization, for example Taylor's Scientific Management movement after World War I (Mintzberg 1979, pp. 73-74). Later, coordination theory has expanded to cover also more informal ways of coordination (e.g. Okhuysen&Bechky 2009). Central ideas of coordination theory focus on different organizational structures. This thesis focuses on the structures as well as on their emergence, inspired by the literature of emergent strategies (Mintzberg&Waters 1985). The second theoretical base of the thesis is formed by the theories of knowledge creation. While the coordination theory focuses on the tasks that individuals execute together while each one conducts a separate task, the knowledge creation theories focus on the joint understanding of the individuals about their interconnected tasks.

1.4 Initial research question

The initial research question of this thesis is focused on organizational issues of preparation of request for tender. It is assumed that the preparation work cannot be done alone, and therefore the organizational issues of distribution of work and collaboration are of crucial importance.

Initial research question

How to coordinate the work of experts in the preparation phase of the public procurement process?

1.5 Focus and scope of the thesis

The focus of this thesis is the coordination and knowledge creation in preparation of request for tender. The preparation of request for tender is part of the public procurement preparation phase. Detailed analyses of the tendering and contract implementation phase are mostly left out from this thesis (Figure 2). Nonetheless, those parts were included in the data collection of the research project, and essential events are introduced also from those parts of the process, when the special characteristics of those events are essential to understand the turning points of the preparation phase.

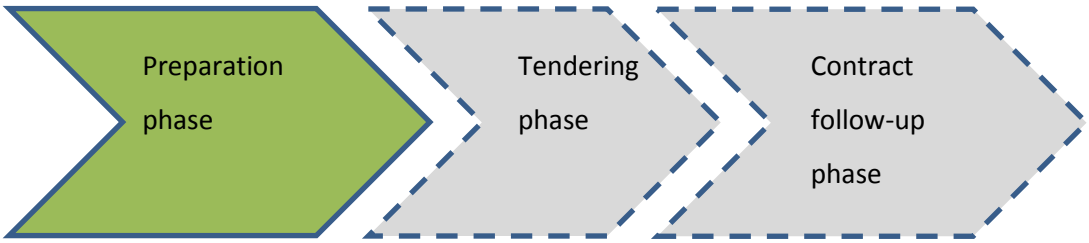

Figure 2 Scope of the thesis in procurement phases

Due to legal regulations, the tender documents dictate many activities of the later phases. However, the preparation phase itself is not strictly constrained by earlier decisions. Therefore the preparation phase offers interesting prospects for studying the development of collaborative activities.

The scope of this thesis is limited to the organization of collaboration in preparation of request for tender. Legal considerations, for example are an important theme in that collaboration, but not in the scope of this thesis. The fair treatment of the competing suppliers is one root of the procurement legislation, but this thesis bypasses such considerations by assuming that the employees of the city and suppliers have a strong motivation to stay out of any suspicious or illegal activity. It is assumed that the risk of such incident is small enough to organize operations for collaboration and effectiveness instead of organizing for the supervision and prevention of any illegal activities. Also the political decision making of the city falls outside the scope of this thesis. Furthermore, this study is

focused on the work about the contents of request for tender and those who do this preparatory work, not on the work of their superiors, who often ratify the decisions in the end in public organizations.

Furthermore, the scope of this thesis is limited to the analysis of coordination and knowledge creation in the organizational contexts of the case organization. The three cases of the case organization present only a subset of all possible ways of organizing procurement projects. Smaller municipalities and bigger cities have different needs and resources for procurement work and thus also different requirements and challenges for knowledge creation.

2 Research method

This thesis applies a qualitative research approach. Thus it attempts to address questions of "how" rather than "how many" (Pratt 2009, p. 856). Qualitative research conceptualizes phenomenon to make it possible to discuss, learn, understand and develop the situation. The research method of this thesis combines the characteristics of constructive research, case study and action research.

2.1 Constructive research

Constructive research is an approach to the managerial problem solving and accumulation of theoretical knowledge through *construction*. The construction can be a model, diagram or plan that produces solutions for a managerial problem. The construction has to be novel and its new point of view often reveals an unforeseen reality of the situation. Due to the complexity of organizations, the practical adequacy of the construction can be tested only in practice. Figure 3 illustrates how the constructive research builds both practical and theoretical knowledge. Practical knowledge evolves from the managerial problem and solution. At the same time, the construction contributes also to theory by challenging or improving existing theories. (Kasanen et al. 1993)

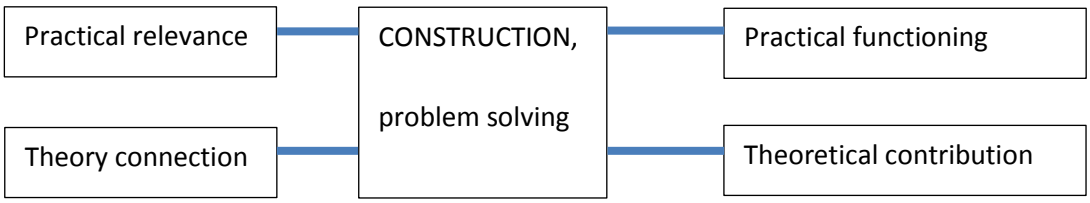

Figure 3 Elements of constructive research (Kasanen et al. 1993, p. 246)

Descriptive research studies relationships between circumstances and causalities, but does not evaluate the superiority of one alternative in contrast to other alternative actions. On the contrary, constructive research tries to solve a problem and is therefore *normative.* It evaluates the most promising solution for the specific problem (Kasanen et al. 1993, pp. 255-258).

2.2 Case study

Case study attempts to examine contemporary phenomenon in its context, in contrast to experimental research that often tries to exclude the environment. The presence of the context makes the research setting complex, as there are "too many variables for the number of observations". Having more than one case study enables comparisons between cases. In practice, the analysis of qualitative data is often done by *coding* the contents of interview or observational data. A theory construction is used to group the data from the case study. The theory construction is further developed during the research project. The essential parts of the theory construction have to be chosen before the extensive coding effort, because a higher number of coding categories makes it unnecessarily difficult. (Yin 1981, pp. 59-61)

2.3 Action research

Action research has emerged from a broad range of fields, but especially the work of John Dewey and Kurt Lewin has been influential in the development of the approach (Brydon-Miller et al. 2003). Action research acknowledges the socially constructed notion of knowledge and the inevitability of values in research, challenging the positivist view of objectivity. In action research, the knowledge generation is explicitly a political and social process. The members of the studied system are involved in the research to combine their knowledge and understanding of the situation with the expert knowledge of the researcher. In addition to data collection, the action research attempts to improve the situation by supporting the members of the system to change it. Seeing how the system responds to the change generates more profound understanding of it. In this process, the validity of knowledge is tested directly by the local stakeholders. (ibid.)

2.4 Abductive research process

Scientific reasoning can be divided into three categories: deductive, inductive and abductive (Niiniluoto 1999 citing Charles S. Peirce 1865). In deduction "a conclusion is logically derived from a set of premises" and thus the validity of conclusions depends only

on the truthfulness of the premises (Ketokivi&Mantere 2010, p. 330). Consequently deduction does not create new knowledge (ibid.) and therefore its use in research is mostly limited to deriving hypotheses and propositions from the theory to test them. (Kovács&Spens 2005).

The second form, inductive reasoning builds theoretical generalizations. The problem of generalization is that any given empirical data can be used to inductively reason several alternative theoretical generalizations that all are coherent with the data. Inductive reasoning is thus methodologically incomplete (Ketokivi&Mantere 2010, p. 316 citing Hume 1969/1739-1740), but it is still the prevalent form of both everyday and scientific reasoning. Due to the incompleteness of the inductive reasoning, authors have to negotiate with their audiences to persuade them about the validity of their claims. (Ketokivi&Mantere 2010) Inductive reasoning is used in research when empirical observations are generalized into theoretical conclusions. (Kovács&Spens 2005).

Finally, abductive reasoning is "inference to an explanation" (Niiniluoto 1999 citing Charles S. Peirce 1865). In abductive reasoning, the observation of surprising fact and knowledge of specific condition to cause such surprising fact is used to infer an explanation that the specific condition is suspected to be true (Niiniluoto 1999, p. 439). In the abductive research process, depicted in Figure 4, researcher observes a real life fact (1) that is surprising in contrast to prior theoretical knowledge (0). A creative iterative process (between steps 1 and 2) is used to find a suitable theory to give an explanation for the initial surprising fact. The aim of the process is to get insight and to understand the phenomenon by studying it from a new perspective and to suggest new theory. The iterative learning process of empirical observation and theory building relies on the creativity and intuition of the researcher to leap from existing knowledge. (Kovács&Spens 2005)

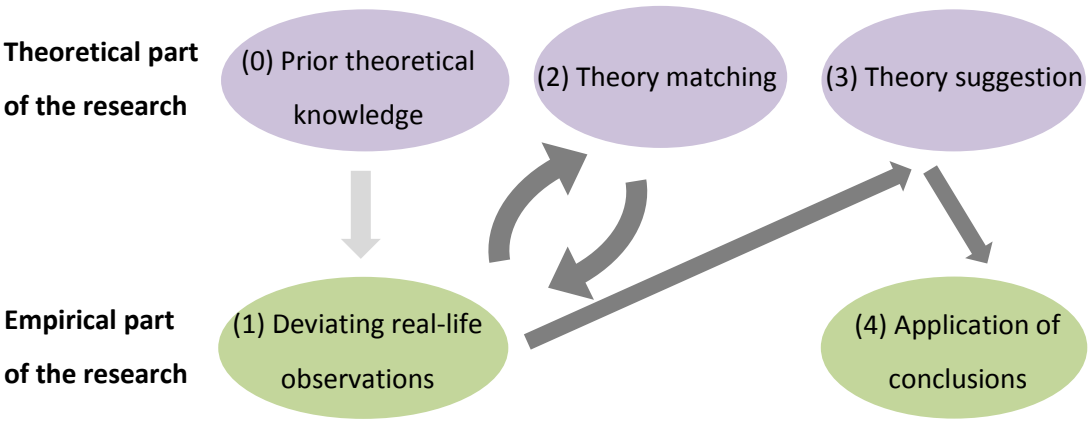

Figure 4 The abductive research process (Kovács&Spens 2005, p. 139)

2.5 Thesis process

The research process of this thesis follows the abductive research process shown above, highlighting the iterative search and building of a suitable theory construction. The starting point for the study was an interest on how processes are able to learn to better meet their goals. Interest in this idea was a result of studies in industrial engineering and observations on several different organizations as an employee, a student, and a customer. The interest originated from the contradiction between rational efficiency reasons asserting rigorous rational standardization, and faith in the inherent problem-solving abilities of humans advocating loose and ad hoc structures.

The process of conceptualizing this contradiction was laborious. The conceptualization is constructed on top of the existing theories, but the search of suitable theories was a burdensome process. The theories had to be profound to be interesting but also concrete to help in the analysis of the data. Each piece of existing literature gave a new viewpoint to the case data, but the evaluation of the new viewpoint required an intensive study of the literature and detailed analysis of the empirical data. Often the result of literature study and data analysis was an observation that when the theories were interesting from the viewpoint of the research question, the author had difficulties to apply them on the practical data analysis. Similarly, when the theories classified the empirical data nicely, the author had challenges in deducing any profound understanding about the research question from the analysis.

The first theoretical conceptualization for the research problem was searched from the execution of strategies (e.g. Mintzberg&Waters 1985). The next one from the network form

of organizations (e.g. Podolny&Page 1998) and from organizational learning theories (e.g. Rashman et al. 2009) followed by systems thinking (Senge 1990). After exploring each of these research domains, the analysis of case data was resumed producing suspicion if the research question and the data are comparable at all.

The repeated data analysis attempts brought out also the importance of understanding different inference logics, research paradigms and the qualitative analysis method itself. Because the initial attempts to start by searching suitable theories to fit with the research problem ended up being too distant from the data, the next iterations were started directly from the analysis of the data. At first the data analysis focused on how participants explained the decisions about the process development. Without comparable case studies, these explanations were difficult to interpret as an indication of process adaptability, but one particular group of comments was noticed to be significant from the view point of the original research question. These were the comments that describe if the coordination of the process was difficult or flowing, and what kind of characteristics of coordination participants appreciate or shun. These comments revealed that without deliberate coordination efforts, it is these intuitive or even instinctive beliefs that guide the everyday coordination development.

These comments were analysed against the literature on process management (Hammer 1990, Deming 1982) and innovation (Wheelwright&Clark 1992, Christensen 1997, Brown&Eisenhardt 1997) to gain better understanding about the development of public procurement processes. Later, process management literature was replaced with coordination theory (e.g. Thompson 1967) because this literature matched better with the detailed level of the data. Similarly, innovation literature was at first used to analyse the characteristics of the systems that enable future learning and adjustments. Later it was found out that research on knowledge creation (e.g. Nonaka 1994, Carlile 2004) focuses exactly on the required flexibility of these operations. Consequently, also innovation literature was largely thrown aside and the literature on coordination and knowledge creation became to form the base of this thesis. The selected theories fulfilled both requirements stated above: they were concrete enough for the analysis of the empirical data, but still able to offer a new and unique understanding about the researched phenomenon.

2.6 Structure of the study

The thesis consists of five parts shown in Figure 5: Introduction, Theoretical background, Empirical data, Results and Conclusions. The first part, Introduction, presents the procurement process and its initial phase where the request for tender is prepared. The focus of the thesis is defined more closely by presenting the research question. The thesis follows research methods of *constructive research, case studies, action research* and *abductive research process.* The central aspects of these methods are discussed in the second chapter.

The second part, called Theoretical background, introduces theories that are going to be used later in the analysis of the empirical data. This part begins with introduction of the focal concepts of coordination in the third chapter. The fourth chapter introduces the theories of knowledge creation. These theories are combined to build a theory construction, discussed in the fifth chapter. After presentation of the theoretical background, the research question is restated more precisely in relation to terms of the theories.

The presentation of theoretical background is followed by the third, empirical part. This part starts by introducing the methods for data collection and analysis and describes the context of the empirical data collection, in chapter six. The empirical data is analysed on the basis of the theory construction in the seventh chapter.

The fourth part is devoted for answering research questions and presenting the improved version of the theory construction. The final fifth part concludes the study by explaining the main contributions of this thesis for theory and practice, presents suitable measures for evaluating the rigor of the study and finally presents some avenues to future research.

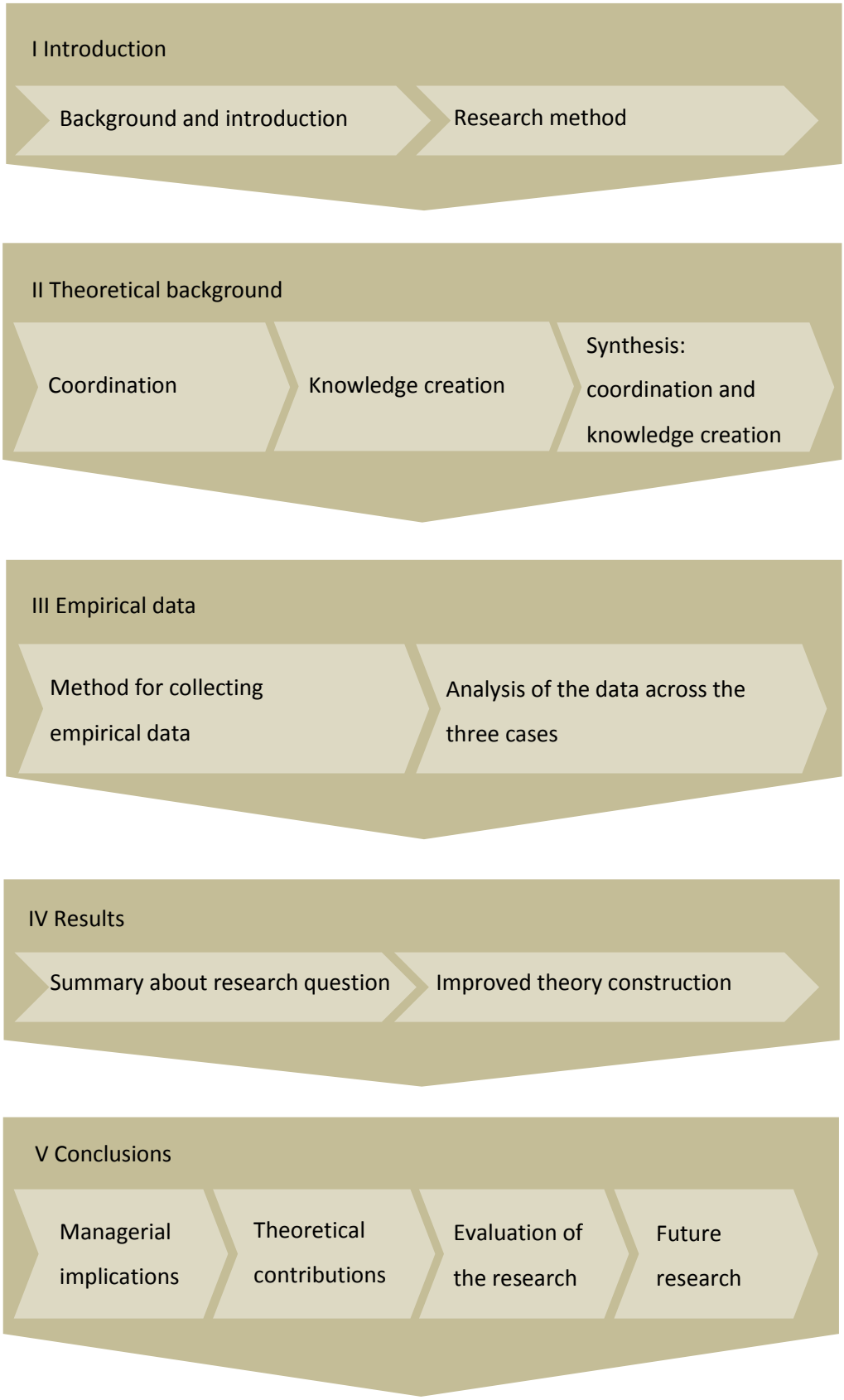

Figure 5 Structure of the study

II THEORETICAL BACKGROUND

In the studied context, the preparation of request for tender is a collaborative endeavour between a procurement expert and a group of substance experts. The participation of procurement expert is needed to ensure the observance of the procurement regulation and the participation of substance experts is needed to understand the user requirements. These experts have to combine their expertise to create the request for tender. In the process of combining their expertise, they create knowledge that none of them initially had; it is a knowledge creation process. Both specialist areas can consider their work only from the perspective of their own specialism, but have to rely on the other experts to check that the decisions make sense also regarding the perspective of the other specialism. As a consequence, the tasks are interdependent and coordination is needed to create a request for tender where the perspectives of the experts form a consistent result.

The theoretical background of this thesis thus consists of theories of coordination and of knowledge creation. The following chapters introduce these theories, followed by a synthesis of these theories in Chapter 5.

3 Coordination

When interdependent tasks are executed by separate individuals, these individuals have to coordinate the interdependencies between them. This chapter begins with a discussion on different *forms of interdependence.* These interdependencies are coordinated with specific organizational structures, called *modes of integration.* The coordination requires work and creates costs. As a result, there are limits to effective coordination, and a need for *improvisation* remains. Finally, *management of coordination* is needed to form the coordinative structures.

3.1 Forms of interdependence

Organizations join people to cope with the tasks that are too complex to be taken care of one individual alone. To be effective, structure is needed to delimit responsibilities, and control over resources. Structure provides boundaries for the members of the organization, who can try to optimize their actions within those boundaries to be effective. Structure is above all required to coordinate the actions of the interdependent parts. (Thompson 1967, p. 54).

Thompson (1967, pp. 54-55) describes three forms of task interdependence: *pooled interdependence, sequential interdependence* and *reciprocal interdependence.* These forms of interdependence visualized in Figure 6 depict how the work of different individuals is dependent on each other:

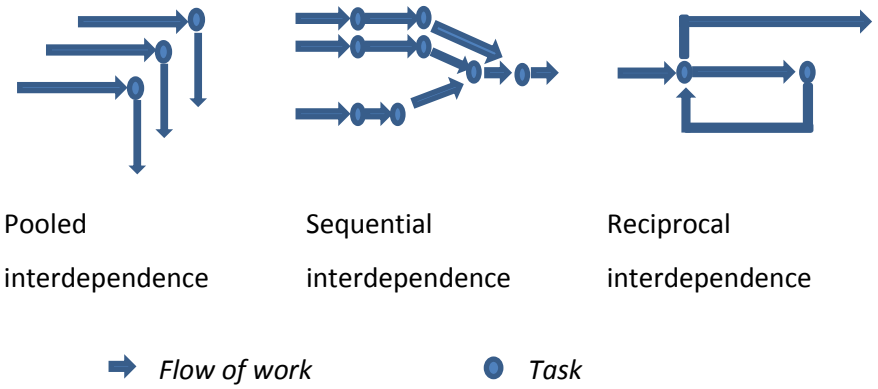

Figure 6 Pooled, sequential and reciprocal interdependence (Mintzberg 1979, p. 23)

In pooled interdependence, each part contributes to the whole separately and is not dependent on the other parts in a direct way. Still, the parts are interdependent in a sense that failure of any part endangers the achievement of the whole and therefore also the existence of its parts. In sequential interdependence, the outputs of one task are inputs of another task. The second task cannot start before the accomplishment of the first task and similarly third task has to wait until it gets the outputs of the second task. (ibid.) In reciprocal interdependence, the unpredictability of the process requires that selection and order of tasks are determined case by case according to real-time feedback and mutual adjustment during task execution. (Sherman&Keller 2011)

In pooled interdependence, the coordination can be achieved by *standardization*, where routines and rules ensure that interdependent tasks are performed in a consistent way. Routines and rules eliminate the need for further communication during the execution of the tasks, but require that procedures are specified in advance of their execution and therefore the tasks have to be relatively stable and repetitive. In sequential interdependence, the coordination can be achieved by a *plan,* which governs the interdependencies of the tasks. While standardization requires tasks to be repetitive, each plan can be different and accommodate to the special conditions of the tasks, as long as those special conditions are known already when the plan is created. Finally in reciprocal interdependency, coordination is achieved by *mutual adjustment,* where the execution of

tasks is adjusted according to new information transmitted during the task execution. (Thompson, 1967, pp. 54-57)

In this order, these forms of interdependence are increasingly difficult to control. A problem of one unit in the pooled interdependence does not affect others as long as the total contribution of the system is adequate. In sequential interdependence, a problem in one unit may require adjustments in the following units as well. (Thompson 1967, pp. 54-56) Further, in reciprocal interdependence, a revision of one task may change the course of the remaining process altogether.

3.2 Integration of interdependencies

Task interdependencies can be managed by instructions, communication methods and organizational structures. Together these different methods for managing interdependencies are called *modes of integration* (Sherman&Keller 2011)

The objective of the efficient organizational structure is to minimize the cost of interdependencies, i.e. coordination costs. Extensive coordination is easiest to achieve in the lowest levels of the organizational hierarchy, where local groups can coordinate their tasks autonomously. The three different types of interdependencies presented above require different levels of coordination. Consequently, the most difficult interdependencies should be grouped together into autonomous groups at the lowest levels of the hierarchy. However, in complex organizations the organizational hierarchy can satisfy only a limited number of interdependencies. Due to the complexity of most organizations, the grouping of units cannot cover all relevant interdependencies, but the remaining interdependencies have to be coordinated between the units via standardization and plans (Thompson 1967, pp. 57-61).

As the level of interdependence rises, increases also the uncertainty of tasks, the participant's information processing requirements and the significance of coordination performance. A sequence of modes of integration has been proposed in addition to the organizational hierarchy, to match these increasing information processing challenges, presented in Figure 7:

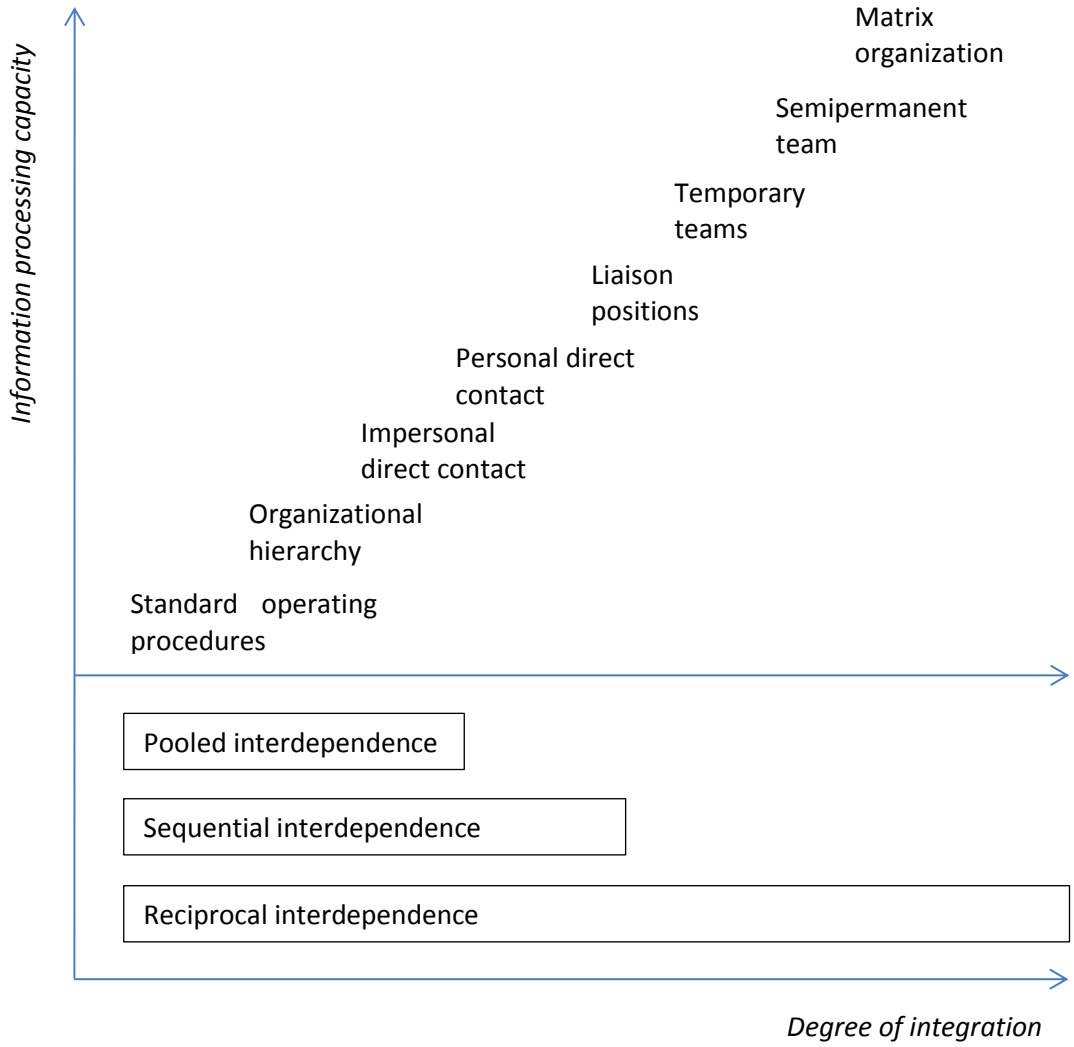

Figure 7 Modes of integration and forms of interdependence (Sherman&Keller 2011)

The limited information processing capacity of the hierarchy can be surpassed by direct contact across the organization, which can be either *impersonal direct contact* by general documents and reports, or *personal direct contact,* where coordination happens by person-to-person conversation. The network of many direct contacts may become too complex to manage, but the units can create *liaison positions* to reduce the number of direct contacts. Liaison positions are able to coordinate the actions of two units, but a *temporary or a semipermanent team* is needed when coordination happens between several units. With the creation of separate reporting structure for these teams, a *matrix organization* has been created. (Sherman&Keller 2011)

Each mode is effective only over a limited range of forms of interdependency. The higher modes have also higher coordination costs and therefore the optimal mode is not the

highest possible mode, but the lowest mode that is able to satisfy the information processing requirements of the task. A mode of integration includes also the use of all previous modes below it. (Sherman&Keller 2011) For example, two units connected with a liaison position have to use also direct contacts between their members, when dealing with complex or uncertain issues. In complex problems, the solutions are not obvious and have to be worked out in direct interaction of people with wide range of perspectives (Ramaswamy and Gouillart 2010, p. 105).

Okhuysen and Bechky (2009 pp. 481-489) propose that three integrating conditions are needed in efficient coordination: accountability, predictability and common understanding. They argue that in addition to more formal coordination methods such as the modes of integration above, these conditions can be also achieved by more informal methods such as routines and collaboration. (ibid.)

3.3 Improvisation

Preceding chapters about forms of interdependencies and modes of integration are based on rational view of organization. The rational view of organization emphasizes the variables and relationships that can be either controlled or reliably predicted (Thompson 1967, pp. 4-7), but organization cannot control every detail of every single task. The individual taking care of the task improvises these details according to individual's understanding about the situation. Brown and Eisenhardt (1997) have demonstrated this kind of *limited structure* with freedom to improvise to improve organization's ability to adapt to changes.

The improvisation is used when the careful analysis and definition of the task is not worthwhile. Improvisation is also needed in organization because of uncertainty: organizations need actions that cannot be thoroughly controlled and predicted, like adaptation, learning and renewal (Weick 1998, p. 544). Not only the management needs these qualities to shape the future of the organization, but also work on every level of an organization contains details that need to be solved without instructions controlling the action.

Weick (1998) presents an idea of *improvisation* from jazz music to describe the foregoing phenomena. This thesis adopts the definition of improvisation as follows: "Improvisation involves reworking precomposed material and designs in relation to unanticipated ideas conceived, shaped, and transformed under the special conditions of performance, thereby adding unique features to every creation" (ibid. p. 544 citing jazz literature Berliner 1994, p.

241). Improvisation builds forms only in retrospect. In improvisation, the participants contribute to the emerging structure and create opportunities for other participants. The structure is not planned or decided beforehand, but emerges during the improvisation and its forms can be seen by sensemaking only afterwards. (Weick 1998, p. 547 citing jazz literature Gioia 1988, p. 61)

Improvisation lies on the continuum from *interpretation* to *improvisation*. The interpretation happens more closely with the precomposed material, by shifting, switching and adding, whereas improvisation departs more from the original material by altering, revising, creating and discovering. Accordingly, interpretation is easier to produce under time pressure, but improvisation adapts better to radical environmental changes. (Weick 1998, p. 545)

Improvisation is not a special assignment in organization, but a viewpoint for seeing that it exists already at every level of the organizations. In *total quality management,* people are encouraged to improvise on plans and routines to enable a flexible treatment of rising issues. (Weick 1998, p. 548) Managers improvise when they develop their own views in the process of seeking consensus (ibid. p. 549 citing Manham and Pye 1991) and front-line customer servants improvise their responses (ibid. citing Weiss 1980, p. 401) to accommodate internal policies to customer requests. Improvisation is not an isolated performance, but interaction. In incomprehensible events, it is often necessary to build the understanding iteratively by adjusting and changing actions according to consequences they result in (ibid. p. 550 citing Starbuck 1993).

Improvisation creates variation. Variation makes it easier to find alternative, possibly better, ways to operate, like organizations that encourages technological variation are more likely to keep up with the technological changes (Tushman&Anderson 1986, p. 462). When the organization specifically avoids variation, it relies on *functional stupidity,* defined by Alvesson and Spicer (2012) as “inability and /or unwillingness to use cognitive and reflective capacities in anything other than narrow and circumspect ways”. The functional stupidity is important for creating certainty in the organization that enables its smooth functioning. (ibid.) For example, as organizations cannot completely remove the uncertainties of their environment, they try to buffer their main operations from the external changes. The productivity of the operations is maximized by fully blocking any external changes from affecting the core, but the costs of buffering surpass the productivity

gains. (Thompson 1967, pp. 19-21). This is an example of *functional stupidity* presented by Alvesson and Spicer (2012). The buffering enables operations that might be slightly "stupid" in the current situations, but in some occasions the productivity gains of certainty may be more important than the continuous renewal of the operations according to each change in the environment.

3.4 Management of coordination

Modes of integration take care of organizational interdependencies, but the selection of the right mode is not straightforward. Mintzberg (1979) argues that each part of the organization has a tendency to favour certain type of modes. Managers at the top of the hierarchy exert pull for centralization to gain control over decision making. In contrast, the employees that are directly involved in the main operations of the organization try to retain autonomy by exerting pull to professionalize. Likewise, the people responsible for organizational development favour pull for standardization that enables them to control organization by development of standards and processes. (Mintzberg 1979, pp. 301-303)

Mintzberg's model of pulls on the organization (1979, p. 302) shows that the achievement of an appropriate mode of integration is not a simple decision of choosing the best alternative, but merely a process of combining a coherent combination of alternatives presented by the different parts of the organization. However, the difficulty presented by Mintzberg's model (ibid.) is that not only are all the alternative solutions skewed by the pull of its creator's organizational position, but also that there is no neutral party who could objectively combine the alternative solutions without incorporating the party's own pulls in it. Although management is an obvious combiner of the alternatives according to the organizational chart, not even the management is free of its own pull for centralization to affect its decisions.

The decision on the mode of integration is not only affected by the organizational position of the decision maker, but also by the intrinsic human characteristics. There is a human tendency to aspire after "thinking in closed systems" in comparison to "adventurous thinking" (Thompson 1967, p. 4 citing Bartlett 1958). This was demonstrated by Sherman and Keller (2011), who argue that organization has a tendency to misjudge the level of interdependency between its units and therefore implement unsuitable modes of integration between those units. Moreover, the distribution of assessment errors was unilateral: the interdependencies were evaluated to be simpler than they really were and

therefore the chosen modes of integration were incapable to coordinate the interdependencies between the units. (ibid.)

Sherman and Keller (2011) explain this phenomenon by the simplified mental representations that managers create to understand their information environments. Furthermore, Bourgeois et al. (1978) demonstrated that when environment becomes more turbulent, the individuals respond counter-intuitively by favouring even more mechanistic structures to "gain a sense of control over the situations", despite the most effective organizations tend to favour organic structure in such situations. Not even the opposite change from turbulent to stable environment caused individuals to respond with more organic structure. To conclude, an environmental change caused individuals to respond not only with ineffective mechanistic structure, but also to keep that structure despite further opposite changes in the environment. (ibid.) Mechanistic structure makes individuals interpret their environment with linear thinking, and the search of clear solutions prevents them from seeing the equivocality of the environment (Daft&Weick 1984).

When a decision is made in a complex environment, it is difficult to predict what the consequence of the decision will be. Because the results cannot be evaluated in this situation, people focus on evaluating "the perceived legitimacy of the decision process". (Van de Ven 1986). Similarly, Thompson argues that when individuals avoid discretion, they resort to formulas, procedures, objective evidence and conservative solutions, which does not free them from discretion, but counter productively only eliminates some alternatives that might have been worth considering. (Thompson 1967, p. 119-120) Furthermore, Sitkin and Bies (1993) describe how the formalization of decision making may replace flexible personal authority of managers with inflexible procedural authority, and may replace concern for humanistic and social considerations with what is defensible by the formal rules.

4 Knowledge creation

4.1 Knowledge creation process

Drawing from Alin et al. (2011, p.59) in this thesis, *knowledge* is defined as "justified – but not necessarily true – belief held by an individual". Nonaka (1994) makes a difference between *explicit* and *tacit knowledge* by defining the explicit knowledge as "knowledge that is transmittable in formal, systematic language" and respectively tacit knowledge as

knowledge that "has a personal quality, which makes it hard to formalize and communicate".

There are two types of knowledge creation processes where the new knowledge is created from the similar type of existing knowledge. The creation of tacit knowledge from tacit knowledge is called *socialization* and occurs in shared experiences, for example in apprenticeship. *Combination* is creation of explicit knowledge from explicit knowledge and is achieved by combining and refining the existing knowledge. Nonaka, however, argues that new knowledge is especially created in dialogue between tacit and explicit knowledge. The four different types of knowledge creation between explicit and tacit knowledge types are presented in Figure 8. The transformation of tacit knowledge into explicit knowledge is called *externalization,* whereas the opposite transformation of explicit into tacit knowledge is called *internalization.* The meaning of internalization is well exemplified by learning where explicit knowledge from books is transformed to tacit knowledge of practical skills in the learning process. The opposite direction, externalization occurs when the sharing of experiences in socialization is continued by successive rounds of dialogue enabling members to articulate their own hidden tacit knowledge in explicit form. (Nonaka 1994, pp. 18-20)

		Tacit knowledge	*Explicit knowledge*
		To	
Tacit knowledge	***From***	Socialization	Externalization
Explicit knowledge		Internalization	Combination

Figure 8 Modes of the knowledge creation (Nonaka 1994, p.19)

By definition, the externalization of tacit knowledge is not easy. It requires *conceptualization*, where the concepts are developed iteratively to better explicate the tacit knowledge. Nonaka describes the conceptualization process to be a dialogue, where the concepts are developed in repetitive revisions. The dramatic and volatile characteristics of the dialogue should not be suppressed. (Nonaka 1994, p. 25)

Nonaka continues by explaining how the newly created concept can be tested in other contexts to validate its reality and applicability. The result of this validation can be a refinement of the concept, but sometimes the whole concept proves to be unsuccessful and is abandoned (Nonaka 1994, pp. 25-26). Despite the fruitful dialogue in conceptualization it is possible that the perspectives of other contexts reveal a fundamental flaw in the concept, which was not obvious in the perspectives of the participants of dialogue.

Furthermore, the communication of ideas between different contexts is not trouble-free either. People interpret knowledge according to their own context and perspectives and thus meaningful ideas in one context can be irrelevant to people in other contexts (Nonaka 1994, p. 30).

4.2 Types of knowledge boundaries

Nonaka (1994, p. 28) notes that in addition to solving problems, knowledge creation is needed to define those problems in the first place: "*In reality, problems do not present themselves as given but instead have to be constructed from the knowledge available at a certain point in time and context.*"

Nonaka's (1994) analysis is based on the differences in the type of knowledge, whether it is tacit or explicit, and how it is transformed between these types. Carlile's framework analyses how the type of knowledge boundary affects knowledge creation over that boundary. The framework is presented in Figure 9 and is based on the three levels of knowledge boundaries: *syntactic, semantic and pragmatic* (Carlile 2004, pp. 557-558 citing Shannon and Weaver 1949).

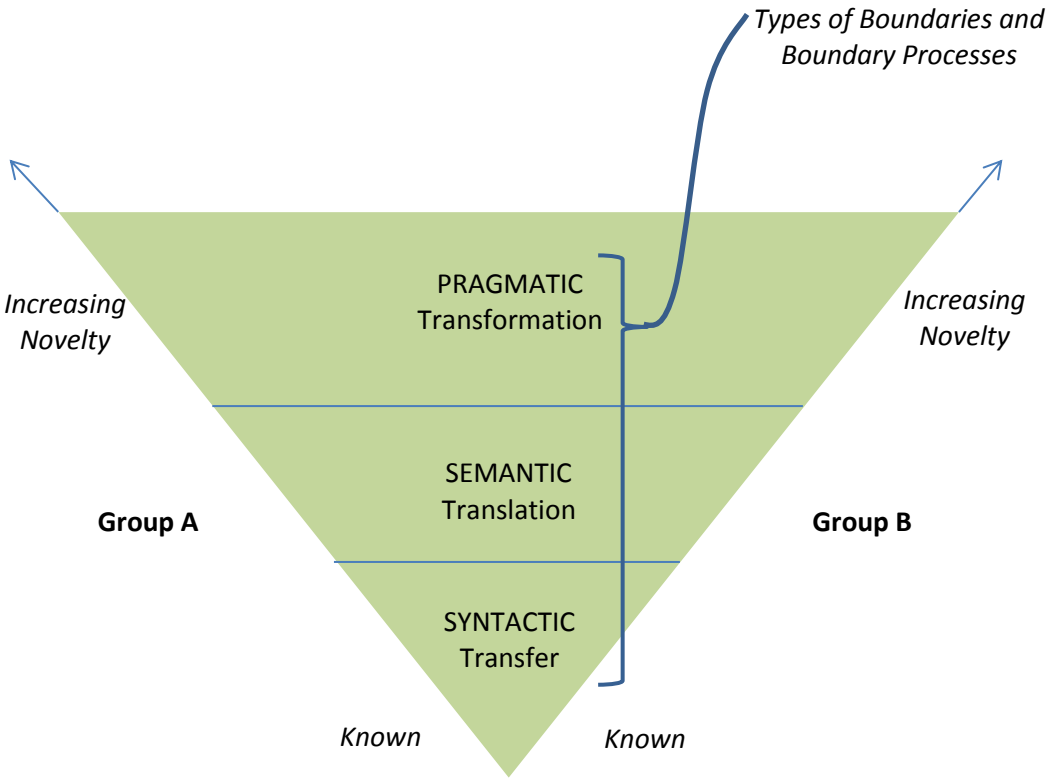

Figure 9 Types of knowledge boundaries and boundary processes (Carlile 2004, p. 558)

At the syntactic boundary, *knowledge transfer* is enough. Knowledge transfer requires actors to have a common lexicon that is adequately able to represent the differences and dependencies of the knowledge between the actors. In practice this happens in stable conditions, where the lexicon is established. At the semantic boundary, the common lexicon is no more sufficient and needs to be improved or rebuilt to cover the differences and dependencies of the novel situation and the knowledge requires *translation* to move over the semantic boundary. This process of translation is largely consistent with Nonaka's process of externalization. Finally, at the pragmatic boundary the negotiation of the common knowledge reveals differences in interests and the *knowledge transformation* entails a political process, where participants negotiate and define their common interests." (Carlile 2004, pp. 558-559)

The crossing of the pragmatic boundary is a laborious iterative process of negotiations and learning. Carlile presents a cautionary example from the 1980's, where the collaboration between different car engineering groups replaced the use of clay models with a new three-dimensional modelling tool. When the tool was used for the first time, groups had to

develop a common lexicon, had to translate and learn about each other's novel requirements and had to settle the trade-offs between the groups. Another project attempted to exploit all this hard-won knowledge, leading to significant problems. The valuable part of the process was not the end result of the negotiation, but the negotiation itself, which enabled participants to represent and learn each other's domain specific knowledge. The members of the second project had access to the results of the earlier negotiations and did not have to go through the laborious negotiations themselves. However, without negotiations they were not able to build a sufficient common understanding about the important interdependencies between groups. (Carlile 2004, pp. 561-564)

5 Synthesis: coordination and knowledge creation

Previous chapters review the theories of coordination and knowledge creation. This chapter combines these theories to build theoretical synthesis on coordination and knowledge creation.

Combination of coordination and knowledge creation is paradoxical, because the perspectives of coordination and knowledge creation embrace quite different goals. Nevertheless, both these perspectives are necessary in public procurement. Therefore these differences are analysed in detail to build the theoretical synthesis which combines the viewpoints of both perspectives.

Paradox is a contradiction between two perspectives. These perspectives are constructed to make sense of the complex and ambiguous reality. Paradoxes are found when the interaction between individuals reveals the irrational coexistence of the contradiction. Due to the complexity of organizations, the constructed perspectives entail only limited understanding about the real situation and its dynamics. Therefore it is possible to find unforeseen solutions for a paradox from the complex reality, despite the contradictory simplified perspectives. When individuals are able to surpass their established perspectives, they are able to become aware of the simultaneity of both sides of the paradox. Eventually, awareness of paradox makes it possible to work through its tensions. (Lewis 2000)

The paradox between coordination and knowledge creation is clear in the difference how these perspectives treat redundancy. According to Nonaka (1994, p. 28), the roots of knowledge creation lie in the creative chaos and in the redundant information. He

mentions internal competition and job rotation as examples of how to foster information redundancy. Contrary to this positive view of knowledge creation, the purpose of coordination is to improve efficiency: with better coordination useless work and redundancy is avoided. At the same time, redundancy is the source of new knowledge but also avoided by efficient coordination.

The purpose of this theoretical synthesis is to support thinking and collaborating simultaneously with the perspectives of coordination and knowledge creation. It is assumed that this paradox between coordination and knowledge creation can be solved by carefully analysing all the subtle details of the paradox.

5.1 Revised research question

The initial research question in Chapter 1.4 emphasizes distribution of work and collaboration through coordination. The theoretical review demonstrates the importance of knowledge creation. More specifically the knowledge creation theories highlight the importance of knowledge boundary crossing. The initial research question is revised to take importance of knowledge boundary crossing into account.

Revised research question

> How to coordinate the work of experts and cross knowledge boundaries in the preparation phase of the public procurement process?

5.2 Theory construction

The concepts of the theoretical background were combined to a theory construction shown in Figure 10. The construction is arranged along the vertical axis that covers the continuum from interpretation to improvisation of tasks (presented by Weick 1998). Three forms of interdependencies are shown along the continuum. In pooled interdependency, the tasks are executed following rules and routines and thus located in the interpretation end of the continuum. Tasks with reciprocal interdependencies depart more form the existing routines and are therefore located at the improvisation end. Each form of interdependency is followed by the corresponding coordination method (Thompson 1967) and different types of knowledge boundaries (Carlile 2004). The collaboration between experts faces two

separate challenges: they must coordinate their interdependencies and they must cross the knowledge boundary between them.

The forms of interdependencies have different levels of control and different level of need for resources. In the interpretation end, the standardization offers a good control of organizational activities, which is loosened along the continuum toward improvisation. In the opposite end of improvisation, the control is weak, as the direction of operations only emerges during iterative negotiations. On the contrary, the need for resources is low in the interpretation end (referred as *coordination costs* in Thompson 1967). Rising level of interdependencies and knowledge boundaries require more coordination and more iteration and thus the need for resources increases toward the improvisation end.

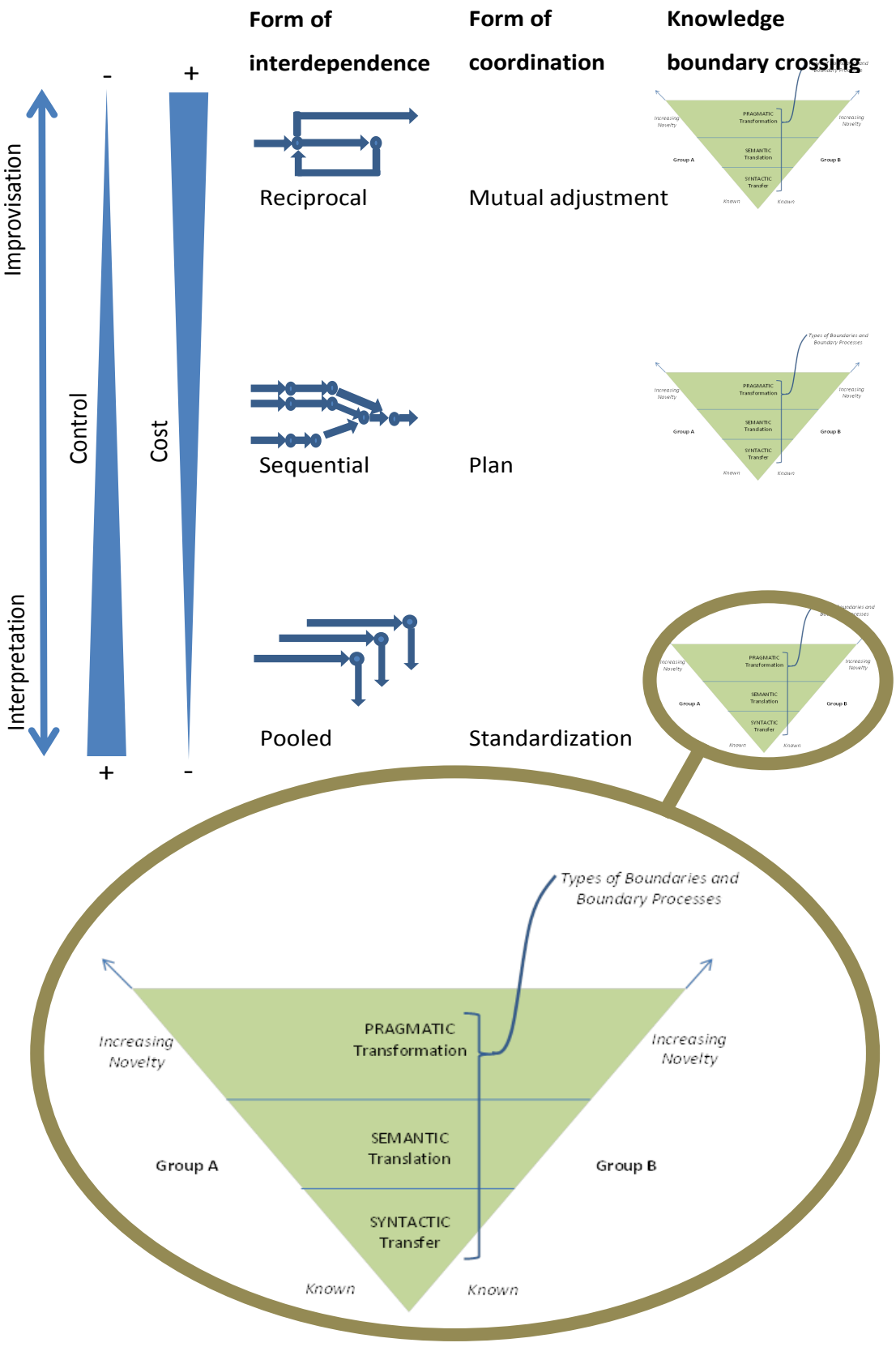

Figure 10 Theory construction: Coordination and knowledge boundary crossing

III EMPIRICAL DATA

6 Method for collecting empirical data

6.1 PRO2ACT

This thesis is done in PRO2ACT research and development project funded by Tekes – the Finnish Funding Agency for Technology and Innovation. During years 2010-2013, the project studied and developed procurement contracting processes of the Finnish municipalities from the viewpoint of Proactive Law and Proactive Contracting. PRO2ACT arranged participatory process development interventions in two Finnish cities using SimLab™ process simulation method.

6.2 SimLab™ process simulation method

The empirical data of this thesis is collected during the PRO2ACT development intervention in one city. The development intervention followed a seven-step *SimLab™* process simulation method. The seven steps of the method are illustrated in Figure 11. The thesis is based primarily on the process modelling and interview data from steps two and three. To get a longitudinal view, a set of follow-up interviews was also done a year after the main interviews. The author worked as a research assistant in this simulation project and is also familiar with other data collected in the research project. This knowledge is used for explaining the backgrounds of the issues that are discussed later and for evaluating the credibility of the analysis throughout the project.

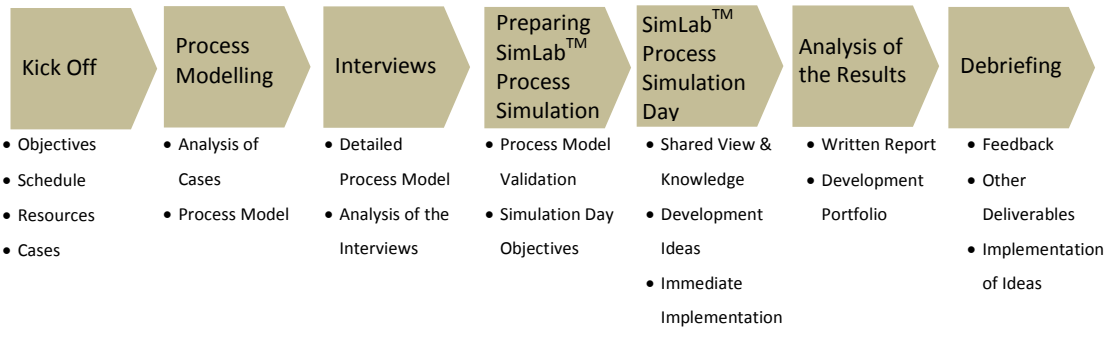

Figure 11 The SimLab™ process simulation project (Smeds et al. 2006)

The SimLab™ process simulation method starts with *a kick off* meeting, where the representatives of the case organization meet with the researchers to decide on objectives,

schedule, resources and cases of the project. In *a process modeling* session, researchers meet with one or few individuals who have a central role in the case process. Together researchers and these individuals build a preliminary process model. Next all key actors of the process are *interviewed*, including suppliers and customer representatives. The purpose of the interviews is to refine the process model and collect data for *the preparation of process simulation.* The core of the method is a *process simulation day,* where researchers facilitate a group discussion of all interviewed individuals in front of a visual process model. The facilitator encourages participants to share their experiences and imagination to build a shared understanding about the process flow among the participants. This carefully prepared discussion reveals inconsistencies and problems when local roles and practices interact in the larger process. The participants generate a holistic process understanding that helps and motivates them to develop and change the process. (Smeds et al. 2006)

6.3 Case descriptions

The data of this thesis comes from the development intervention, where three procurement projects of single city were studied. The procurement centre of the city was involved in all these three cases. The procurement centre is specialized in tendering and contract follow-up. At the time of data collection, it employed five procurement experts and a procurement director. The procurement centre was responsible for procuring products and services that are used in more than one department or unit of the city. The city had made a strategic decision of collaborating with neighbouring municipalities. This decision was applied also in the procurement operations, where some procurement processes were done collectively together with neighbouring municipalities.

Dental technical laboratory work

In the procurement of dental technical laboratory work, the procurement expert was responsible for the preparation phase and tendering phase, but the contract management was the responsibility of dental care director. Moreover, the expertise of two dental care specialists was needed to write the product definitions. Therefore the procurement expert, dental care director and one of the dental care specialists formed a temporary project team (Figure 12) to coordinate the preparation work.

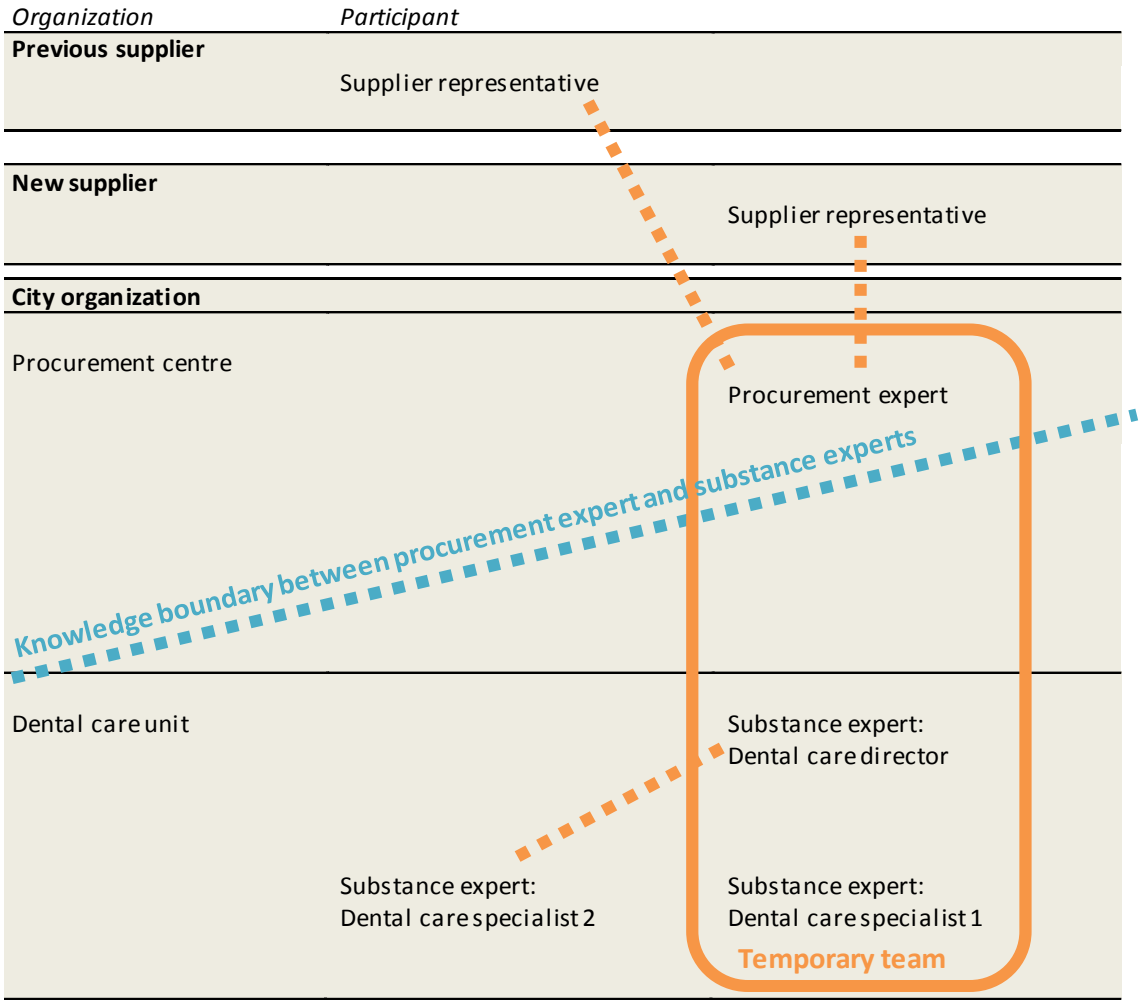

Figure 12 Collaboration in the procurement of dental technical laboratory work

The previous two-year contract was signed in 2007. It was extended because of the upcoming merger of health care organizations. The extension of the previous contract made it possible for the new contract to cover the whole merged organization. In principle the procurement would have been the responsibility of the dental care director, but in practice the procurement centre was used to take care of the competitive tendering part of the process. The dental care director and procurement expert started a discussion on who should participate in the project team and on the content of the contract. It was decided that the contract should cover the procurement of three different types of laboratory work. The first dental care specialist was asked to do the product definitions and to join the project team. The specialist started writing product definitions for the first two parts of the procurement, but the third part required other expertise and was assigned to the second dental care specialist and to his/her team.

The specialists focused on the product definitions and more general parts of the request for tender were prepared by the procurement expert. The second dental care specialist

prepared only the product definitions of his expertise but did not participate in the meetings of the project team. The specialists did not check the definitions of the other, because both of them were defining the products of their own specialization. They did not feel it necessary or to be capable of verifying the work of the other specialist.

Project team combined the request for tender from the documents written by procurement expert and two dental care specialists, after which the request for tender was published. Five tenders were obtained, but two of them were rejected because those did not meet the requirements. During the tender comparison it was noticed that the requirements of the third part of the request for tender, the one prepared by the second dental care specialist, were not sufficiently precise that the tenders could be compared fairly. Consequently the procurement of this third part had to be suspended. The dental care director and the chosen suppliers signed the contracts about the first two parts in the beginning of 2011. The dental care specialists started working on the failed product definitions of third part again. The previous contract was extended with the previous supplier of the third part to handle that laboratory work purchases for the duration of the new competitive tendering project.

The process of creating product definition for the first two parts was also laborious. The dental care specialist used trade names to define the products. The procurement expert noticed this in their temporary team and advised the trade names are not generally allowed according to legislation. The dental care specialist had great difficulties in inventing product definitions that would specify the needed product without using trade names. This was a conflict of interest. It was in the interests of the dental care specialist to specify products in detail, because he/she was going to work with those products later. At the same time, it was in the interests of the procurement expert to avoid trade names, because the use of trade names would have required more detailed legal consideration and may have reduced competition.

This case of Dental technical laboratory work offers also an interesting example of why shared understanding is needed between the experts. The procurement expert, substance expert and supplier were all satisfied with the product definitions. The procurement expert was satisfied when there were no trade names in the product definition. The substance expert was able to get appropriate products by defining the exact trade names when ordering the products from the supplier, although the comparison of tenders was made

with general product titles without trade names. At the same time, the supplier concluded that it might be possible to charge higher prices, because the ordered products had more strict requirements because of the trade names than the original request for tender written with general product titles. Although all these individuals were satisfied with the product definitions, shared understanding of these viewpoints reveals a risk that prices of the competitive tendering are not followed in practice.

Bakery products

The semipermanent team, called Procurement ring, was taking care of groceries procurement of several organizations. The contract of bakery products was one of the contracts handled by this group. The group of participating organizations differed slightly from contract to contract. In the selected case project, four smaller municipalities and three education or health care organizations joined the procurement project (Figure 13).

Procurement ring had operated already for over a decade. The number of participants in work group had grown as more organizations had joined the procurement ring. This procurement case was chosen for the study because it was felt to be an exemplary case of the long-standing collaboration practices of the procurement centre. The procurement expert in the procurement centre managed the contracts of the procurement ring and organized the activities of the working group. Group consisted of representatives of the participating organizations.

The procurement project started with the extension of a previous contract. The previous contract of bakery products was expiring in July 2010. During spring 2010, it became evident that the procurement expert was too busy with his/her previous assignments and could not start preparation of tendering documents early enough to have a new contract signed in time. Consequently procurement expert and work group suggested 4 month extension to the existing contract for the supplier.

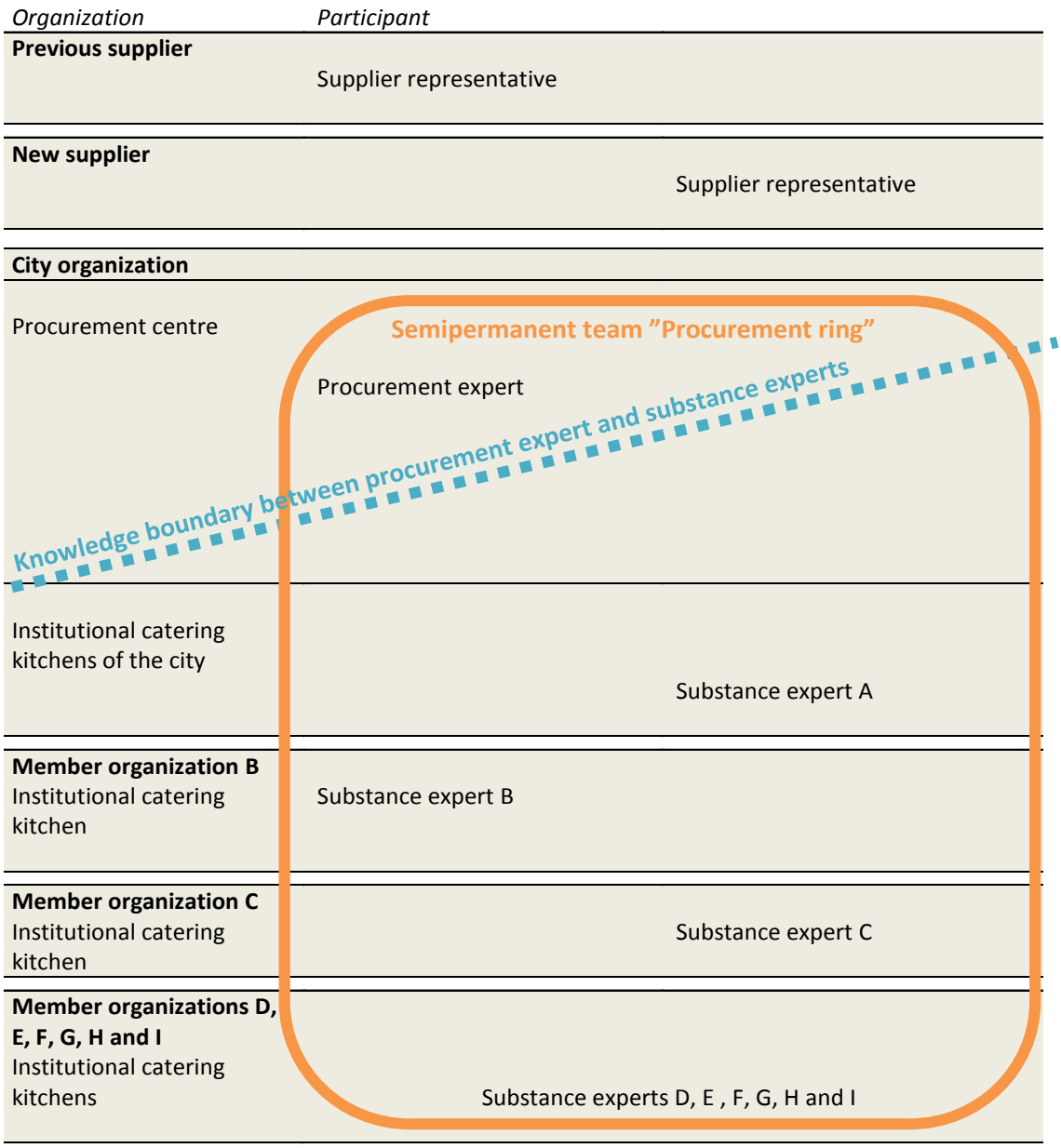

Figure 13 Collaboration in the procurement of bakery products

The procurement expert started to prepare request for tender and planned a timetable for the procurement process. The procurement expert also compared the products of different suppliers from their internet sites and prepared a draft of product definitions. A work group meeting was arranged to discuss the product definitions.

One of the participating organizations employs a nutritionist who is taking care that the food served by that organization has optimal nutritional values. The procurement expert negotiated with the nutritionist about how the take nutritional aspects into account in the product definitions. After the draft of the request for tender document was put together, the procurement expert asked the work group members for comments.

The procurement expert published the request for tender in the autumn of 2010. Two tenders were received, but both were found to be insufficient. The procurement expert requested those two suppliers for further clarification, but still only one supplier was able to meet the conditions of qualification. Consequently a contract was signed with the only qualified supplier.

In the procurement of bakery products, the users of the contract are the employees of institutional catering kitchens. The daily operations happen between these kitchen workers and the employees of the supplier. Therefore small problems and improvement suggestions are communicated directly between those people. Kitchen workers are supposed to report important issues to their work group representative, who reports those onward to the procurement expert. In addition to this daily feedback process, regular follow-up meetings are organized every few months. In these meetings the procurement expert, work group participants and the supplier meet to discuss how to improve co-operation between the kitchens and the supplier.

Higher level political decision obliged city to collaborate with smaller neighbouring municipalities. However, some participants felt division of work to be unfair and were concerned about the economic consequences of having low volume buyers along.

Wood- and metalworking machines

The preparation of request for tender requires information from the substance experts. The procurement centre faced difficulties in finding those experts and engaging them to participate in the mapping of the market, to prepare the product definitions and to comment on request for tender drafts. To overcome these challenges, the procurement centre started the *procurement apprentice* experiment.

During a period of a year, an employee of the department spent regularly time with the procurement expert to become acquainted with procurement expertise. The initial idea was that the procurement apprentice would locate the best specialists from the department to help with the procurement preparations and could collect the needed information from the department to ease the work of the procurement expert in writing tendering documents. The tight resource situation of the procurement centre changed the original idea of the apprentice experiment so that the procurement apprentice prepared the straightforward procurement cases alone.

Originally, the purpose of this procurement apprentice experiment was just to make it easier to collect information for the procurement expert, who actually executes the procurement process. However, in practice the apprentice started to execute procurement processes himself/herself and used the procurement expert just as a consultant in the most difficult procurement problems. Eventually the emerged division of work was preferred over the original idea.

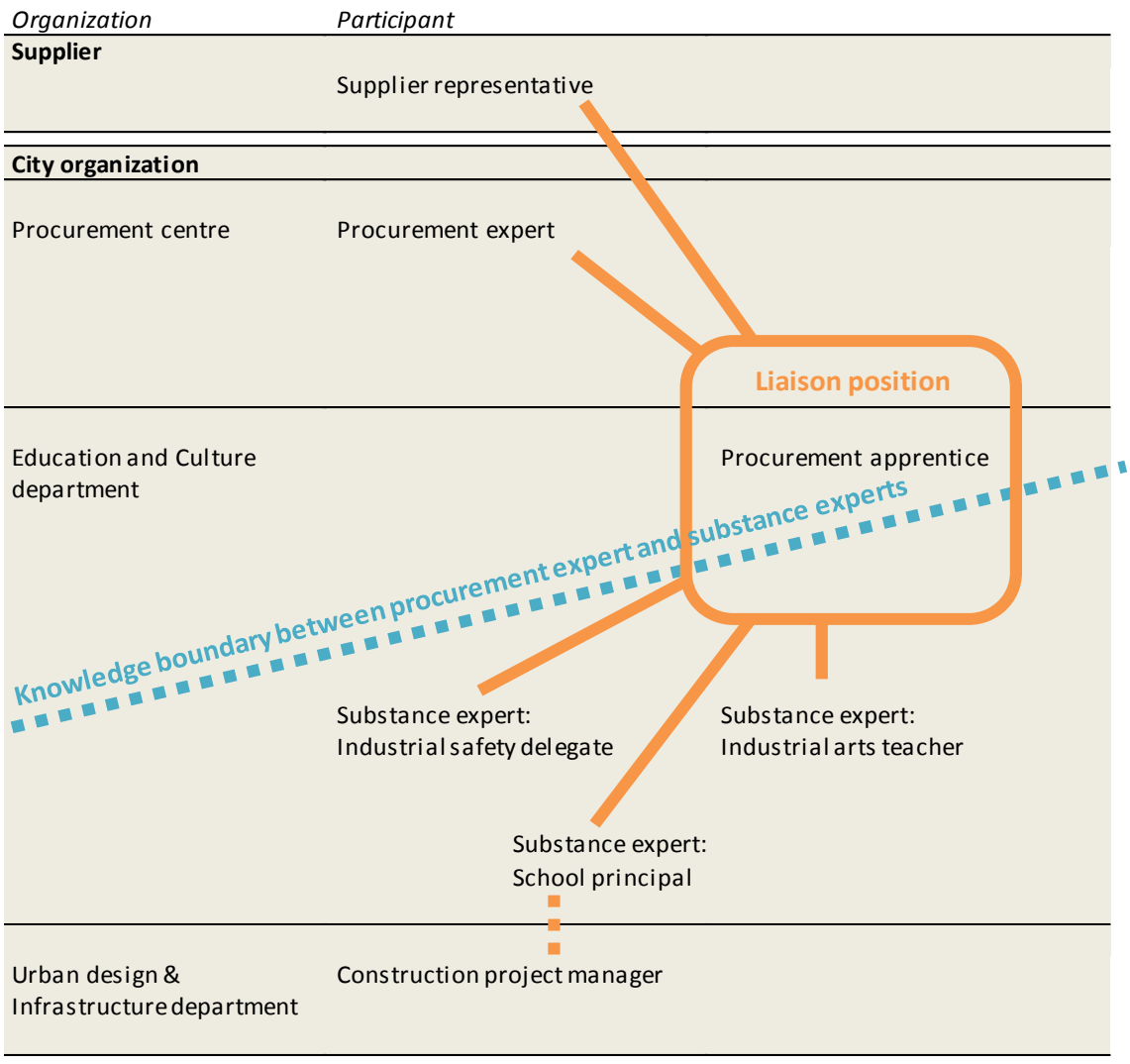

Figure 14 Collaboration in the procurement of wood- and metalworking machines

The procurement of wood- and metal working machines was a part of a larger construction project, where an old elementary school was extended. The extension included an industrial arts class that needed new wood- and metalworking machines. The city council had accepted the larger construction project in 2009 and in the spring 2010 the procurement apprentice started to draft request for tender documents of the new wood- and metalworking machines. The procurement expert helped procurement apprentice in

the details of procurement regulation when necessary. The school principal acted as a user representative of the school in the construction project. An industrial arts teacher was helping to define the requirements for the machines and the industrial safety delegate of the city was helping with the safety requirements for the machines. The overall construction project was managed by the construction project manager employed by other department.

Comparison of the cases

Three procurement projects were selected for the study. Selection was done together with the researchers and the procurement centre by trying to choose procurement projects that had signed a contract recently or were going to do so during the data collection. Additionally projects were selected to exemplify different aspects of procurement centre operations. Table 1 lists the key differences between these projects.

Procured product or service	**Dental technical laboratory work**	**Bakery products**	**Wood- and metalworking machines**
Responsible party	Department	Procurement centre	Department
Organizer	Procurement expert	Procurement expert	Department
Mode of integration	Temporary team	Semipermanent team “Procurement ring”	Liaison position “Procurement apprentice”
Continuity of purchase	Continual	Continual	Non-recurring
History	New procurement expert	Established	New experimental way of collaboration
Challenges	- Conflict of interest in product definitions - Need for shared understanding	- Conflict of interest between high- and low-volume buyers	- Development of the procurement apprentice experiment

Table 1 Comparison of procurement projects

The procurement centre was the responsible party only in the procurement of bakery products. Although the departments were officially the responsible parties of the two other projects, in practice the procurement expert had an active role also in the procurement of dental technical laboratory work. In the procurement of wood- and metalworking

machines, the role of the procurement expert was only consultative and limited to knowledge about procurement regulation, whereas the procurement apprentice from the department organized the procurement project.

The procurement apprentice case was a one-time purchase. Two other cases prepared a contract that is used for continual purchases for several years. Work group has worked with grocery purchases for over a decade and the procurement centre saw it as an exemplary case of their collaborative practices. Other cases were newer arrangements. The procurement apprentice was a collaboration experiment started a few years ago and the project team was created just during the procurement project. The procurement apprentice experiment was described promising according to the procurement centre. On the contrary, the collaboration of Procurement ring was felt challenging.

6.4 Interviews

Interview data was collected in three rounds. The first round was a process modelling workshop, while the two successive rounds were semi-structured interviews. The number of interviewed procurement centre employees, substance experts and suppliers are presented in Table 2. The total number of informants in all three rounds is 20, because some informants were present in multiple data gathering rounds. In the first round, a separate process modelling workshop was held for each of the three procurement projects. The researchers and procurement expert of the chosen case drew the first version of a visual process model on a big paper hanging on the wall. The duration of these sessions varied between two and three hours. The interview questions focused on the selected cases, but the interviewees shared also many experiences from other procurement projects. These experiences from other projects are also included in the research data.

	Round 1 Process Modelling	**Round 2** Interviews	**Round 3** Follow-up interviews
Procurement centre	3	6	6
Substance experts	0	11	3
Suppliers	0	3	0
Total	**3**	**20**	**9**

Table 2 Number of informants in three rounds of data collection

In the second round, all employees of the procurement centre were interviewed. The process modelling sessions and other interviews were used for identifying other relevant people of the studied cases. Consequently 11 other employees of public organizations were interviewed, presented in the Table 2 as *substance experts*. Also a supplier of each case was interviewed. The planned duration of the interviews was an hour and a half. One interview was stopped after half an hour because of the busy interviewee. A few interviews lasted two hours.

The third round consisted of follow-up interviews, one year after the first rounds of data collection. The follow-up interviews of six people lasted around an hour each. Most follow-up interviews were done face to face, but three of them were done by telephone. Usually, the informants were interviewed alone, but one follow-up interview was held simultaneously for two procurement experts, because of the busy interview schedules.

The interviews and process modelling workshops were audio recorded and the recordings were transcribed. There were two interviewers present in each interview and one of the researchers was primarily asking questions while the second focused on writing notes. The PRO2ACT research team met twice a week to discuss the findings of the interviews to share and compare the perceptions of different participants. All interviews were done in Finnish. The discussion chapter includes quotations of the interviewees to support the analysis of the data. These quotations were translated to English by the author and are presented alongside the original Finnish transcription.

6.5 Observation and participation

In addition to interviews, the data collection of the research project included observations of group discussions, notes, process models and a feedback questionnaire. The observations were done during the process modelling sessions and simulation day. In addition to transcribed audio recordings, process modelling sessions produced notes and a preliminary process model. The participants of the simulation day filled a feedback questionnaire. Moreover, the daily issues of the procurement centre were discussed by the research team and the key people from the procurement centre in several unofficial meetings. The author is familiar with this additional data and observed personally most of the events.

The research project entailed a similar set of case studies in another city and a third more general procurement process simulation. In addition, the researchers arranged five

networking meetings, where interested people from numerous cities and companies met to present and discuss the topical issues of public procurement. The author was also following these activities of the research project.

6.6 Data analysis method

The analysis of empirical data started with the classification of the data based on a theoretically derived classification scheme. In constructive research (introduced in Chapter 2.1) the existing theoretical knowledge offers a practical outline for the classification scheme. The transcribed data was compared with the classification scheme and quotes from the data were classified into the theoretical categories. In the next phase of the analysis, the quotes of each category of classification were analysed against the theoretical background of the category. Results of this analysis are discussed in Chapter 7.

6.7 Classification scheme

The classification scheme was combined from the most relevant terms and ideas presented in the theoretical background. The following scheme of 17 categories was used for the classification of the empirical data of transcribed workshops and interviews.

1. Need for coordination
2. Pooled interdependence
3. Sequential interdependence
4. Reciprocal interdependence
5. Modes of integration
6. Improvisation
7. Interpretation
8. Pulls on the organization
9. Uncertainty
10. Socialization
11. Externalization
12. Combination
13. Internalization
14. Problems has to be constructed
15. Syntactic boundary
16. Semantic boundary
17. Pragmatic boundary

7 Analysis of the data across the three cases

7.1 Forms of interdependence

The need for coordination was a prevalent theme in interview data. The procurement experts, substance experts and suppliers were well aware of their sequential interdependencies:

Case Bakery products

"That also bothers me in this process, that X [procurement expert] does not ask these things from us just for fun, we should commit better. But there are heaps of other things to do etc., but we should commit ourselves to this [procurement] work, because he/she cannot proceed, if he/she gets only a few answers or no comments at all, then he/she cannot carry on with his/her work."	*"Sekin oikeesti tässä prosessissa harmittaa, että ei X [hankintasuunnittelija] kysy huvikseen meiltä näitä asioita, että kyllä meidän pitäis sitoutua. Mutta kun maailmassa on niin miljoona asiaa jne., mutta pitäis pystyä sitoutumaan tähän [hankinta]työhön, koska hänhän ei pääse eteenpäin, jos tulee jokunen vastaus, tai kukkaan ei kommentoi, niin eihän hän pääse eteenpäin."*

The preparation of product definitions required coordination between the procurement and substance experts. Often coordination is needed also between the procurement project and other public units or organizations. In the procurement of bakery products, the product definitions had to be coordinated between all member organizations of the procurement ring. The actions of procurement project of wood- and metalworking machines had to be coordinated with a larger construction project. In addition, the contract changes have to be coordinated with the actual contract users to ensure the continuation of daily operations:

Case Bakery products

"[the supplier change] is an enormous process, it is an absolutely huge process, it really is. – We need to do all that background work in the ordering system, those ordering templates. We change our whole process, we may change our recipes according to that supplier's new product, we change our own supervision systems, everything. It is so huge, nobody understands that, how much work it causes to us when we change the supplier."	*"Sehän [toimittajan vaihto] on valtava prosessi, se on ihan huikee prosessi, ihan oikeesti. – me tehdään kaikki ne tilausjärjestelmään ne pohjatyöt, ne tilauspohjat ja muutetaan se koko oma prosessi, me saatetaan muuttaa reseptiikkaa sen mukaan, mikä on sen uuden tavarantoimittajan tuote, omavalvonnat, kaikki, se on niin valtava, sitä ei kukaan käsitä, kuinka paljon se täällä aiheuttaa työtä, kun me vaihdetaan."*

The interviewed procurement experts had a strong aspiration to avoid current difficulties in collaboration. It was thought that over time the substance experts learn to understand and appreciate the working methods of the procurement centre and are able and willing to adjust their own work in to that style. Earlier practices of the procurement centre were diverse and it was hoped that consolidating those conventions would make it easier for others to work with the procurement centre:

Employee of procurement centre

"and some day they [substance experts] will produce that information for us [procurement experts] dexterously"	*"ja joku päivähän ne voi tuottaa meille [hankinta asiantuntijoille] jo sen tiedon ihan näin vaan"*

These procurement experts had an aspiration of a standardized process guided by routines and rules. However, the coordination by standardized operating procedures is only possible in pooled interdependence, where all participants are able to do their work without a need to communicate with other participants during the process. According to interviews, however, the preparation of request for tender is a collaborative process, where all participants have to learn from each other and adjust their work accordingly. This is an example of the reciprocal interdependence, where the process will inevitably reveal surprising details that force participants to adjust their work, regardless of how much they put work on standardizing and planning the process beforehand.

Some interviewees had a strong confidence in a systematized way of working. It was thought that standardized processes are the most efficient way of working. The following quotation illustrates such a belief:

Case Bakery products

"and I love these processes, in my opinion it is the only right way to do things well, so that those things start from somewhere, it goes like this, in an agreed manner and without mistakes, without problems, without accidents. When it is thought in advance, that when we start from this situation and do this way and operate that way, and then we develop those, improve and agree together things, that certainly is the easiest way of working. And in my opinion that produces the best possible quality after all and the best possible end result, when processes really flow in the agreed and thought manner."	*"ja mä itse rakastan näitä prosesseja, mun mielestä se on ainut tapa tehdä asioita hyvin, että se vaan alkaa ne asiat jostakin, ja se etenee näin, sovitulla tavalla ja ilman virheitä, ilman ongelmia, ilman vahinkoja, kun on mietitty, että kun lähdetään tästä ja tehdään näin ja toimitaan näin, ja sitten kun niitä hiotaan, parennetaan, sovitaan yhteisesti asioita, niin sehän on se helpoin tapa toimia. Ja se mun mielestä kuitenkin edelleen tuottaa sen parhaan mahdollisen laadun ja parhaan mahdollisen lopputuloksen, että oikeesti prosessit sujuvat niin kuin on sovittu ja ajateltu"*

The quotation is a description of a process in pooled interdependence. However, the current reality of procurement operations revealed more complex reciprocal interdependencies. The assumption of pooled interdependency was visible when the problems of the contract period were attributed to inadequate request for tender. For example, there was a problem of bread becoming mouldy before its best-before date and it was thought if they should have required sanctions in such situation already in the request for tender. In pooled interdependency it is possible to predict the problem and standardize the solution to that problem, but the interdependencies of the studied projects were often more complicated. With these complicated interdependencies it becomes truly burdensome to try to anticipate every possible future problem. Furthermore, even with the most detailed product definitions there are still properties of products that are hard to standardize, for example the taste of groceries. Assumption of pooled interdependency causes attempts to solve the problems with standardization, whereas admitting the reciprocal nature of the interdependency calls for coordination by mutual adjustment.

The form of interdependency and coordination method was analysed in all three cases. All cases faced unexpected challenges. The procurement of dental technical laboratory work had challenges in creating the product definitions and other two cases had difficulties in creating a request for tender that would attract a sufficient number of suppliers. These challenges have a significant effect on the success of those procurement projects, and these challenges could be solved with more thorough collaboration between experts. Consequently, all three cases were analysed to have a reciprocal interdependency between the procurement expert and substance experts (Table 3). The participants of the temporary team of the Dental technical laboratory work case was able to improve their collaboration during the project, which exemplifies that they were using mutual adjustment as their coordination method. Unfortunately the coordination of method for the critical part was more like coordination by plan (shown in Table 3), in a sense that plan coordinates sequential interdependencies without adjusting the process during the process execution according to new information that arises. Mutual adjustment between both expert areas is needed to do a procurement that is both useful and legitimate.

In Bakery products case, the semipermanent team would have allowed mutual adjustment, but in practice the experts wrote their parts of the request for tender largely alone, thus their coordination method resembled coordination by plan. In the wood- and metalworking machines case, the procurement apprentice and substance experts discussed together enabling coordination by mutual adjustment.

	Dental technical laboratory work	**Bakery products**	**Wood- and metalworking machines**
Form of interdependency	Reciprocal	Reciprocal	Reciprocal
Coordination method	Plan	Plan	Mutual adjustment

Table 3 Form of interdependency and coordination method in the three cases

7.2 Integration of interdependencies

The city organization is structured in departments such as education and health care. In this structure, the most demanding interdependencies of a single department are grouped together and can be effectively managed within the department. Likewise full-time procurement experts are located in the procurement centre to enable efficient

coordination of their work within the procurement centre. However, procurement projects require the expertise of both procurement expert from the procurement centre and the expertise of substance expert from the department. Consequently the procurement projects have developed different structures to coordinate the procurement activity across the organizational hierarchy. The coordination across the hierarchy was felt to be more difficult than coordination with units that are near to each other:

Case Wood- and metalworking machines

"we create this kind of centralized units, that serve us. Of course, those are no more on the same corridor with you, you know, those are then elsewhere. It would be ideal, that they are situated near to us."	*"me tavallaan muodostetaan tämmösiä keskitettyjä yksiköitä, jotka sitten palvelee meitä. Nehän ei oo sit samalla käytävällä enää, eiks niin, vaan ne on sit jossain muualla. Se ihanne olis, että ne olis mahdollisimman lähellä."*

The modes of integration list several possibilities for the inter-unit coordination, e.g. direct contact, liaison position and temporary team, (Sherman&Keller 2011). In all three cases, the direct contact was not sufficient, but a more extensive mode of integration was needed (Table 4). A temporary team was formed for the dental technical laboratory work procurement to coordinate the work of the procurement expert, the dental care director and another dental care specialist. In the case of procurement ring the long history had transformed it already into a semipermanent team, coordinating groceries procurement operations between several different organizations. The procurement apprentice is an example of liaison position that was coordinating procurement operations between the procurement centre and the department.

	Dental technical laboratory work	**Bakery products**	**Wood- and metalworking machines**
Mode of integration	Temporary team	Semipermanent team	Liaison position

Table 4 Mode of integration in the three cases

The procurement of dental technical laboratory work faced many challenges: the process was unfamiliar to some participants, the content of the procurement changed significantly during the process and one part of the procurement had to be eventually suspended. The

participants were clearly interdependent of each other and their method of integration, temporary team, allowed them to adjust to the evolving situation.

The separation of procurement experts from the departments in organization structure causes problems in the daily work of procurement projects, but so would other form of structuring these operations. The structure of the procurement centre optimizes learning and knowledge sharing of procurement expertise, but every structure is reasonable for taking care of only a limited number of similar objectives. There are many other objectives that could be supported with the organization structure like financial performance, end-user experience, environmental values or social viewpoints.

Case Wood- and metalworking machines

"it was thought already earlier, … if we should have procurement people solely in the procurement centre, or should they be in service sectors. But then there is all this learning, legislation changes how are they able to stay up to speed, therefore the centralized [procurement centre] is a better solution."	*"sitähän mietittiin jo silloin, … että onko se niin, että meillä on hankintaihmisiä hankintakeskuksessa ja sitten palvelualueella mut sitten just kaikki tää koulutus, lainsäädäntö muuttuu, pysyykö kaikki ajan tasalla niin sitten ne, se osin keskitetty on parempi ratkasu."*

It would be impractical to involve experts of all different objectives to the preparation work. Additionally, it would be difficult to reach a consensus in that big group. Thus the distribution of work in the procurement project must have one person with overall responsibility to decide on the weighting and involvement of other experts.

Case Bakery products

"The number of people is not always the thing that makes operations efficient, It is more about …, that we have to make the process more efficient and set right roles, so that the snappy expert organization can work out more procurement projects."	*"aina se päitten lukumäärä ei oo se, mikä tehostaa sitä toimintaa, vaan ehkä enemmänkin …, et pitää saada se prosessi tehokkaammaks ja roolittaa ne eri osapuolten roolit oikein, niin että se napakka asiantuntijahankintaorganisaatio pystyy viemään enemmän niitä hankintoja läpi."*

Some modes of integration were endorsed in the procurement centre, especially the *semipermanent team* of the procurement ring was seen as a good example of collaboration

between different organizations and *liaison position* in the apprentice experiment was a promising mode of integration between the city departments. In practice the mode of integration in each case emerged during the project where established practices, personal preferences and job descriptions were put together in different combinations to get the work done.

Emergence and development of the mode of integration was different in three cases (Table 5). The dental technical laboratory work procurement worked as a temporary team, but the importance of the second dental care specialist was not noticed and the mode of integration was not improved to engage that specialist closely enough. In the groceries procurement project, the problems of semipermanent team were identified, but the participants were not able to develop their mode of integration to solve those problems. Finally in the procurement of wood- and metalworking machines the mode of integration was changed, but the change was not attributed to difficult interdependencies or difficulties of knowledge creation.

	Dental technical laboratory work	**Bakery products**	**Wood- and metalworking machines**
Mode of integration	Temporary team, but the problematic part was prepared alone	Semipermanent team	Liaison position
Recognition of the problem	Only after publication of request for tender	Recognized	Attributed to the lack of resources
Development of mode of integration	No	No	Yes, the department took over of the project

Table 5 Development of mode of integration in the three cases

7.3 Improvisation

Lack of time to do things properly was mentioned in the interviews. Time constraints favour interpretation (Weick 1998 p. 545) i.e. working with existing material instead of creating something novel. Nevertheless, interviewees' descriptions of past projects included also examples of improvisation:

Case Bakery products

"we took samples from those suppliers, so we also took samples and a sensory evaluation of quality was also one of the evaluation factors…. we really tasted and saw what those products are. And maybe then we noticed something that we were not able to take into account beforehand."	*"otettiin niiltä, jotka tarjos niitä, niin otettiin myös näytteet, ja siellä huomioitiin myös aistinvarainen laatu yhtenä tekijänä. … oikeesti päästiin maistamaan ja näkemään, mitä se tuote on. Ja siellä ehkä huomattiin jotakin sellasta, mitä ei etukäteen ollu osattu huomioida."*

In the previous quotation, the improvisation in the sensory evaluation was seen to improve evaluations in areas that were not identified beforehand. Sometimes it was also thought that improvisation was not only needed to improve things, but improvisation was the best way of doing the task in the first place:

A follow-up interview

"I have tried to avoid presenting directly ready suggestions [about the content of the request for tender], because the readers easily just accept and say that let's do it that way."	*"olen välttänyt nyt sitä, että lähtisin esittämään suoraan valmiita [ehdotuksia tarjouspyynnön sisällöstä], koska helposti siitä samaistuu lukija, että tehdään vaan noin"*

The procurement expert had noticed that his suggestions easily suppressed the substance expert's suggestions. The procurement expert learned that it was better to let substance expert improvise his/her own solution first, because it was difficult to get any alternative suggestions after the first solution was presented.

In the following two quotations of the follow-up interviews, the procurement experts describe how they try to develop their skills and the practices of the procurement centre by varying their routines. In other words, they are improvising on the procurement process:

A follow-up interview

"now I am testing restricted procedure for the first time. … I wanted to try that restricted procedure to learn what kind of process it is."	*"nyt testaan parasta aikaa ekaa kertaa rajoitettua menettelyä. … mä halusin kokeilla, että miltä rajoitettu menettely, miten se menee prosessina."*

A follow-up interview

"always when we have started a new suitable procurement project, … we have then tried something new there."	*" aina kun joku sopiva uus hankinta alotettu, … on sitten kokeiltu jotakin uutta."*

However, the development of procurement operations with improvisation requires good knowhow on procurement regulation. Improvisation requires ability and courage to seek for novel ways of working. These improvisation experiments were regarded useful in the procurement centre, but elsewhere attitude toward procurement regulation was more cautious:

Case Wood- and metalworking machines

"Well, in reality we have to live within the limits of this regulation, that way many good improvement ideas cannot be put put into action."	*"Niin, ihan todellisuudessa tässä joudutaan elämään kuitenkin näitten säännösten puitteissa, että sillä tavalla semmoset hyvätkään kehittämisehdotukset, välttämättä niitä ei voida sitten toteuttaa."*

Of course, the same regulation applies to the work of the procurement centre, but the good expertise on procurement regulation makes it possible to find more alternative solutions that simultaneously improve operations and adhere to regulatory limits. Furthermore, the regulation sets most strict limits only for the tendering phase in contrast to preparation and follow-up phases. The procurement centre has recently put more emphasis on these preparation and follow-up phases, which may explain their more positive outlook on development possibilities in comparison to people outside the procurement centre who may still focus mostly on the competitive tendering phase.

In larger scale, a sequence of smaller improvisation efforts may thoroughly change the process itself. The emergence and development of procurement apprentice experiment followed this kind of an adaptation process. The original idea of the apprentice to be an informant for the procurement centre is also an example of procurement centre's attempt to buffer their main operations from external difficulties (Thompson 1967, pp. 19-21). The differences between departments and difficulties in collaborating with them were seen to

hinder the efficiency of procurement centre and procurement apprentice was an attempt to buffer those difficulties.

In hindsight the need for the adaptation of the apprentice experiment can be understood also as a move to a more extensive coordination method. The form of interdependence was assumed to be sequential, whereas the interdependencies were reciprocal in practice. Consequently, the role of the apprentice widened to include more procurement expertise to reduce the difficulties of communicating reciprocal interdependencies through the apprentice between the procurement centre and substance experts.

7.4 Management of coordination

The adaptation of the apprentice experiment demonstrates how the planned process required some modifications to make it work better in practice. In a same way, the other city operations may require modifications every now and then. A problem arises, when the city operations are interdependent with the procured product or service which is defined in the request for tender and where substantial modifications are not possible during the contract period. Consequently, the preparation of request for tender is an influential phase to develop the operations of public organization for the duration of the contract period, which may last for several years.

The procurement process was felt complex, but interviewees had versatile views for the reasons for this complexity. Often current practice was compared with the prior practices of the city or with their experiences as individual consumers to highlight the current difficulties of public procurement regulation. However, what was not mentioned as a reason was the increase in the number and diversity of products and services procured by the city. Outsourcing and changes in public services has changed the public procurement of cities from simple material purchasing to the important way of arranging public services in complex collaboration networks of public and private actors. The procurement is the key phase in management of those private actors in these networks. This manager role is much more challenging than the earlier role of simple material purchaser. However, it is noticeable how references to this role development were mostly absent in the interview data. When this development was not noticed, the uncertainties and reciprocal interdependencies puzzled people in their search for a more standardized way of working:

Case Dental technical laboratory work

"this preparation phase, I have tried to structure it and tried to develop some new methods, or tried to get at least some kind of backbone there, but it is still missing something, something so that everybody would know what we are doing."	*"tää valmisteluvaihe, niin jotakin siis, tää, vaikka mä oon kuinka yrittänyt jäsentää sitä ja kehittää niinkun vähän jotain uutta toimintamallia tai saada edes vähän jotain selkärankaa siihen, mutta, mut siis jotakin se vielä siis kaipaa, jotakin semmosta niinkun, emmä tiedä niinkun, kaikki tietäs että mitä tehdään."*

According to the follow-up interviews, the procurement centre had put more emphasis on the preparation and follow-up phases of the procurement project. This more comprehensive emphasis on preparation and follow-up had demonstrated the importance of procurement management in contrast to the plain writing of the request for tender work.

A follow-up interview

" there is the project manager there … it is much smaller part of time, that is spent on that mechanistic work"	*"sit on se projektinjohtaja siinä … Et kyl se ajallisesti on paljon pienempi aika, mikä menee siihen itse tavallaan mekaaniseen työhön"*

In the follow-up interviews, the interviewees told how they have improved in scheduling. This was achieved by using the elapsed time of previous projects as an estimate for the duration of future projects instead of trying to schedules solely based on the plans. Procurement experts used to create schedules by planning the projects in advance, but after experiencing several delayed projects it was found out that the duration of previous projects is a better estimate. Plans underestimated the amount of extra work caused by uncertainties that come up during the project.

Thorough preparation work may help to predict problems during the later phases. In the primary interviews, the importance of thorough preparation was mentioned regularly. Still in reality, several procurement projects faced surprising challenges. During the primary interviews, many interviewees assumed that more thorough preparation work should have considered these challenges already during the preparation of the request for tender. The uncertainties and serious consequences of error make people avoid discretion (Thompson,

1967). When avoiding discretion, people resort to formulas, procedures, objective evidence and conservative solutions (ibid.). In the studied cases, this aspiration after conservative solutions was visible when the procurement experts aspired after standardized processes that would ensure the quality of the request for tender. Later in the follow-up interviews, some procurement experts had noticed that it is easier to tackle some problems only when they arise than try to anticipate everything beforehand.

A follow-up interview

"it is not possible to find a solution and an answer to every issue in that one procurement and in that one contract … And then I also have to accept that there are always some issues that … are just left to be negotiated during the contract period."	*"kaikkiin asioihin ei vaan voi löytyä ratkaisua eikä löydy vastausta siinä yhdellä kilpailutuksella ja yhdellä sopimuksella … Sit toisaalta pitää myös hyväksyä se, … että jotain jää aina sinne sopimuskaudelle sit sovittavaks."*

7.5 Knowledge creation process

In the preparation of request for tender, the substance expert has knowledge that has to be incorporated into the request for tender. The knowledge from the professional training and part of the organizational knowledge is already in explicit form and the process of combination (Nonaka 1994) is enough to take advantage of that knowledge. However, the knowledge how the specific task happens in a specific organization has not been taught in textbooks or defined in managerial documents, but the substance expert has learned it through socialization (ibid.), knowledge that is often referred to as work experience. This knowledge is in tacit form and can be put to request for tender only after transformation from tacit to explicit form in externalization.

Case Wood- and metalworking machines

"this productization phase of it, it is interesting, I have always described it so that they know what they want, but they are not able to tell that on the paper."	*" tämä tuotteistusvaihe siinä, että se on jännä, että mä oon sitä kuvannu aina näin, että tiedetään mitä halutaan, mutta sitä ei osata kertoa paperille."*

Case Dental technical laboratory work

”when I ask them to tell me how this service works and how it is managed, somehow they are not, so they are not able to explain that to me. It is because that task is so mundane for them.”	*”jos niiltä kysyy että kerro miten tää palvelu toimii ja miten sitä, miten sitä hoidetaan niin jotenkin ne ei, niin he ei osaa avata sitä mulle. Koska se on niille niin semmosta arkipäivää.”*

The definition work of dental care specialist required him/her to externalize (Nonaka 1994) tacit knowledge into explicit form. The externalization process proved to be laborious. The dental care specialist had to iteratively conceptualize tacit knowledge in dialogue with the procurement expert to comply with the legal requirements and in dialogue with the suppliers to make sure that his concepts are understood correctly.

Case Dental technical laboratory work

”we had to create generic names for these products, I had to do it 2-3 times all over again this – productization because I was always told that there still is a trade name there. And I really had to make calls and ask, what might be that kind of name in Finnish that does not reveal the name of the product.”	*“meidän piti yleisnimittää nää nimet, niin tää oli se, mä jouduin tekeen 2-3 kertaa uusiks tän – tuotteistuksen sen takia, koska aina sanottiin, että siellä esiintyy tuotenimi. Ja todella piti soitella ja kysellä, että mikä vois olla sellainen suomenkielinen nimi, jossa ei tuotteen nimi käy ilmi.”*

When the dental care specialist had to define the materials without using trade names, he/she was in fact externalizing his tacit knowledge to explicit knowledge in the iterative and error-prone conceptualization process. Likewise the procurement expert was trying to make sure that the request for tender is suitable for the daily operations of dental technical laboratory work. Afterwards it was noticed that requested cost of delivery did not take into consideration that some products require several deliveries because the denture may not fit correctly and has to be fixed. This failure is natural, when the knowledge creation is analysed in this situation. According to Nonaka’s model of knowledge creation (1994), the procurement expert was trying to learn tacit knowledge of dental care specialists through socialization and then trying to convert it to explicit knowledge, thus facing all the challenges of socialization and externalization.

The procurement experts were surprised how difficult it was to get substance experts committed in the preparation work of the product definitions. One reason for this indifferent attitude seems to be that procurement work was not always defined part of the substance expert's work. They have to do product definitions in addition to their daily work. The more intractable part of the problem is the distance of knowledge areas of the procurement expert and substance expert. Both experts thought that there is a knowledge area that is not their expertise and then assume that it is part of the other expert's expertise. Consequently, both experts thought that they were doing other's work, but the assumption of neighbouring knowledge areas might be incorrect. The product definitions may have very little to do with the daily work of the substance expert, like demonstrated with the following quotation:

Case Dental technical laboratory work

"But there was a problem also, that we were digitizing our imaging, and made a competitive tendering of this digital X-ray machine, … so you can imagine that I as a dentist, I don't have that kind of knowledge"	*"Mutta siinäkin oli semmosta ongelmaa, että kun mehän digitalisoitiin meidän kuvantaminen, ja kilpailutettiin tämmönen digitaali röntgenkuvalaitehankinta, … niin voitte kuvitella, että mä hammaslääkärinä, ei oo semmosta tietämystä"*

The concepts created through externalization can be refined by testing them in other relevant contexts, but occasionally the test can reveal a fundamental flaw and the conceptualization has to be started again right from the start (Nonaka 1994). The definitions prepared by the second dental care specialist failed to comply with the requirements of the procurement regulation. Unfortunately, it was noticed only in the competitive tendering phase and the procurement of that part had to be suspended.

This dental care specialist did not have enough procurement expertise to cope with the task alone, but as this person and procurement expert were not communicating directly, this lack of procurement expertise was not noticed early enough. This occasion is also interesting in regard to the apprenticeship experiment. Specialists doing product definitions and procurement experts have to collaborate closely to identify this kind of shortages of knowhow. The procurement expert has to verify that definitions meet the requirements of the procurement regulation, but it is equally important to try to understand the needs of

specialist to suggest better ways of specifying the product definitions. Deeper collaboration between procurement expert and substance expert is needed to ensure that the created product definitions are legally sound and fulfil the procurement needs. Collaboration on product definitions can be difficult through mediated communication through the apprentice and this kind of mediated collaboration might unnecessarily prevent product definitions that are operationally beneficial but whose accordance with regulation is not self-evident.

In the studied cases, the substance experts were professionals in the use of the procured products, but not in defining them. A central challenge in all studied cases was the transformation of tacit experiences into explicit definitions. For example, the industrial arts teacher works with the wood- and metalworking machines, but the use of these machines produces only tacit knowledge about the machines. Externalization of this tacit knowledge into the explicit form of product definitions is a laborious process and may result in inadequate product definitions. The situation with bakery products is similar. Kitchen workers tacit experience of working with the product has to be externalized before it can be used in the request for tender. The procurement of dental technical laboratory work had an additional difficulty of interdependent processes between the public health care organization and the private dental technician. The patient was treated in collaboration of a dentist employed by the city and a private dental technician. Also in this case the tacit experiences of collaboration with different dental technicians were difficult to externalize.

This externalization challenge was evident in the definition of the electronic ordering system of the bakery products supplier. This ordering system was required in the request for tender. Some interviewees were unsatisfied with these systems and complained the systems to be more like a plain e-mail than a real ordering system.

Case Bakery products

“But how would it be possible to write down that, what kind of ordering system I would like to have?”	*”Mutta mitenkä semmosenkin kirjoitat, että mitä minä haluan siltä tilausjärjestelmältä.”*

The city could have required for a more sophisticated ordering system in the request for tender. There are many specialized methods in public IT procurements to ensure that the needed system is achieved, but it is unfeasible to expect kitchen workers to be

professionals in these specialized methods. It would be expensive for the city to create such requirements, but also for the supplier to accommodate to those requirements. On the other hand, when the city omitted these definitions, it lost the control to define the system and therefore had to accommodate its own operations to work with the particular system that supplier happens to have. For example, the former processes of one purchaser relied on the ordering system to generate the confirmation of order document that was needed in other associated process of invoice checking. The ordering system of the chosen new supplier does not produce such document. Presumably the purchaser unit has to accommodate its own processes.

Case Bakery products

"we do not get any document, when we make an order, it just goes there. So there should be that kind of fairly reliable document about order, it is needed also for checking the invoice."	*"me ei saada mitään dokumenttia, kun me on jätetty tilaus, se meni sinne vaan. Elikkä sehän pitäis olla tommonen aika varma dokumentti siitä, myöskin laskuntarkastuksen pohjaks sitten."*

Recognition of externalization has a significant effect on the procurement project. The substance expert is not just a source of information, but an active participant, who needs the resources to do the difficult externalization. When the substance expert is not familiar with the difficulties of externalization, additional support is needed to teach how to develop and test conceptualizations.

7.6 Types of knowledge boundaries

The challenge of managing knowledge across boundaries can be divided in three parts: at the syntactic boundary knowledge is transferred with a common lexicon established in stable conditions, at the semantic boundary the lexicon needs to be improved to be able to translate each other's novelty to other participants. Finally, the political processes of knowledge translation are needed at the pragmatic boundary to negotiate the common interests. (Carlile 2004) There were many examples in the empirical data where the common lexicon was not enough to transfer the knowledge:

Case Wood- and metalworking machines

"And then just procurement people put papers forward, put announcements to Hilma [a national web service for publishing request for tenders], and then somebody asks, what is that Hilma."	*"Ja sitten vaan hankintaihmiset laittaa papereita menemään, laittaa Hilmaan ilmoituksia, ja sit kun joku kysyy, et mikä se Hilma on."*

Table 6 presents the types of knowledge boundaries and boundary processes in the three cases. In dental technical laboratory work case, the procurement expert and dental care specialist described that their collaboration was difficult at the beginning. There was a semantic knowledge boundary between them, until they were able to create a shared lexicon to overcome the boundary. However, they had also a conflict of interest in discussion on how to define the products. Consequently, the knowledge boundary was in fact pragmatic. There was a conflict of interest also in Bakery products case, between high- and low-volume buyers. In Wood- and metalworking machines case, the procurement expert had to learn about machines and the substance expert had to learn about procurement legislation, forming a semantic knowledge boundary between them.

In Dental technical laboratory work case, the conflict of interest was not thoroughly negotiated and the boundary process of knowledge transformation was not possible. Participants of the temporary team tried to translate their knowledge over the knowledge boundary. However, there was no attempt to translate knowledge of the second dental care specialist over the boundary, but it was simply transferred. Without translation or transformation, this knowledge did not meet the requirements of the procurement legislation and that part of the procurement had to be suspended. In Wood- and metalworking machines case, the empirical data was not accurate enough to infer the type of the boundary process with certainty.

	Dental technical laboratory work	**Bakery products**	**Wood- and metalworking machines**
Type of knowledge boundary	Pragmatic	Pragmatic	Semantic
Boundary process	Knowledge transfer	Knowledge transfer	?

Table 6 Type of knowledge boundary and boundary process in the three cases

In the Bakery products case, a quintessential problem of the semipermanent team was the obscurity for the reason for its existence. The participants of the groceries work group felt co-operative procurement to be unfair. The high volume buyers were worried if the costs of having low volume buyers raised prices, but also division of preparatory work was felt unfair. The actual reason for the existence of the group is the higher level political decision of the city to help smaller neighbouring municipalities. Nonetheless, the political decision of collaboration was not mentioned at all during the interviews with the work group participants.

Case Bakery products

"And our organisation was in that, I do not know, probably these all seven others did not work similarly at all … so that we were in this case … that party of the contract who did the biggest part of the preparation work with the procurement centre. Hence, others did not do similar work, so that they got these things ready-made."	*"Ja siinä varmaan meidän organisaatio oli siihen, mä en tiedä, varmaan nää kaikki 7 muuta ei tehny samalla tavalla töitä todellakaan … et me oltiin siinä nyt se … sopimuksessa se osapuoli, joka tässä varmaan hankintatoimen kanssa teki eniten sitä valmistelutyötä. Eli ei varmaan … muut … tehny sitten vastaavaa, että heille tuli tämmöstä valmista."*

Even after having experienced the difficulties of the pragmatic boundary, it seems to be difficult to recognize other pragmatic boundaries. Carlile (2004) showed similar difficulties in the attempt to use knowledge learned at another pragmatic boundary. Likewise, the studied groceries procurement process was perceived laborious, but interviewees were optimistic in evaluating how easy the process could possibly be. On the contrary, the groceries work group had worked together at least for a decade, which illustrates the difficulty of recognizing that the methods chosen for managing knowledge across the boundary are not adequate for that type of the boundary.

Case Bakery products

"there certainly is a slightly easier way to do this"	*"kyllä tätä varmasti voidaan vähän helpommalla tavalla tehdä"*

Both theoretical review and empirical analysis show that crossing knowledge boundary is difficult. In organizational context difficult issues result in costs and uncertainties, unless

the difficult issue can be neglected. Consequently the necessity of knowledge boundary crossing is an important question, because otherwise organization would be able to avoid all these difficulties simply by neglecting knowledge boundary crossing. However, according to three case studies this is not a viable option.

In preparation of request for tender, the alternative for knowledge boundary crossing challenges is dramatic and implausible: Knowledge boundary crossing can be neglected altogether when old requests for tender are copied without any consideration if they were successful, if they are compatible with the need of the city and if they are up-to-date. Alternatively, knowledge boundary crossing would be avoided if a single person would be capable of writing the request for tender alone or it would be easier if the required individuals would be in the same organizational unit. Analysis of the three cases demonstrates that these alternatives would hamper too much the main service production of the city: careless reuse of old requests of tenders or writing request for tender solely in procurement centre will reduce usefulness and quality of procured products or services. Likewise, if the departments prepare requests for tender alone, they are gambling with the procurement legislation.

When these alternatives are not viable, the request for tender has to be created in collaboration of different experts. Collaboration requires coordination and often the boundary of knowledge creation between specialists is semantic or pragmatic, because individuals have different education and work in different organizational units pursuing different goals. Syntactic boundary is easier to achieve when the people have similar backgrounds and work with similar tasks. For example procurement experts were sometimes able to simply transfer their experiences to other procurement experts, having a syntactic boundary between them. On the other hand, the boundary between dental care specialists of two different specialisms was not anymore syntactic and an attempt to simply transfer knowledge failed, when translation or transformation of knowledge was needed. In theory, it should be possible to find syntactic boundaries also between different professions, when the stable conditions have allowed formation of common lexicon (Carlile 2004). However, conditions of the studied cases were not stable enough for this. There may be several years before the procurement project has to be renewed and therefore procurement expert and substance expert have to develop again a common lexicon to translate the novelty of each other's specialism that has accumulated during those years.

Sometimes those advances have created even conflicts that have to be identified and solved to define their common interest.

The initial idea of liaison position relied heavily on the assumption of syntactic knowledge boundary, where the informants in departments could prepare their parts alone and then just transfer the information through the liaison person. The analysis of empirical data revealed that the challenge is not the transfer of knowledge, but knowledge has to be created in the first place. The procurement expert did not have time to write the request for tender of wood- and metal working machines, and therefore the procurement apprentice did that. Also in the department, the request for tender was prepared in collaboration, where the procurement apprentice collaborated with other members of the department to write the request for tender. It is possible that the collaboration is easier within the department because the knowledge boundary might be lower there. However, it is important to note that this easier collaboration does not mean that it would be more efficient to organize procurement operations inside departments. The procurement work inside department is easier because part of the work is neglected: the part-time procurement workers do not have equal possibility for learning the changes in procurement legislation. As a consequence the knowledge boundary is lower for them, but at the cost of neglecting the novelty of procurement legislation.

IV RESULTS

8 Summary about research question

The research question of this thesis is **"**How to coordinate the work of experts and cross knowledge boundaries in the preparation phase of the public procurement process?" This chapter presents and elaborates three success factors as an answer to that question.

	Dental technical laboratory work	**Bakery products**	**Wood- and metalworking machines**
Form of interdependency	Reciprocal	Reciprocal	Reciprocal
Coordination method	Plan	Plan	Mutual adjustment
Type of knowledge boundary	Pragmatic	Pragmatic	Semantic
Boundary process	Knowledge transfer	Knowledge transfer	?

Table 7 Coordination and knowledge boundary crossing in the three cases

Table 7 above shows that the procurement expert and substance expert were reciprocally interdependent in all three cases. Consequently their collaboration entails tasks that cannot be coordinated only by standardizing everything with routines and rules or by detailed planning. The uncertainties of the process need to be handled with mutual adjustment during the process. Sherman and Keller (2011) found that there is a tendency to underestimate the form of interdependency. The table above supports that finding, because two of the three cases were trying to coordinate by plan despite their reciprocal interdependency.

Two of the three cases had a pragmatic knowledge boundary between the procurement expert and substance expert and it was semantic for the third one. This demonstrates that it is not possible to simply transfer knowledge between these experts, but they have to create their common lexicon, settle possible arising conflicts of interest and translate or transform each other's knowledge over the boundary. The analysis of the boundary processes demonstrates that there seems to similar underestimation bias in evaluation of the type of knowledge boundary than what Sherman and Keller (2011) found in evaluation

of the form of interdependence. Both cases with pragmatic knowledge boundary were trying to cross that boundary with plain knowledge transfer when knowledge transformation was needed. This warrants the first success factor:

Success factor 1

> Recognition of the reciprocal interdependencies and pragmatic knowledge boundaries

According to these cases more complex forms of interdependencies and types of knowledge boundaries are emphasized in the preparation phase of the public procurement process. Reciprocal interdependencies and pragmatic knowledge boundaries limit the possibilities for coordination by standardization and knowledge transfer, but require coordination by mutual adjustment and knowledge transformation.

In a public procurement project, different professions need to collaborate to create shared understanding to create the request for tender. The legal requirements are fully understood only with knowledge of the professional procurement expert. Similarly, the substance requirements are fully understood only with professional knowledge of the substance expert. Moreover, these legal and substance requirements are interdependent. Analysis of the empirical data showed that it is not enough that all different professions check that the request for tender is in order according to their individual viewpoint. A thorough evaluation of the request for tender requires that all relevant professions spend a significant amount of their time on sharing and learning each other's professional knowledge.

The request for tender in Dental technical laboratory work case highlights the risk of conflict when interpretations of different professionals are not combined in the preparation phase of the procurement project. Obtaining shared understanding already in the preparation phase is not easy. The elements of shared understanding are hidden in the professional knowledge of the participants and can be exposed when these professionals build a shared understanding by carefully sharing and learning each other's professional knowledge.

Success factor 2

> Shared understanding between the experts

The recognition of externalization and shared understanding are needed especially in the preparation of request for tender. The request for tender should define all the significant aspects of the procurement, but the experiences of the interviewed people and especially their answers in the follow-up interview demonstrated, that there are always issues needing managerial attention, that aren't taken care of in the request for tender.

Success factor 3

Continuous management of the procurement process

For example, when the city merged with the neighbouring municipalities, there was a need for diligent managerial consideration to decide how to work with the existing procurement contracts in this new situation. Managerial issues range from strategic decisions to minor details. The contract follow-up creates a continuous stream of operational issues that require day-to-day management. This operational management is needed also to learn the pros and cons of the current procurement project. These results can be utilized to improve both strategic and operational decision making in future procurement projects.

Strategic issues include make-or-buy decisions, decisions on how to prepare and manage procurement projects and what societal goals are sought with the public procurement. An important aspect of make-or-buy decisions is the manageability of the contract. The procurement of standardized products from a perfectly competitive market is much easier to manage than procurement of customized services in areas where the procurer is not a professional:

Case Bakery products

"Competetive tendering is not worthwhile for its own sake, a public monopoly is a bad solution, but a private monopoly is worse, because the city loses its expertise."	*"se kilpailuttaminen ei oo itseisarvo, että vieläpä tämmöstä julkista monopolia huonompi ratkaisu on yksityinen monopoli, jolloin kunnalta häviää se osaaminen."*

9 Improved theory construction

Chapter 3.1 describes three forms of interdependence (Thompson 1967): pooled, sequential and reciprocal interdependence. Chapter 4.2 presents three types of knowledge boundaries (Carlile 2004): syntactic, semantic and pragmatic knowledge boundary. Chapter

5.2 formed a theory construction which placed the forms of interdependence along the continuum from interpretation to improvisation (Weick 1998). The studied cases demonstrated the importance of reciprocal interdependencies in the preparation phase of the public procurement and the problems of underestimating the needed coordination method. This is reflected in the improved theory construction in Figure 15 by highlighting the reciprocal interdependencies and its coordination method of mutual adjustment. Moreover, these cases with reciprocal interdependencies had tendency for pragmatic knowledge boundaries, which is reflected by highlighting the pragmatic knowledge boundary of the reciprocal interdependency.

The theory construction shows that costs increase along the continuum from interpretation to improvisation. However, the simultaneous analysis of coordination and knowledge boundaries revealed that it is not just costs that increase, but also novelty. Complex forms of interdependencies create more coordination costs and more costs to overcome knowledge boundaries, but also create possibility to cope with higher levels of novelty and uncertainty. Working across the pragmatic boundary and in reciprocal interdependence is difficult and creates costs, but it is also a necessity when working with novel issues.

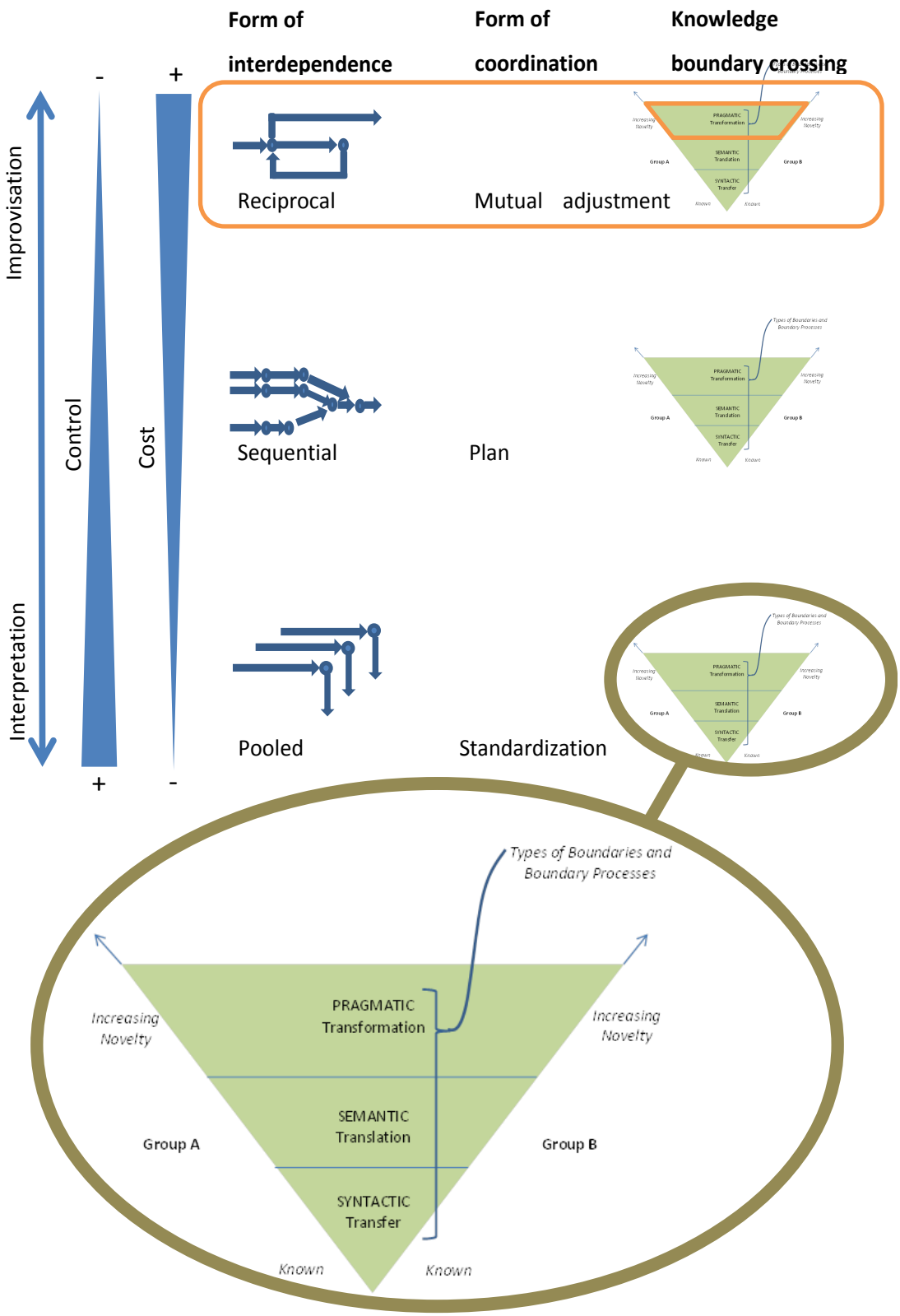

Figure 15 Improved theory construction: Coordination and knowledge boundary crossing

V CONCLUSIONS

10 Managerial implications

Two practical problems were repeatedly encountered in preparation of request for tender: the timing of the preparation project and the quality of the request for tender. Several preparation projects were delayed by unexpected problems and despite rigorous effort some deficiencies were found afterwards from requests for tender. The straightforward attempts to fix these issues with more detailed planning and instructions did not completely solve the problems. The discussion in Chapter 7 provides a more thorough analysis about these issues.

First of all, it was found out that the challenges in communication between units were not only challenges in knowledge transfer, but actually the knowledge had to be created first. The knowledge of how substance experts do their work is largely tacit: usually there is no need to explicate that knowledge in their daily work. In preparation of request for tender, this knowledge has to be brought to explicit form. Creation of explicit knowledge from tacit knowledge is a laborious process, where the concepts for describing the tacit knowledge have to be invented and tested.

Another difficulty of knowledge creation is that the substance experts and procurement experts cannot solve all problems separately. There were important issues were both the understanding of substance expert and procurement expert had to be combined to understand the total effect of the request for tender that they prepared. Successful communication over the boundary between substance expert and procurement expert is not self-evident, but requires that these parties develop a shared lexicon to discuss the interdependencies between their jobs. In addition, the conflict of interests between legislative and practical issues is apparent in request for tender. Again, a shared understanding between both experts is needed to negotiate a good compromise for the conflict.

Recognition of these difficulties reveals that other actions are needed than more rigorous planning and more detailed instructions: both procurement expert and substance expert have to work closely and intensively to develop a shared lexicon to understanding each other's jobs, to make good compromises in conflict issues and to support substance expert in his or her difficult process of converting tacit knowledge to explicit product definitions.

All these tasks are laborious and prone to errors. Both the preparation phase and contract period are then likely to have some number of surprising incidents and the procurement project should have a project manager that has resources and authority to do the detailed daily managing of the project in every phase of it.

This management viewpoint is another way to explain the observed difficulties of the procurement projects. One purpose of the management in city is to develop the service offerings of the city and to develop processes between different service production units. Even when the service production itself is outsourced, the questions of these development issues are too dependent on the internal operations of the city to be outsourced. When the service production is done inside the city, this development work can take place continuously, little by little. In contrast, when the service is procured, all significant development work has to happen already in the preparation of phase of the procurement project. The preparation of request for tender is an important phase where the city should explore the need of service, design suitable service offerings and develop processes how the different service production units coordinate their work. In a way, this work has been partly done already in the studied cases, but it was labelled simply as writing of request of tender and its product definitions, whereas the labels of strategic planning, service design and process development might be more suitable names for describing all the challenges of this phase.

11 Theoretical contributions

The results demonstrate that the theories of knowledge boundary crossing and coordination are valid and important in the studied cases. Consequently, these results validate the theoretical positioning of this study. The results corroborate established theories about forms of interdependence (Thomson, 1967) and types of knowledge boundaries (Carlile 2004). Additionally, the thesis confirms that the level of interdependency is often underestimated (Sherman&Keller 2011).

The improved theory construction extends existing theories by bridging the theory of forms of interdependence and the theory of knowledge boundaries. The analysis of the empricial data suggests that there is a connection between the form of interdependency and the type of knowledge boundary. The pragmatic type of knowledge boundary was prevalent in the studied cases with reciprocal interdependencies.

The three success factors are based on the existing literature. The categorization of forms of interdependence (Thomson 1967) and types of knowledge boundaries (Carlile 2004) are well known in the literature. This thesis identified that in practice it is easy to underestimate the type of knowledge boundary. When the type of knowledge boundary is underestimated, its difficulties, workload and risks are underestimated. This phenomenon has many similarities with the underestimation of the level of interdependency found by Sherman and Keller (2011).

Okhuysen and Bechky (2009) argue that common understanding is one of the integrating conditions for coordination. The second success factor of this thesis, shared understanding is based on the idea of common understanding and includes the ideas of usefulness of a common understanding regarding the task, knowledge of the different parties or knowledge about the broader context of the task (ibid.). However, the empirical data demonstrated that while common understanding might be enough in coordination generally, more in-depth shared understanding is needed when there is a knowledge boundary between the tasks. To reach shared understanding, participants may have to create knowledge together, not just share what they already know.

The third success factor is the continuous management. The division of work can be defined only concerning the tasks that are known beforehand. During the execution of tasks new unexpected tasks may appear, that have to be taken care of. Purpose of continuous management is to do exactly this, resembling the idea of process owner. The specific characteristics of the continuous management are the cross-organizational nature of the procurement projects and the uncertainties associated with the knowledge boundary.

More generally, the findings of the thesis elaborate reasons that hinder efficient self-organization of the procurement projects. Underestimation biases about the level of interdependency and knowledge boundary clearly make it more difficult to recognize how to organize procurement projects efficiently. Christensen's (1997) book *The Innovator's Dilemma* describes a similar paradox, where existing firms have one after another been unable to notice the disruptive technological changes. The Christensen's paradox can be described also in words of coordination and knowledge boundaries: efficient coordination of existing operations does not help organizations to create new knowledge about disruptive technologies. Hence also Christensen argument can be interpreted to demonstrate how organizations are inclined to exaggerate on the interpretation side at the

cost of improvisation. There are also several attempts to solve this paradox. Benner and Tushman (2003) use concept of *ambidextrous organization* to solve the paradox with the separation of departments, so that one department is optimized for efficient process management and exploitation of the existing capabilities in stable contexts, whereas all innovation and explorative activity is fostered in another separate department (ibid.). Also proponents of *Business process re-engineering* suggest that the paradox can be solved when outdated organizational operations can be updated with extensive process redesign efforts (Davenport&Short 1990, Hammer 1990).

Systems thinking (e.g. Senge 1990) and *Total quality management* (e.g. Deming 1982) argue that these problems can be solved by analysing and explaining the situations thoroughly and profoundly so that the problems of too narrow thinking become obvious. Problem of that kind of analysis is that when working with creativity and uncertainty, it is often impossible to completely explain the necessity of those actions during the execution of the tasks. It is seen only afterwards, if the creative attempts created any useful end results and if those results had any effect on the future of the organization.

12 Evaluation of the research

Adequacy of positivist research is traditionally judged according to its *objectivity, reliability* and *validity.* Objectivity in positivist research demands the neutrality and avoidance of bias, values and prejudice. Reliability assesses the consistency, predictability and dependability of the study, demanding that every repetition of the equivalent study should generate similar results. Finally, validity is the extent to which the results describe how the situation is in reality in the study (internal validity*)* and the extent to which these results are generalizable to other settings (external validity). (Guba&Lincoln 1989, pp. 233-236)

Inevitability of values in research challenges the positivistic view of objectivity. (Brydon-Miller et al. 2003). An action research study attempts to change the systems and therefore repetition of the study may not produce the same results, questioning the reliability. Finally, internal and external validity assumes that results describe how the situation in objective reality is (Guba&Lincoln 1989, pp. 236), while in action research every individual has his or her own interpretation of the situation and there is no such single objective reality.

Instead of these positivist criteria, Guba and Lincoln (1989, pp. 236-243) suggest that constructivist research should be evaluated according to its *credibility, transferability, dependability* and *confimability.* While internal validity in the positivist paradigm tries to ensure uniformity between results and reality, dependability in the constructivist paradigm ensures uniformity between the results and the realities of the participants. (ibid.) In this study this was ensured in data collection with iteration. Key persons were met several times, which allowed researchers to make sure that their interpretation of the situation was uniform with the understanding of the informants.

The criterion of transferability in the constructivist paradigm is parallel to external validity and generalizability in the positivist paradigm, but with the difference that it is not obvious what the important characteristics of the studied situation are. Therefore constructivist research favours *thick description*, meaning detailed description of the time, the place, the context, and the culture of the study. With this information, the judgement whether the results are transferable to other contexts are left for the reader. (Guba&Lincoln 1989, pp. 241-242) In this thesis, the intense research project enabled good understanding about the context discussed in Chapters 1 and 6.3 in detail.

The constructivist criterion of dependability resembles the positivist criterion of reliability, but acknowledges that the development of methodology and construction during the study does not lead to questionable reliability but to more mature understanding (Guba&Lincoln 1989, p. 242). The initial rounds of this development are described in Chapter 2.5 and the final refinements of the construction are shown in this thesis when the theory construction of theoretical background is developed to the improved theory construction.

Finally, the criterion of confirmability resembles the conventional criterion of objectivity. Even a rigorous description of the research methods cannot prove that the results are rooted in the real contexts and real persons, but the researcher has to verify the confirmability of the results by coherent narratives and convincing analysis. (Guba&Lincoln 1989, p. 243) This humbling challenge was taken seriously during the writing of this thesis, but the success of this endeavor can only be evaluated by the reader.

13 Future research

This thesis analysed the coordination in knowledge boundary crossing in three procurement cases of a single city. Although the preparation of request for tender was organized

differently in all the three cases, there are many other ways to organize procurement work. For example, departments may have a bigger role in this work and the amount of participants may range from one to dozens. It would be beneficial to compare how these different ways of organizing procurement projects affect the coordination and knowledge creation.

The importance of shared understanding between procurement and substance experts was emphasized because it is a necessity in the preparation of request for tender. However, a shared understanding is also needed to analyse the more far-reaching strategic questions of public procurement. In its make-or-buy questions, a city has to evaluate what are the advantages, costs, risks and manageability of different alternatives. It its plausible that similar difficulty of attaining shared understanding is present in this strategy work also, presenting an interesting avenue for future research.

The empirical data of this thesis includes only public procurement cases. However, the theoretical roots of the thesis are not specific to public procurement at all. Consequently it is plausible that the theory construction may be useful in other contexts as well for gaining better understanding about the relationship between coordination and knowledge boundaries in general.

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