

HANNELE VÄYRYNEN

Constructing Innovativeness in the Organization

*Knowledge Management and
Information Technology Management Perspective*

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in the Organization

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Information Technology Management Perspective*

ACADEMIC DISSERTATION

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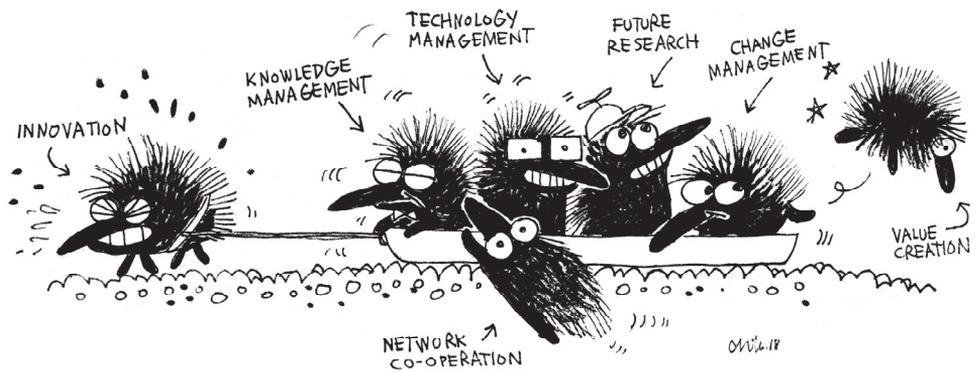
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PunaMusta Oy
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This dissertation is dedicated to my dearests.

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Intohimoinen heittäytyminen mielenkiintoiseen aiheeseen vie mennessään, syvälle, positiivisessa merkityksessä. Niin kävi minullekin. Haasteena matkan alussa oli aaltoilu käytännön tiedon ja tieteellisen tiedon yhdistämisessä ja vuoropuhelun tasapainottamisessa. Mutta sukellus värikkääseen aihe maailmaan kannatti. Tuloksena on väitöskirja, johon aalloissa tarttui mukaan rikkauksia eri projekteista, näkökulmista ja eri ihmisiltä, eri värejä. On kiitosten aika.

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Hannele Väyrynen

ABSTRACT

“Every problem is a brilliantly disguised opportunity”

- John Gardner –

Organizations operate in an increasingly rapidly changing business environment and forces them to develop new kinds of problem solving capabilities. In order to remain competitive, there is not only the need to constantly develop products, services and processes, but also to create totally new innovations. This means that new information needs to be absorbed and new technology places novel competence demands on the actors. Therefore, more integrated information is needed on the different approaches to innovativeness as well as on the different processes of the organization and on how the functions influence each other. The main objective of this research is to build a comprehensive understanding about the knowledge management practices that can promote the development of the organization and innovativeness. In this research innovativeness is considered as knowledge creation and knowledge development in the organization. The research questions in this dissertation examine how the innovativeness can be supported with actionable knowledge, the capability to utilize information technology and the future awareness.

The innovation process requires the support of different organization functions to succeed. The knowledge-based view offers a strong theory bases to innovation research and at the same time, gives space for the other research views, information technology adoption and future awareness. This research can be characterized as an exploratory study. With four different empirical studies pertaining to the current dissertation, organizational knowledge management operations are explored using a mixed-method approach. The main research methods were Internet-based questionnaires and interviews. The data was collected in 2014-2017. The results were compiled from the analyses of the very distinct theoretical approaches that target knowledge utilization and creation, organizational development and innovativeness as a common thread. The literature review and the empirically grounded results confirm that a comprehensive picture of the organization’s processes is necessary to

enable organizational development. The four individual research articles construct a continuum for each other and answer the research questions.

The basic assumption in this research is that the firm level knowledge is construed at the individual level. However, the individuals need functional knowledge management practices for the operations. The main contribution to innovation management is the combination of the different theory approaches, organization change management, knowledge management, information technology management theories and future research, as an umbrella by providing a more holistic view of knowledge management practices that affect the innovation processes of the organization. This research suggests practical issues to evaluate in the organizations for their innovation processes. The companies can develop their innovation processes considering the identified knowledge creation and information technology adoption challenges as well as future research possibilities.

Keywords: Knowledge management, knowledge utilization, information technology adoption, future awareness, change readiness, innovativeness

TIIVISTELMÄ

“Every problem is a brilliantly disguised opportunity”

- John Gardner -

Organisaatiot toimivat nopeasti muuttuvassa liiketoimintaympäristössä ja organisaatioilta vaaditaan uudenlaisia ongelmanratkaisutaitoja. Yrityksen kilpailukyvyä säilyttämiseksi tarvitaan tuotteiden, palvelujen ja prosessien uusiutumisen lisäksi täysin uusia innovaatioita. Tämä tarkoittaa sitä, että tarvitaan uutta tietoa ja osaamista sekä uudenlaisen teknologian omaksumista. Siksi tarvitaan integroidumpaa tietoa eri innovatiivisuus-näkökulmista sekä organisaatioiden eri prosesseista ja toimintojen vaikutuksista toisiinsa. Tutkimuksen tavoitteena on luoda kokonaisvaltainen kuva toimivista tiedon ja osaamisen johtamisen käytännöistä, jotka voivat edistää organisaation kehittymistä ja innovatiivisuutta. Väitöstutkimuksessa innovatiivisuutta tarkastellaan tiedon luomisena ja tiedon kehittymisenä organisaatiossa, ja tutkimuskysymysten avulla selvitetään, kuinka innovatiivisuutta voidaan tukea toimintaan johtavalla tiedolla ja osaamisella, kyvyllä hyödyntää informaatioteknologiaa sekä toimijoiden tulevaisuustietoisuudella.

Innovaatioprosessi vaatii onnistuakseen eri organisaatiotoimintojen tukea. Tietoperustainen lähestymistapa antaa vahvan teoriapohjan innovaatiotutkimukselle tarjoten samalla eri tutkimusparadigmoille tilaa, informaatioteknologian omaksumiselle sekä tulevaisuustietoisuudelle. Tämä tutkimus on kartoittava tutkimus. Empiirisen aineiston neljän eri tutkimuksen avulla tutkittiin organisaation tiedon ja osaamisen johtamisen toimintoja monimetodisilla tutkimusmenetelmillä. Työn keskeisimmät tutkimusmenetelmät olivat Internet-pohjainen kysely sekä haastattelut. Tutkimusaineisto kerättiin vuosina 2014-2017. Tulokset koostettiin analysoimalla vastauksia eri teorialinssien kautta, ja analyysit kohdentuivat tiedon ja osaamisen hyödyntämiseen ja luomiseen, organisaation kehittymiseen ja innovatiivisuuteen. Aikaisempi kirjallisuus ja empiiriset tulokset vahvistavat, että organisaation kehittämiseksi tarvitaan kokonaisvaltainen kuva organisaation

prosessiketjusta. Neljä itsenäistä tutkimusartikkelia muodostavat jatkumon toisilleen ja niiden avulla vastataan tutkimuskysymyksiin.

Keskeinen oletus tässä tutkimuksessa on, että yritystason tieto rakentuu yksilötasolla. Yksilöt tarvitsevat kuitenkin toimivia tiedon ja osaamisen johtamisen käytäntöjä organisaatiotoimintoihin. Keskeinen kontribuutio innovaatiojohtamisen tutkimuskenttään on eri teoriakenttien yhdistelmä, organisaation muutosjohtaminen ja tietämyksenjohtaminen, informaatioteknologian johtaminen sekä tulevaisuustutkimus, sateenvarjona, jonka alla muodostetaan kokonaisvaltaisempi kuva tietämyksenjohtamien käytäntöjen vaikutuksista organisaation innovaatioprosessiin. Tutkimus tarjoaa käytännön kohteita, joita voidaan arvioida organisaatioiden innovaatioprosesseissa. Yritykset voivat kehittää innovaatioprosessejaan tarkastelemalla tunnistettuja tiedonluomisen ja tietotekniikan omaksumisen haasteita sekä tulevaisuustutkimuksen mahdollisuuksia.

Avainsanat: Tietämyksen johtaminen, tietämyksen hyödyntäminen, informaatioteknologian omaksuminen, tulevaisuustietoisuus, muutosmyönteisyys, innovatiivisuus

CONTENTS

1	INTRODUCTION.....	19
1.1	Motivation for the research.....	19
1.2	Positioning of the research and limitations.....	21
1.3	Key concepts	22
1.3.1	Actionable knowledge.....	24
1.3.2	Information technology adoption.....	25
1.3.3	Future awareness	27
1.3.4	Innovation.....	27
1.4	Research objective and research questions	28
1.5	Structure of the research.....	29
2	THEORETICAL BACKGROUND.....	31
2.1	Change management offers an opportunity for organizational development and innovativeness	31
2.2	Knowledge management extending knowledge to innovativeness.....	34
2.3	Technology management orchestrating knowledge and information technology in innovation process	37
2.4	Future research building the bases for innovation orientation.....	39
2.5	Endeavour to innovate	40
2.6	Summary of theoretical background.....	43
3	RESEARCH DESIGN.....	45
3.1	Methodological approach	45
3.2	Research methods	47
3.2.1	Research method for the theoretical part.....	48
3.2.2	Research method for the empirical part.....	49
3.3	Data analyses.....	54
3.4	Research process	58
4	SUMMARIES OF THE ARTICLES	59
4.1	Publication I: Tietämyksenhallinta osana organisaation toimintaa – hallintaa vai hämmennystä?	59
4.2	Publication II: Knowledge management for open innovation: comparing research results between SMEs and large companies	60
4.3	Publication III: Why don't one maximize database utilization in product and service development in manufacturing?	61
4.4	Publication IV: Information initiates to future – if used	62

5	discussion.....	65
5.1	How can knowledge creation support the development of the organization?.....	65
5.2	Which factors in information technology adoption facilitate the development of the organization?	67
5.3	Which future awareness factors facilitate development of the organization	67
5.4	Promoting innovativeness with functional KM practices	69
6	CONCLUSIONS.....	73
6.1	Contribution of the research.....	73
6.1.1	Contribution to theory.....	73
6.1.2	Contribution to practice.....	74
6.2	Research quality.....	75
6.3	Future research directions	78
7	References.....	80

List of Figures

Figure 1. Positioning of the research.....	22
Figure 2. Research clusters in the research literature review (made with Vosviewer 2017 by the researcher).....	23
Figure 3. Research questions of the dissertation.....	29
Figure 4. Theoretical framework of the research.....	44
Figure 5. The research strategy	46
Figure 6. Independent studies and information progression for innovativeness of the organization.....	57
Figure 7. The research process	58

List of Tables

Table 1. Role of the author in the publications.....xvii

Table 2. Views for understanding organizational change.....33

Table 3. Views for understanding knowledge management in an organizational change situation.....36

Table 4. Views for understanding information technology management in an organizational change situation.....39

Table 5. Views for understanding future awareness40

Table 6. Views for understanding innovativeness.....42

Table 7. A summary of the publications and contributions to innovativeness of the organization and to the thesis.....64

Table 8. Critical KM elements affecting the innovation capability of the organization in the empirical results.....70

ABBREVIATIONS

AST	Adaptive Structuration Theory
ECM	Engineering Change Management
ECP	Engineering Change Process
EIM	Equity-Implementation model
HR	Human Resources
IS	Information System
IT	Information Technology
KBV	Knowledge Based View
KIT	Key Intelligence Topics
KM	Knowledge Management
KMS	Knowledge Management Systems
NDP	New Product Development
P & D	Production and Development
RPV	Resources, Processes and Values
SME	Small and Medium Sized Enterprise
SPSS	IBM SPSS Statistics, Software Package for Statistical Analysis
TAM	Technology Acceptance Model
UTAUT	Unified Theory of Acceptance and Use of Technology
VCE	Value Chain Evolution

ORIGINAL PUBLICATIONS

- Väyrynen, H. Helander, N., & Jalonen, H. 2015. Tietämyksenhallinta osana organisaation toimintaa – hallintaa vai hämmennystä? Hallinnon tutkimus, Vol. 34, No. 4, pp. 310-325.
- Väyrynen, H., Helander, N. & Vasell, T. 2017. Knowledge Management for Open Innovation: Comparing Research Results Between SMEs and Large Companies. International Journal of Innovation Management, Vol. 21, No. 5, 22 pages.
- Väyrynen, H. & Manu, M. 2017. Why don't one maximize database utilization in product and service development in manufacturing? Presented in conference, Proceedings of the 12th International Forum on Knowledge Asset Dynamics: St. Petersburg, Russia, 7-9 June 2017. pp. 93-105 13 pages.
- Väyrynen, H. 2017. Information initiates – if used. AcademicMindtrek'17, September 20–21, 2017, Tampere, Finland © 2017 Association for Computing Machinery. ACM ISBN 978-1-4503-5426-4/17/09. DOI:<https://doi.org/10.1145/3131085.3131089>.

Table 1. Role of the author in the publications

Publication	Author	Role of the author
1. Tietämyksenhallinta osana organisaation toimintaa - - hallintaa vai hämmennystä?	Lead author	<ul style="list-style-type: none">- Carried out the survey- Analysed and reported the empirical data- Wrote the theory with the co-authors- Wrote the empirical part of the paper- Coordinated the writing process- Wrote the paper with the co-authors during the review process
2. Knowledge management for open innovation: comparing research results between SMEs and large companies	Lead author	<ul style="list-style-type: none">- Carried out the survey- Analysed and reported the empirical data- Wrote the theory with the co-authors- Wrote the empirical part of the paper- Coordinated the writing process- Wrote the paper with the co-authors
3. Why don't one maximize database utilization in product and service development in manufacturing	Lead author	<ul style="list-style-type: none">- Designed the case study- Carried out the survey- Analysed and reported the empirical data- Initiation of the idea of the paper- Wrote the theory with the co-author- Wrote the empirical part of the paper- Coordinated the writing process- Wrote the paper with the co-author- Presented the paper in the conference
4. Information initiates to future – if used	Solo author	<ul style="list-style-type: none">- Designed the survey- Carried out the survey- Analysed and reported the empirical data- Wrote the whole paper- Presented the paper in the conference

1 INTRODUCTION

1.1 Motivation for the research

Companies are becoming increasingly conscious of the need for regeneration in products, services or operations. There may be knowledge of what to innovate but the knowledge of how is missing (Christensen, Anthony & Roth, 2004; Darroch, 2005; Schilling, 2010). “Change” as a phenomenon exists in the organization but converting the phenomenon to “changing” (Weick and Quinn, 1999) enables the organization actors to identify the possibilities of change and promote organization development (Kanter, 1983). Interest in organizational development opportunities was the primary reason for the research. What were the mechanisms that promote or restrain positive organization change? Through positive organization change, new resources can be obtained (Armenakis, Harris, and Moosholder, 1993), like new knowledge or competence or cultural change that may guide further to new products, services or processes and can give competitive advance in the market (inter alia Feldman, 2004; Darroch, 2005). The main objective of this research is to build a comprehensive understanding about the knowledge management (KM) and knowledge the creation practices that can promote the development of the organization and innovativeness.

At Finnish level, the productivity of the industrial sector has lagged behind that in other developed and developing countries (Palokangas and Rautaportas, 2017). Information technology (IT) utilization, especially in small and medium-sized enterprises, (SMEs), has more potential resources than the companies avail themselves of. Companies need to either update their products and services or design new ones to stay competitive, reform and grow. However, companies are cautious to invest resources in innovation and product and service development, or even decrease their research, development or design resources. (E.g. Kuismanen, Malinen & Seppänen, 2017, p. 16; Turunen, Rauhansalo & Volanen, 2017; OECD a, 2017; OECD b, 2017)

The research and development activity and expenditure of Finnish business enterprises increased between 1990 and 2007 in Finland but, since 2007, investments in innovations have decreased¹ (Statistics Finland, 2017, Appendix 2). This may mean that companies are attempting to produce new products or services with old organization processes and practices (Schilling, 2010).

¹”Description of indicator: Research and development activity (R&D) is understood as systematic work undertaken to increase the stock of knowledge and use it to devise new applications. The defining criterion is that the purpose of the activity should be the presence of an appreciable element of novelty. Research and development activity includes basic research, applied research and experimental development. The statistics on research and development describe the resources used for research, and for product and process development. R&D data are examined by sector, region and sub-regional unit. The statistics are based on data obtained from enterprises, universities, central university hospitals, polytechnics and public sector organisations. The classifications used in the statistics are: Industry, municipality, sub-regional unit, region, sector and field of science” (Statistics Finland / Research and development, 26.10.2017)

The competence that is needed in companies in the future is defined more from organization-external requirements. The assessment of the driver for employee development is that the most important place or space for competence development is the companies' work community. (Linturi and Kauppi, 2017, p. 31) The idea is that the work is done in interaction between interdependent organization actors (Kilpi, 2016, p. 119). Furthermore, competence is also built with technology or machines and for innovations there must be a co-operative network in the company (ibid.). Rapidly changing work and new organization business models mean new and fast learning requirements for individuals and "will increasingly be based on greater autonomy for high-performing, creative contributors" (Boyd, 2016, p. 3).

Innovativeness can be seen as knowledge creation and knowledge development. For knowledge to be a resource, the organization has to define which information is relevant for the company, which information technologies support knowledge creation best or what kind of competence is needed to actualize the development of the organization's processes, products or services. The knowledge-based view emphasizes knowledge as the most important resource of the firm (Grant, 1996; Spender, 1996; Nonaka et al., 2000). However, the organization needs to have the capability to utilize knowledge (Nonaka and Takeuchi, 1995) and understanding about the knowledge creation process that affects individuals, the organization and the environment (Nonaka and Toyama, 2003).

From the research point of view, both the innovation research field as well as the body of literature are fragmented. Studies on the subject have been published in many disciplines, including organization science, strategic management, the management and leadership approach, intellectual capital research, design theory, psychology and social and learning areas, performance and measurement or accounting, technology field, future forecasts as well as complexity or risk management approaches. However, a combination of the several theory approaches in the innovation research is missing (Galende, 2006; Chesbrough and Appleyard, 2007; Andreeva and Kianto, 2011; Martin-de Castro et al., 2011). Furthermore, when examining organization and technology, a comprehensive picture of the organization functions, technology, practitioners, knowledge, communication and external influence is also lacking (e.g. Orlikowski, 1992; Tavcar and Duhovnik, 2005). A wider approach of knowledge utilization and IT adoption to promote organization development and innovativeness is needed (Darroch, 2005; Lapointe and Rivard, 2005) as well as new innovation processing tools (Hurt, Joseph, and Cook, 1977; Wang and Ahmed, 2004; Martensen, Dahlgaard, Park-Dahlgaard & Gronholdt, 2007; Dobni, 2008).

The challenge for the research to combine different approaches to the innovation theme comes from the different disciplines and their research methods and streams of literature. Previous studies have called for the comprehensive research of organizational change and organizational development, e.g. IT adoption or change and individuals' reactions and behaviour (Joshi, 1991; Avey, Wernsing & Luthans, 2008; Ford, Ford, & D'Amelio, 2008; Beaudry and Pinsonnelt, 2010; Laumer and Eckhardt, 2011), seen in a feeling of uncertainty (Lawler, Thye & Yoon, 2000), or individuals' evaluation of the change benefits (Joshi, 1991; Kim and Kankanhalli, 2009) or the momentum of the change (Jansen, 2000). Since the current research considers functional KM practices and elements that are part of the comprehensive picture of the organization's operations, the selection of research methods is challenging. The company sizes in this research differ as well as the operating methods of the companies. Thus, an explorative study is more suitable for the research, using different research methods than only either a quantitative or qualitative approach. Taking more a precise view of the concepts related to

organizational development, enables the researcher to reveal the effects of the different functions on the operations of the organization.

Participation has been found to promote organization development in earlier studies (Armenakis, Harris & Moosholder, 1993; Labianca, Gray & Brass, 2000; Lines, 2004). However, there needs to be a capability in the organization to utilize the benefits of network opportunities (Kothandaraman and Wilson, 2001; Schilling, 2010) and external knowledge (Saunila, Pekkola & Ukko, 2014). Current KM practices, knowledge creation and sharing processes and IT adoption in organizations seem to focus on operational functions, which does not promote the important dimension of the development of the organization and innovation processes. Moreover, future research and environment scanning are not sufficient if they are carried out by a certain profession or unit in the organization. In order to promote innovativeness in the organization, information is needed about the functional KM practices that promote knowledge creation.

1.2 Positioning of the research and limitations

This chapter presents the theoretical research areas and the position of the current research in the area of KM research, especially knowledge creation towards innovations. Innovation, knowledge and new processes, products or services are not dependent on the scientific field. Innovation management research is associated with many disciplines, e.g. management science (Yukl, 2006; Schilling, 2010), economics (Maliranta, 2014; Rikama, 2014), business sciences, both financial or accounting and operational or production aspects (Suomala, Manninen & Lyly-Yrjänäinen, 2011), social sciences (Arnkil, Järvensivu, Koski & Piirainen, 2010; Alasoini, 2017), administrative sciences (Haveri and Anttiroiko, 2009; Häkli, Karppi & Sotarauta, 2009), or technological sciences (Menanteau and Lefebvre, 2000; Phaal, Farrukh & Probert, 2004; Robinson, Huang, Guo & Porter, 2013).

This dissertation combines theory, approaches and concepts of KM, IT management and future research areas. KM literature focuses on knowledge utilization in the organization, including organization-internal and -external knowledge resources. IT management in this dissertation refers to information systems (IS) and data and operational equipment in the organization that produce data with digitalization to be adopted and utilized. Organizational change exists in the operations of the organization constantly and affects different functions of the organization (Jansen, 2000). Organizational change management research offers different scoping, including research on new technology, practices or operational implementation, changes in organization resources, and network or social aspects. The emphasis is on organizational change from the organization development approach. Future research includes the tools that are available to promote the future and opportunity awareness of individuals. The aim of the theoretical approaches is to obtain a more comprehensive picture of those KM practices that promote knowledge creation and organizational development. The positioning of the research is illustrated in Figure 1.

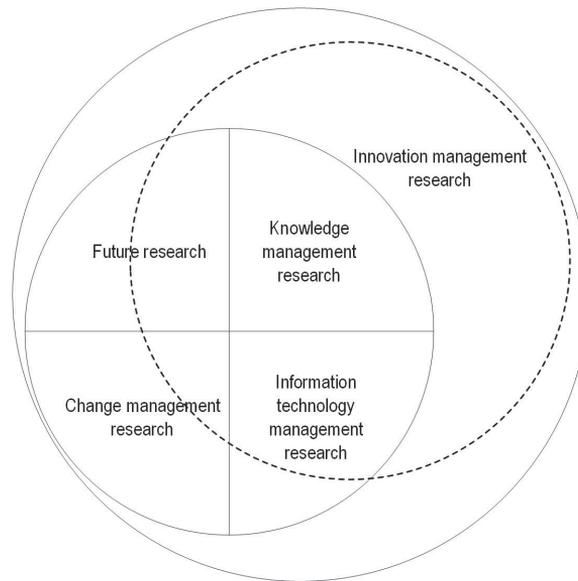


Figure 1. Positioning of the research.

All four theoretical approaches are viewed through the context of organization, products or service provider. The research is bordering the definition of organization only to the enterprise context but the line of business is not restricted. Therefore, the public sector or the third sector organizations are not within of the scope of this research.

The unit under consideration is the organization and the other stakeholders that affect individuals' choices, behaviour or action. The role of the individuals in the organization processes are operating products and services. However, a service is seen as a part of the product supply, for example the maintenance of the product. Therefore, the service as such is omitted from this research. This research focuses on the KM processes and individuals as psychological actors are addressed indirectly (e.g. reactions or meaning in a change situation).

Knowledge and IT in this research are seen primarily as a resource of the organization. Due to many meanings and functions of KM and IT, the purpose is to focus on those dynamic elements of the individuals' change readiness, of actionable knowledge, of IT adoption and of future awareness that could activate individuals for organization development – innovativeness. The identified KM practices of this research are the results of the empirical data of the Finnish companies. Next the key concepts of the research are described.

1.3 Key concepts

The research started by exploring four concepts from the literature: change resistance, change readiness, knowledge and technology, and how these four concepts are discussed in the interdisciplinary areas. During the literature review, the theoretical change framework became more precise from a combination of four concepts: change resistance and change readiness combined as organizational change, IT adoption, manufacturing and innovation. With the concept analysis, the purpose was to unveil how these concepts are discussed across the scientific

field or how the concepts are defined in the different scientific fields. According to the literature review, the research area is discursive and Figure 2 illustrates the disunity. Analysis formed the theme clusters with the strongest topic in a cluster as the heading. The formulated clusters were change, user and material cluster, model and IT, the result cluster, the personal and individual cluster and finally, the context cluster. Only the analysis function was to consider the interdisciplinary dialog of the concepts. The content of the separate clusters is explained next.

Change as such is an active research field. However, the selected issues of this thesis that promote organizational development and innovativeness are less interrelated. Figure 2. illustrates the concept analysis and the linkages that are formulated between the sample's references. An analysis is made of the selected material from the literature review and the references behind the links are expressed in Tables 2, 3, 4, 5 and 6. The literature review and the criteria for the sample selection are explained in chapter 3.2.1. Of the six different research clusters, change (red) is surrounded by the user and material cluster (light green), the model and IT' cluster (light blue), the result cluster (bright blue), the individual aspect (pink) and finally, the context cluster (yellow). Next, the cluster content is analysed more deeply. (Figure 2. Keyword clusters and linkages)

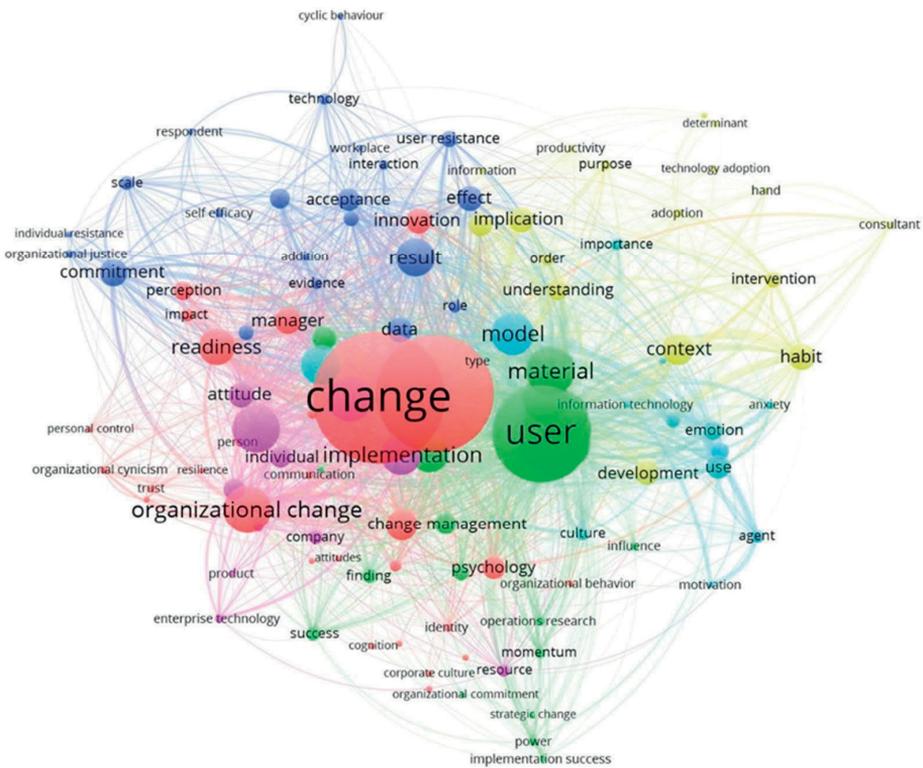


Figure 2. Change research clusters in the research literature review (made by the researcher with Vosviewer 2017).

The change cluster consists of organizational change, change management, psychology, trust, resilience, organizational cynicism and personal control, innovation and readiness for change situation. The user and material cluster consists of more organization strategic and operation aspects, e.g. strategic change, power relations, influence and implementation success. The user

cluster orient into the model and IT cluster where the organization culture, technology use, emotions, the importance of change, motivation and agent affect IT utilization. The result cluster has data very close to change phenomena and data can be interpreted as addressing an important issue in change literature. The result cluster also comprises a strong individual input of acceptance, commitment, user resistance and organizational justice. Furthermore, the workplace and interaction with technology are included in the result cluster. The personal and individual cluster's main focus is on attitude as well as the company and company's resources, product and company technology. The context cluster is composed of understanding the implications of change, intervention and purpose of change as well as the habits and development viewpoint.

When thinking of organizational readiness for change, the purpose of organizational practice development and furthermore, organizational innovation and future awareness, all those factors that enable promotion of innovativeness are at the outer edge of the figure. Cognition and identity, finding and success, motivation, self-efficacy, productivity and adoption and momentum are unarticulated themes but essential for future innovation development.

The following sections evaluate how four research fields discuss four concepts: change resistance, change readiness, knowledge and technology. After a very short literature review time, it became clear that beside these four concepts, the construction of a comprehensive organization innovation path needed more concepts. Therefore, future awareness and innovation were added to express how organizational change and individual awareness of innovation can be enabled with a pro-change attitude, KM and IT adoption in the organization.

1.3.1 Actionable knowledge

Knowledge is defined with different aspects and not only because of different research fields, e.g. strategic management literature, KM, economic theories or IT literature, but different organization functions as well. Knowledge can be a resource for the company and it can be constructed in the organization culture and practices. Furthermore, knowledge is interaction between people and technology as information systems that enable communication, information processing and storing. The most fostering role is that knowledge includes the potential for change, e.g. for action or new vision (Gill, 1996; Feldman, 2004; Ford et al., 2008; Chermack, 2012; Wells and Nieuwenhuis, 2012), but supports intellectual capital development (Armenakis et al., 1993; Labianca et al., 2000; Lawler et al., 2000; Alavi and Leidner, 2001; Avey et al., 2008, p. 50; Stevens, 2013). However, essential is to adopt knowledge for change instead of avoiding it (Lewin, 1947; Joshi, 1991; Haugtvedt and Petty, 1992; Fairhurs, Green & Courtright, 1995; Tremblay, 2000; Oreg, 2003; Jarrett, 2004; Lapointe and Rivard, 2005; Foster, 2007; Hyland, 2007; Stanley-Garvey, 2007; van Dick and van Dick, 2009; Boughenooghe, 2010; Westling, 2010; Stevens, 2013; Bergström, Styhre & Thilander, 2014; Thundiyil, Chiaburu, Oh, Banks & Peng, 2015). However, knowledge per se does not give value to the company but KM can support knowledge utilization. Darroch states that the literature does not give clear guidance on what successful KM means (2005, p. 103). Therefore, she expands KM and resource-based integration to the role of KM and the impact on KM acceptance and further, innovation and firm performance (ibid.)

The knowledge-based view theory focuses on knowledge per se as a resource and on processes and interaction between the functions and the actors in the organization who create,

store and apply knowledge (Schendel, 1996; Spender, 1996). The knowledge in the organization is produced and developed by the individuals (Grant, 1996) and their environments (Nonaka et al., 2000; Nonaka and Toyama, 2003). Knowledge is seen the most important resource of the firm's desire to obtain competitive advantage (Nonaka et al., 2000). It is essential to identify how knowledge leads to innovativeness and competitive advantage (Spender, 1996).

Knowledge can be understood as an instrument (Foster, 2007) or contextualized knowledge (Korpelainen, 2011). There are requirements for knowledge that could promote knowledge adoption. The knowledge should be evidence-based (Burke, 2011), relevant (Savolainen, 2013), accurate (Foster, 2007), solid (Hudson, 2011), plentifully expressed (Gagnon and Toulouse, 1993), exchanged between the actors, firms as well as within the firm (Grant, 1996; Harrison and Laberge, 2002) and timely and there should be a flow of knowledge exchange (e.g. Colin, 2009; Oudhuis and Tengblad, 2013; Rusly, 2015; van den Heuvel, Schalk & van Assen, 2015). There must be minimum knowledge (Foster, 2007) and enough information (Mattila, 2006) so that the organization can operate. All in all, the knowledge creation process as such needs to be adaptable to the members of the organization (Spender, 1996).

Hansen, Nohria and Tierney (1999) categorize knowledge assignment into whether it is technology-based knowledge (stored on computers or platforms) as codification strategy or person-level knowledge possession that needs to be shared as personalization strategy. The authors emphasize that one of these two strategies needs to be chosen as the main strategy. In that case, either strategy can be executed properly but one strategy supports the other. (Ibid.) Knowledge is central in IT management as well as in innovation management.

Knowledge in the present research is understood as information, data and competence and is based on the definition of "information possessed in the mind of individuals" (Alavi and Leidner, 2001, p. 109) and knowledge is merged in human action (Nonaka et al., 2000). The essential point is to regenerate the existing knowledge forward in interaction with other people. Furthermore, the actors need the ability to combine the old knowledge with new knowledge (Grant, 1996). As Spender (1996) states, the knowledge-based view theory can reveal individual-level creativity and the interactions with the organization's existing knowledge, giving meaning, in this research, meaning for the organizational development and innovation process. For better performance, organizations need to have the ability to focus on putting knowledge into action rather than knowledge itself (Alavi and Leidner, 2001, p. 129).

1.3.2 Information technology adoption

Beside IT, other knowledge process enablers are needed to further the application of knowledge. Knowledge needs to be integrated into the organization's existing knowledge: organization policy and practices, routines and professional task-based knowledge. IT can be a tool for knowledge integration and support the organization for faster operations and updated information. (Alavi and Leidner, 2001) However, besides technology in its technical definition ("objective force"), the social aspect ("socially constructed product") needs to be considered (Orlikowski, 1992, p. 406). Equity in the organization influences the use of information systems (IS) (Joshi, 1991). When routines in IT utilization and organization practices are interrupted, emotions and adaptation behaviours provide a means to deal with the changing situation (Beaudry and Pinsonneault, 2010, p. 690). Regarding IT, user acceptance by organization members is

characterized by its complexity and incoherent nature (Venkatesh and Davis, 2000). For individual-level knowledge sharing in the organization, lean knowledge can describe the need for knowledge: the right individual at the right time and in the right social context. At the organization level, knowledge sharing supports the operational environment but the right process resources are needed. IT enables not only the storing of lean knowledge but its utilization as well. However, the challenge is often that the organization systems are not integrated or the capabilities of the actors or motivation to utilize the systems are weak. Therefore, Riege emphasizes that IT integration and utilization strategy are important to avoid technology complexity, both operationally and socially. (Riege, 2005)

The IT change process needs to be considered from different contexts: technology, organization and environment (Wang, Wang & Yang, 2010). The role of IT is limited and needs individuals' knowledge processing from organization strategy level to implementation and practical level so that the knowledge is utilized effectively (Alavi and Leidner, 2001). Information technology rejection can be defined so that user resistance differs from user to user regarding the new IS implementation and change situation as such (Kim and Kankanhalli, 2009, p. 568).

As stated by Alavi and Leidner, knowledge management is "at a minimum ... processes of creating, storing/retrieving, transferring, and applying knowledge" (2001, p. 114). KM systems (KMSs) are defined as IT-based systems that support these minimum knowledge functions and the role of IT is to categorize organization knowledge. These categories include processing best practices, making company knowledge visible with directories and creating and utilizing knowledge networks. (Ibid.) Technology is seen as an "enacted environment" (Weick, 1979, p. 260).

Knowledge creation happens in a certain context. Nonaka and Konno (1998) defined the knowledge creation place as "ba" where knowledge originates, interacts, is cybered and practised (learned). In "ba," IT enables electronic interaction. Knowledge is stored somewhere: in the individual's memory or in social and organization memory. Memory is a way to document knowledge in different forms but storing knowledge can engender knowledge barriers as well. IT can both support knowledge documentation and knowledge sharing but set barriers because of the access to knowledge. Knowledge transfer happens at different organization levels, individual, group and organization levels. However, as stated by Alavi and Leidner (2001, p. 120), the majority of the literature addresses knowledge transfer channels while the focus emphasis could be on the perceived value of knowledge, motivation to share, receive and absorb the knowledge and usability of transfer channels (e.g. formal or informal channels).

Organizational operations utilize IT and although the term technology is not understood and used as embodied as such (Feldman, 2004). In this research, IT is understood as a tool for operating processes and developing practices and IT management includes information systems (IS) and data and operational equipment in the organization that produce data with digitalization to be adopted and utilized. Moreover, IT is an artefact that challenges the practitioners to maximize the technological possibilities in organization operations by the adoption of IT and data produced by the IT systems or operational equipment.

1.3.3 Future awareness

Future awareness can be a momentum (Jansen, 2000; Savolainen, 2013), an image of the future (Bergström et al., 2014), an ideal future state (Hudson, 2011) or future reality that is built (Chiucci, 2013). Alternatively, future awareness can be a changeable future (Ming-Chu and Meng-Hsiu, 2015) that is redesigned (Gharajedaghi, 2007), a vision (Crouzet et al., 2014) or an envisioned future (Fiol and O'Connor, 2002) or a pathway (Wells and Nieuwenhuis, 2012).

Future awareness may be preparation for what is coming: awareness of interruptions in the future (Beaudry and Pinsonneault, 2010), operating with complexity (Savolainen, 2013), flexibility (Mattila, 2006) and “an individual’s perception of the positive or negative force of motion associated with pursuing some end state or goal” (Jansen, 2000, p. 54). The future is evaluated for benefits (Foster, 2007).

The description of the future in the literature includes an uncertain future (Bergström et al., 2014) or setback (Moenkemeyer, Hoegl and Weiss, 2012) or an individual’s future may be limited because of change (Foster, 2007). KM literature examples show that future awareness may be uncertain because the organization development is based on expert knowledge and not shared knowledge. This leads to the unawareness of the expectations of the relevant knowledge needed in the organization. (Alavi and Leidner, 2001)

Positive future awareness characterizations include an exciting future (Gharajedaghi, 2007), hope, optimism and potential future (Moenkemeyer et al., 2012), a stable orbit (Watanabe, Kishioka, & Nagamatsu, 2004), rosy future (Mattila, 2006) or the belief of future satisfaction (Tremblay, 2000). The definition of future awareness in this research leans on the idea that the future, present situation and past relationships are to be evaluated actively and that this evaluation guides action. Future awareness at the individual level means that thinking and given meanings are critically rethought (e.g. change situation). (Tulevaisuuden Tutkimuskeskus, 2017)

1.3.4 Innovation

The “Technology Imperative” model by Orlikowski (1992) expresses the research aspect that technology is an independent artefact and disregards the role of individual action in development and change technology, while the purpose of the “Strategic Choice” model in the internal organization is to modify human action and design (1992, p. 400). However, innovation occurs in a certain context and the context is influenced by either outer or inner factors of the organization (Christensen, Anthony & Roth, 2004). Rogers (1995, p. 11) defines innovation as an idea, an organization process or an object that is identified as new.

Darroch (2005) identified that good KM practices promote companies’ innovation processes. She emphasizes that the capability of being innovative requires knowledge resources but also the awareness of what to do with that knowledge (Darroch, 2005, p. 111). KM has several different roles in innovation, for example being the coordinating mechanism, and supporting new possibilities, knowledge development and company performance (ibid.). Knowledge utilization affects the organization innovation level: whether the company target is to develop innovations in customer interaction (personalized KM strategy), or to develop innovations for customers with bulk products and services (codification KM strategy). (Hansen et al., 1999) However, the KM processes need to be considered both from the human and IT aspects.

Innovativeness in this research refers to the actors of the organization searching for new alternatives or possibilities for knowledge utilization, IT adoption and furthermore, the search for learning processes among past, current and forthcoming situations. Innovative thinking by the actors requires process capability, the competence to consider the comprehensive organization processes that support the ability to meet organizational development. New product or service innovations are enabled by the process innovations of the organization.

1.4 Research objective and research questions

The purpose of this thesis is to broaden the existing innovation management theory literature further with KM, IT management, organization change management and future research theory approaches to the organization's ability to create and develop knowledge and improve future awareness. The central elements are functional KM practices and IT utilization.

The research questions of the dissertation are as follows:

How do knowledge management practices support the development of the organization and innovativeness?

- a. How can knowledge creation support the development of the organization?
- b. Which factors in information technology adoption facilitate the development of the organization?
- c. Which future awareness factors facilitate the development of the organization?

Figure 3 illustrates the research questions and the relationship between the publications.

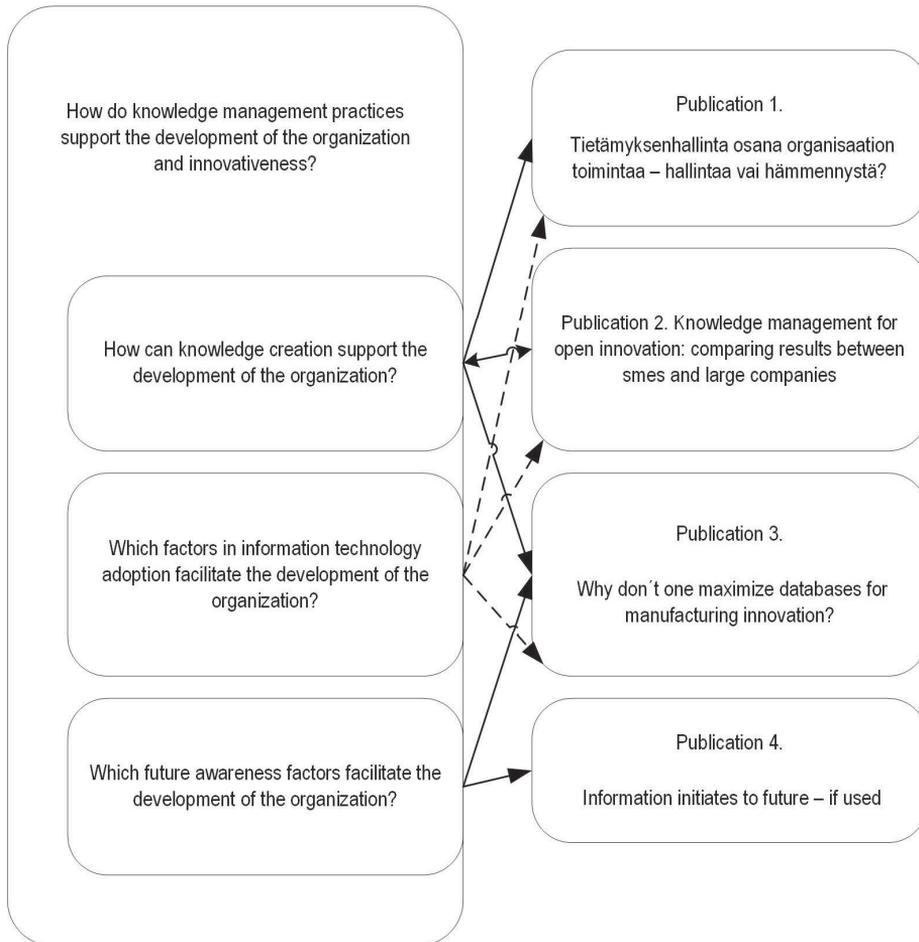


Figure 3. Research questions of the dissertation

The research contribution to the innovation management research literature is justified by the need to express the fact that cognizable and essential elements, knowledge creation and utilization, IT adoption and future awareness offer the possibility for the organization to engender development. Furthermore, when considering the previous elements from the organization and the other stakeholders' approach, functional KM practices can be identified that promote not only the individuals' independent work evaluation but also evaluation of the organization process. This awareness of comprehensive organization process scanning is one way to promote organization innovativeness – i.e. the individuals as innovators.

1.5 Structure of the research

This research consists of four academic publications. The integration of the publications is introduced through the research process. The first part of the thesis is the introduction part. The first chapter describes the motivation for this research and the path that led to the theoretical

investigation. The objective, the positioning in the research field and innovation construction with the essential selected concepts are presented.

The second chapter describes the theoretical basis for the research. The purpose was to consider how the selected concepts are discussed in interdisciplinary terms between change management, KM, IT management and future research. Therefore, at the end of the theoretical section, the approach is an aggregate of the concepts that appear in the research area dialogue. Four theory viewpoints are presented in relation to the innovation process in the text. In addition, the theoretical framework is illustrated at the end of the chapter.

The third chapter provides a methodological description of the research including empirical data collection. Furthermore, the process of data analysis is elucidated and the reasons for selecting these research methods are given. The main findings and contribution of the individual publications are summarized in the fourth chapter. At the end of the chapter, the contribution of the publications to the thesis is listed in Table 7. The results are discussed in the fifth chapter and the research question is answered. Chapter six concludes the thesis by presenting the theoretical and practical implications of the thesis, and the evaluation of the research and avenues for future research.

The second part of the thesis contains the original publications. The first part of the thesis was written during and after the individual publication process. The second part of the thesis includes the four original publications as they were published.

2 THEORETICAL BACKGROUND

The main objective of this research is to increase understanding of functional KM practices, knowledge utilization and creation processes, IT adoption and future awareness as drivers that can promote the actors in an organization to develop further innovativeness.

2.1 Change management offers an opportunity for organizational development and innovativeness

Researchers in change management research lean on the early era theorists (Burnes, 2015), e.g. on Coch's (1948) results of individual and group level change resistance, the reactions to change situation, choice and the effect of the choices on manufacturing productivity. Also, Lewin's (1951) individual behaviour or identified or unidentified needs in change situation are referred to. In the late 1960s, Merton (1968) focused on social structures, society culture, functions and values: how the values are adopted and how the adoption process affected individual experiences and feelings. At the end of the 1970s, Weick (1979) addressed the organization environment, individual's selections and the idea of how an individual could imagine the outcome of that selection in the future situation. These theories are the basis of several studies carried out during the past decades.

However, the organization studies need to be explored from different approaches (e.g. Van de Ven and Poole, 1995; Jensen, 2003). As mentioned before, in this research change has been understood as development-oriented action and the purpose of change theory is to reveal that change is an opportunity for innovativeness. Therefore, the organizational change management theories are considered regarding how the change is discussed in the selected literature next.

Even though organizational change in organizations were continuous (Tsoukas and Chia, 2002), work design (Gill, 1996) or motors for operations (Nielsen, 2008), the organization and environment mismatch needs to be considered active (Avey et al., 2008). The new technology environment and digital business environment challenge the organization's previous operation processes (e.g. Wargin and Dobic, 2001). Tavcar and Duhovnik state that change management needs to begin instantly when the change is at the conceptual level as well as during the whole development process and they emphasize a comprehensive process evaluation in the organization (2005).

The organization resources need to be allocated during the change process and resources need new process practice models in addition to understand change and change resistance in the organization (Feldman, 2004). Change resistance can be a value for the resource (Courpasson, Dany & Clegg 2012) if the change agent is capable of arguing the necessity of change well and maintaining dialogue with the change recipients (Ford et al., 2008). Persuasion can be one way to accept change implementation (Haugtvedt and Petty, 1992; Harrison and Laberge, 2002). However, organization culture and context affect the change process, which needs to be considered (Burke, 2011; Kawakami, Durmusoglu & Barczak, 2011).

The individual's own cognition affects change implementation as does the agent's role in the change process (Armenakis et al., 1993; van Dick and van Dick, 2009). Change agents may have an influence with their decisions so that a general change attitude in the organization evolves into a self-fulfilling process (Meyerson et al., 1995; Jansen, 2000). Agents not only have the responsibility of change planning and implementing the outcome but also power relations in the change process are revealed (Armenakis et al. 1993; Mattila, 2006; Lines, 2007). Previous management experiences of the organization members in change situations may have an effect on change acceptance (Fuchs and Prouska, 2014) and Ramstad (2014) emphasizes shared leadership in change management to boost company innovation processes.

Joshi's (1991) equity-implementation model (EIM) supports individual-level evaluation of IT implementation benefits or disadvantages as well as development and self-realization alternatives. Kim and Kankanhalli (2009, p. 569) developed Joshi's E-I model further for change evaluation (assumptions of norms and control) and explanations of the costs or threats that a new information system (IS) engenders and its effect on negative IS utilization. Equity can be understood as fairness or voices and utterances that are heard (Jiao and Zhao, 2014; Klonek, Lehmann-Willenbrock & Kauffeld, 2014). Empowerment of employees in a change situation is one way to increase participation in decision making (Labianca, Gray & Brass, 2000) and promote the feeling of equity in the organization. Furthermore, participation assists the organization to achieve goals (Lines, 2004; Crouzet, Parker & Pathak, 2014). Besides the structural change or the effect of the facilitator on a change situation, we need to consider how organizational change is understood.

Organizational change can be understood as chaos, where consciousness is the organization's mind and learning processes are the primary change drivers for transformation, developing novel interaction schemas. The other chaos characteristic is connectivity, which means that individuals make the wholeness of the organization and individuals construct transformation. (van Eijnatten, 2004) However, without the individual-level motivation, change implementation encounters challenges (Merrick and Shafi, 2011; Klonek et al., 2014).

The other approach to organizational change can be a social exchange (Lawler et al., 2000), group cognition (Fiol and O'Connor, 2002) as well as organization level commitment to change (Kwahk and Lee, 2008; Colin, 2009; Savolainen, 2013) that lead to positive emotions and readiness for change and support reduced uncertainty in the change situation (Crouzet et al., 2014). To achieve group readiness for change, knowledge of group attitudes needs to be acquired, stored and manipulated, a dialogue of group readiness held (Vakola, 2013) and organizational support for change constructed (Ming-Chu and Meng-Hsiu, 2015). Resistance can be reduced with employee participation (Lines, 2004) and both top-down and bottom-up support in operations are needed (Hudson, 2011).

Individuals evaluate the change situation in terms of what kind of value or benefit they can receive (Deffuant, Huet & Amblard, 2005; Kim and Kankanhalli, 2009). After the evaluation phase comes the individual's choice that affects behaviour and one's future action (Chermack, 2012). An individual's psychological resources, positive emotions, attitude (Avey et al., 2008) and intellectual capital (Chiucci, 2013) may promote change process implementation. Nevertheless, individuals evaluate the value of their emotions according to the change situation and their possibility to affect the forthcoming situation enables the endorsement of the change (Savolainen, 2015). Psychological resources and resilience also include the capability to meet risks and a feeling of uncertainty in situations that affect how fast changes are implemented in the

organization (Denrell and March, 2001; Watanabe et al., 2004; Moenkemeyer et al., 2012). When an individual feels threatened in a change situation, defence behaviour (Jarrett, 2004) or irritation may occur (Zuwerink and Devine, 1996). Organizational change affects the work identity of the individual in an organization (van Dick and van Dick, 2009). An individual's personality traits may include a negative attitude to change, fear of losing one's work identity, or individual may keep up routines because of fear of losing the control of work (Oreg, 2003) or one may lose personal control over the situation (Jensen, 2003). A summary of the change theory framework of this thesis is shown in Table 2.

Table 2. Views for understanding organizational change

Viewpoint	Examples in literature
Factors that affect organizational change	Joshi,1991; Armenakis et al.,1993; Scully,1995; Gill, 1996; Tremblay, 2000; Wargin & Dobiey, 2001; Fiol & O'Connor, 2002; Holt, 2002; Feldman, 2004; Deffuant et al., 2005; Tavcar & Duhovnik, 2005; Stanley-Garvey, 2007; Avey et al., 2008; Ford et al., 2008; Meyerson & van Dick & van Dick, 2009; Beadry & Pinsonneault, 2010; Bouckenoghe, 2010; Burke, 2011; Kawakami et al., 2011; Chermack, 2012; Wells & Nieuwenhuis, 2012; Savolainen, 2013; Fuchs & Prouska, 2014; Savolainen, 2015; Thundiyil et al., 2015; van den Heuvel et al., 2015
Organization change is the operating environment	Wargin & Dobiey, 2001; Tsoukas & Chia, 2002; van Eijnatten, 2004; Polites & Karahanna, 2013; Pretorius et al., 2015; Savolainen, 2015; van den Heuvel et al., 2015
Organization change is resisted	Haugvedt & Petty,1992; Fairhurst et al., 1995; Jarrett, 2004; Denrell & March, 2001; Oreg, 2003; Lapointe & Rivard, 2005; Mattila, 2006; Lines, 2007; Ford et al., 2008; Rajaniemi, 2010; Westling, 2010; Bergström et al., 2014; Fuchs & Prouska, 2014; Klonek et al., 2014; Thundiyil et al., 2015; Courpasson et al., 2016
Readiness for organization change	Lawler et al., 2000; Tremblay, 2000; Watanabe et al., 2004; Hyland, 2007; Avey et al., 2008; Moenkemeyer et al., 2012; Chiucci, 2013; Oudhuis & Tengblad, 2013; Stevens, 2013
Organizational change is an enabler for development	Joshi, 1991; Zuwerink, 1996; Labianca et al., 2000; Lines, 2004; Harrisson & Laberge, 2002; van Eijnatten, 2004; Foster, 2007; Kwahk & Lee, 2008; Nielsen, 2008; Colin, 2009; Kim & Kankanhalli, 2009; Hudson, 2011; Savolainen 2013; Crouzet et al., 2014; Jiao & Zhao, 2014; Ramstad, 2014; Ming-Chu & Meng-Shiu, 2015

The present literature review is discursive with many theoretical perspectives and change lenses. To achieve favourable organizational development, the following theoretical approaches need to be considered. The changes that happen in the operations through small steps have a tendency to cumulate from the smaller unit to the wider organization entity (Van de Ven and Poole, 1995). Organization evolution in the current research is understood as organization development and the concept "survive" is strategically important when the "development steps" are constructed (Merton, 1968). However, the concept "evolution" even in the organization unit has a wider content than the concept "development". Nevertheless, the researcher wanted to keep the concept evolution in the current research because, in an organization unit, development can be a premeditated action or the organization is developed through action by the organization members and by the different functions. Organization evolution may become disturbed by

external or internal occurrences and the unit needs either to find ways to overcome or adapt to the situation and modify operations or resources.

To sum up, Weick (1979) notes that technology can be an ecological organizational change or an environment adapted with practitioners technological process practices, and the individuals develop their processes with the dialogue of the ecological and enacted environment.

2.2 Knowledge management extending knowledge to innovativeness

To expand understanding of the forthcoming organizational development, knowledge needs to be provided (Polites and Karahanna, 2013), and knowledge is not something “out there” (Chermack, 2012, p. 39). In the current thesis, the core of KM is knowledge utilization to obtain continuous organization development and innovativeness practices. For the organization, it is essential to evaluate information with criteria that are set because information supports risk management and can give guidance in choosing a suitable alternative or reproducing successful previous action or experiments. An individual’s earlier risk experiences are engrams that influence the adoption time of new knowledge. (Denrell and March, 2001) Thus, communication needs to be taken into account especially in an organization’s change situation.

Different standpoints of communication for forthcoming change are offered. The role of KM is thought to be external KM and different spoken communication as well (Armenakis et al., 1993). For example, with IT system implementation, it is essential to pay attention to how the process is introduced (Kim and Kankanhalli, 2009; Beaudry and Pinsonneault, 2010). Information can be a source of power relations (Merrick and Shafi, 2011; Courpasson et al., 2012) or control-based communication (Fairhurs et al., 1995). Therefore, it is important how the change is justified (Foster, 2007) and legitimate communication has to be developed well beforehand (Ford et al., 2008), being continuous (Savolainen, 2013) so that the decision making is decentralized (Harrison and Laberge, 2002). To ensure better communication to tackle problems and promote IT implementation in the engineering change process (ECP), communication needs to be paid attention, especially in the decision-making phase (e.g. communication channels, dialogue and documents) (Tavcar and Duhovnik, 2005). Personal interaction is important and Jarrett emphasizes using “emotional ears” (2004, p. 247) and collecting the data of emotions that appear in the organization as well as tacit knowledge (Kesti, Stenvall & Syväjärvi, 2009) and non-verbal communication (Merrick and Shafi, 2011).

Information engenders emotions and individuals can have different meanings for information during their sense-making process of the change (Jiao and Zhao, 2014). On the other hand, individuals may be suspicious of the information that is offered (Rajaniemi, 2010). Avey et al. (2008) explored how mindfulness affects individual psychological capital. The organization can place effort into inputs to forward an individual’s feeling of equity, e.g. of literary acknowledgments (Joshi, 1991), support positive emotions (Avey et al., 2008) or offer training programs to accomplish positive outcomes and IS advantages (Avey et al., 2008; Kim and Kankanhalli, 2009; Crouzet et al., 2014). Even though, there should be organizational learning of new knowledge (Kwahk and Lee, 2008) as well as unlearning of old practices (Gharajedaghi, 2007). Both formal and informal learning are important to fulfil organization knowledge (Rusly, 2015).

Besides individual level information processing, there is also social information (e.g. individual and group communication, messages and knowledge sharing) (Jansen, 2000; Chiucci, 2013), social opinion (Deffuant et al., 2005) and interaction patterns should be considered because they affect individuals' commitment to change as well as promoting a positive individual identity (van Dick and van Dick, 2009). Frequent productive exchange (e.g. information or social interaction) generates positive emotions and enhances identified group cohesion, and further increases commitment behaviour (Lawler et al., 2000). However, it is challenging to combine different aspects and meanings for information (pluralism) (Boughenooghe, 2010). "Tempered radicals" such as organization internal change agents can promote changes even though their radicalism may be silent action. The purpose of tempered radicals is to question the existing context of the organization and to act for energy, learning and transformation. (Meyerson and Scully, 1995, p. 586)

To enhance the organization's knowledge development, Lines (2007) identified that only content-based professional knowledge had a direct effect on change implementation (see also e.g. Harrison and Laberge, 2002; Chiucci, 2013). Gill states that knowledge is task dependent (1996). However, companies also need to look at knowledge and a joint venture enables shared professionals in the organization (Nielsen, 2008). An external network and knowledge sharing can generate new ideas (Ramstad, 2014). New or modified information changes organization practices and the consequences of the knowledge asset (Feldman, 2004), and meaningful and unconfirmed information can induce new practice models within the organization (Labianca et al., 2000).

However, change resistance may occur because individuals are familiar with routines and loss of control leads to a certain reaction (Oreg, 2003). Shared different alternatives in knowledge and previous experiments (e.g. risks that have been met or the learning process) in the organization affects the speed of information adoption (Denrell and March, 2001). Change as chaos seldom generates universalized knowledge but it generates different knowledge that helps the organization members to understand the current situation better (van Eijnatten, 2004).

The organization's new current situation can promote competitive advantage for the organization and can be achieved through KM and learning or the organization's ability to innovate products, services and processes. Competitive advantage can be promoted with both organization internal and external knowledge. However, Riege (2005) emphasizes the fact that knowledge sharing barriers would be individual-, organization- and technology-level barriers. Barriers such as organization culture, national culture, organizational community and knowledge, communication and interaction, social trust or collaboration systems are those affecting collaboration. The other identified and affecting issues are part of the organization's operations, e.g. individuals, structures, processes, technology and systems. Riege asks whether knowledge-sharing practices are "people-driven or technology-driven" (2005, p. 20). The organization's knowledge opportunities can be identified if there is collective knowledge that can promote creativity. Nevertheless, individuals do not know what kind of decision-making or problem-solving expectations there are in the organization. Therefore, there should be dialogue about these expectations. (Riege, 2005) On the other hand, the viewpoint of Wang et al. (2010) expresses that information intensity affects IT device adoption negatively and needs to be noted.

All in all, with knowledge management systems (KMS) there is the potential to create and extend knowledge in organizations. The knowledge can be an asset as well as being a resource of

the company (Alavi and Leidner, 2001) and it is essential how the organization utilizes that resource. The KM theory framework of this thesis is outlined in Table 3.

Table 3. Views for understanding knowledge management in an organizational change situation

Viewpoint	Examples in literature
Knowledge management is information and communication management	Haugvedt & Petty, 1992; Armenakis et al., 1993; Gagnon & Toulouse, 1993; Fairhurst et al. 1995; Lawler et al., 2000; Tremblay, 2000; Harrison & Laberge, 2002; van Eijnatten, 2004; Watanabe et al., 2004; Deffuant et al., 2005; Foster, 2007; Lines, 2007; Kesti et al., 2009; Bouckenoghe, 2010; Rajaniemi, 2010; Burke, 2011; Merrick & Shafi, 2011; Chermack, 2012; Savolainen, 2013; Courpasson et al., 2016
Knowledge management is part of the operational process	Jansen, 2000; Holt, 2002; Feldman, 2004; Tavcar & Duhovnik, 2005; Nielsen, 2008; Colin, 2009; Kim & Kankanhalli, 2009; Chiucci, 2013; Oudhuis & Tengblad, 2013; Savolainen, 2013; Vakola, 2013; Crouzet et al. 2014; Ramstad, 2014; Pretorius et al., 2015; Rusly, 2015
Knowledge management is competence management	Joshi, 1991; Meyerson & Scully, 1995; Gill, 1996; Labianca et al., 2000; Fiol & O'Connor, 2002; Harrison & Laberge, 2002; Gharajedaghi, 2007; Stanley-Garvey, 2007; Kwahk & Lee, 2008; Kim & Kankanhalli, 2009; Korpelainen, 2011; Polites & Karahanna, 2013; Crouzet et al., 2014; Rusly, 2015
Knowledge management is reception management	Denrell & March, 2001; Jarrett, 2004; Avey et al., 2008; Jiao & Zhao, 2014

In order to utilize the knowledge resource, the operations of the organization can be guided by a knowledge management strategy. The industry sector affects which knowledge management strategy is suitable for the processes. The benefits of each function depend on how the process is supposed to operate: whether for instance the customer or the other organization member solution is easy or quick to solve, or the operation is processed effectively by documentation (codification) or whether the customer or other actor needs deeper or longer lasting expert communication or meetings, or whether the products or services are more customized, needing more expert knowledge (personalized). On the other hand, in some processes, e.g. a new product launch, at the beginning a personalization strategy is needed and when the product is familiar to the customers, the strategy can be transformed into a codification strategy. Both strategies are needed but it is essential that the company decide which method is used most. (Hansen et al., 1999)

However, before the organization can design the development of the organization, there needs to be information about which issues need to be changed. Armenakis et al. (1993) introduced a framework that enables the organization to identify the change requirements and gives guidance on how to influence the individual-level attitude to change.

2.3 Technology management orchestrating knowledge and information technology in innovation process

There is a critique in the literature of the technology-based approach in change situations (e.g. Orlikowski, 1992; DeSanctis and Poole, 1994). It has been discussed that some technologies are fashionable and technology can also be a strategic possibility (Wells and Nieuwenhuis, 2012). One approach that technology is the “body of knowledge” typifies the interplay of knowledge and technology (Pretorius, Pretorius & Benade, 2015, p. 224). Pretorius et al. also state that technology would be the result of innovation in the “environment and social context” (ibid., p. 223).

As in this research, technology has been understood as a tool for operating processes and developing organization’s practices, focusing on IT. Technology is used in practice in an organization’s operations and technology is not understood as an independent resource (Feldman, 2004). Therefore, organization resources should be considered as comprehensive assets and in this research, technology management involves information and operational technology management and IT and system implementation as well as IT adoption to promote the development and innovativeness of the organization. Tsoukas and Chia wished to focus on organization’s processes radically to achieve organizational development (2002, p. 569). To obtain competitive sustainability and improved productivity, the organization needs to utilize technology possibilities effectively (Venkatesh, Morris, Davis & Davis, 2003). However, technology utilization is affected by the existing structures in the organization.

The Adaptive Structuration Theory (AST) by DeSanctis and Poole (1994) considers the structures that come from technology and the structures that arise in human and technology interaction in organizational change. New IT systems evoke reactions and emotions, and individuals evaluate whether IT usage is a benefit, or a threat to current practices and work (Davis, 1989; DeSanctis and Poole, 1994; Venkatesh et al., 2003; Beaudry and Pinsonneault, 2010; Jiao and Zhao, 2014). When the members in the organization decide not to use technology, similarly they change the organization practices (resources or rules) (Orlikowski, 1992). The E-I model by Joshi (1991) suggests that, in IT implementation, the system should be considered from the user-friendly and usefulness aspects (also Oudhuis and Tengblad, 2013). Power relations or conflicts in the implementation process should be considered as comparison of things, stress level of use, work satisfaction and the increasing workload and improved customer satisfaction to avoid the user omitting to use the new IT systems (Joshi, 1991). The associated cost of the change and uncertainty feeling versus the individual-level conception of the value of IT increase user resistance while individual self-efficacy decreases it. (Kim and Kankanhalli, 2009). The identified threats at both the individual and organizational level seem to have a lesser effect at the individual level, and IT adoption would be more favourable (Lapointe and Rivard, 2005).

The following scientific tools offer guidance on how technology and interaction can be explored in the organization. Venkatesh et al. (2003) identified three determining factors that affect personal intention to use technology: “performance expectancy, effort expectancy, and social influence” (2003, p. 467). Their Unified Theory of Acceptance and Use of Technology (UTAUT) offers a tool to design new technology for organization members and implementation. Social and technology interaction could be emphasized more to benefit from the technology resources (e.g. Orlikowski, 1992; DeSanctis and Poole, 1994).

The structural model of technology by Orlikowski (1992) enables technology and interaction analyses as well as internal operations interfaces between group and individual levels of the organization. Therefore, the model expands the understanding of technology movement and transformation between organizations “through time-space ... analyzing interorganizational relations of learning, influence, and dependence”. (Orlikowski, 1992, p. 422) The Adaptive Structuration Theory (AST) provides a tool for consideration in advanced IT structures in human-group-technology interaction. The interaction can promote technology utilization and further, organization development. (DeSanctis and Poole, 1994) The Technology Acceptance Model (TAM) offers an example and tool of how an individual’s behaviour in technology adoption can be regarded: through the individual’s evaluation of technology usefulness and evaluation of usability (Venkatesh and Davis, 2000). After all, individuals are expected to notice that job goals that are set and IT system usefulness will match in the future while their experience of the technology usage increases. Furthermore, visible, concrete and successful examples promote technology usage. (Ibid.)

One challenge for new technology utilization or development can be a conservative organization (Nielsen, 2008) or the fact that resources may be restricted. One step for organization technology development might be external co-operation. The advantageous effects of technological opportunities can be achieved through external collaboration. (Schilling, 2015) Co-operation can lower the threshold to test the new technology as well.

However, technological maturity slows IT system adoption at the firm level and restrains positive change (Wang et al., 2010). Furthermore, Wang et al. found that complexity as a phenomenon has a significant effect on IT device adoption because of non-integrated systems, for example. Tavcar and Duhovnik (2005) evaluated engineering change management (ECM) from the viewpoints of engineering methods, communication, organization structures and processes and IT systems to reveal process activities and involvement practices in the organization. Saldago and Verduco (2011) identified marketing concentration as having a positive relation to IT adoption.

Technology adoption should be constructed in social interaction with methods, instruments and momentum (e.g. Burke, 2011), and teamwork is one way of interaction (Harrison and Laberge, 2002). Rivard and Lapointe (2012) highlight the fact that the IT implementers’ responses play a significant role in IT implementation. Recipients of the change try to make the sense of new IT as well as finding arguments for technology utilization (e.g. Nielsen, 2008; Jiao and Zhao, 2014).

An employee may feel pressure to adopt technology (Gagnon and Toulouse, 1993). The established distinctive organizational routines or habits may discourage new technology adoption (Polites and Karahanna, 2013). Individuals may simply underrate the new technology (Rajaniemi, 2010) or be afraid to use it (Tremblay, 2000). There may occur crises in technology adoption, even violent behaviour (Tremblay, 2000). The emphasis of the self-efficacy approach is that the individual evaluates the technology based on perceived use and how easy the technology is to use. Also the utilization of IT-produced data belongs to the evaluation of usefulness. These evaluation criteria affect individual behaviour and the decision whether to adopt the technology or not. (Davis, 1989) Continuous communication and training can mitigate technology adoption (Velcu, 2007; Ramstad, 2014). A summary of the technology management theory framework of this thesis is shown in Table 4.

Table 4. Views for understanding information technology management in an organizational change situation

Viewpoint	Examples in literature
Information technology management is IT system and change implementation	Wargin & Dobiey, 2001; Wargin & Dobiey, 2001; Venkatesh et al., 2003; Tavcar & Duhovnik, 2005; Feldman, 2004; Nielsen, 2008; Kim & Kankanhalli, 2009; Wang et al., 2010; Burke, 2011; Wells & Nieuwenhuis, 2012; Oudhuis & Tengblad, 2013
Information technology management is information technology adoption management	Gagnon & Toulouse, 1993; DeSanctis & Poole, 1994; Venkatesh & Davis, 2000; Lapointe & Rivard, 2005; Stanley-Garvey, 2007; Kwahk & Lee, 2008; Beadry & Pinsonneault, 2010; Rajaniemi, 2010; Chiucchi, 2013; Polites & Karahanna, 2013; Thundiyil et al., 2015
Information technology management is the management of the possibilities	Joshi, 1991; Orlikoveski, 1992; Gill, 1996; Harrisson & Laberge, 2002; Velcu, 2007; Saldago & Verdugo, 2011; Wells & Nieuwenhuis, 2012; Ramstad, 2014; Pretorius et al., 2015

Technology as such changes practices and the operation of the organization rapidly. Furthermore, rapid change cycles in the operation environment force the actors to modify their own practices flexibly for the demands of the changing situations as well as the demands of the future.

2.4 Future research building the bases for innovation orientation

How employees think about the future is affected by their awareness of the current situation in the organization and what kind of desired end-state is targeted (Armenakis et al., 1993). Avey, Wernsing and Luthans (2008) talk about the organization and environment discrepancies that are concretized with the chasm of present and future goals. In this research, the role of future research is to indicate that the evaluation of the future, the present situation and past relationships, promotes organizational development and innovativeness and that this evaluation guides action.

Future awareness of new IT system implementation, according to Beaudry and Pinsonneault, means that individuals are aware of possible future interruption in organization processes (2010) but modify old practice models as well (Feldman, 2004). However, earlier alternative experiences affect future knowledge adoption, even if the alternative has potential positive outcomes when evaluated (e.g. Denrell and March, 2001). There may be a mistrust of the future and the feeling that the old times were better defeats future thinking (Rajaniemi, 2010).

The organizational capability to enact practice models and organization practices affect future action. Organization charts (e.g. process practices) are developed rather than comparing the old version of charts with the new one, and negotiated at individual and organization level (Labianca et al., 2000). However, as Feldman states, at the individual level, even if there is enough knowledge, it is difficult to forecast which of the chosen practices will work. (Feldman, 2004)

Most of all, the change situation is an opportunity or possibility for the organization (Tsoukas and Chia, 2002). The chaos lenses of van Eijnatten define “indeterminacy” as events being constructed by cause and effect and the future being unknown (2004, p. 437). Creation and developing the new is based on the old (dissipation) and “emergence” means that the organizational mind (consciousness) and collective vision lead forward to action through

dialogue (ibid). Therefore, focusing on possibilities instead of threats opens up new alternatives (Wang et al., 2010).

The role of change agents can be to create new realities (Ford et al., 2008). On the other hand, change agents may not have a comprehensive vision of the change (Meyerson and Scully, 1995). It is essential to decide on the goal selection (Merrick and Shafi, 2011) because more and more customized products have an influence on the company's supply and that will also affect future planning (Oudhuis and Tengblad, 2013). The future awareness theory framework of this thesis is outlined in Table 5.

Table 5. Views for understanding future awareness

Viewpoint	Examples in literature
Future awareness can be seen as a positive future attitude	Armenakis et al., 1993; Jansen, 2000; Tremblay, 2000; Fiol & O'Connor, 2002; Tsoukas & Chia, 2002; Mattila, 2006; Foster, 2007; Gharajedaghi, 2007; Beadry & Pinsonneault, 2010; Hudson, 2011; Merrick & Shafi, 2011; Moenkemeyer et al., 2012; Wells & Nieuwenhuis, 2012; Chiucchi, 2013; Savolainen, 2013; Crouzet et al., 2014; Ming-Chu & Meng-Shiu, 2015
Future awareness can be constrained because of a negative future attitude	Holt, 2002; Stanley-Garvey, 2007; Rajaniemi, 2010; Moenkemeyer et al., 2012;
Future awareness can be constrained because of the feeling of an uncertain future	Denrell & March, 2001; van Eijnatten, 2004; Wang et al., 2010; Chermack, 2012; Savolainen, 2013
Future awareness can be seen as a promoter of organization development	Labianca et al., 2000; van Eijnatten, 2004; Ford et al., 2008; Chermack, 2012; Oudhuis & Tengblad, 2013; Ramstad, 2014; Pretorius et al., 2015

Different future analysis tools offer guidance on what or how the organization could analyse future requirements. The most commonly used future analysis methods available for organizations to utilize are described in more detail in Paper IV.

2.5 Endeavour to innovate

Different theory fields and research approaches are used in innovation management research, e.g. organization science, strategic management, the management and leadership approach, intellectual capital research, design theory, psychology and social and learning areas, performance and measurement or accounting, technology field, future forecasts as well as complexity or risk management views.

Innovation management theories can be categorized using the strategic approach or future evaluation approach etc. Strategic design includes among other things the disruptive innovation theory, which provides guidance on evaluating organization supply and resources according to customer demands. The Resources, Processes and Values (RPV) theory (Christensen et al., 2004) reveals the strengths and weaknesses of the organization. However, when considering operations through RPV, the innovation opportunities are lost because the organization focuses on its own

operations instead of external innovation. The value chain evolution (VCE) theory (ibid.) reveals the company's success in the performance with problem-solving future evaluation. Future evaluation includes the signals of industry or customer changes as well. In all, different theories can give guidance to research the innovation as phenomena, the organization capability to innovate or the utilization of the innovation. (Ibid.)

Innovation can be an idea, organization practice or an object that the actors see as new and decide the object is new to them (Rogers, 1995, p. 10-11). An innovation is useless until it is adopted and utilized. The newness of the innovation is constructed of new knowledge of the innovation, persuasion in favour of the innovation, or of the actor's decision to adopt the innovation (ibid., p. 11). The innovation adoption process needs to be close to the implementation of the innovation and the confirmation phase of the process. In other words, the innovation needs to be implemented and consolidated for the innovation decision (ibid., p. 20). However, Rogers highlights that the communication of the innovation represents the individual or organization level uncertainty, which also needs to be taken into account. The new idea's diffusion elements are the innovation as such, the communication channels that are used for the dialogue, time for innovation adoption and in the current research also time for the innovation process that is needed; the social system that in this research means the individual in the organization and with other stakeholders. (Rogers, 2002, p. 990)

Rogers' (2002) innovation diffusion model evaluates the innovation through relative advantage, compatibility, complexity, trialability and observability. Relative advantage in the current research means whether the evaluated innovation idea is better than the existing product, service or process of the organization. As Rogers notes, the evaluation needs to reveal the benefits of the innovation to the user (ibid.). Compatibility in the current context includes, as in the Rogers model, the needs of the users but is complemented with the organization's technological integration compatibility. Complexity refers to whether the innovation is challenging to understand or use for the actor. Trialability guides the innovation idea's experimentation possibilities or limits in the organization. Observability in the current research considers how the innovation idea can be expressed to the other actors in the organization coherently. (Ibid.) However, innovativeness does not happen intrinsically in an organization.

Different strategies occur to support innovativeness. To search for external and internal innovation possibilities a distinct search strategy is suggested (Laursen and Salter, 2006), a strategy for supporting the creativity of the employees (Ouakouak and Ouedraogo, 2017) or innovation as integrated into business strategy. Pearce and Manz emphasize self-leadership strategies for innovation capabilities but make note of the challenges that self-leadership face. However, self-leadership is needed to identify possibilities, especially when the innovation processes are continuous. (Pearce and Manz, 2005) Innovation strategy as such is regarded as innovation performance for flexibility or a formality for new product development (NDP) (Lee, St. John & Bao, 2018).

Innovation can be seen as having high social value for an organization (Deffuant et al., 2005) and innovation as highly involved management is one basis of organization process development (Ramstad, 2014, p. 27). Also, Rajaniemi (2010) accentuates the fact that innovations are part of the features of an organization. In an organization, social identities and roles need to be defined so that individuals know what the expectations in innovation processes are (e.g. Harrison and Laberte, 2002). Kanter (1983) calls for innovation conditions in the organization that support individuals to create new or develop old products and processes, i.e. flexible organization

boundaries or a free atmosphere for the flow of information and ideas. However, development requires resources from the organization.

Organization resources for research and development may be limited. Therefore, co-creation with other people in the same industry or a different field can be a solution for new design and innovation. Kothandaraman and Wilson offer models to evaluate of the potential co-creation partners (2001). It has been stated that companies with a positive attitude to co-operation and network are more innovative. Furthermore, there seems to be more knowledge sharing and connected resources between co-operators. One essential finding is that individuals can find new pathways as co-operation with other people and companies. (Schilling, 2015)

However, personified power can be a barrier to development and innovations (Rajaniemi, 2010). There are measurement tools for exploring innovation practices or the organization's and individual's capability to innovate from different approaches, for example, the organization innovation culture (Dobni, 2008), the organizational innovativeness construction (Wang and Ahmed, 2004) or individual willingness for innovation, or the adoption time of innovation (Hurt, Joseph & Cook, 1977). Key Intelligence Topics (KIT) enable the organization to identify the intelligence requirements that the organization processes need currently and in the future and support decision making and strategy management. (Herring, 1999) The purpose of innovation is also to develop old practices, products or services. Saunila, Pekko and Ukko offer a measurement tool that indicates the organization innovation capability and organization performance relationship (2014). For innovation excellence measurement is designed a conceptual model (Martensen, Dahlgaard, Park-Dahlgaard and Grønholdt, 2007).

Innovation adoption can be said to be context-dependent (Christensen et al., 2004, p. 20), firstly, because new innovation can be adopted in a totally different context or function than it was originally designed for and secondly, the organizations may utilize the innovation in very different ways. (Christensen et al., 2004) A summary of the innovativeness theory framework of this thesis is shown in Table 6.

Table 6. Views for understanding innovativeness

Viewpoint	Examples in literature
Innovativeness can occur or be constrained through a mechanism	Kanter, 1983; Orlikowski, 1992; Hansen et al., 1999; Christensen et al., 2004; Darroch, 2005; Dobni, 2008; Rajaniemi, 2010; Chermack, 2012; Ramstadt 2014; Schilling, 2015
Innovativeness can mean value for the organization	Harrisson & Laberte, 2002; Deffuant et al., 2005; Rajaniemi, 2010; Jiao et al., 2014
Innovativeness is capability	Hurt, Joseph & Cook, 1977; Kanter, 1983; Herring, 1999; Denrell & March, 2001; Rogers, 2002; Christensen et al., 2004; Watanabe et al., 2004; Stanley-Garvey, 2007; Burke, 2011; Kawakami et al., 2011; Moenkemeyer et al., 2012; Wells & Nieuwenhuis, 2012;

Only when the innovation study of the organization is directed to the barriers to development can the company identify the significance of the barriers' impact on the innovation process. (Hadjimanolis, 1999). The barriers to innovation can be internal or external to the organization, related information or competence or a lack of resources or funding (Adeyeye, Egbetokun,

Opele, Oluwatope & Sanni, 2018). The barrier can be the actors' idea that the development does not belong to their job description. The current research considers external barriers as external information and interaction between the co-operation partners, and excludes governmental or political reasons.

Knowledge utilization barriers to innovation are revealed in several studies. For instance, utilization of technology-based information (Adeyeye et al., 2018), capability of open knowledge sharing and co-creation (Nardelli and Broumels, 2018), knowledge sharing and effect on creative problem solving capability (Carmeli, Gelbard & Reiter-Palmon, 2013) or the lack of competence for knowledge utilization as well as barriers to technology adoption (Fujiwara and Watanabe, 2017). The future orientation can be decreased if the information is not utilized actively. Lybaert (1998) found that those companies that utilize information efficiently achieved better performance and an optimistic approach to the future. However, in the current research, the selected innovation research references from the innovation barrier or promoter approach did not analyze future research or environment scanning as such. Future orientation was stated as part of strategic planning or project management. Therefore, this research emphasizes the fact that innovation exploration needs future research and analysis.

Co-operation barriers include the difficulty of finding co-operation partners (Adeyeye et al., 2018). The other viewpoint relates that companies have no initiative for product or work development without an external partner, e.g. the customers (Löfqvist, 2017). External co-operation was also studied by Samson, Gloet and Singh (2017), from the approach of how companies searched for ideas from the external network and the organizations' capability to take risks as well. After all, co-operation clusters enable knowledge sharing and the innovation platform but require clear roles and policy for action (e.g. Miller and Olleros, 2007; Tomlinson, 2010).

Technological transformation places challenges on organization operations and one way to try to mitigate them is technology exchange with co-operating partners. However, technology exchange can turn into an innovation barrier if the magnitude and the benefits of the co-operation are not clear between the partners (e.g. Thomas and Obal, 2018). Internal co-operation can be a barrier for innovation as well. Time resources are also a barrier to innovativeness because of primary operational functions. The lack of time resources can occur as the unwillingness to take risks in innovation and trying to ensure solutions that are free from risk (Karlsson and Stetler, 2015).

2.6 Summary of theoretical background

Individuals can affect the future of an organization because “the future is not given” (Prigogine, 2000, p. 36). Individuals as the key actors make choices in their actions that shape the evolution of the organization and enable the organization development as well (ibid.). Figure 4 aggregates the theoretical frameworks of the present research.

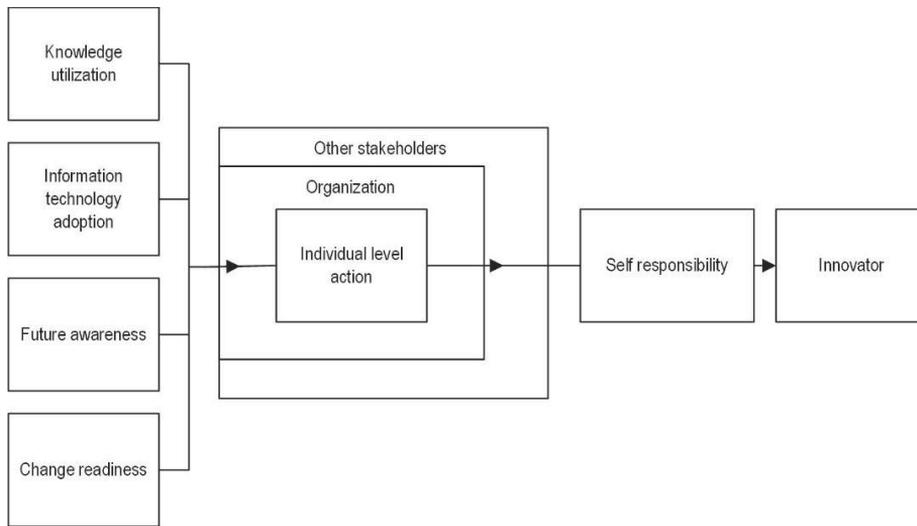


Figure 4. Theoretical framework of the research

In order to support positive development, the organization needs to utilize the knowledge resources inside the organization, adopt the IT that is needed to achieve business competitiveness and construct future awareness with the staff. These functional requirements need to be realized at both organization level and individual level. For the goals that are set to be achieved, it means that every individual in the organization is not only responsible for his/her own work area but is also capable of perceiving the comprehensive picture of the organization processes. Through this comprehensive process picture, the individuals can consider the development objects of the organization.

3 RESEARCH DESIGN

This chapter describes the methodological choices were made to conduct the research process from the beginning to the end, as well as the research strategy. The research strategy guides the choices and utilization of the research methods both theoretically and practically. (Hirsjärvi, Remes & Sajavaara, 2008) The research methods used for the theoretical review and for empirical studies are introduced and the analyses are described study by study. The research process is illustrated at the end of the chapter, Figure 7.

3.1 Methodological approach

The current research examines how knowledge utilization, IT adoption and future awareness can promote innovativeness in the organization. The objective and the research questions are more practically oriented and aim to identify the best KM practices to promote the innovation process in the organization. This research's ontology represents critical realism, in which the reality is constructed in social situations (Archer, 1995; Van de Ven, 2007). It has been argued that critical realism can support operation research and management science and is also influential for other disciplines (Mingers, 2000) like organization theory (Tsang and Kwan, 1999).

Critical realism is partly a positivist approach but allows consideration of the world of experience beside the “factual” world. This means that there is the thing and the individual who senses that he/she is processing the thing in his/her mind. (E.g. Mingers, 2000; Saunders, Lewis and Thornhill, 2009; Fellows and Liu, 2015) The philosophy conceptualizes social reality with specific terms and it is essential to identify what in the reality needs to be explained (Archer, 1995, p. 17). Critical realism exhorts us not only to identify the organization and individual level but also the level of other organization stakeholders level (Bhaskar, 1991) and the emphasis for the different interfaces (Dobson, 2002, p. 6). Exploring the different levels in the organization modifies the researcher's understanding about the phenomena during the research process. (Saunders et al., 2009) Therefore, Tsang and Kwan suggest that critical realism could compensate for different philosophical and theoretical approaches (1999, p. 776).

The current research considers dynamic elements that are part of the comprehensive picture of the organization's operations. However, the research could have represented the pragmatic approach but the research methods that are utilized are more positivist. The most substantial reasoning for critical realism comes from epistemology that the research focus is on explaining individual behaviour and his/her choices in context (Dobson, 2002; Saunders et al., 2009). The knowledge of reality is constructed in social interaction and individuals are part of that social reality, producing and reproducing continuously changing knowledge with their own values (ibid.) that the researcher needs to understand.

The robust theoretical basis at the beginning of the research process guided the collection of empirical data. Furthermore, the questionnaires were made on the basis of previous validated metrics and the studies of the current thesis are highly structured. Therefore, the current research

can be designated as a deductive research approach with knowledge being developed during the empirical part. The deductive approach enables the cause-effect examination of phenomena and alternative explanations in the social environment (Van de Ven, 2007). However, like critical realism, the inductive knowledge construct examines a certain event or phenomena in context and enables smaller samples than the deductive research approach (Saunders et al., 2009). Therefore, the inductive approach is also partially utilized to understand the context of the individual and the metrics from the theory are enacted in the current studies. Figure 5 illustrates the research philosophy and the strategic research decisions based on the “research onion” model of Saunders et al. (2009).

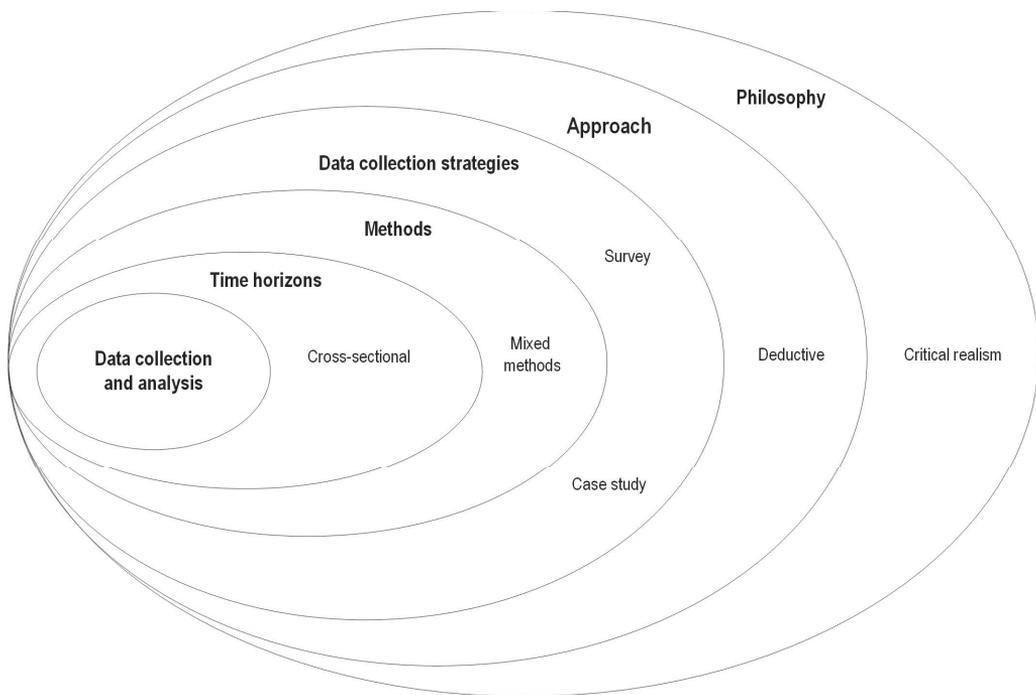


Figure 5. The research strategy

This research paradigm includes both a regulation and objectivist perspective, and a radical change and subjectivist perspective (the model of four paradigms of the analysis of social theory of Saunders et al., 2009, p. 120). The next section elaborates how critical realism contributes to the paradigms of regulation and objectivist perspective and radical change and subjectivist perspective in the current research.

Critical realism emphasizes the fact that the individual needs to critically create an explanation for the perception of his/her own nature (Bhaskar, 2008, p. 248) and the different levels identified in structural interactions need to be noticed (Dobson, 2002, p. 6). Objectivism and regulation in this research mean that the individual acts in the existing organization context with the existing practices and policy. However, one can enact action on the limits of the directives.

This functionalist paradigm marks out the rational explanation for organization challenges and guides the development recommendations based on the results (Saunders et al., 2009). The benefit of the critical realism approach for objectivism and regulation is “that it maintains reality whilst still recognizing the inherent meaningfulness of social interaction” (Mingers, 2000, p. 1267).

The other paradigm radical humanist means in the current research that in the subject and radical change dimension, the purpose is to bring about change in the individuals activity of innovativeness – to accomplish the organization development. Critical realism considers the challenges both of the individual beliefs, meanings and experiences and also of the organizational change (Mingers, 2000, p. 1267). Furthermore, this position enables understanding of the psychological and social structures that are either barriers or facilitators for learning and organizational development (ibid.).

The other two paradigms of Saunders et al. (2009); the interpretive paradigm as individual sense making of the surrounding world or the radical structuralist paradigm with the idea of the achievement of fundamental organizational change do not serve the interpretation approach of the current research.

The choice of the functionalist and radical humanist ontological position supports the research questions that were set for this research and assist in finding the answers to the research questions. As Burrell and Morgan note, the problem-oriented approach leads to the provision of a practical solution for practical problems (Burrell and Morgan, 1998, p. 26).

3.2 Research methods

The current research corresponds to an exploratory study. Exploratory study answers the research question “what,” as the functional KM practices for organizational development and innovativeness in the organization are explored. Moreover, in the current study, the quantitative frequencies (Yin, 2009, p. 5-6) and non-graphical methods with calculation of the summary statistics are used. The graphical methods play a big role in the analyses summarizing the data schematically or with illustrations (e.g. Seltman, 2015). The organization’s situation and the causality of the identified challenges and reasons behind the challenges need explaining, from the perspective of individual knowledge utilization, IT adoption and future awareness in the organization (e.g. Tsang and Kwan, 1999; Van de Ven, 2007; Saunders et al., 2009). Therefore, the explanatory approach is also used to obtain the answer to the main research question “how” (Yin, 2009).

Mixed research methods enable us, most of all, to answer the research questions of the thesis and of the separate studies in the thesis. Critical realism allows the researcher to choose both qualitative and quantitative research methods (Tsang and Kwan, 1999; Mingers, 2000; Saunders et al., 2009). The mixed-methodology approach is utilized in the current research. The paradigm definition is based on Saunders et al. (2009) as a way to examine and expand the understanding of social phenomena. The unit of the current research is the organization with other stakeholders. On the one hand, an individual is an object in the organization and on the other hand, an actor in the organization processes. Therefore, when exploring functional KM practices and the effect on the innovation capability of the organization, the mixed-methodology approach is reasonable to reveal the barriers or the motors for innovativeness from different organization levels.

A survey was the main strategy for data collection in the current research, involving the idea of a standardized questionnaire for a sample both for quantitative and qualitative methods (Hirsjärvi et al., 2008; Saunders et al., 2009). The empirical material was collected with an Internet-based questionnaire in all the studies of the current research (studies A-D). Furthermore, one of the studies was complemented with telephone interviews (study B). The structured and standardized interviews were designed based on the Internet questionnaire because the researcher wanted to consider whether the results would confirm each other. The questionnaires and interviews are explained more precisely in chapter 3.2.2. The role of the survey for this research was to obtain an overall picture of KM, technology adoption and future research in Finnish companies.

3.2.1 Research method for the theoretical part

The current research is strongly based on a critical and systematic literature review. The essential function of the literature review for the research is to develop awareness of the basic theories and defined concepts (Saunders et al., 2009) as a map of the research field (Tranfield, Denyer & Smart, 2003), previous studies and results as well as the research gaps that call for research. The research questions of the study are clarified or reinforced through the literature and help to identify how to measure the phenomena or test the data (Saunders et al., 2009). There may be challenges in combining several research areas as well. Offered options for combining different approaches include considering the power relations between the theories (Alvesson and Willmott, 2012, p. 42), by organizing the theory approaches and voices in a text (Alvesson and Deetz, 2011) or conducting different theoretical interpretations of the phenomena for the research theme (Alvesson, 1996). Most of all, the review is intended to show what the researcher has learnt (Webster and Watson, 2002). However, the selected literature is detailed during the research process (Saunders et al., 2009). To cite Christensen et al. (2004, p. 272) concerning theory and confirmation of the results: “Trust. But verify”.

The combined research areas, KM, IT management and future studies and change management have a very different trajectory in theory development. Change management, with a longer theory development path, has drawn the variety theory field on, like three more recent selected theoretical approaches (e.g. Webster and Watson, 2002).

The timeframe selected for the research literature framework was from the 1990s to 2015. Technology development accelerated rapidly from the 1990s, engendering shock in many industries. The other reasons for the timeframe are that IT has affected KM practices radically and employees have needed to adopt totally new competence. Technology, among other influences that alter the ever rapidly changing reality and organization environment, calls for scanning of the future and the environment. The situation was crucial then as well as today: new technology offers new opportunities, and on the other hand, uncertainty among employees and the industry increases. (Schilling, 2015)

The literature review follows the model of Saunders et al. (2009, p. 60) and is concept-centric (e.g. Webster and Watson, 2002). After the research idea, research questions and objective of the research, the parameters were set and the leading journals (publication forum 1, 2 or 3) and thesis were selected for the material. Different research reports or customization researches were excluded. The keywords were generated (change resistance, change readiness, technology

adoption and manufacturing) and the search was conducted to retrieve the relevant literature. The draft of the review was clarified and the most commonly occurring concepts of the research area identified through the classification and colour system, leaning on the Webster and Watson (2002) Concept Matrix model. The total number of articles at the beginning of the process was 851. The evaluation phase considered the selected four concepts of this research and the keywords of the articles or abstracts match. The assessment of the obtained 234 articles identified a total of 81 articles for closer study. These articles were the basis of the theoretical part of the current research, which were complemented with basic research field theories. Furthermore, the measurement models from the literature were identified for the current research. The literature and the connections between the concepts were illustrated to give a comprehensive picture of the combined four theory fields, as shown in Figure 2 (page 26).

Besides the theoretical consideration, it is important to identify who has developed the methodology and the theory in the research field (Tranfield et al., 2003). Therefore, the connections between the authors of the selected literature were analysed and illustrated. The purpose of the analysis was to identify the theorists who are active or have influenced the literature theory framework area the most. The analysis included references and the co-citation network between the authors (e.g. Leite, Van Aken & Martins, 2012) and is presented in Appendix 1.

3.2.2 Research method for the empirical part

The exploratory object of the current research consists of separate descriptive studies. Descriptive studies have been stated as being a piece of exploratory research and in management research they hold a very clear position (Saunders et al., 2009, p. 140). With the mixed-methods approach, both quantitative and qualitative methods are used to study and explain the relations between different variables and answer the research questions. Furthermore, a qualitative sample is quantified to convert the results to numerical form and graphics (Ghauri and Gronhaug, 2005; Saunders et al., 2009). Mixed-method utilization enables a more comprehensive opportunity to reveal findings and answer the research questions (Tashakkori and Teddlie, 2003). Exploratory and descriptive study with survey data collection answer the questions what, how much or how many, e.g. which IT systems were utilized, how much they were utilized or which organization functions utilized them (ibid., p. 144). Although Saunders et al. (2009, p. 113) argue that human feelings or social choice and the statistical approach distance an individual's subjectivity, the current research utilizes quantitative data and qualitative data with quantization analysis (e.g. tables and graphics). However, the emphasis of the research is quantitative.

The questionnaire is the most utilized survey strategy method in management research and used for descriptive and exploratory research (Saunders et al., 2009). The questionnaire was developed from the theory and validated measurements that promised to answer the problems that were explored. There were two ways to collect data with the questionnaire: self-administered using the Internet (an e-mail link to the respondent who answers the questionnaire and sends it to the Internet platform) and one-to-one telephone interviews. The interview is structured and the interviewer-administered questionnaire enables the collection of quantifiable data (Saunders et al., 2009). The questions of the interviews were on the same issues as those in the Internet questionnaire in study B, but more open. The respondents were asked to justify some answers

more deeply so that the answer can be set in a wider context while gaining a multifaceted analysis (e.g. Hirsjärvi et al., 2008). Therefore, the interviews can also be described as semi-structured interviews. The role of the interviews for the current research was to obtain a bigger sample of small and medium sized enterprises (SMEs). Furthermore, the researchers wanted to explore whether the Internet questionnaire and interview confirmed the results. The questionnaire was utilized in all the studies (A, B, C, D) of the current research.

The case study methodology enables the capturing of data from the vertical and horizontal levels of the organization with different perspectives (e.g. Leonard-Barton, 1990). Since the emphasis of the current research is on the question “how” in certain phenomena in a certain real-life context, a case study was the logical choice for the methodology (Saunders et al., 2009; Yin, 2009). Furthermore, the case study approach is commonly used in exploratory research and includes questionnaires (Saunders et al., 2009). The justification for the case study comes from its role in the current research, which is introduced in study C.

As the research examines how knowledge utilization, IT adoption and future awareness can promote organizational development and innovativeness in the organization, each of the singular study is constructing the information about the path of the possibilities or constraints to innovativeness in the organization as well as for individuals. Next the studies and the variables that are used are introduced: Why the variables have been selected and what has been measured. In Chapter 3.3., data analyses, is explained to what the variables are utilized for and what is the contribution of the variables for the organizational development and further for the innovation research. The construction of the development path from study A, B, C and D forward innovativeness of the organization is illustrated in Figure 6.

Study A comprised an Internet questionnaire (Paper I). The human resources (HR) and IT administration departments of the 50 largest Finnish companies were contacted by email with a research link and information letter. The purpose was to obtain a comprehensive picture of KM, KM practices and challenges and the utilization of information systems in Finnish companies. The survey was similar to a study conducted in 2002 and the metric in 2002 was based on a theoretical base (Hannula, Kukko, & Okkonen, 2003). The metric was updated for this survey. The questionnaire was structured with the Likert scale from 1 to 10 and open questions. The variables that were considered were organization structures for the functions and strategic capability, technology utilization and resources as well as social interaction practices in knowledge acquisition and knowledge sharing.

With the theme of the organization structures for the organization functions and strategic capability was measured to find out how KM in the organization culture was manifest in the companies. The respondents were asked to evaluate what kind of decision making practices there were in the organization, e.g. the data or information based decision making, involvement for the decision making processes or the control of the effects of the decisions. Feedback practices, internal interaction and co-operation practices or confidentiality and the atmosphere of the organization were evaluated through communication practices and the support of the organization structure for communication, team work or social relations in the organization. In addition, the respondents marked how well they know the company strategy or how they can participate in strategy work.

The technological theme of the study was in order to gain understanding about the activity of the information system and the data utilization overall. The respondents were asked to identify the utilization of the existing information systems of the organization for internal or

external co-operation or the new information acquisition. Furthermore, the utilization of the data bases for development, or the ideation tools of the organization were evaluated.

The theme of process capability of the organization addressed the key elements of knowledge acquisition in the company. The respondents were asked to represent the processes of the knowledge acquiring, knowledge documentation and knowledge protection, knowledge sharing and exchange and knowledge network utilization. On the other hand, the access to the verge of information, the informal knowledge sharing or communication barriers were asked to evaluate as well.

The questions of the knowledge developing practices were related to organization development. The survey asked for the evaluation of the strategy based competence development of the individuals, the existing resources for development or the communication practices for the need of the knowledge development and ideation work. Beside the knowledge developing, the knowledge adoption and application for the organization processes is important. Therefore, the information on the company's resources for knowledge application, project practices, project evaluation and best practice dissemination were asked from the respondents.

The last theme of the survey was the organizational effectivity. Thus, the respondents were asked to describe the productivity and accomplishments of the organization. Especially this part of the survey concentrated on the organization capability for anticipation for forthcoming, capability to identify new business possibilities, innovation capability and capability to improve the existing products, service or processes of the organization. The KM challenges and development targets of the company were asked in order to verify whether the identified challenges and developing targets in KM reproduce the results of the previous questions of the survey.

The survey was considered suitable for gaining a comprehensive understanding about the key elements of KM implementation in the 50 largest Finnish companies. The data of 36 respondents was transferred to SPSS (IBM SPSS Statistics) and analysed using quantitative methods.

Study B included both a questionnaire and interviews (Paper II). The questionnaire was modified from study A to make it more suitable for SMEs and some questions were removed. However, the purpose was the same as in study A, to explore KM practices and challenges in the same variable issues but in the context of a smaller company. Furthermore, the internal and external knowledge utilization and co-operation among open innovation practices were emphasized in the questionnaire during the analysis phase. The HR and IT administration departments of the companies were contacted randomly.

Simultaneously with the Internet-based survey, the representatives of the HR and IT administration were interviewed in order to gain deeper understanding about KM practices, challenges and development targets in SMEs. Furthermore, the role of the interviews was to check whether the results verify the Internet-based survey. The questionnaire of the interviews was more open. However, the questions were on the same themes and the respondents were asked for a numerical evaluation. Moreover, the interesting result in the survey called for a deeper argument than in the interviews, e.g. what kind of team work the company has, or how the employee's competence development is organized, or what factors make the company efficient.

This resulted in 15 Internet responses and seven recorded interviews with notes from 22 companies. The data was transferred to SPSS for quantitative analysis and the interviews were analysed qualitatively.

In study C, the case study gave a framework to analyse certain functions and phenomena in a certain manufacturing context (Paper III). The questionnaire that was developed from the theory and validated measurements was utilized in the data collection. The purpose of the case study was to identify factors that could promote the data utilization of the organization's external or internal information system and furthermore, to identify other stakeholder networks to create value for the customer. The explored themes were technology adoption and the customer value creation that promotes innovation practices, e.g. organization processes, knowledge utilization and knowledge sharing practices within information systems, and organization flexibility and development practices. In a case study, it is important to define the unit of analysis (Yin, 2009, p. 44). Therefore, the case company functions that were explored were delimited to the sales and marketing customer interface.

The first theme was emphasized on orchestrating the technology processes in order to obtain information about the employee's awareness of the existing information systems and data bases in the company or the communication and process development in the company. The theme is constructed of variable clusters that are based on the engineering change management metric by Tavcar and Duhovnik (2005).

The first cluster included variables of how the technological processes are defined or understood in the company. For example, how the technology is introduced in the company and how technology effect on the succeed of the customer service in the company, or what kind of time resources there is in the company to modify the processes when needed, or if the employee have an access to the data or information in product or process development or not.

The second cluster addressed communication and how the communication practices in the processes and between the different functions and units in the company work out. The variables were about the communication channels, or how the information about the changes in the organization levels reaches the employee, or how informal communication effect on the development practices.

The third variable cluster handled about the processes, employee and the time resources to prepare for the forthcoming changes or getting information about the procession in the production. Furthermore, the co-operation between different organization functions was considered. The fourth cluster explored the time resource that is needed for the implementation of changes as well as the accountability in change situations.

The last cluster included the variables of the IT systems in order to gain information about usable of data that the systems produce, the time resource to modify the systems if needed, or the integration of the information systems in the company or the access level for the data or the information. The metric was considered suitable in order to obtain a comprehensive picture of the information system utilization and communication practices for product development in the case company.

For the measurement of the innovation and development culture theme was utilized Dobni's (2008) metric and the most suitable variables for the case company's need were chosen. The purpose was to perceive those factors that either promote or hinder innovativeness in the company. The variables considered e.g. organizational learning and the competence development of the employee, or organization capability to change ideas, products or services if needed based on the customer demands or market situation. Additionally, the market and the value orientation of the organization were evaluated with variables. For example, the activity of the market or

competitor scanning, or the activity of searching ideas or innovations from the operational environment or the market, or just the innovation propensity of the company was measured.

The survey continued in order to gain understanding about the individual level ability for the customer value development and the attitudes to routines. The issue was evaluated with a few variables of Oreg's (2003) The Resistance to Change Scale. Furthermore, the utilization activity of the existing databases in the company was explored.

The data was collected by means of the Internet questionnaire from the respondents. The questions were evaluated with the Likert scale from one to ten. The benefits of the company's utilization of IT systems were asked in an open question. Being a pilot study with ten respondents, the case study provided exploratory devices to develop the next study on the organization (e.g. Yin, 2009, p. 40-41). The data was transferred from the Internet platform for quantitative (Excel) analysis.

Study D data collection was made using an Internet questionnaire (Paper IV). The purpose of this study was to consider the overall future research in the 50 largest Finnish companies. The questionnaire was developed from the future theory. Using simple questions, a survey was made on whether the companies were doing future research, what kind of research they were doing and how far into the future. The respondents were asked for the justification in an open question. The survey was targeted at financial managers, IT officers and production and development (P & D) group. The survey resulted in 16 responses, which were transferred from the Internet platform to Excel for quantitative analysis.

The samples of the individual studies are small. Two of the studies (study A and D) concerned the 50 largest companies in Finland. There were challenges, firstly to reach the respondents from the organizations and secondly, to encourage the respondents to answer the survey. The studies would have benefited from interviews in addition to the Internet questionnaire. The reasons behind the correlations would have been more reliable while interviews would have allowed the confirmation of the subject during the discussion. The other alternative for both studies would have been to select more companies from the company list to broaden the sample from 50 companies, and define the company by the actual size. However, study A was conducted according to the previous 2002 study and the purpose was to obtain a comparative study to the previous one and to reach a large target group with the Internet questionnaire.

Study B targeted a combination of the 50 largest companies and a group of SMEs in a certain region in Finland. The questionnaire was modified for SMEs from study A. The analyses were aimed more at open innovation analyses. The reasons for the small sample are partly the same as in study A. With a total of 58 respondents (Internet questionnaire and interviews), there should have been more interviews for both company sizes, especially SMEs, to reach more respondents for the survey to confirm the results of the study.

Study C was a pilot case study in a certain organizational function with the purpose of broadening the study to other organization units later. The main aim of the pilot was to produce information for the company on the status, restrictions and challenges in database utilization in the company product development. The study would have yielded more convincing results if interviews had been held or the study has been expanded to other units during the research.

The small sample of the independent studies was challenging for the current research. It was only possible to utilize certain analysis methods for quantitative analyses. Furthermore, only the most significant results could be noticed. This means that there were limited results to utilize in the research. The qualitative interviews were held partly to explore whether the results would

verify the results of the Internet questionnaire. If the samples of the studies were about a minimum of five times bigger, the results could be generalized in a Finnish context instead of being the descriptive results. Furthermore, the companies would benefit from the results in a more detailed way rather than at a general level. However, both research methods and their results made it possible to formulate a research conclusion of the independent studies. Therefore, the research methods and the samples performed their function for this research.

3.3 Data analyses

Data analysis consists of examining the data, category and tabulating, testing or other systems to produce evidence-based conclusions (Yin, 2009, p. 126). Quantitative analysis made with SPSS or Excel programs needs to be processed from data into information. With frequencies, classifications, relationships between different variables and graphics, raw data can be turned into descriptive and illustrated form (e.g. Saunders et al., 2009). Non-graphical and graphical analysis methods play a complementary role in obtaining a comprehensive picture of the data. The non-graphical methods represent the quantitative and objective approach, while graphical methods such as qualitative and subjective analysis are also required. (Seltman, 2015) The qualitative analysis of the interviews was done by content analysis. The purpose of content analysis is to obtain a description of the examined phenomena in summarized form. Although the analysis considers respondents' interpretations of the phenomena and weight of the texts, content differentiation enables us to represent the content of the text for instance in a quantitative way. All in all, the purpose of the analysis is to describe the content of the interview verbally. (Tuomi and Sarajärvi, 2002)

All the analyses of the current research were made by the author. The author is aware of the small sample of the research and therefore it was only possible to carry out limited quantitative analysis. Furthermore, only analyses with highly statistically significant results are considered. Therefore, the low response rate of the Internet inquiries and the results of the separate studies can be considered descriptive, rather than universal. Descriptive statistics enables the researcher to describe or compare variables numerically (Saunders et al., 2009, p. 444). Frequencies are the simplest descriptive analysis to obtain the characteristic of variances, e.g. the percentage of the specific responses (e.g. Saunders et al., 2009). All the studies (A, B, C, and D) were analysed with frequencies to describe the distribution of the results. In all the studies, graphics play a strong role in the presentation, e.g. pie charts or bar charts. Visualizing the data, categorizing the results or assorting the data with graphics or detailing the tables beside the text enriches the representation of the results (Saunders et al., 2009).

Study A enabled the most diverse utilization of quantitative analysis. The purpose was to obtain a comprehensive picture of KM, KM practices and challenges and the utilization of information systems in Finnish companies. Additionally, the KM challenges and development targets were analysed in order to gain the information about the complex phenomena of the KM in different functions that occurred among the employee (Paper I). The formulated sum variables were analysed with a frequency description to obtain a picture of the strategy work and decision practices or structures of the organization in communication practices etc. The frequencies were tabulated to present for instance the definitions and the identified functions of KM in the

companies, how the knowledge resources and information systems were utilized or the organization efficiency.

In exploratory research, it is interesting to explore the relationships between different variables (e.g. Saunders et al., 2009). Therefore, regression analyses were done to identify whether some variable caused the other variable to change or whether there was a cause and effect relationship (ibid.). By strengthening the frequencies, the correlations were analysed, e.g. what factors affect the change between certain variables in systematic KM practices or utilization of organization-internal knowledge resources. Furthermore, with factor analysis the most effective factor for certain phenomena was analysed, e.g. for organization-external knowledge utilization. The frequencies were illustrated in graphics for information systems utilization, KM challenges and KM development targets. The purpose of the analyses was to identify the KM challenges in large Finnish enterprises and consider the challenges through the lenses of uncertainty, complexity, ambiguity and equivocality. The study A gave an overall picture of KM functions and information system utilization. With the results of Study A, the critical factors of communication, knowledge acquisition and sharing, information technological systems or data utilization and policy as well as KM challenges or development targets were identified. The results opened an opportunity to consider the innovativeness in the organization throughout KM lenses.

Study B included quantitative descriptive frequency analyses and rotated component matrix (sum variable) analysis of the usage of knowledge and IT in large enterprises and in SMEs. Furthermore, the qualitative interviews were analysed using content analysis. The comparison in innovation between the large companies and SMEs gave an interesting initial scenario. The purpose of the analyses was to obtain a picture of the KM challenges and development targets and the technology utilization that either promote or restrict open knowledge sharing and the networking that affects the organization's innovation capacity. Therefore, Paper II contains data from study A and study B.

Frequency analyses and rotated component matrix (sum variable) analysis results were tabulated. Correlations were analysed between open knowledge dialogue, open knowledge availability, internal and external networks with regression analysis. Qualitative analysis was done using content analysis. The transcribed data from the interviews was classified and codified with colours. The analyses were combined and reported. Using graphics, information systems utilization, organizational challenges and organization development targets were illustrated.

The KM analyses helped to understand the utilization of the internal or external knowledge of the organization in the company's development and innovation processes. Moreover, the co-operation and network practices and the employee's competence development were discovered. The information system activity analyses revealed the utilization of the information system resource in the companies. The results guided the author to take into account those identified factors in KM practices, co-operation and open innovation resource utilization in innovation processes.

Study C consisted of frequencies and means. A simple radar chart illustrated the results of the questionnaire that focused on engineering management in the case organization. The purpose of the analysis was firstly to obtain confirmation of whether the existing innovation process model of the case organization was being implemented in the organization practices and secondly, to give guidance towards the development of a customer value-creation process model. The analyses revealed the functional KM practices that need to be considered in organization processes to promote internal organization innovation processes.

The engineering change management (Tavcar & Duhovnik, 2005) analyses, as well as the analyses of the existing databases utilization, purpose were in order to gain a comprehensive picture about the case company's databases utilization in the product development process. Even though the technology approach measurement was different than in Studies A and B the analyses unveiled the same kinds of results in the technology utilization theme. The analyses increased the information about the technology resource exploitation, especially in the innovation processes.

The analyses of the innovation and development culture theme were for obtain understanding about those critical motors or restrictions that either promote or hinder innovativeness in the company. Additionally, the analyses guided the case company to the internal process development and the processes needed deeper exploration in the next step. The analyses of the individual level orientation for the customer value creation, or the individual seeking a comfort zone were essential for the case company in order to gain information about change readiness in the changing work. Moreover, the company was in the organizational change situation and needed data about the issue. The contribution of the case study analyses was the information required to be considered in an organization internal innovation process.

Study D consisted only of the frequencies with percentages. The responses of the economic, production and development, and technology viewpoints were combined and illustrated with pie charts. The purpose of the analysis was to describe the overall picture of future research implementation in Finnish large enterprises. Although the study was limited, the robust theory of future research with alternative future methodologies provides a strong basis for forthcoming research and analysis. The contribution of the analyses was in order to gain information about the future awareness of the companies.

Since the purpose of the current research was to offer information to support the innovation process in organization practices, Figure 6 illustrates with the links how independent studies A, B, C and D produced information for the current research. The empirical results and the critical KM practices that either promote or hinder organizational development and innovativeness are summarized in Table 8.

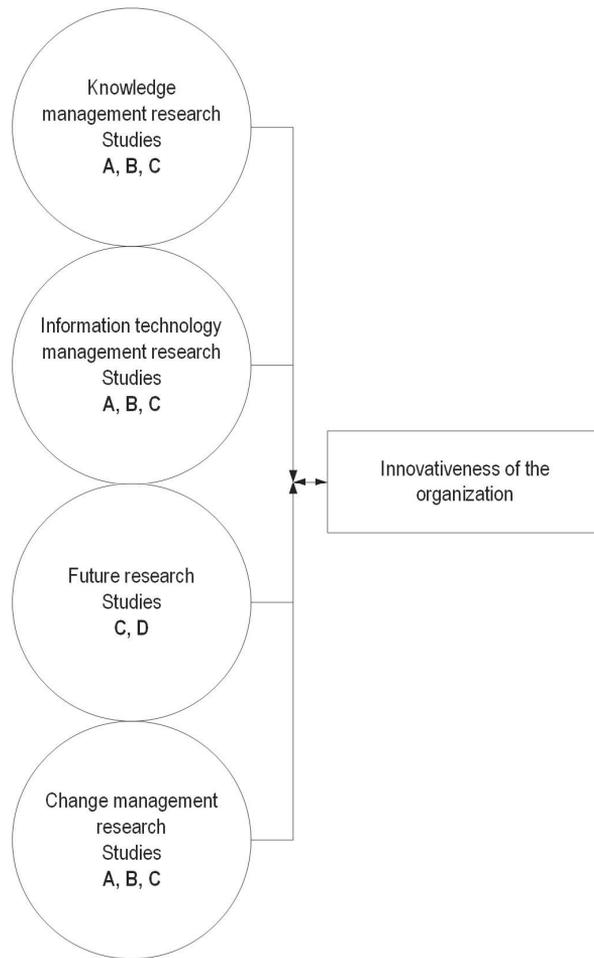


Figure 6. Independent studies and information progression for IAGM

3.4 Research process

At the end of the research process, it became clear to the author that the innovation management research area is discursive. Furthermore, the literature review and the research results confirmed that a comprehensive picture of the organization processes was needed for organization development to become possible. The research process is illustrated in Figure 7.

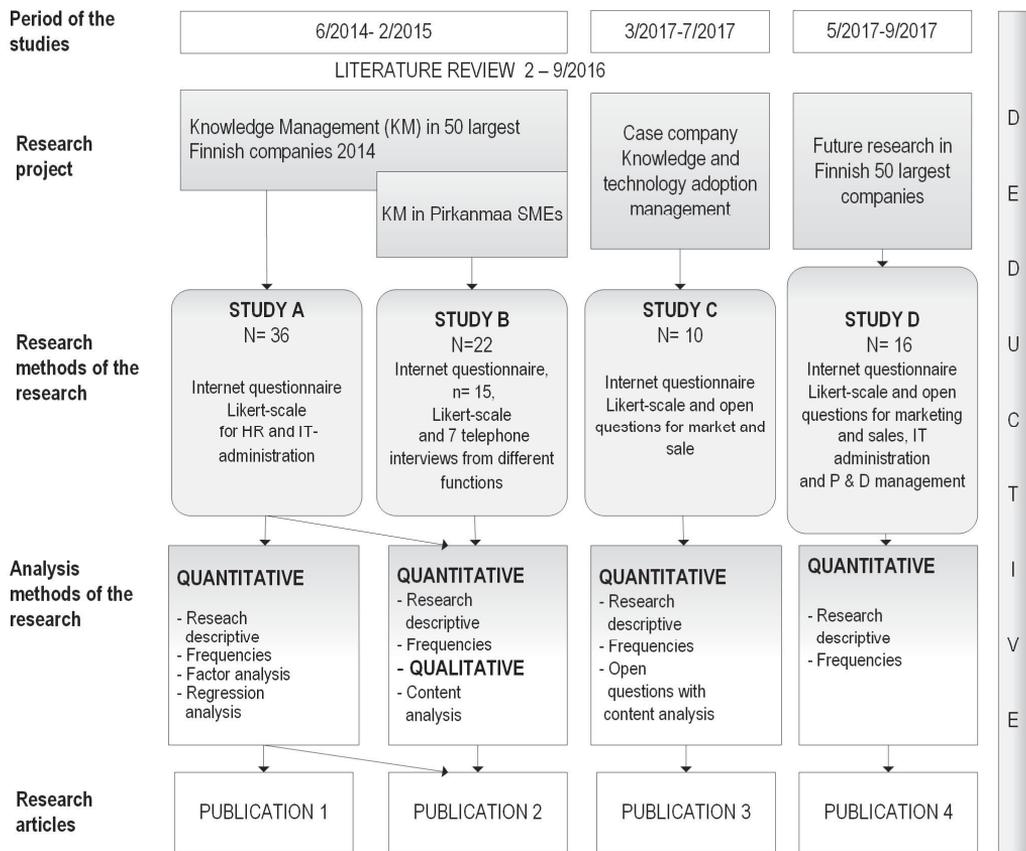


Figure 7. The research process

4 SUMMARIES OF THE ARTICLES

This chapter contains a summary of the publications of the thesis and the purpose is to show their contribution to the research. At the end of the chapter, the illustration shown in Table 7 illustrates the role and the objective of the article, the theories and methodologies that are used and furthermore, the principal contribution of the article.

The research questions are examined from different theoretical approaches to formulate a comprehensive picture of what aspects are needed to gain competitive advantage for business and support innovation processes in organizations. The theories are KM and the knowledge-based view (KBV), open data and data theory, IT adoption, innovation management theory and future theory. The publications guided the construction of the thesis by processing each approach of the theoretical framework of the thesis. Step by step, a comprehensive picture was built up of those elements that are needed in organization innovativeness. KM is one theoretical bridge in all of the publications while the other theories are complementary.

4.1 Publication I: Tietämyksenhallinta osana organisaation toimintaa – hallintaa vai hämmennystä?

Background and objective

This publication starts with the idea that simultaneously, the companies have information too much and too little. Meaning that it is challenging to identify the essential information from the stream of information for the company and find the optimal technological solutions for processes and communication. The first publication discusses the sub-questions of “how can knowledge creation support the development of the organization?” and “which factors in information technology adoption facilitate the development of the organization?”. The objective of the publication was to explain KM and KM processing in large Finnish enterprises. While the literature acknowledges that information and knowledge are essential resources for the companies, not enough is explored KM practices and challenges that the Finnish large companies meet in their daily operations. The KM challenges are considered through uncertainty, complexity, ambiguity, and equivocality which create the theoretical framework for the empirical part of the study (study A). To tackle these four KM challenges, both KM and organizational change management are needed because KM actions affect organization practice transformation as well as promoting readiness for change in individuals. The Internet-based survey targeted the 50 largest Finnish companies, namely staff responsible for human resources and IT systems.

Result and contribution

Technology enables efficient data and knowledge processing and the IT resources have more benefits to utilize and search for possibilities to increase organization productivity and new

innovations. The empirical part of the publication unveiled that IT supports especially communication and the search for knowledge, and technology is one way for the companies to decrease uncertainty in the organization, while helping to understand the correlations between the phenomena and diminishing the complexity of things. The publication denotes that to tackle ambiguity and equivocality in an organization, the solutions of the dominant technology approach attenuate social interaction and knowledge sharing. However, the study unveiled that the functions of competence development and innovation actions could utilize IT systems more in the companies under the scope.

The publication expresses that KM has various meanings for different organizations, mostly focusing on diverse organization functions. The publication is too asking that beside the technological development, are the processes of the company and the people following and developing in the same swiftness to technology. Therefore, the suggestion of the publication is that a systematic KM strategy can support both the organization and individual level to acquire, absorb, share and develop knowledge and reduce the effect of the identified KM challenges. The publication contributes to the innovation management literature by indicating that knowledge in organizations is context-based and providing empirical understanding about the unutilized knowledge resources and furthermore, about the overlapping operations that could be diminished to get productivity. To summarize the publication, different KM tools are needed for different knowledge challenges to improve organization practices. The social approach to KM promotes the engendering of tools that support individuals in the organization for criticism to develop work and organization practices.

4.2 Publication II: Knowledge management for open innovation: comparing research results between SMEs and large companies

Background and objective

The second publication is a continuum of the first publication. The publication examines KM practices for the utilization of organization and individual internal and external network knowledge and IT adoption practices are expanded to support open innovation. The need for the discussion around open innovation is argued in the publication that both internal and external knowledge exchange are needed. However, the boundaries around the knowledge exchange needed to be unveiled. The consideration of open innovation practices in an organization is intended to answer the sub-questions: “how can knowledge creation support the development of the organization?” and “which factors in information technology adoption facilitate the development of the organization?” It has been argued that KM is the path to open innovation (Lakemon, Bengtsson, Laursen & Tell, 2016). Beside KM, the literature base of the publication is on management, leadership and project management approaches, and furthermore, IT adoption, utilization and integration to guide on open innovation. Thus, in this publication, KM practices are compared between small- and medium-sized companies (SMEs) and large companies and how these practices support open innovation. Besides the Internet-based survey of the 50 largest Finnish companies, the SMEs answered either the survey or were interviewed.

Result and contribution

Empirical examination reveals that the challenges and development targets in the companies that were identified in this study were the lack of information and competence and active utilization of technology. The main function of both IT and KM was to support operations, designated the relevant business information and competence resources, while organization and operation development was not. Regarding individual-level open innovation, the publication emphasizes the need for individual activity to construct the organization practices and tools; firstly, for uncertainty management (e.g. Jalonen, 2012), secondly, for external co-operation, and thirdly, for KM strategy development. Both external knowledge and resources and organization internal capabilities promote co-creative innovation processes. In the empirical part of the publication, the framework culminated in systematic KM practices and KM strategy and their affect the innovation processes. Furthermore, the comparison between large enterprises and SMEs unveiled that the companies have either similar challenges in openness in the operations, e.g. access to open data or network co-operation practices, or differences in external innovation processes or knowledge exchange. The results confirm that the KM strategy makes KM practices visible to individuals to develop practices, products or services further. The contribution of the innovation management research and IT adoption research is in the emphasis on dialogue, in that, despite technological development, companies need practices and tools for identifying innovation possibilities that support individuals for the development of organization and innovation activity.

4.3 Publication III: Why don't one maximize database utilization in product and service development in manufacturing?

Background and objective

The third publication extends the utilization of organization IT data and external information to co-innovation with customers or other network partners in the case company. The sub-questions: "how can knowledge creation support the development of the organization?" and "which factors in information technology adoption facilitate the development of the organization" and "which future awareness factors facilitate the development of the organization?" are addressed in this publication. The literature review discusses knowledge importing to product and service perspective and knowledge development in the innovation process. As the baseline of the publication is that the employee of the case company don't utilize the existing databases efficiently, those critical factors are explored that either furthers external or organization internal information system data utilization that promotes producer and customer co-creation in the products and services. The focus is on technology infrastructure, IT management and IT adoption practices and individual agency both as part and the most active part of the innovation collaboration in new product or service design. The factors that either promote or discourage the innovativeness of the organization can be identified and measured with the measurement that was designed for this study. The survey instrument was targeted at the customer interface for a small group. The purpose of this case study was to identify the restrictions and challenges of not only the utilization of databases but the environment and future market scanning of the organization in the innovation process as well.

Result and contribution

Empirical examination disclosed that the structure and practices around the IT and IT as such supported the innovation processes manifold of the case company. However, the results revealed that instead of the focus of external information utilization, the focus called for turn to the needs of the organization's internal process development in the case company. Despite the demand for individual activity in knowledge and the benefits of IT utilization, the organization processes needed to be comprehended overall. The designed customer value-creation process model in the publication illustrates the different functions and roles of the inputs to the innovation process in the case company. The model emphasizes the individual role in the product and service innovation process. The results revealed that the individual as an innovator is made possible with a clear self-remit and real time internal information for quick problem solving and decision making. However, the publication identified that there is a requirement for a new kind of thinking from the individual: initiative action, environment evaluation and systematic co-operation both in the internal and external organization. The role of the publication in this thesis is revealing. The publication contributes to innovation management research by the fact that the tools for innovation processes exist in the organizations but the challenge for individuals is to identify the tools and harness them for action, especially if the tools are not systematic in the existing practices of the organization. The publication is a bridge to the next publication, i.e. future awareness of the organization.

4.4 Publication IV: Information initiates to future – if used

Background and objective

The last publication looks at the construction of future awareness and describes how forecasting methods are utilized in Finnish companies. The publication continues by answering the sub-question “which future awareness factors facilitate the development of the organization?” The previous literature reviews called for understanding about the comprehensive KM practices and operations of the organization. Knowledge needs to be acquired from different sources in the companies to accomplish analyses at all. Therefore, the purpose of this publication was to consider whether the theory-based future analyses are concretized in the Finnish companies. The focus is on future evaluation practices. The survey target group was at management level of various functions, emphasizing financial managers, IT and the production and development group.

Result and contribution

The theoretical framework of the future studies in the publication offers tools for company environment or technology evaluation. Furthermore, the framework formulates a bridge to the results that emphasize dedicating more effort to ensuring comprehensive analyses of the economic, social and technical perspectives instead of a single analysis method. The results indicate that the future analyses of the study seem to concentrate on strategic work and the information sources were emphasized on external information or data or studies. The publication emphasizes that if the future analyses are in the strategy work, the strategy needs to be made

visible among the staff and share the common vision of the future. However, the empirical examination expresses that there is consciousness in the companies of the future direction should focus on even if the future research is centred on the certain profession. Therefore, the contribution of this publication for KM, open data and the data science field, future studies and innovation management research field is the point that, besides future evaluation in strategy work, active future scanning by the individual is needed to obtain future awareness and an innovation approach in daily functions.

Table 7. A summary of the publications and contributions to innovativeness of the organization and to the thesis

Publication	Objective	Theories	Methodology and data	Contribution
1. Tietämyksenhallinta osana organisaation toimintaa - hallintaa vai? - hämmennystä.	To examine practices and KM challenges in Finnish	Knowledge Management, Innovation management theory.	Quantitative, based on sample of 50 largest Finnish companies N=36.	Indication of knowledge, context and individual dependent complexity and challenges that need to be considered in the innovation evaluation process to promote innovativeness.
2. Knowledge management for open innovation: comparing research results between SMEs and large companies.	To compare KM practices and support for open innovation between SMEs and large companies.	Knowledge Management, Technology adoption, Innovation management theory.	Quantitative, based on sample of 50 largest Finnish companies N=36, also SMEs in Pirkanmaa . n=15 Qualitative, based on sample of interviews in 7 SMEs. SMEs N=22.	Distinguish the practices in open innovation at the company and individual level operations that need to be considered in the innovation evaluation process to promote innovativeness.
3. Why don't one maximize database utilization in product and service development in manufacturing.	To identify challenges of database utilization and environment and future scanning in the innovation process.	Knowledge Management, Technology adoption, Innovation management theory.	Quantitative, based on sample of the case survey. N=10	Expanding understanding of the individual's knowledge utilization in customer co-creation and process development that needs to be considered in the innovation evaluation process to promote innovativeness.
4. Information initiates to future – if used.	To consider how large Finnish companies do future evaluation.	Knowledge Management, Open data and data science, Future studies, Innovation management theory.	Quantitative, based on sample of 50 largest Finnish companies. N=16	Both organization and individual level future awareness is the basic element of the innovation evaluation process to promote innovativeness.

5 DISCUSSION

The focus of the current research was on the dynamic elements of an individuals' readiness for change, actionable knowledge, IT adoption and future awareness that encourage individuals to take part in organization development – innovativeness. Papers I-IV construct a continuum for each other. Papers I and II address the problematics of KM and IT management, with the focus on data and the utilization and adoption of information, competence and information systems. Paper III took a step towards design and innovation orientation. With the illustration of external knowledge utilization (other stakeholders' knowledge of the organization), a customer value-creation process model was designed for the innovation process for the case company. Paper IV completed the innovativeness consideration of the current research with future orientation and future studies.

The results were compiled from the analyses of the very distinct theoretical approaches that all targeted knowledge utilization, organizational development and innovativeness as a common thread. The next chapters describe the effects of KM, IT adoption and future awareness on the actors of organization innovation processes: the individual, the organization and the external relationships with other stakeholders. The results are reflected in the construction of readiness for change, both at the individual and organization level. The results are aggregated in Table 8 to give an evocation of the features of KM, IT adoption and future research that either promote or discourage innovativeness.

5.1 How can knowledge creation support the development of the organization?

In chapter 2.2 it was discussed that KM includes different functions in the organization's operations. The organization can be seen "as knowledge systems" that "consist of ... a continuous set of processes and practices embedded in individuals" (Alavi and Leidner, 2001, p. 123). These functions can be data and information processing, competence allocating, communicating or information systems integration into organization practices. The essential point is the integration of the individual's experiences and interpretation of information with the organization policy, operations and goals. The core of KM in the current research was to find the functional KM practices that enable knowledge diffusion and progression for organization innovativeness.

The business strategy work of the studied organizations (studies A and B, Papers I, II) was given a contradictory status to KM. On the one hand, strategy-based development was the basis for KM in large enterprises when comparing large enterprises and SMEs. On the other hand, the view was offered that the strategy of the organization was not known at all. The strategy describes the visions and desirable goals that the organization wants to reach. It is possible to operate with the desired vision if the target is known. Otherwise, hidden objectives engender ambiguity among the actors. In particular, SMEs are identified as having challenges to integrate the organization's existing knowledge into a strategy context, building organizational level barriers for knowledge sharing

(Riege, 2005) (study B, Paper II). Dialogue concerning the strategy clarifies interpretations and enables the commitment of the actors to the strategy.

Organization external knowledge was seen not only as an opportunity for new competence or network co-operation but for unexpected situations (studies A and B, Papers I, II). In an uncertain organization situation, actors may look outside the organization for knowledge, competence or other co-operation (Nonaka and Takeuchi, 1995). However, divergent networks and changing information technologies cause uncertainties that need to be recognized and addressed as part of a KM strategy. Knowledge protection practices in the organizations investigated varied (studies A and B, Papers I, II). There was uncertainty of knowledge acquisition, sharing and documentation practices. Furthermore, the networking policy was unclear for some of the respondents. Carlsson (2004) notes that knowledge protection for knowledge-based resources was possible only as "isolation mechanisms" (2004, p. 638). In any case, there needs to be a dialogue about the limits and degree of freedom to obtain and share knowledge.

Knowledge-based lenses were used in Paper I, which means that knowledge is the basis of the resources and capabilities of the organization (Carlsson, 2004). Studies A, B and C (Papers I, II and III) revealed that the studied organizations had more knowledge resources available than they utilized. Darroch (2005, p. 201) defines KM as a mechanism for coordinating, and in the organizations studied in this research, the KM mechanism was unclear. It is crucial that on the one side of the coin, the organizations emphasized real time operational information and the other flip of the coin reveals that a comprehensive picture of the organization processes is challenging to obtain (studies A, B and C). It was also challenging to perceive the competence possessed or who owns the knowledge in the organization.

New knowledge as such does not increment innovativeness but the organization's internal knowledge creation process boosts innovations (Nonaka and Takeuchi, 1995). Darroch's (2005) study confirmed that when knowledge acquisition and dissemination succeed and the actors really react to the new knowledge, the organization can succeed in innovation processes as well. However, her study revealed that most of the innovation inputs were focused on improving the existing products (ibid., p. 108). This thesis emphasizes the fact that the companies in Finland not only need new products, services or process innovations to strengthen business but to get totally new business markets.

Network utilization for innovations was considered in studies A, B and C (Papers I, II and III). Mostly the network was concretized in the customer interface and at the operational level while the development function had a minor role. However, the large Finnish companies found that a network affected innovation capability (study A). The SMEs thought that networking and activity were focused on certain business units and actors (study B). Study B (Paper II) resulted in the conclusion that open access knowledge is an unused resource in Finnish companies. Besides the information, the competence resource can be obtained from the organization's external network. Paper II concludes that there has not been any strong development in KM practices and internal (competencies and IT systems) and external knowledge (data, information and network) utilization for a period of twenty years. Schilling (2015) studied networks and external collaboration and concluded that innovative firms are more attracted to alliances.

5.2 Which factors in information technology adoption facilitate the development of the organization?

The identified challenges for KM were in human-to-human interaction as well as human-to-technology interaction and from organization to individual level (studies A, B and C). If the KM function were the change overall, would the communication mechanism be essential for the organization. Both the argument for the need for change and the actors that enable the change need a dialogue to actively influence the change readiness of the organization actors (Armenakis et al., 1993).

Business strategy and KM strategy can complement each other (Hansen et al., 1999; Carlsson, 2004). KM strategy can be defined as “knowledge vision” and the core knowledge based resources and competence are identified (Carlsson, 2004, p. 637). Knowledge sharing challenges both human interaction and the IT system channels that were addressed in Papers I and II. Uncertainty emerged, for instance in the lack of systematic knowledge sharing practices in the organization. The potential of the knowledge increases when knowledge sharing benefits become visible but this requires awareness of what the purpose of the knowledge is (Riege, 2005).

Acquisition, sharing and utilization of individual-level knowledge that furthers organization innovativeness depend on the other hand on organizational issues like the organization culture or power relations or communication practices. The current research focus is on organization-level knowledge utilization and IT adoption and how the social environment affects whether the individual will adopt new information or IT systems. The comparison between the old information or organization practices and the new ones occurs for instance as emotional reactions or unsure action. (E.g. Labianca et al., 2000). The interviews revealed that it is essential for the individual to identify what to do with new knowledge or what the benefits of the new IT are for the individual’s work (study B, Paper II). A bigger unit inside the organization, for example a team or other group, can promote new IT implementation as structural support for the individual (DeSanctis and Poole, 1994). IT adoption needs to consider the existing complexity and establish the benefits of the systems for the individuals (e.g. the results of Kim and Kankanhalli, 2009, p. 578).

The adoption capability of an individual is not always a barrier to information as such or IT adoption. Studies A, B and C identified IT barriers for knowledge utilization and sharing. IT barriers may discourage access to the data that is needed, or the IT systems may not be integrated into the organization processes. In addition, the actors do not know how to utilize the data that the IT systems produce (e.g. devices in the process) or the IT systems or databases are totally unknown to the actors. Conclusions of the same kind of this research confirm that the IT chosen needs to be usable and fluent for the processes and the operator (Davis, 1989; Riege, 2005). However, the time resource for information utilization and IT adoption was one of the challenges in studies A, B and C (Papers I, II and III). Individual-level knowledge-sharing barriers of the same kind are suggested by Riege (2005).

5.3 Which future awareness factors facilitate development of the organization

It is challenging for companies to design a vision for the future if there is no intuition of what information or competence is needed in the company’s future operations (Nonaka and Takeuchi,

1995). Study D considered utilization of future research methods in large Finnish companies (see Paper IV for more details about future research methods). The methods were used actively but discursively for different analyses, such as financial, environmental or risk analysis. Also, scenarios and market and technology analyses were done. However, future research in the studied companies was seen as a part of the strategy work and centralized for those with a certain professional status. Darroch (2005) concluded that the organizations that carry out financial analysis with well-developed systems enjoyed more business growth. Furthermore, the companies reached their five-year objectives more often (ibid.).

Future analyses are needed but it requires implementation in the organization's operations. Communication of the current situation of the organization is important as well as the vision of the future. It is essential to argue why and how the vision can be implemented in practice. (Armenakis et al., 1993) Furthermore, in an unexpected occurrence, e.g. an event, phenomenon or accident in the environment that affects the operation of the organization, may hamstring the operation temporarily. Therefore, communication of the next steps is invaluable for the organization to survive as well as individual-level processing. Most of all, strategic planning entails preparing for forthcoming events and positive targets and for emerging situations although future scanning is also necessary (Makridakis, Hogarth & Gaba, 2010).

There can be different types of organization-level future research. This thesis emphasizes future awareness both at the individual level and organization level as well as evaluation orientation in daily processes. Study C (Paper III) approached future scanning from the marketing and sales functions. In particular, external pre-interaction with other stakeholders at the case company was passive. This passivity culminated in the lack of a comprehensive picture of the customer order and supply chain process from the information database. Darroch's (2005) study showed that sensitiveness to market scanning correlates to an organization's business growth.

The individual can construct a future of his/her own, for example through increasing competence and expertise. Studies A, B and C (Papers I, II) addressed the needs for competence development regarding innovativeness. The new competence requirements were identified in the organizations but were only partly implemented. The innovation objectives of the organization were not clear for the actors. Furthermore, in a new change situation, the competence of the individual may expire (Armenakis and Bedeian, 1999). It is not harmful to be opportunistic, either at the organization or the individual level (e.g. Govindarajan, 2016). Once again, Darroch's (2005) study confirmed that an opportunistic organization has better possibilities for business growth. Why is the same not valid for individuals? In any case, innovativeness requires moving out of one's comfort zone (Darroch, 2005) and sometimes a place for innovation design.

Innovation space can be the place where new knowledge can be constructed, either with organization-internal or -external co-operation (cf. "ba" of Nonaka and Konno, 1998). Study C (Paper III) revealed that the existing innovation place promoted innovativeness, the place that enables organization members and other stakeholders to co-create new products. Nevertheless, space alone does not promote innovativeness. There needs to be a systematic process around the space, design, evaluation and learning processes. How can the innovativeness of the organization be supported?

5.4 Promoting innovativeness with functional KM practices

The purpose of the main research question “how do knowledge management practices support the development of the organization and innovativeness?” was to find what benefits can be obtained when understanding the comprehensive picture of the organization’s KM processes to promote the development of the organization and innovativeness. Furthermore, the question was also intended to elucidate the KM elements that need to be understood to encourage the actors of the organization towards self-reliant innovation. Schilling (2015, p. 34) states that by combining the knowledge of different companies together to innovate, new pathways can be constructed between firms and individuals that otherwise would not be made. The organization external as well as internal knowledge utilization and co-operation in the innovation process were addressed in studies A, B, and C (Papers I, II, III). When the purpose is to innovate and create organizational readiness for change, it is crucial to allow room for individuals to make sense of the new situation (Armenakis and Bedeian, 1999). Furthermore, the organization needs to provide alternative pathways for individuals development to promote innovativeness.

The strategy of the organization can be seen as a policy for organization evolution, a framework that steers the future orientation. However, the strategy can be mystifying for the organization actors and engender confusion and ambiguity (as in study A, Paper I). The dialogue of the strategy at all organization levels offers a fruitful basis for innovativeness in the organization evolution. The actors of the organization operate the strategy and it is essential to give them a variety of ways to implement the strategy in the organization processes. The business strategy also needs a KM strategy (Hansen et al., 1999; Carlsson, 2004). Therefore, this research identified that the KM strategy did not materialize in the studies of the current research (studies A, B and C). Nevertheless, a KM strategy provides a systematic base for communication practices, competence development, future research and internal and external information policy, e.g. knowledge protection and IT system practices. These elements call for attention in order to develop the organization’s operations under study.

Knowledge utilization and IT adoption are more or less the selection of resources, which is one of the organization evolution approaches (Van de Ven and Poole, 1995). The other models are variation and retention. Variation can be understood in the current research e.g. as an organization-external event that affects organization operations. Retention is the model that needed strengthening in the studied organizations. Retention includes persistence in the organization. However, in the current research, retention needed to focus on reforming new models of the organization instead of updating or maintaining the existing forms. The relevant information at the right time and for the right people protects information overload and clarifies the processes of the organization. However, the possibility to access and acquire unknown information needs to be given so that the individuals can generate an idea of new products, services or processes.

In technological transformation, organizations need to find ways to survive and resources to develop products, services or processes to stay competitive in the business markets. Technology transformation occurred in the studied organizations firstly because of the requirements of the technological environment and secondly, because of the pressure of regeneration (studies A, B and C) (E.g. Schilling, 2015) The technology-organization level infrastructure in the organizations succeeded but the human–technology interaction partly faltered (Papers I, II, III). IT systems should not be a barrier to knowledge acquisition or sharing, and the relevant open access to data and information is needed. However, besides the access to knowledge, competence development for IT

adoption is important, not only because of the system or database adoption but also for expressing the benefits of the IT for the operations and the actor's work.

Future awareness may be understood as small development steps that statistically cumulate from small events and affect the larger population (Van de Ven and Poole, 1995, p. 523). Future events may occur abruptly or through the strategic planning of the organization. Therefore, preparing for the future is even more important but needs implementation and dialogue at all organization levels to become familiar with future planning (Paper IV). The future research was only implemented by people of a certain professional status in the researched organizations (Papers I, II, III mostly as a strategy work).

The previous development suggestions are more or less about the organization structures from the individual point of view. Selected practices or organization structures and ideas are retained but have an impact on the organization progression in the long run (Van de Ven and Poole, 1995, p. 531). The organization can have a positive change originating from the action of individuals.

Table 8 summarizes the empirical results of the functional KM practices that affect the innovation capability of the organization (studies A, B, C and D). The first part of Table 8 is the actionable organization-internal knowledge that emphasizes the data or information resources that were seen as barriers to knowledge resource utilization. The second part reveals the organization-external factors that offer both an opportunity and a barrier to innovativeness that need to be processed. The third item, IT adoption, is about the information systems as such and their utilization or the access to the systems that affect innovativeness. The last part, future awareness, expresses the external and internal future work factors and the place where the future design is done to promote innovativeness.

Table 8. Critical elements affecting the innovation capability of individuals in the empirical results

Critical element	Promote innovative-ness	Reject innovative-ness	Appears as	Changes that promote innovativeness
Actionable internal knowledge				
Communication Knowledge sharing		x x	Uncertainty, ambiguity, equivocality, negative attitude	<ul style="list-style-type: none"> • Systematic KM • Emphasis on systematic communication and knowledge-sharing practices, both personal interaction and information system • Strategy familiarization
Time resources for knowledge adoption		x		<ul style="list-style-type: none"> • Encouragement for organization and competence development
New knowledge/product/service utilization		x	Uncertainty	<ul style="list-style-type: none"> • If a new process the a new responsible person is required
New competence	x			<ul style="list-style-type: none"> • Systematic competence development
Invest in real-time information		x	Constricted viewpoint	<ul style="list-style-type: none"> • Systematic development planning and design, future and environment evaluation • Beside operations, ongoing focus on possible innovations
Knowledge protection		x	Uncertainty	<ul style="list-style-type: none"> • For knowledge protection clear practices and policy for knowledge acquisition, sharing and documentation

Critical element	Promote innovative-ness	Reject innovative-ness	Appears as	Changes that promote innovativeness
Innovation target	x		Uncertainty	<ul style="list-style-type: none"> Open innovation target expression
Actionable external knowledge Network co-operation	x		Complexity, contradictory, uncertainty	<ul style="list-style-type: none"> Clear practices for external network and encouragement for external co-operation
Time resource for data and information processing and knowledge assimilation		x	Complexity	<ul style="list-style-type: none"> Anticipation with procedures for external requirements (long and short term). Critical evaluation of own work.
Overlapping features and information	x		Organization capability improvement	
Unexpected factors	x		Shock, opportunity	<ul style="list-style-type: none"> Designated responsible person to operate either survival or development, e.g. operations, product or services
Information technology adoption Open access to information Open access to competence information	x x	x x	Positive effect on organization innovation capability	<ul style="list-style-type: none"> Open access further to identify the relevant information and the competence needed for operations
Unknown IT systems IT data utilization		x x	Uncertainty, inefficiency, passivity, being busy, discursive information	<ul style="list-style-type: none"> Individual early stage IT implementation and access to IT systems Evidence of the benefits of data utilization If possible, IT system modification Access to IT systems
Process development or learning systems utilization Integrated IT systems		x x	Uncertainty Uncertainty, overlapping	<ul style="list-style-type: none"> Activation of the existing system utilization If integration not possible then another control for knowledge sharing
Future awareness External pre-interaction		x	Limited time resources	<ul style="list-style-type: none"> Industry, environment or competitor scanning natural component to work
Strategic work	x		Distant, certain professional mission	<ul style="list-style-type: none"> If not innovation strategy, strengthening the target of the new direction Visible forecast that the desired outcome is implemented by company's processes and practices
Narrow analysis	x			<ul style="list-style-type: none"> Future analysis important but focus should be on unknown and overall organization functions
Innovation space	x			<ul style="list-style-type: none"> External and internal co-design practices but need evaluation afterwards.

The KM elements that the actors of the organization need to evaluate in the innovation process are how they concern the actionable knowledge, IT adoption and future awareness, both from the viewpoint of the organization social and organization operations as well as the new innovation for the organization, e.g. process or technology innovation. Rogers (2002) defined the newness of innovation of knowledge, persuasion and decision on the innovation adoption. In other words, individuals evaluate the innovation whether to accept the innovation or not based on what he knows of the innovation or how to think of the innovation and make the decision of accepting or rejecting it. The individuals of the organization have the key to advance the innovation potentially onwards from the evaluation phase. There needs to be a negotiation of the innovation process in the organization: knowledge creation and sharing challenges, available IT resources, a co-creation and network policy and the time or financial resources for the innovation process. The emphasis is to encourage individuals to actively engender new ideas for products, services or organization processes.

6 CONCLUSIONS

6.1 Contribution of the research

This research aims to give a comprehensive picture of the KM elements that affect innovativeness in the organization. Innovativeness can be achieved if there is an assumption in the background that those KM elements promote the readiness for change of the organization in the first place. The elements considered were knowledge utilization, IT adoption and future awareness. The thesis consisted of different theoretical approaches, namely change management, KM, IT adoption and future research. Next, the contribution to innovation management theory and to organization practice is described.

6.1.1 Contribution to theory

At the beginning of the thesis, it was argued that current KM practices, knowledge creation and sharing processes and IT adoption in organizations seem to focus on the operational functions, which does not promote the important dimension of the development of the organization and innovation processes. Moreover, the future research and environment scanning are not sufficient if they are done by a certain profession or unit in the organization. To obtain innovativeness in the organization, information is needed about the functional KM practices that promote knowledge creation. This contention is justifiable, firstly because of the selected literature framework. The fragmented picture given in the literature of the organizational change for development approach shows that KM, IT management and future research needed a more comprehensive research framework to promote innovativeness. There was a call for the innovation management research that considered the issue from the interdisciplinary approach in this research (see Figure 2). Therefore, one of the contributions of this research relates to new empirical information on the combination of organizational change, KM, IT management and future research, to promote innovativeness. To strengthen the innovation management literature contribution of the current thesis, not only the different theoretical approaches but also different organization functions had to be explored in the organization context (e.g. Van de Ven and Poole, 1995; Tsang and Kwan, 1999; Jensen, 2003; Van de Ven, 2007; Saunders et al., 2009). This research identified the same kind of challenges in KM, IT adoption and future awareness than the earlier researchers (e.g. Armenakis & Bedeian, 1999; Tremblay, 2000; Venkatesh et al., 2003; Wang & Ahmed, 2004; Gharajedaghi, 2007; Kwahk & Lee, 2008; Kim & Kankanhalli, 2009; Polites & Karahanna, 2013; Govindarajan, 2016). Through different theoretical approaches and empirical results it is possible to offer information for the companies to take into account the identified KM challenges in the innovation process of the organizations.

The second argument leans on the organization framework. Only the change literature was fragmented but the KM and IT management policy and practices were discursive in the studied

organizations. This research indicates that companies identified their existing resources (e.g. data or information resources or IT systems or data bases) (e.g. Orlikowski, 1992; DeSanctis and Poole, 1994; Darroch, 2005; Venkatesh, et al., 2003; Schilling, 2015). However, the resources were in passive use. On the other hand, organization resources can be restricted, in which case the resources need to search for external resources (external co-operation possibilities) (e.g. Ramstad, 2014; Schilling, 2015; Samson et al., 2017). To summarize the organization approach contribution to the innovation management literature, the results confirm the earlier research studies. Furthermore, the research expands the organization innovativeness research with KM, IT management and future research approaches. Combining these research areas under one research umbrella, the cross-over effect of single KM, IT management or future research action can be considered. It is important to identify how e.g. changes in the operations of the organization effect on the operating sequence. The performance measurements in the organization can guide to innovativeness but need the comprehensive picture of the innovation processes (e.g. Muller, Välikangas and Merlyn, 2005; Carayannis & Provan, 2008; O'Reilly & Tushman, 2013; Ukko, Hilden, Saunila and Tikkamäki, 2017). However, the measurements are often made by the management, and as Ukko et al. state (2017) both the individual level and group level reflections of the organization operations are needed.

The current research did not consider the individual from a psychological approach. The individual was seen as an organization actor who operates the organization functions and makes individual choices in the changing environment. However, the choices engender reactions and a mood that affects the action of the individual. Especially the KM practices, IT adoption challenges and future orientation engendered uncertainty, complexity, ambiguity or equivocality. The previous theorists and the results of the current research confirm that there is a possibility of individual innovativeness (e.g. Pearce and Manz, 2005; Carmeli et al., 2013; Fujiwara and Watanabe, 2017; Nardelli and Broumels, 2018). This research emphasizes that the essential issue is to develop the innovation process of the organization constantly. There is an emerging discussion about self-organizing of the individual in the organization and management research field (e.g. Rosell, Kumar and Shepherd, 2014; Kakar, 2017; Martela & Kostamo, 2017). This research has not directed towards self-organizing of the individual although there is an emphasis of self-responsibility of the individual in the innovation process. However, with KM and the predictability of the operations, self-organizing can be formed as a new innovation process practice.

The triangle of KM, IT management and future research area theories along with the empirical information made it possible to broaden the innovation management research field for evaluation of the organization-level innovation process. As stated earlier, a common understanding of the innovation process is needed between the actors in the organization: what are the action boundary conditions for the actors to develop the innovation process?

6.1.2 Contribution to practice

The author argues that the diffusion model of Rogers (2002) also has a promoting influence on the organization innovation process. The contribution of the current research to practice culminates in two-dimensional ways. Firstly, the innovation process of the organization can be evaluated through the lenses of different organization elements i.e. knowledge utilization, IT adoption and future

awareness, and compared with the empirically identified challenges of knowledge creation. Secondly, the actors of the organization can develop the innovation process as innovators.

As stated before, this thesis emphasizes the fact that Finnish companies need new product, service or process innovations not only to strengthen business but also to obtain totally new business markets. Therefore, the innovation process of the organization needs to be evaluated in the organization context and cooperative action taken between different organization functions. The individual does not necessarily know all the effects of the innovations on the organization processes. Hence, co-operation between both the internal and external actors as well as the innovation dialogue within the organization is needed: to design the innovation process and boundaries for the innovation process. Another earlier point of emphasis was that future awareness at the individual level and the evaluation orientation in daily processes are necessary (e.g. Govindarajan, 2016). Therefore, the future awareness dialogue at daily operation level is needed.

6.2 Research quality

The current research is based on robust theory to implement the empirical research. For the literature review, the most relevant and highly esteemed academic journals and basic theory references were selected. The limitation of the framework is that the material is focused on the manufacturing context and material from other industrial sectors is not used. The generalizability of the results to other industries can thus be questioned. The outcome of the current research is the identification of functional KM practices for the innovation process. The limitation to the thesis derives from the separate studies as well as the separate research fields. The theoretical background had been addressed in detail in chapter 2 and the construction of the measurements of the separate studies in chapter 3.2. It was challenging to combine the different research areas under the research questions. Therefore, more designed plan of the measurements of the separate studies would have been directed the focus on precisely to innovation field at the beginning of the research process. Due to the selection criterion of the literature, some essential material e.g. innovation practices or innovation process tools may be lacking from this study. All in all, the studies supported the structure of this thesis well.

The research evaluation consists of the concepts of validity and reliability. In the current research, both quantitative and qualitative research methods are utilized. Ghauri and Gronhaug (2005, p. 109) state that between these research methods, it is not a question of quality but procedure. Concept validity in general considers whether the research is elaborated and the results and the deductions are appropriate. (Saunders et al., 2009; Yin, 2009). In contrast, quantitative research evaluation expresses the fact that the measurement operation and the metric are reliable as internal validity. (Uusitalo, 1991; KvantimO'TV, 2013). Furthermore, in construct validity, the evaluation contains how well scientific concepts or theory meet the questionnaire that is used and that the questionnaire measures precisely the intended phenomena or fact (Ghauri and Gronhaug, 2005; Saunders et al., 2009; Yin, 2009; Seltman, 2015). External validity expresses whether the research was generalized (Yin, 2009). Reliability in quantitative research as well as in general research evaluation, reliability evaluation presents whether the research can be repeated (Yin, 2009). In qualitative research, the emphasis of validity is on description, interpretation, theory and generalization (Ghauri and Gronhaug, 2005). Qualitative research can be evaluated with Cuba and Lincoln's (2007) characterization of trustworthiness, which consists of credibility (internal validity), transferability

(external validity), dependability (reliability) and neutrality (objectivity) (Schwandt, Lincoln and Cuba, 2007). The validity and reliability confirmation of the current research are described next.

The selected core concepts of the current research are knowledge utilization, IT adoption and future awareness. The concepts were identified from the literature and were developed during the first study of the current research. The construct validity of the core concepts is included in the research sub-questions of the current research. Furthermore, the empirical research was focused on knowledge utilization and IT adoption in studies A, B and C. Future awareness was targeted in studies C and D. The interview questionnaire in study B was validated so that the same structure of the questionnaire was utilized as that of the Internet-based survey in study A. The research methods of the individual studies and the data collection are addressed in the academic papers. Studies A and B were submitted to the funding institutes before the academic publication. The four research papers of the current dissertation have gone through the peer-review process. Therefore, the process should ensure the quality of the academic research.

Internal validity is based on the questionnaire and on the data analysis of the individual studies. The challenge was to combine many theoretical approaches in the same questionnaire. As Saunders et al. (2009) note, the questionnaire needs to ensure that it collects the data that is needed to receive answers to the research questions of the current research (2009, p. 361). The validity is confirmed by utilizing the scientific evaluated metrics mentioned earlier. The questionnaires were compiled with the combination of separate studies and permission to utilize the metrics was requested from the authors. The qualitative interviews were verified with the structural questionnaire. However, the results are interpreted by the researcher and therefore, the confidence of the results is based on frequent responses. Even though some of the questionnaire (studies A and B) was used already fifteen years ago (Hannula et al., 2003), some of the results showed that the challenges in KM were current then as they are now. This indicated the limitations in the variables utilized in the metrics in the studies A and B in this thesis. The companies were in a different digitalization phase in their operations and information technology systems. Therefore, the comparison between the different-sized companies was challenging. Both the on line and the interview questionnaire had multiple limitations, especially when the sample was small as in these studies. The limitation of the questionnaire was that all the questions did not affect SMEs similar to large enterprises. In SMEs for example, the effect on the certain information system was difficult to evaluate if the system did not exist in the company. More interview-based research would have given deeper material for the analysis. In this way, the validity of the results would have been improved. The selected methods in study A and B unveiled KM and IT utilization practices in the companies studied and the interviews verified some results. However, deeper examination is needed in both company sizes to confirm the results. A larger sample would have validated the results more, e.g. the correlation explanations in studies A and B as well as in case study C aspects from the different organization functions more detailed information about innovation process of the organization. In study D, the larger sample would have enabled the generalization of the results. However, the selected methods offered an overview of KM and IT adoption as well as future methods utilization practices in Finnish companies.

Statistical analyses enable the reader to follow how the researcher has constructed the deduction (Uusitalo, 1991). Therefore, the analyses of the individual studies are detailed and illustrated in the academic papers. Statistical analyses enable the utilization of research data in different ways and approaches. However, the level of uncertainty of the results and criterion of the analyses need to be stated. (Seltman, 2015, p. 5) The author is aware of the limited sample of the studies of the current

research. Therefore, analysis methods appropriate for small samples and the simplest analyses are utilized. Furthermore, the most significant results with the statistical method criteria have been noted and reported (e.g. Cronbach's Alpha for the metric construction and testing variables, significance testing for the result). It is important to highlight, that the separate studies were made in the context of Finnish companies. The quantity of the large-scale enterprises in Finland is quite small. The obtained sample of the 50 biggest companies resulted in 28 % responds which can be considering as an satisfying outcome. However, both the large enterprises and SMEs aspect require a bigger sample to verify and deepen the results.

External validity or generalizability considers whether the results of the research can be generalized to a wider context (Ghauri and Gronhaug, 2005). All the studies of the current research are descriptive rather than generalized. Research quality evaluation includes a dialogue on whether practice-based information is scientifically qualified information (Uusitalo, 1991) or whether case studies preclude the use of quantitative evidence (Yin, 2009, p. 11, 14). The current research is based on the practice approach by considering the knowledge utilization, IT adoption and future orientation challenges in organizations. However, the basis for the problem's possible solutions is identified from the robust theory. The reasons for the descriptive and not generalized validity are firstly that the samples of the studies are limited or small both quantitative and qualitative samples. Secondly, the case study results (study C) are context-dependent and therefore not generalized in this research study form. However, the case study was a pilot study for one unit of the company in question and the purpose was to expand the research to other units of the company. Therefore, pilot study research can be utilized for the comparison between different company units. Study D needs to be broadened to obtain a more comprehensive picture and deeper analysis of future research in Finnish companies. Although the factors that affect the innovativeness of the organization were identified, many results were not empirically validated after the studies. Some of the results are mere examples and require more in-depth research.

Reliability relates to demonstrating that, when using the same operation for the research, the same results can be achieved (Hirsjärvi et al., 2008; Saunders et al., 2009; Yin, 2009). In the current research, the Internet-based questionnaires are easier to repeat. Reliability of the statistical analyses becomes possible through the clear rules of unambiguous classification and interpretation (Uusitalo, 1991). Therefore, the statistical analyses have been detailed in chapter 3.2 and in papers I-IV. However, the qualitative interview, even though implemented with the same questionnaire framework as the Internet survey (studies A and B), was different. The interviewer was the same in all the interviews but the respondents were representatives of different professional groups in different companies. The limitation of the interviews comes from the fact that the representatives were from different professional groups and thus it is challenging to formulate the overall picture of the KM and IT adoption as well as future research practices in the companies. To ensure reliability, the interviews were taped and complemented with notes. The data was transcribed and analysed, documented and collected in a database. Neutrality means that the researcher retains objectivity during the research process and this was verified with the structured telephone interviews so that the interviewer's personal contiguity did not have an effect on the interviewee (Schwandt, Lincoln & Cuba, 2007). All the independent studies and the research processes of the current research are described in chapters 3.2 and 3.3 and illustrated in chapter 3.4.

The novelty of the current dissertation is the combination of organization change management, KM, IT management theories and future research as an umbrella for innovation research. The companies can develop their innovation processes taking into account the identified challenges of

knowledge creation and IT adoption challenges. It is essential that the organizations would find new innovations that promote operations while enabling the organizations to identify new business alternatives.

While providing this result, the research has some limitations. The evaluation of the thesis and the learning process of the author are desirable as well. The congruence of the thesis was constructed during the research process. A certain timeframe was needed to balance the different theory approaches and to take a complementary role in the thesis. The research questions were structured study-by-study leading to the core of innovativeness in the organization. The description of the research process and the dissertation structure can be considered successful. The most important impact was a clear goal for the thesis: to identify the functional KM practices to promote organizational innovativeness as an outcome of the research. The research processes were carried out by the author independently. However, the questionnaires were designed in co-operation. The research papers were produced in co-operation, except for study D and paper IV. However, the discussions with the co-authors deepened the analyses of the studies and guided the research forward. During the dissertation process, the knowledge resource of the author was expanded and the professional expertise developed more.

6.3 Future research directions

The current research offered many interesting combinations of theories and analyses from various standpoints on innovativeness, although deeper examination is needed, since the empirical material was restricted. This research focused on certain professions or organizational functions and was not able to provide information on the different organization levels, e.g. the distinct KM practices operating in a separate group or unit or views on understanding the benefits of information system adoption or utilization. Further research is required about the functional KM practices identified as promoting the innovativeness of the organization and their effectiveness for innovation processes. However, this kind of effectiveness evaluation needs a systematic project in companies to develop the identified issues, measurements for the evaluation and a longitudinal research.

Change is an ever-present phenomenon in the operations of an organization. Change has effects on the actors of the organization as well as on operations and needs work in the present and preparation for the future. The future research is an instructive research area. The future study aspect of the current research was limited to utilization of future research methods. The successful future analyses of the organization were considered for investigation: how the analyses and the visions of the organization are implemented. However, this requires longitudinal research with the organizations as well.

This research identified that the individual in the organization has a strong role in promoting the development of the organization and innovation process. There is a need for a tool that the individual can use to evaluate the innovation process and the new ideas for the processes, commercial products or services of the organization. Furthermore, longitudinal research could be carried out on how the evaluated innovation ideas are concretized into commercial products, services or process innovations in the organizations or, alternatively, the reasons behind an unsuccessful product, service or process innovation cycle. This may lead to another theory combination for innovativeness, which is a complementary theory for the innovation process.

The companies may meet unknown IT adoption challenges than presented in this research because of developing technology. However, new technology can bring opportunities for the organizations. Interesting future avenues are offered by co-innovative platforms that may be digital or more traditional co-operation. Open access innovation creates huge opportunities for organizations. The manufacturing transformation with robotics brings new interesting research areas. Robotics offers a new way of operating and gives the actors a new kind of role in their work. The released resources should be targeted for ideation and design for seminal products, services and processes. This human-robot interaction offers a novel research area. However, the new co-operation platforms and innovation systems within the new work roles require flexible thinking and future awareness, knowledge sharing, IT adoption up front and change readiness not only from individuals but from the organizations and other stakeholders.

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PUBLICATIONS

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Tietämyksenhallinta osana organisaation toimintaa – hallintaa vai hämmennystä?

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Tietämyksenhallinta osana organisaation toimintaa – hallintaa vai hämmennystä?

Hannele Väyrynen, Nina Helander & Harri Jalonen

ABSTRACT

Knowledge Management as part of organizational operation – management or confusion?

Information and knowledge are essential resources for businesses to maintain their competitiveness. Knowledge management (KM) enables companies to develop their activities using the right information at the right time. It also offers tools to manage and to exploit the skills and knowledge of personnel. There are many practical challenges that organizations must systematically identify and solve in order to get the most out of KM. The challenges of KM can be viewed from the viewpoints of uncertainty, complexity, ambiguity, and equivocality. Together they form a framework that enables us to analyze KM's role in organizational operations. The purpose of this study is to empirically analyze the status of KM in large Finnish enterprises and to identify the related practical challenges in daily business operations. The study was carried out in spring 2014 through a web-based survey targeted at the 50 largest companies in Finland. By comparing the results of this study and a similar one conducted in 2002, it is possible to examine the development of KM in large Finnish enterprises. The results show the direction of the development of KM practices in large Finnish companies.

Keywords: Knowledge management, large enterprise, practices, survey, quantitative method

JOHDANTO

Tietämyksenhallinnalla tarkoitetaan organisaation systemaattista tiedon ja osaamisen hallintaa. Tietämyksenhallinnan avulla organisaatio ennakoii, toteuttaa, sopeuttaa sekä arvioi ja kehittää toimintaansa. Organisaation tietämyksenhallinnan perimmäisenä tavoitteena on relevantin tiedon erottaminen epäolennaisesta informaatiosta. Tämä on helpommin sanottu kuin tehty. Nykyajalle on leimallista tilanteet, joissa organisaatioilla on samanaikaisesti tarjolla sekä liikaa että liian vähän tietoa. Nobelisti T. S. Eliotin kysymys ”missä on se tieto, jonka olemme hukanneet informaatioon” on kenties ajankohtaisempi kuin koskaan. Syitä tähän on monia, mutta yhtenä merkittävimmistä tekijöistä on tieto- ja viestintäteknologian kehitys. Internetin hakukoneet, massadata (Big Data), esineiden internet (Internet of Things) ja sosiaalinen media ovat esimerkkejä teknologioista, joiden myötä tarjolla olevan informaation määrä on moninkertaistanut lyhyessä ajassa. Tarjolla olevan informaation määrän kasvu voi tarkoittaa organisaatioille parempaa tietämyksenhallintaa. Tämä ei tapahdu kuitenkaan itsestään.

Tässä tutkimuksessa selvitetään tietämyksenhallinnan nykytilaa viidessäkymmenessä Suomen suurimmassa yrityksessä. Yritysten tietämyksenhallinnan tilaa tarkastellaan neljän tietämiseen kohdistuvan ongelman (epävarmuus, monimutkaisuus, epäselvyys, monitulkintaisuus) näkökulmasta. Artikkelissa kuvataan yritysten tietämyksenhallinnan systemaattisuutta ja prosessikyvykkyyttä sekä tietämyksenhallintaan

kohdistuvia haasteita ja kehittämistarpeita. Tutkimuksen aineisto koostuu vuonna 2014 toteutetusta Internet-pohjaisesta kyselystä. Tutkimusryhmä toteutti vastaavan tutkimuksen tietämyksenhallinnan tilasta Suomen 50 suurimmassa yrityksessä ensimmäisen kerran vuonna 2002 (Hannula ym. 2003.). Käsillä oleva tutkimus antaa siten myös vertailevaa tietoa vuoden 2002 tietämyksenhallinnan tutkimukselle. Tämä mahdollistaa suomalaisen tietämyksenhallinnan kehityskaaren analysoinnin suurten yritysten osalta reilun kymmenen vuoden aikana.

Tietämyksenhallinnan kehityskaarta ajatellen on oletettavaa, että teknologinen kehitys on helpottanut informaation puutteesta johtuvan epävarmuuden vähentämistä sekä ilmiöiden yhteen kytkeytymisestä johtuvan monimutkaisuuden hallintaa. Reaalimaailman ilmiötä koskevan faktatiedon tarkastaminen vaikkapa Wikipediasta käy tätä nykyä käden käänteessä. Markkinoilla on ollut jo pitkään myös palveluja, joiden avulla ihmiset voivat automatisoida rajattuja ilmiötä koskevan informaation (esim. pörssi-informaatio) keräämisen. Samoin tietokoneiden kasvanut laskentakapasiteetti ja informaation visualisointitekniikoiden kehittyminen ovat helpottaneet monimutkaisten asioiden simulointia ja mallintamista. Paradoksaalista tai ei, kolikon käänttöpuolella on niiden tilanteiden yleistyminen, joissa informaation määrän kasvu on synnyttänyt uudenlaisia tiedollisia haasteita. Vaikka informaation helppo ja nopea saatavuus onkin luonut organisaatioiden tietämyksenhallinnalle uusia mahdollisuuksia, seurauksena on ollut epäselvyyttä ja monitulkintaisuutta. Vertauskuvallisesti ilmaistuna lääkkeellä on ollut ei-toivottuja sivuvaikutuksia. Näyttääkin siltä, että informaation määrää kasvattamalla ei voida vähentää tietämättömyyttä, sillä uudella informaatiolla on taipumus synnyttää uusiin ilmiöihin ja tapahtumiin liittyvää tietämättömyyttä. Tietämyksenhallintaa koskevasta tietoisuuden kasvusta ja tietämyksenhallintaa tukevan infrastruktuurin kehittymisestä huolimatta parannettavaa riittää. Aihe on siis nyt jopa vielä ajankohtaisempi kuin reilut kymmenen vuotta sitten, jolloin tietämyksenhallinnan opit olivat kuitenkin nykyistä vahvemmin mediassa esillä, johtuen oletettavasti oppien uutuusarvon mukanaan tuomasta viehätysvoimasta.

Tässä artikkelissa esitetään tuoreita näkemyksiä suomalaisen tietämyksenhallinnan käytännöistä ja niistä haasteista, joita suomalaiset suuryritykset kohtaavat tiedon johtamiseen liittyen päivittäisissä toiminnissaan. Artikkelin rakentuu (i) tietämyksenhallinnan teoreettisesta viitekehyksestä, jossa erityisenä fokuksena tietämisen ongelmat ja niiden vaikutus tietämyksenhallinnan käytäntöihin, (ii) tutkimuksen toteuttamisen kuvauksesta, (iii) tutkimustuloksista, jotka sisältävät vertailevan pohdinnan tuloksista vuoden 2002 tutkimukseen sekä (iv) johtopäätösluvusta.

TEOREETTINEN TARKASTELU: TIETÄMYKSENHALLINTA JA TIETÄMISEN HAASTEET

Tietoperustainen näkemys (knowledge-based view, KBV) korostaa tiedon merkitystä organisaation kilpailukyvyssä (Grant 1991; Spender 1996). Tietoperustaisessa näkemyksessä tieto nähdään moniulotteisena, sosiaalisessa vuorovaikutuksessa rakentuvana sekä jatkuvasti muuttuvana ja kehittyvänä resurssina. Tiedon moniulotteisuus ilmenee esimerkiksi siinä, että tieto voi olla eksplisiittistä ja hiljaista, yksilöllistä ja kollektiivista, yleistä ja kontekstisidonnaista (Nonaka & Takeuchi 1995; Spender 1996). Tieto on organisaation keskeinen resurssi, joka rakentuu organisaation informaatiosta ja datasta (Davenport & Prusak 1998), osaamisesta, rakenteista ja niiden tuesta sekä toimintaympäristöstä (Laihonen ym. 2013). Tieto on kumuloituvaa (Leonard-Barton 1995; Shapiro & Varian 1999), dynaamista ja kehittyvää (Pralhad & Hamel 1990; Nonaka ym. 2001), ja yritys joka osaa käyttää tietoresursseja hyödyksi, voi saada aitoa kilpailuetua (von Krogh & Roos 1995). Tiedon moniulotteisuudesta ja dynaamisuudesta johtuen organisaation kilpailuetu ei voi perustua yksinomaan ulkoisen informaation tehokkaaseen hyödyntämiseen, vaan kysymys on organisaation kyvystä luoda, jakaa ja soveltaa tietoa.

Jotta tiedosta voisi saada parhaan mahdollisen hyödyn, tulisi sitä hankkia, kasvattaa, kehittää, suunnitella ja hyödyntää tehokkaasti (Nordhaug 1994; Nonaka & Takeuchi 1995). Tähän päästäkseen organisaation johdon tulisi osata rakentaa sellaisia fyysisiä ja sosiaalisia rakenteita, jotka takaavat tiedon kattavan käyttö-

misen (Tece 1998). Kuitenkin tiedon määrittely, löytäminen ja tehokas hyödyntäminen koetaan usein haasteellisiksi. Siksi monilla yrityksillä on paljon hyödyntämättömiä tietoresursseja, joita käyttämällä ne voisivat kehittää kilpailukykyään, jos niillä vain olisi kyky oppia ja rakentaa niistä uusia yhdistelmiä. (Prusak 1996.) Yrityksellä pitäisikin olla kyky ylläpitää, kehittää, koordinoi- da ja hyödyntää tietoaan (Nonaka & Takeuchi 1995). Tietämyksenhallinta on keino tämän keskeisen resurssin, tiedon, hyödyntämiseen tehokkaasti. Olennaisena seikkana tietämyksen- hallinnassa on tiedon jakaminen kattavasti koko organisaatiossa. Myös uuden tiedon luominen olemassa olevan tiedon pohjalta on tietämyksenhallinnan keskeisiä tavoitteita (Nonaka ym. 2001). Tiivistetysti sanottuna tietämyksenhal- linnan tavoitteena on toiminnan tehokkuuden saavuttaminen ja uusien ideoiden synnyttämi- nen olemassa olevia tietoresursseja levittämäl- lä ja hyödyntämällä (Wah 2000; Laihonen ym. 2013; Kukko 2013). Objektiivisten faktojen ja kiistattoman informaation hyödyntämisen ohel- la tietämyksenhallinnassa olennaista on organi- saation sisäisten ja ulkoisten tapahtumien hal- tuun ottaminen tavalla, joka hyödyntää organi- saation ihmisten erilaisia tietoperustoja. Viime- kädessä kysymys on erilaisten tietämiseen liit- tyvien ongelmien ja haasteiden ratkaisemisesta (vrt. Zack 2001).

Gold ym. (2001) ovat tutkineet yritysten tietämyksenhallintaa organisatorisen kyvyk- kyuden näkökulmasta. Kyvykkyyden näkökul- massa tietämyksenhallinnan infrastruktuuri rakentuu teknologiasta, organisaation raken- teista ja kulttuurista. Tiedon prosessoinnin ky- vykkyyks taas muodostuu tiedon ja osaamisen hankinnasta, muuntamisesta, levittämisestä ja tiedon ja osaamisen suojaamisesta. Oleellista tehokkaassa yrityksen tiedon ja osaamisen hyödyntämisessä on organisaation toiminta ja sen tietämyksenhallinnan prosessit, jotka kes- kittyvät sosiaalisen pääoman hyödyntämiseen (Gold ym. 2001). Sosiaalinen pääoma mahdol- listaa liiketoiminnan tarpeiden ja tietojärjes- telmien ja mahdollisuuksien ymmärtämisen: IT-henkilöiden ja liiketoimintayksiköiden kes- kinäinen tiedonvaihto on keino oikeiden väli- neiden ja työkalujen kehittämiseen. Kun liike- toiminnan tarpeet ja tietojärjestelmien tarjonta kohtaavat, lisääntyy myös IT:n hyödyntäminen

ja IT:n joustavuus muutoksissa. (Wagner ym. 2014) Chen ja Huangin (2009) mukaan yrityk- set, jotka ovat hyviä suuntaamaan IT- ja henki- löstöstrategiaansa tietämyksenhallinnan strate- gian avulla osoittavat parempaa suorituskykyä. Tietämyksenhallinnan prosessit vaikuttavat sekä ulkopuolisen että sisäisen tiedon hyödyn- tämiseen. Hansen ym. (1999) painottavat, että yrityksen kilpailukykyinen strategia tarvitsee tuekseen tietämyksenhallinnan strategian. He jakavat tietämyksenhallinnan strategian kodifi- kaation strategiaan, jossa ajatuksena on kerran tuotetun tiedon kierrättäminen yrityksessä, ja tieto on kaikkien saatavilla ja helposti hyödyn- nettävissä. Toinen tietämyksenhallinnan strate- gia on personalisaation strategia, jolloin tietoa ja osaamista jaetaan ihmisten keskinäisessä vuorovaikutuksessa. Oleellista yrityksen tietä- myksenhallinnan strategian valinnassa on itse strategian valinta, ja tässä yrityksen johtotaso on avainasemassa. Molempia strategioiden toteut- tamismalleja tarvitaan tietämyksenhallinnas- sa (kierrättämistä ja kommunikointia), mutta toimintamallin valinnassa kannattaa keskittyä jompaankumpaan valintaan, jotta tiedon hyö- dyntäminen olisi tehokasta.

Tietämyksenhallinta näyttäytyy uudessa va- lossa, kun sitä tarkastellaan nimenomaan tietä- miseen liittyvien haasteiden ja ongelmien kautta. Kirjallisuudessa tietämisen ongelmia on tun- nistettu lukuisia, joista kuitenkin neljä nousee ylitse muiden. Tietoa tarvitaan epävarmuuden (*uncertainty*), monimutkaisuuden (*complexity*), epäselvyyden (*equivocality*) ja monitulkintai- suuden (*ambiguity*) kohtaamisessa (Zack 2001; Jalonen 2013). Nämä neljä näkökulmaa ovat keskenään vuorovaikutuksessa, mutta tarjoavat kukin oman hyödyllisen analyysikulmansa tie- tämyksenhallinnan haasteiden tunnistamiseksi ja ratkaisemiseksi. Seuraavassa avataan tarkem- min nämä neljä tietämisen ongelman näkökul- maa, joita käytetään tässä tutkimuksessa empii- risen aineiston analyysisilmälaseina.

Epävarmuus tarkoittaa tosiasioita koskevan informaation puutetta. Epävarmuutta synnyttä- ville asioille on luonteenomaista se, että ne ovat olemassa ihmisistä riippumatta. Epävarmuus näkyy tietokuiluna, joka aukeaa toimintatilan- teessa tarvittavan informaation ja yksilön (tai organisaation) hallussa olevan tiedon välille. Epävarmuus on luonteeltaan kesy ongelma (ta-

me problem) (Rittel & Webber 1973), sillä sen ratkaisemiseen tarvittava informaatio voidaan määrittellä aukottomasti, eikä informaation tulkinta aiheuta ristiriitoja. Olennaista epävarmuuden vähentämisessä on relevanttien kysymysten muotoilu ja vastauksessa tarvittavan informaation etsiminen. ”Mikä on tuottemme markkinaosuus alueella X?” on esimerkki kysymyksestä, johon on löydettävissä selkeä ja ko. asiaan liittyvän epävarmuuden poistava vastaus. Käytännössä epävarmuuden vähentäminen edellyttää informaation varastointia, organisoimista, jalostamista ja kommunikointia tukevia tietojärjestelmiä.

Monimutkaisuus syntyy asioiden ja ilmiöiden välisistä riippuvuuksista. Monimutkaisuudelle on tyypillistä, että yksittäiset asiat kietoutuvat toisiinsa muodostaen ongelmakimppuja. Niiden avaaminen on vaikeaa, koska yhden osan ratkaiseminen riippuu siitä, mitä vaikutuksia ehdotetulla ratkaisulla on ongelmakimppun muihin osiin. Esimerkiksi päätös tuotteen markkinaosuuden kasvattamisesta hintaa laskemalla voi osoittautua vaikeaksi, sillä ratkaisun hyvyteen vaikuttavat muun muassa kilpailijoiden ja jakelukanavien ratkaisut. Niistä voi tehdä oletuksia, mutta niitä ei voi tietää. Monimutkaisuuden vähentämisessä olennaista on organisaation ja sen ihmisten kyky prosessoida ilmiöiden ja asioiden monimutkaisuudesta kertovaa tietoa. Tietoperusteisen organisaatiokäsityksen hengessä voidaan olettaa, että monipuoliset tietoresurssit lisäävät organisaation menestymisen todennäköisyyttä, sillä ne mahdollistavat toimimisen monimutkaisissa tilanteissa (Grant 1991). Erityisen tärkeää tällöin näyttäisi olevan, että organisaatio koostuu ihmisistä, joilla on erilaista tietoa. Näin syntyy monimuotoisuutta, joka edistää asioiden tarkastelun monesta eri näkökulmasta, mikä puolestaan mahdollistaa yhtäältä asioiden välisten riippuvuussuhteiden tunnistaminen ja toisaalta monimutkaisten kokonaisuuksien purkamisen paremmin hallittaviksi asiakokonaisuuksiksi.

Epäselvyys merkitsee asian tai ilmiön tulkintavaikeutta. Organisaation voidaan sanoa kärsivän epäselvyydestä silloin kun se ei pysty sovittamaan yksittäisiä tiedonsirpaleita osaksi isompaa tulkintakehikkoa. Epäselvyydellä on kaksi lähdeä. Ensinnäkin kysymys voi olla tulkintakehikon puutteellisuudesta. Tulkintakehikon

puutteellisuus kertoo organisaation ja sen ihmisten tietopohjassa olevista aukoista. Esimerkkinä vaikkapa suomalaiset kaupan alan yritykset, jotka eivät nähneet verkkokaupankäynnin kasvua, vaan luottivat omien liiketoimintakonseptiensä toimivuuteen. Toiseksi epäselvyyttä aiheuttaa tulkinnan kohteena olevan ilmiön uutuus. Esimerkiksi organisaation toimintaympäristössä vaikuttava hiljainen signaali voi jäädä tunnistamatta, koska organisaation ihmisillä ei ole aiempaa kokemusta po. hiljaisen signaalin merkityksestä organisaation toiminnalle. Molemmissa epäselvyyden lähteissä on viime kädessä kysymys organisaation ja sen ihmisten kyvyttömyydestä nähdä ja ymmärtää asioita. Epäselvyyden kohtaamisessa siksi olennaista on merkityksellistämisen prosessi – tuntemattoman näkyväksi tekeminen ja yksittäisten informaatiopalasten sovittaminen osaksi laajempaa tulkintakehikkoa. Merkityksellistämisessä on kysymys ilmiöiden havaitsemisen, ymmärtämisen, selittämisen sekä ennustamisen prosesseista (Weick 2000). Merkityksellistämistä ei voi koskaan pitää täydellisenä. Merkityksellistämisen uskottavuutta ja käyttökelpoisuutta voidaan kuitenkin lisätä tukemalla yksilöiden sosiaalista vuorovaikutusta (Weick 1995). Parhaimmillaan merkityksellistämisen voi johtaa organisaation toimintaa ohjaaviksi sosiaalisiksi konstruktioiksi, jotka kohdistavat yksilöiden ajattelua organisaation kannalta tärkeisiin ja mielekkäisiin asioihin.

Monitulkintaisuus tarkoittaa tilannetta, jossa ilmiö tai tapahtuma synnyttää erilaisia tulkintoja. Kysymys ei ole ilmiön tai tapahtuman ominaisuudesta vaan tulkitsijoiden erilaisiin tietoperustoihin ja arvoihin perustuvista näkemyksistä. Tulkinnat ovat usein toisiaan poisulkevia, mistä johtuen seurauksena on usein organisaatioiden sisällä kamppailua vallasta, asemasta ja resursseista. Tyypillinen monitulkintaisuutta aiheuttava tekijä on organisaation strategian uudistaminen. Strategian toimivuus (tai toimimattomuus) paljastuu tulevaisuudessa, mistä johtuen hyvälle strategialle on vaikea löytää objektiivisia etukäteisarviointikriteereitä. Sitäkin helpompaa on puolustaa olemassa olevien toimintojen tarpeellisuutta. Äärimmillään monitulkintaisuus on ns. ilkeissä ongelmissa (wicked problem), joille on ominaista se, että niiden ratkaisuyrityksiin osallistuvat eivät jaa yhteistä näkemystä edes siitä, mikä oikeastaan

onkaan ongelma (Raisio 2010; Rittel & Webber 1973). Monitulkintaisuuden tapauksessa onkin luontevaa puhua ongelmien ratkaisemisen sijaan niiden kohtaamisen tavoista. Kysymys on sen hyväksymisestä, että kaikki ratkaisuehdotukset ovat jostakin näkökulmasta katsottuna puutteellisia, sillä yhtä ja samaa ”todellisuutta” tulkitaan eri lähtökohdista. Lähtökohtaisesti todellisuudesta tehtäviä rinnakkaisia tulkintoja voidaan pitää yhtä tarpeellisina (vrt. Bäcklund 2007). Olennaista monitulkintaisuuden kohtaamisessa on varmistaa erilaisten näkökulmien huomioiminen. Tärkeäksi nousee vuorovaikutuksen responsiivisuus, joka merkitsee sitä, että ongelman vaikutuspiirissä olevat toimijat ovat yhtäältä valmiita hyväksymään monet mahdolliset ”totuudet” ja toisaalta valmiita kyseenalaiseen paitsi toistensa myös omaa ajatteluaan.

Nämä edellä avatut neljä tietämisen ongelmaa tarjoavat teoreettisen viitekehyksen, joiden kautta seuraavassa käydään läpi tutkimuksen empiiristä osuutta, tietämyksenhallinnan nykytilaa suomalaisissa suuryrityksissä selvittävää kyselytutkimusta.

TUTKIMUKSEN TOTEUTUS

Tutkimus toteutettiin survey-tutkimuksena kvantitatiivisella tutkimusotteella. Internet-pohjainen kysely-tutkimus lähetettiin sähköpostilinkkinä Suomen viidenkymmenen suurimman yrityksen henkilöstöasioista sekä tietohallinnosta ja -järjestelmistä vastuullisille henkilöille. Tutkimus toteutettiin kesäkuun ja syyskuun 2014 välisenä aikana.

Suomalaiset suuryritykset ovat kohderyhmänä erityisen kiinnostava, koska ne toimivat usein kansainvälisillä markkinoilla ja laajoissa verkostoissa toimivia, jolloin heidän tietämyksenhallinnaltaan odotetaan myös ulottuvuutta organisaatiosta ulospäin. Kohderyhmä tarjoaa mahdolliseen tällöin monipuolisen kuvan saavuttamiseen tietämyksenhallinnasta. Tutkimuksen tarkoituksena ei kuitenkaan ollut saada syvällistä yksityiskohtaista analyysiä tietämyksenhallinnasta, vaan saada yleiskuvaus kyseisestä ilmiöstä näissä yrityksissä sekä toiminnan käytännön haasteista ja tarpeelliseksi koettavista kehittämiskohteista. Tavoitteena oli selvittää, onko tietämyksenhallinta vakiintunut yritysten toimintaa tukevaksi ja systemaattises-

ti hallituksi kokonaisuudeksi, vai onko tietämyksenhallinta edelleen yhtä hämmennystä herättävä kokonaisuus kuin vuoden 2002 toteutetussa vastaavassa tutkimuksessa tuli esille. Kyselytutkimus valittiin tutkimusmenetelmäksi, koska se mahdollistaa yleiskuvan saamisen kohdittuun laajasta kohderyhmästä tehokkaalla tavalla sekä vertailun vuonna 2002 kvantitatiivisesti toteutettuun vastaavaan tutkimukseen.

Kysely rakennettiin edellisessä luvussa esitettyjen teoreettisten näkökulmien mukaisesti, jolloin saatiin yritysten rakenteiden antama tuki, teknologian käyttö ja teknologian hyödyntämisen keinot sekä sosiaalisen vuorovaikutuksen toimintamallit tietämyksenhallinnan toteuttamisessa esille.

Tutkimukseen osallistui yrityksiä talouden ja rakentamisen, kaupan sekä finanssi- ja palvelujen sektoreilta. Yhdestä yrityksestä kontaktettiin vastaajiksi sekä henkilöstöosaston että tietohallinnon edustajia. Vaikka vastausprosentti kontaktoiduista henkilöistä jäi 28 %:iin (n=135), saatiin tutkimukseen Suomen 50 suurimmasta yrityksestä vastausedustus yli 50 % yrityksestä, joten vastausprosenttia yritystasolla voidaan pitää melko hyvänä. Vastanneista henkilöistä 67 % edusti henkilöstöhallintoa, 18 % tietohallintoa ja loput 10 % taloushallintoa. Tutkimustuloksia voidaankin pitää kuvailevina tuloksina tietämyksenhallinnan tilasta Suomen 50 suurimmassa yrityksessä.

Seuraavassa analysoidaan empiiristä aineistoa teoriaosuudessa esitetyn neljän tietämisen ongelman kautta keskeisimpien tietämyksenhallinnan haasteiden ja kehittämistarpeiden tunnistamiseksi suomalaisissa suuryrityksissä.

TULOKSET: TIETÄMYKSENHALLINNAN HAASTEIDEN JÄSENTÄMINEN NELJÄN TIETÄMISEN ONGELMAN AVULLA

Epävarmuus

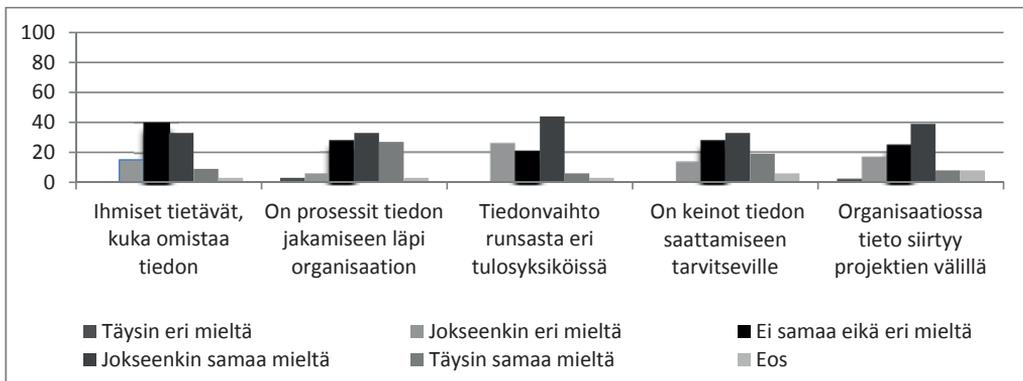
Tutkimusaineiston perusteella epävarmuus tulee esille erityisesti organisaation sisäisen tiedon hyödyntämisessä. Työntekijöillä ei ole tarkkaa tietoa siitä, onko organisaatiolla tarvittaessa toimivat prosessit ja järjestelmät tiedon jakamiseen työntekijöiden, organisaatiosojen ja eri projektien kesken. Samoin on epävarmuutta siitä kuka omistaa tiedon (kuviot 1).

Epävarmuutta voidaan vähentää lisäämällä tietämyksenhallinnan systemaattisuutta. Tietämyksenhallinnan systemaattisuus rakentuu suunnitelmaan pohjautuvista käytännöistä. Tutkimuksessa organisaation toiminnassa arvioitiin organisaation rakenteellista ja strategista kyvykkyyttä päätöksenteon ja strategiatyön, palautekäytännön, luottamusilmapiirin, organisaation rakenteiden tuki tiedonjakamiselle sekä teknologian hyödyntämisen kysymyksillä.

Alla olevassa taulukossa 1. on esitetty vastausten jakautuminen summamuuttujille. Vastausten painotusten perusteella yritysten tietämyksenhallinnan systemaattisuus on jokseenkin hyvällä tasolla, vastaukset ovat painottuneet ”Jokseenkin samaa mieltä systemaattisuuden toteutumisesta”. Vapaa tiedonkulku ja ryhmätyö painottuivat vahvimaksi systemaattisuuden toteuttajaksi, vaikkakin organisaation rakenteellista tukea tiedonkululle ei koettu osittain riit-

täväksi 14% osuudella, ja tämän vahvisti myös epähierarkkisen viestinnän heikko selitysarvo selityskomponenteissa. Palautteenanto yrityk- sessä ei ollut riittävää 3%:n mielestä, ja palautteenanto ei muodostunut myöskään selittäväksi vaikuttajaksi systemaattisuuteen jääden vahvojen komponenttien ulkopuolelle. Tietämyksenhallinnan systemaattisuuteen näyttäisi vaikuttavan strategiatyö ja sitoutuminen, päätöksenteko, palautteenanto sekä luottamusilmapiiri, jotka selittävät yhdessä 44 % systemaattisuuden muuttujien vaihtelusta.

Toinen vahva epävarmuuden alue esiintyy tiedon ja osaamisen suojaamisessa. Vastaajista 16% koki tietämättömyyttä tiedon suojaamisen prosesseista: tiedon sisä- ja ulkopuoliselta epäasialliselta käytöltä, liikesalaisuuksien suojauksen menettelytavoista, salaisten tietojen määrittelyä sekä organisaation valvonta- ja tarkastusmenettelyistä. (Näissä kysymyksissä vastausvaihto-

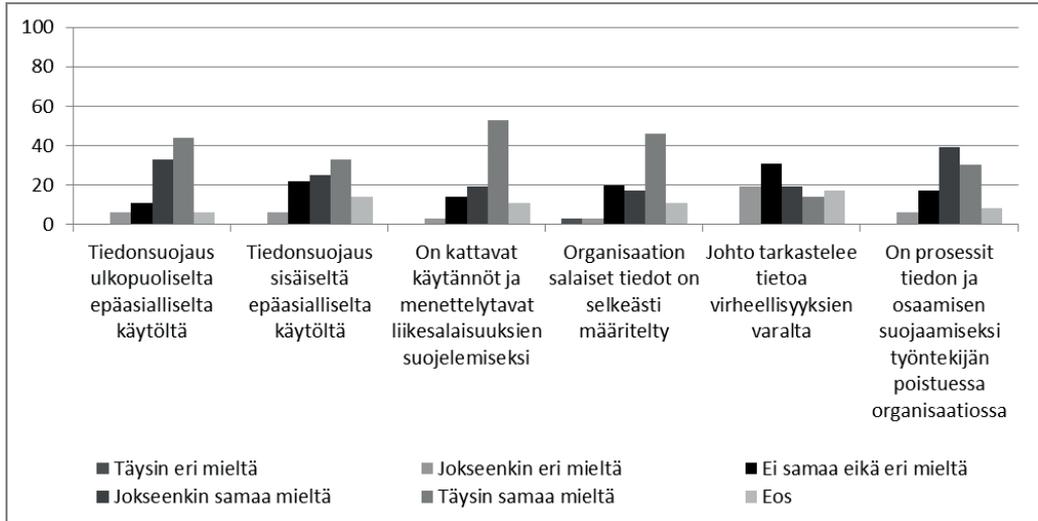


Kuvio 1. Epävarmuuden esiintyminen sisäisen tiedon hyödyntämisessä, prosenttia (n=36).

Taulukko 1. Systemaattisuus summamuuttujilla jakautuneet vastaukset (%)

	1	2	3	4	5	YHT.
Strategiatyö ja sitoutuminen		8	22	42	28	100
Päätöksenteko		5	17	50	28	100
Palautteenanto	3	5	28	42	22	100
Luottamusilmapiiri		3	11	56	30	100
Vapaa tiedonkulku ja ryhmätyö		3	17	58	22	100
Rakenteiden tuki tiedonkululle		14	30	45	11	100

1 = Täysin eri mieltä, 2 = Jokseenkin eri mieltä, 3 = Ei samaa eikä eri mieltä, 4 = Jokseenkin samaa mieltä, 5 = Täysin samaa mieltä



Kuvio 2. Epävarmuuden esiintyminen tiedon suojaamisessa, prosenttia (n=36).

ehdoista (n = 216) vastaukset olivat kohdassa ”En osaa sanoa”). Tämän pohjalta voidaankin kysyä, onko organisaatioiden jäsenillä tietämyksen suojaamisesta riittävästi tietoa?

Organisaatioissa on tulosten perusteella olemassa määritellyt luottamuksellisista tiedoista sekä käytännöt tiedon suojaamiseksi. Vahvimman komponentin (selitysosuus 51 %) kohdat koskevat suojaamisen viestinnästä organisaatioissa. Toinen selittävä komponentti (13 %) sisältää tietoa yrityksen tietämystä mahdollisesti kohtaavista uhista sekä yrityksestä poistuvan työntekijän tiedon varmistamisesta organisaation käyttöön. Muuttuja ”Organisaatiollamme on prosessit organisaatiostamme poistuvien henkilöiden tiedon jäämiseksi organisaatiomme käyttöön” on mielenkiintoinen, koska sama muuttuja näyttäisi olevan vahvin vaikuttaja osaamisen kehittämisen varmistamisen vaihtelusta ($r = .71$, $F(8, 30) = 6,8$, $p=0,000$). Tutkimuksen kannalta herää kysymys, ottavatko yritykset osaavan työntekijän tietotaidon panostetusti käyttöön vasta, kun tietämys on siirtymässä ulos organisaatiosta.

Tieto- ja viestintäteknologian hyödyntämisen osalta tiedon ja osaamisen suojaamisen taso näyttäisi kuitenkin olevan jokseenkin hyvällä tai erittäin hyvällä tasolla, katso Taulukko 2. (arvo 4 = 39 % ja arvo 5 = 36 %). Tämä kertoo teknisen tietoturvallisuuden hyvästä tasosta.

Taulukossa 2 on esitetty myös muut tieto- ja viestintäteknologiaan liittyvät muuttujat.

Tiedon epävarmuuteen vaikuttaa usein juuri tieto- ja viestintäteknologioiden käyttöön liittyvät asiat. Tiedon ja osaamisen hankinta ja soveltaminen on jaoteltu kysymysten perusteella organisaation sisäisen tiedon ja organisaation ulkoisen tiedon hyödyntämiseen. Sisäinen tieto tässä analyysissä tarkoittaa organisaation sisäisten prosessien toteuttamisessa tarvittavaa ja käytettävää tietoa. Ulkoisella tiedolla tarkoitetaan organisaatiosta ulospäin suuntaavaa ja ulkoa organisaation tulevaa tietoa. Tiedon ja osaamisen kehittämistä on tarkasteltu tieto- ja viestintäteknologian hyödyntämisen sekä uuden ja vanhan tiedon hyödyntämisen näkökulmasta.

Organisaation sisäisen tiedon hyödyntämisen muuttujien vaihtelua selittävät 49 % ajantasaisen tiedon helppo löytäminen ja käytännöstä oppiminen. 10 % selittää tiedon oikean sijainti ja sen löytäminen, parannusehdotusten huomioiminen sekä menettelytapojen ja -ohjeiden päivittäminen. Taulukon 2 vastausten mukaan sisäisen tiedon hyödyntäminen on jokseenkin hyvällä tasolla organisaatioissa (arvo 4 = 50 %).

Tiedon ja osaamisen kehittäminen organisaatioissa koettiin jokseenkin hyvälle tasolle (taulukko 2, arvo 4 = 47 %). Organisaatioissa on strategialähtöiset prosessit osaamisen arviointiin, soveltamiseen sekä kehittämiseen, ja nämä muodostavat 51 % selitysosuuden tiedon ja osaamisen kehittämisen varianssille. Uuden tiedon ja osaamisen kehittäminen ryhmätyöllä

ei saanut vahvaa selitystä, vain 10 %, ja sama tulos kuvastui uusien työntekijöiden tiedon ja osaamisen hyödyntämisen heikkoutena ulkoisen tiedon hyödyntämisen kohdassa.

Kuviossa 3 on kuvattu tietojärjestelmien käytön aktiivisuus yrityksissä. Prosessien hallinnassa järjestelmiä hyödynnettiin operatiiv-

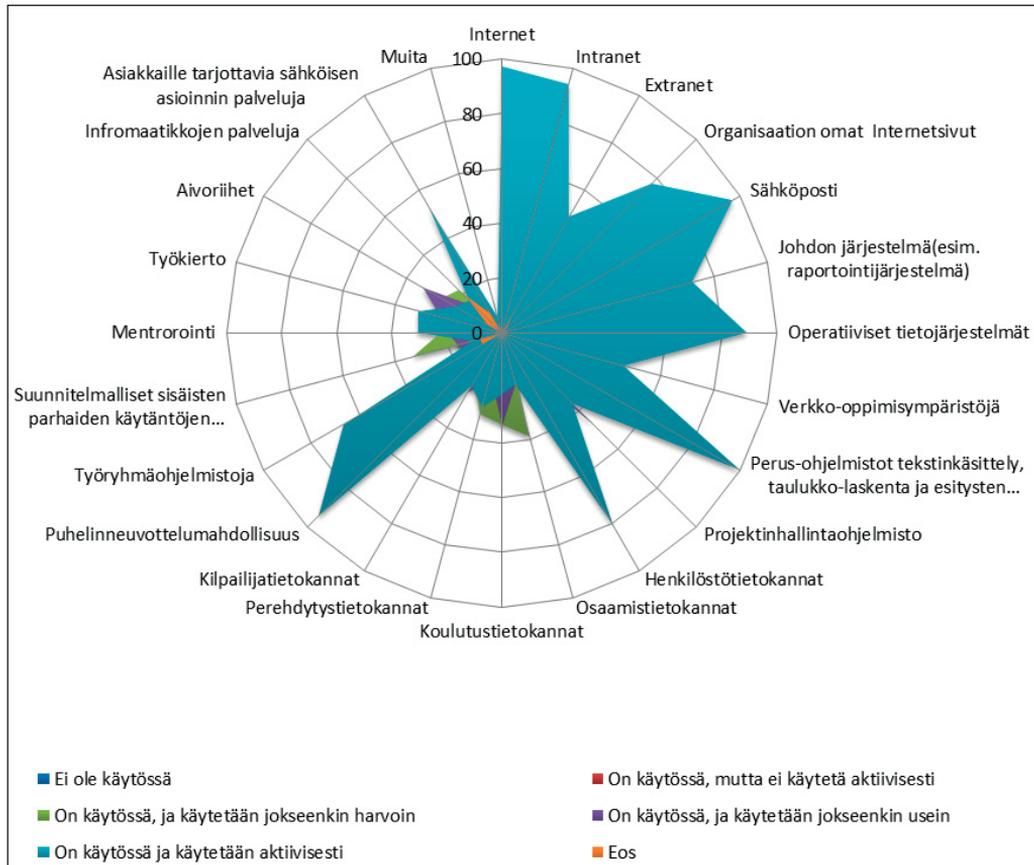
visilla tietojärjestelmillä aktiivisesti 89 % ja jokseenkin usein 11 % yrityksistä. Projektinhallintaohjelmistot olivat myös hyvin hyödynnettyjä: 36 % aktiivisessa, 47 % jokseenkin usein ja 11 % jokseenkin harvoin.

Tulosten analysoinnissa huomio kiinnittyi siihen, että organisaatioissa panostetaan reaaliai-

Taulukko 2. Tieto- ja viestintäteknologian hyödyntäminen summamuuttujilla jakautuneet vastaukset (%)

	1	2	3	4	5	Eos	YHT.
Organisaation sisäisen tiedon hyödyntäminen		3	36	50	11		100
Organisaation ulkoisen tiedon hyödyntäminen		5	14	58	23		100
Tiedon ja osaamisen kehittäminen		3	31	47	19		100
Tiedon suojaaminen		3	19	39	36	3	100

1 = Täysin eri mieltä, 2 =Jokseenkin eri mieltä, 3 = Ei samaa eikä eri mieltä, 4 = Jokseenkin samaa mieltä, 5 = Täysin samaa mieltä, Eos = Ei osaa sanoa



Kuvio 3. Organisaatioiden tietojärjestelmien käyttöaktiivisuus, prosenttia (n=36).

Taulukko 3. Organisaatorinen tehokkuus summamuuttujilla jakautuneet vastaukset (%)

	1	2	3	4	5	Eos	Mis	YHT.
Organisaatio kyvykkyyden parantuminen		3	16	50	25	3	3	100

1 = Täysin eri mieltä, 2 =Jokseenkin eri mieltä, 3 = Ei samaa eikä eri mieltä, 4 = Jokseenkin samaa mieltä, 5 = Täysin samaa mieltä, Eos = Ei osaa sanoa, Mis = Puuttuva vastaus

kaisen tiedon (toimintaa varten) ja organisaation ulkopuolisen verkoston (asiakkaat, ulkopuolinen vuorovaikutus) tiedon ylläpitämiseen, sen sijaan tiedon prosessien ja oppimisen kehittämisen järjestelmät olivat vähäisemmällä käytöllä tai ei käytössä ollenkaan. Tutkimuksen näkökulmasta herää kysymys, ovatko vastaajien käsitykset tiedon ja osaamisen kehittämisen tilan reaalisuudesta erilaiset kuin mitä tietojärjestelmien käytön aktiivisuus todellisuudessa kertoo.

Monimutkaisuus

Monimutkaisuus ilmeni tutkimusvastauksissa tiedon prosessoinnin riittämättömänä aikaresurssina. Vain 5 % vastaajista oli sitä mieltä, että heillä on riittävästi aikaa tiedon etsimiseen ja soveltamiseen. 32 % mielestä aikaa prosessointiin oli kohtalaisesti, mutta jo 57 % oli epävarma ajan riittämisestä. On kuitenkin huomattava ajan kokemisen subjektiivisuus: yksilöillä on erilaiset tarpeet ja menetelmät tiedon hankkimisessa ja käsittelyssä. Tiedonhallinnan monimutkaisuutta lisää organisaation tarve reagoida ulkoisten vaatimusten tuomiin muutoksiin, jolloin tieto muuttuu nopeasti ja haasteena on saada tieto kulkemaan läpi eri toimintojen.

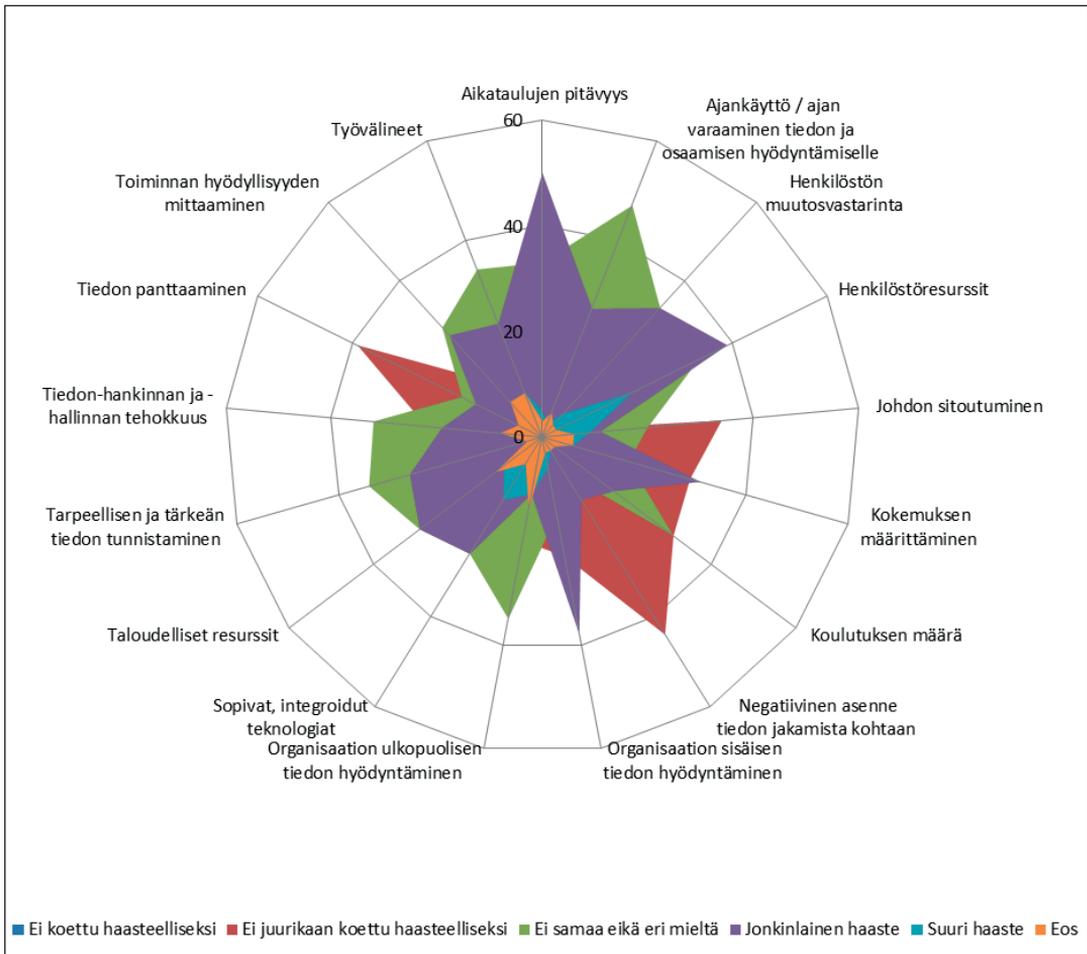
Tutkimuksessa organisaation ulkoisen tiedon hyödyntäminen on vastausten mukaan paremmalla tasolla kuin sisäisen tiedon hyödyntäminen (taulukko 2, arvo 4 = 58 % ja arvo 5 = 23 %.) Ulkoisen tiedon muuttujien vaihtelusta 35 % selittävät olemassa olevat prosessit ulkopuolisen tiedon saamiseen uusista tuotteista ja palveluista, kilpailijoista, markkinoista ja uudesta tiedosta. Verkostojen kautta haettavat ideat ja uusien työntekijöiden tiedon arvostaminen ja hyödyntäminen kuuluivat tähän komponenttiin. Työnantajan kannustamisella työntekijöiden verkostoitumiseen näyttäisi olevan vaikutusta ($r = .516$, $n = 36$, $p < 0,005$), mutta organisaatioissa käytettävistä olevista prosesseista ulkopuolelta saatavan tiedon hankkimiseen ei 6 %:lla ei ol-

lut tietoa ollenkaan, ja 9 % oli sitä mieltä, että organisaatioissa ei ole prosesseja tiedon hankkimiseen uusista tuotteista, palveluista, kilpailijoista tai prosesseja tiedonvaihtoon liikekumppaneiden kanssa. Uusien työntekijöiden tiedon ja osaamisen arvostaminen kuului myös tähän komponenttiin. Kuitenkin uusien työntekijöiden tiedon hyödyntäminen organisaatioissa sai vain 39 % selitysosuuden ($R^2 = 0,39$, $F(2,34) = 10,2$, $p = 0,000$.)

Tietotekniikan hyödyntäminen ulkoisessa viestinnässä korostui Internetin käytössä, jota kaikki yritykset käyttivät aktiivisesti. Internetin käyttöä selittävät osittain yritysten omien internet-sivujen ylläpito ja vuorovaikutus asiakkaiden kanssa: omia internet-sivuja käytettiin aktiivisesti 77 %:ssa organisaatioista, ja jokseenkin usein 11 %. Asiakastietokantoja hyödynsi 97 % yrityksistä, joista 53 % käyttää aktiivisesti ja 19 % jokseenkin usein.

Tutkimuksessa organisaatorista tehokkuutta ja kyvykkyyttä arvioitiin kysymyksillä organisaation tuloksellisuudesta ja aikaansaannoksista sekä organisaatioissa kohdatuista haasteista ja kehittämistarpeista. Taulukon 3 vastausten mukaan organisaation kyvykkyys ennakoita, kehittää, innovoida ja sopeuttaa prosesseja on painottunut ”jokseenkin hyvällä tasolla” (taulukko 3, arvo 4 = 50 %.) Vahvaksi selittäjäksi (59 %) organisaatorisen tehokkuuden varianssille muodostui ulkoisen toimintaympäristön muutosten mukaan tehtävät prosessien muutokset tai kehittäminen. Toinen selittäjä (11 %) muodostui organisaatioiden kyvystä vähentää toimintojen ja tiedon päällekkäisyyksiä. Tiedon päällekkäisyyksien vähentämisessä kehittyminen muodostui myös tilastollisesti erittäin merkitseväksi ($r = .54$, $F(4,34) 8,8$, $p = 0,000$.) Kun organisaatioissa ei ole tietoa päivitetty, heikentyvät mahdollisuudet organisaatorisen kyvykkyyden parantamiseen.

Kuviossa 4 on graafisena esityksenä organisaatioiden kokemat tietämyksenhallinnan suu-



Kuvio 4. Organisaatioiden kokemat tietämyksenhallinnan haasteet, prosenttia (n=36).

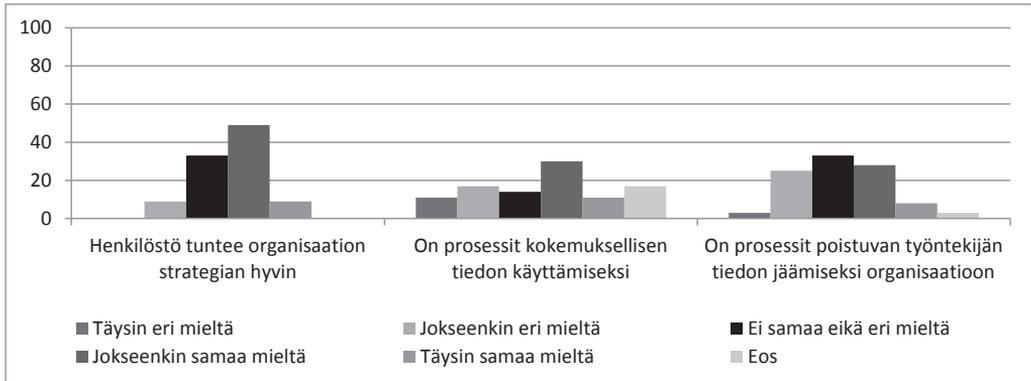
rimmat haasteet. Vastausten perusteella haastavinta näyttäisi olevan henkilöstöresurssit (58%), toiseksi suurimpana haasteena aikataulujen pitävyys (55 %) ja kolmanneksi organisaation sisäisen tiedon hyödyntäminen (44%). Neljänneksi haastavinta organisaatioissa oli sopiva ja integroitu teknologia (40 %).

Epäselvyys

Tutkimuksessa tietämyksenhallinnan systemaattisuuteen vaikuttava ja selittävä strategiatyö ja strategiaan sitoutuminen pohjautuvat tietoon ja tulkintoihin. Yllättävää on se, että organisaation strategian laatimisprosessin määrittely, strategialähtöinen henkilöstön kehittäminen ja

strategiasta käytävä keskustelu sekä henkilöstökyselyt selittävät vain 9 % systemaattisuuden vaihtelusta. Vastaajista vain 8 % koki henkilöstön tuntevan yrityksen strategian hyvin, 48 % jokseenkin hyvin ja 40 % oli epävarma henkilöstön strategian tuntemisesta. Yrityksellä on olemassa strateginen suunnitelma – tieto tulevasta toiminnasta, ja jos organisaatioissa ei käytä dialogia strategiasta, ja luoda mahdollisuutta strategian sisäistämiseen osaksi toimintaa, voidaan dialogin vähäisyyttä tai puuttumista pitää paitsi epävarmuutta, myös monitulkintaisuutta synnyttävänä tekijänä.

Epäselvyyttä ilmenee myös organisaation käytännöissä. Työntekijät eivät ole varmoja, on-



Kuvio 5. Epäselvyyden esiintyminen organisaatiossa, prosenttia (n=36).

ko yrityksessä sovittuja käytäntöjä tai tietojärjestelmiä esimerkiksi kokemuksellisen osaamisen ja uuden tiedon yhdistämiseen, tai poislähtevän työntekijän tiedon ja osaamisen jäämisen organisaatioon ja sen varmistamiseen (kuvio 5.) Epäselvyyttä sisäisen tiedon hyödyntämisestä ja tiedonjakamisesta kuvastaa myös tietämättömyys siitä, millä toiminnan osa-alueilla organisaatio on tehokas tai millä alueilla organisaation toiminta on kehittynyt.

Epäselvyyttä organisaatiossa kuvastaa myös tutkimusvastausten hajanaisuus koetuista haasteista ja kehittämistarpeista. Haasteena muutosvastarinta koettiin viidenneksi haastavammaksi tietämyksenhallinnan johtamisessa (39%). Tiedon riittämättömyys luo hämmennystä, koska yksilöllä ei ole työkaluja epävarmuuden käsittelyyn ja muuttuvan tiedon omaksumiseen. Koetut haasteet ja kehittämistarpeet voidaan tulkita myös monitulkintaisina, koska tulkintaa tehdään aina vastaajan oman kokemusmaailman kautta (ks. kuviot 4 ja 6).

Monitulkintaisuus ja tavoitteiden merkitys

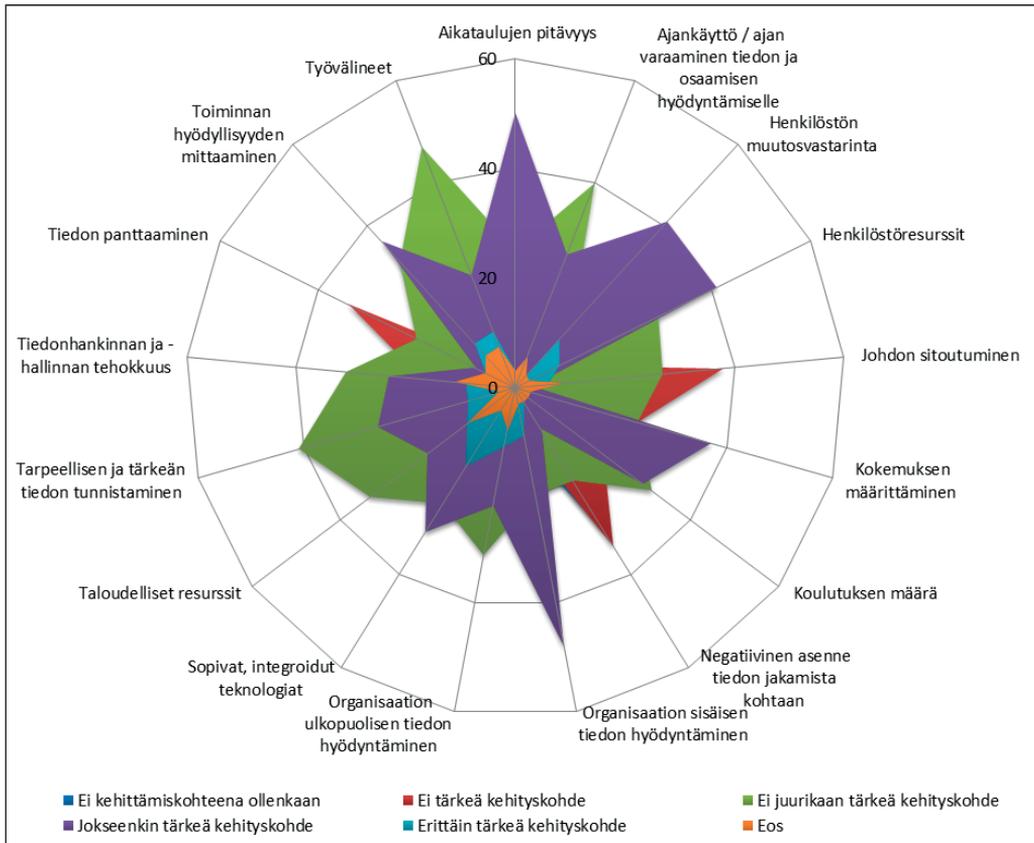
Tutkimusvastauksissa tietämyksenhallinnan johtamisen tärkeimmäksi tavoitteeksi määriteltiin strategia-lähtöinen tiedon ja osaamisen kehittäminen asetettujen tavoitteiden saavuttamiseksi (35%). Toiseksi tärkein tavoite oli tieto- ja osaamispääoman fokusointi liiketoiminnan kannalta oleellisiin asioihin (25%), ja kolmanneksi tärkeintä oli ydintoimintaan keskittyminen oikea-aikaisella tiedolla (15%). Tavoitteena

oli myös pyrkimys vaikuttaa henkilöstön asenteiden kehittämiseen.

Onko tietämyksenhallinnan johtamisen tavoite tavoitteellista vuorovaikutusta? Vain yksi vastaaja koki tavoitteen näin. Pidetäänkö vuorovaikutusta ja kaikkien osallistumista vuorovaikutukseen itsestänselvyytenä? Jos vuorovaikutuksen edistäminen kirjattaisiin strategiaan tavoitteisiin, niin toiminta voisi kohdistua tietoisemmin vuorovaikutuksen edistämiseen ja tiedon leviämiseen organisaatiossa.

Kehittämiskohteiksi organisaatiossa vastaajat nimesivät tärkeysjärjestyksessä tärkeimpänä organisaation sisäisen tiedon hyödyntämisen (57%). Sisäisen tiedon hyödyntämisen tulokset usealla tutkimuksen mittarilla vahvistavat käsityksen, että organisaatioiden tiedon ja osaamisen tietoresurssien käyttö tai tunnistaminen ei ole niin tehokasta kuin resurssit olisi organisaatioilla käytettävissä. Toiseksi tärkeimpänä kehittämiskohteenä nimettiin henkilöstön muutosvastarinta yhdessä aikataulujen pitävyyden hallinnan kanssa (53%). Henkilöstöresurssien hallinnan kehittäminen koettiin kolmanneksi tärkeimmäksi asiaksi organisaatiossa (50%). Sopivien ja integroitujen järjestelmien kehittäminen toiminnan tukemiseksi koettiin neljänneksi tärkeimmäksi tehtäväksi (48%). Toiminnan hyödyllisyyden mittaamiseen sekä osaamisen määrittämiseen kaivattiin kehittämistä, mutta nämä kehittämiskohteet hävisivät edellisille. Kuviossa 6 on esitetty kehittämiskohteet graafisesti.

Strategisen suunnittelun työstämisen eriaikaisuus eri organisaatiossa ja jaetun tiedon



Kuvio 6. Organisaatioiden kehittämiskohteet, prosenttia, (n=36).

määrä vaikuttavat yksilöiden merkityksellistämismalliin, kehittämiskohteiden hyväksymiseen, yksilöllisen tulkinnan kautta kehittämisen hyödyllisyyden reflektointiin ja kehitysprosessiin sitoutumiseen. Monitulkintaisuuden käsittely mahdollistaa organisaation kehittämiskohteissa, niiden tarpeellisuuden ymmärtämisessä ja kehittämissuunnitelmien implementoinnissa yhteisen tavoitteenasettamisen ja tavoitteeseen sitoutumisen.

Strategiset tavoitteet ja tavoitteiden saavuttaminen tarkoittaa henkilöstölle eri toimintoihin panostamista. Työntekijät hyödyntävät teknologiaa erilaisilla intresseillä: toiset hyödyntävät tietojärjestelmiä innovoivasti tai toiset toteuttavat operatiivisia toimintoja rutiinimaisesti. Tietoperustainen tiedonrakentaminen ja tiedon moniulotteisuus vaativat sosiaalista vuorovaikutusta. Tutkimusaineisto vahvistaa organisaation tietoresurssin tehokkaamman hyödyntämisen

tarpeen: sekä yksilöiden osaamis- ja tietopääoman että teknologian tuoman hyödyn tehokkaan käytön.

KEHITYSKAARI SUOMALAISESSA TIETÄMYKSENHALLINNASSA: TUTKIMUSTULOSTEN VERTAILU VUODEN 2002 TUTKIMUSTULOKSIIN

Vuoden 2002 tutkimus (Hannula ym. 2003) paljasti, että tietämyksenhallinta oli vielä suhteellisen uusi toiminto suomalaisissa suur yrityksissä. Tietämyksenhallinta oli kuitenkin jo herättänyt monien yritysten kiinnostuksen ja osalla yrityksistä oli jo jonkin verran systemaattista toimintaa tietämyksenhallinnan saralla. Pääasiassa toiminnot keskittyivät kapeammalle alueelle osaamisen hallinnan kysymyksiin. Strategisempi lähestymistapa sekä tietämyksen jakaminen ja hyödyntäminen koko organisaation tasolla jäi

pitkälti näiden toimintojen taustalle. Vuoden 2014 tutkimuksen perusteella osaamisen ja tietämyksenhallinnan systemaattisuus on vihdoin vakiintunut osaksi organisaatioiden toimintaa, vaikkakin tutkimus osoittaa vielä kehittämistarpeita usealla tietämyksenhallinnan osa-alueella. Esimerkiksi tietämyksenhallinnan prosessien kehittäminen on edelleenkin vähäisellä painotuksella. Tutkimustulosten keskinäisessä vertailussa on kuitenkin hyvä huomioida myös toimintaympäristössä tapahtuneet muutokset, erityisesti lisääntynyt digitalisaatio ja verkostoituminen, mitkä molemmat tarjoavat sekä uusia mahdollisuuksia että myös haasteita tietämyksenhallinnalle.

Ulkoisessa viestinnässä tietotekniikan keinojen hyödyntäminen onkin kasvanut voimakkaasti vuoden 2002 tutkimuksesta. Internetiä käytti puolet yrityksistä vuonna 2002, kun nyt käyttävät kaikki aktiivisesti. Myös omien internet-sivujen käyttö on erittäin aktiivista yrityksissä. Asiakastietokantojen hyödyntäminen on kasvanut 56 %:sta 97 %:iin, yrityksistä 53 % käyttää niitä aktiivisesti ja 19 % jokseenkin usein. Asiakastietokantojen laajeneminen yritysten ja asiakkaiden integroiduiksi järjestelmiksi on tapahtunut vuoden 2002 jälkeen, mikä selittää osaltaan voimakasta kasvua. Uusia tiedon käsittelyn ja jakamisen sekä vuorovaikutuksen keinoja ja järjestelmiä on tullut osaksi yritysten toimintaa, mm. keskustelupalustoja tai tiedon prosessoinnin ja säilytyksen alustoja. Uusi teknologia tai organisaation ulkopuolinen tieto tuo monimutkaisuutta organisaation arkeen: haasteena on uuden teknologian tai uuden tiedon yhdistäminen kokemukselliseen ja vanhaan tietoon. Jalonen (2010) tuo esille yksilön mahdollisen valikoivan tietokäyttäytymisen, jossa yksilö välttelee uuden tiedon omaksumista. Henkilöstön osaamisen varmistamisella ja tiedon omaksumisella voidaan vähentää monimutkaisuuden tuomaa vaikutusta organisaation toimintaan.

Henkilöstötietokantojen käyttö oli kasvanut 97 %:sta 100 %:iin, joista 81 % käytti aktiivisesti, 11 % jokseenkin usein ja 9 % yrityksistä käytti harvoin. Intranetiä hyödynnettiin tiedottamisessa kaikissa yrityksissä, 94 % aktiivisesti ja 6 % jokseenkin usein, kun vuonna 2002 lähes 90 %:lla oli käytössä sisäinen tiedotusjärjestelmä. Epävarmuutta organisaatiossa voidaan

vähentää eksplisiittisen tiedon levittämisellä, ja tässä sisäisen ja ulkoisen tiedon organisoimisen prosessit ovat keskiössä (ks. Jalonen 2013). Kehittämisen arviointiin koulutustietokantojen käyttö oli kasvanut 86 %:sta 94 %:iin, joista 22 % käytti aktiivisesti, mutta 6 %:lla yrityksistä koulutustietokantoja ei ollut käytössä ollenkaan. Osaamisen tietokantojen käyttö oli kasvanut 72 %:sta 91 %:iin, mutta vain 19 % käytti aktiivisesti ja 9 %:lla osaamisen tietokantoja ei ollut käytössä. Verkko-oppimisympäristöjen hyödyntäminen on nykyään aktiivista. Hyödyntämistä voi puoltaa aikaan ja paikkaan sitoutumaton opiskelu, jolloin käyttäjälle jää toiminnan valinnan mahdollisuus.

Vastausprosenttia heikensi tutkimusaiheen laaja kokonaisuus, sillä joidenkin kontaktien mielestä oli haasteellista hahmottaa organisaation henkilöstöhallinnon, prosessien, tiedonhallinnan ja tietojärjestelmien kokonaisuus, ja vastata kysymyksiin oman asiantuntijuutensa näkökulmasta. Organisaation eri prosessien tunteminen voisi vähentää kompleksisuutta luovaa epäselvyyttä ja tulkintoja. Tiedon rakentaminen vuorovaikutuksessa eri toimintojen välillä edistäisi organisaation kykyä luoda, jakaa ja soveltaa tietoa tehokkaasti.

Vuoden 2002 tutkimuksessa haastateltavat edustivat henkilöstötoimintojen edustajia. Tässä kyselyssä vastaajia haettiin henkilöstöhallinnon sekä tietojärjestelmien edustajista, koska haluttiin saada inhimillisen ja teknisen näkökulman edustus vastauksiin. Tietämyksenhallinta koettiin tärkeäksi tai erittäin tärkeäksi sisäisen tiedon hyödyntämisen sekä aika- ja henkilöstöressurssien hallinnan ja asenteiden vaikuttamisen osa-alueilla. Sopivien ja integroitujen järjestelmien haasteet ja kehittäminen toiminnan tueksi koettiin myös tärkeäksi.

Tietämyksenhallinnan käytössä oleva termistö on vakiintunut yrityksissä, osassa yksityiskohtaisemmin toimintojen mukaan. Osaamisen hallinta tai johtaminen on vuonna 2002 ollut vahvempi termi kuin tiedonhallinta. Tämän tutkimuksen perusteella molempia nimityksiä käytetään yhtä paljon. Kompetenssin painotus on tullut mukaan terminologiaan, ja muita yksittäisiä toimintoihin fokusoituvia nimityksiä. Huotari ja Savolainen (2003) analysoivat ”knowledge” käsitteen tulkinnallisuutta ja kysyvät aiheellisesti, että mitä ”tiedossa” itse asiassa

hallitaan ja johdetaan. Tutkimukseen osallistuneille yrityksille tietämyksenhallinta merkitsi eri toimintoihin fokuoittumista. Oleellista olisi määritellä tietämyksenhallinnalle ydintoimintaa tukeva strategia, ja keskustella, mitä tiedon ja osaamisen hallinta ja johtaminen tarkoittaa yrityksessä toiminnan tasolla (ks. Hansen ym. 1999.)

Vuoden 2002 tutkimuksen tuloksissa tavoitteina oli saada osaamisen ja tietämyksenhallinta osaksi systemaattista toimintaa, ja lisätä kyvykkyyttä verkostomaiseen toimintaan. Tavoitteena oli myös liiketoimintalähtöisten muutosten kautta toiminnan kehittäminen, joka myös lisäisi osaamisen ja tietämyksen hallinnan vaativuutta. Tutkimuksen mukaan organisaatioiden nimeämät tavoitteet on saavutettu tämän tutkimuksen yrityksissä. Tietyillä osa-alueilla tietämyksenhallinnan systemaattisuus toteutuu, kuten prosessien hallinnassa ja ulkoisen tiedon hyödyntämisessä. Haasteita on vielä edessäkin. Sisäisen tiedon hyödyntäminen organisaation tehokkaaseen käyttöön oli haasteena vuonna 2002 – sama haaste tuli voimakkaasti esille myös tässä tutkimuksessa. Strategisten tavoitteiden ymmärtäminen osaksi omaa toimintaa tuo esiin monitulkintaisuuden mahdollisuuden. Monitulkintaisuudessakin avoin vuorovaikutus mahdollistaa yhteisen tiedon ja ymmärryksen rakentamisen, jolloin yksilölliset tavoitteen toteuttamisen keinot voidaan tuoda näkyväksi.

JOHTOPÄÄTÖKSET JA POHDINTA

Tiedon hallinta on kehittynyt kymmenen vuoden aikana, mutta myös tiedon määrä ja nopeus ovat lisääntyneet voimakkaasti. Toisaalta teknologia mahdollistaa nopean tiedon keräämisen, prosessoinnin ja dokumentoinnin, mutta edelleen voidaan kysyä pysyvätkö prosessit ja ihmiset tiedonkäyttäjinä perässä, ja kehittyvätkö ne yhtä nopeasti. Tietämyksenhallinnan keinoin organisaatiot voisivat panostaa käyttämättömien resurssien hyödyntämiseen ja päällekkäisten toimintojen vähentämiseen, ja yrittää löytää panostusten kautta kasvua tuottavuuteen.

Tutkimustulosten perusteella tietämyksenhallintaan on tullut systemaattisuutta lisää erityisesti kodifointiin painottuvan lähestymistavan ja tietojärjestelmien hyödyntämisen saralla. Tietojärjestelmien näkökulmasta tieto

nähdään esineen kaltaisena asiana (thing), jota voidaan varastoida ja siirtää. Teknologioiden kehittyminen on auttanut organisaatioita kohtaamaan epävarmuutena ja monimutkaisuutena ilmeneviä tieto-ongelmia. Erityisesti ajantasaiset tietovarastot, modernit tiedonlouhinnan tekniikat ja vuorovaikutusta tukevat kommunikointivälineet mahdollistavat sekä tehokkaan tiedonhaun (epävarmuuden vähentäminen) että ilmiöiden riippuvuussuhteiden analysoinnin (monimutkaisuuden vähentäminen), mitkä omalta osaltaan vähentävät tiedon jakamiseen liittyviä teknologisia ongelmia (Riege 2005).

Osaamisen kehittämisessä ja innovoinnissa tietojärjestelmien tuomaa hyötyä ei kuitenkaan kyselyn perusteella käytetä vieläkään tehokkaasti. Tieto-ongelmien näkökulmasta kysymys on epäselvyyden ja monitulkintaisuuden kohtaamisesta ja sen hyväksymisestä, että tieto syntyy ja leviää sosiaalisessa vuorovaikutuksessa. Kuten aikaisemmissa tutkimuksissa on todettu, tiedon jakamisessa korostuu kuitenkin yksilön vapaan tahdon rooli (Prusak 2000) ja erityisesti kriittistä tietämystä omaavat organisaation työntekijät voivat muodostua pullonkauloiksi halutessaan turvata oman valta-asemansa tiedon panttaamisella (Pfeffer & Salancik 1978). Täydellisen informaation etsimisen – saati sellaisen löytämisen sijaan epäselvyyden ja monitulkintaisuuden kohtaamisessa tarvittava tieto onkin luonteeltaan subjektiivista ja ihmisiin uppoutunutta (embodied & embedded knowledge, ks. Blackler 1995). Yksi vastaajien asettama haaste aikaisemmassa, vuoden 2002 tutkimuksessa, oli juuri työntekijöiden eläköitymisen myötä osaamisen ja tietämyksen varmistaminen organisaation käyttöön. Vuoden 2014 tutkimuksen mukaan organisaatioissa on tiedonhallinnan prosesseja kehitetty paljon erityisesti teknologiaan pohjautuen, mutta tiedon ja osaamisen turvaaminen ja hyödyntäminen ei ole hallussa vieläkään. Esimerkiksi organisaatiosta poislähtevän työntekijän osaamisen ja tiedon varmistaminen käynnistyy liian myöhään – vasta kun työntekijä on jo lähdössä. Voidaankin kysyä, eikö tieto ja osaaminen kannattaisi valjastaa aikaisemmin organisaation käyttöön tehokkaasti, koska poistuvan tiedon saaminen näyttäisi olevan vahvin vaikuttaja osaamisen kehittämisen varmistamisessa? Entä miten organisaatioissa voitaisiin ylittää tiedon jakamiseen yksilötasolla liittyvät

haasteet (Riege 2005; Prusak 2000), kun pääpaino kehittämisessä tuntuu tutkimustulosten perusteella edelleen olevan vain teknologisissa ratkaisuisissa?

Tutkimustulokset osoittavat, että vaikka tietämyksenhallinta on systematisoitunut yrityksissä osaksi niiden toimintaa, on yritysten tietämyksenhallinnassa myös edelleen kehittämisen tarvetta. Yrityksissä tarvitaan konkreettisten työkalujen kehittämistä etenkin organisaation sisäisen tiedon ja osaamisen hyödyntämiseen tehokkaasti. Tietoperusteisen organisaatiokäsitykseen (KBV) sisältyvä väite siitä, että tieto on nykyorganisaatioiden kriittinen resurssi, on ymmärrettävä, mutta jää kuitenkin ontoksi, ellei samalla huomioida sitä kontekstia, jossa tietoa tuotetaan, jalostetaan ja hyödynnetään. Morganin (1997) organisaatiometaforia väljästi mukaillen yritysten tietämyksenhallinnassa voidaan erottaa kaksi ääripäätä: yhtäältä yritys voidaan nähdä *mekaanisena koneistona*, jolloin sen tietämyksenhallinnan pääpaino on olemassa olevan tiedon tehokkaassa hyödyntämisessä (epävarmuuden ja monimutkaisuuden vähentäminen), toisaalta yritys voidaan mieltää *eläväksi organismiksi*, jolloin sen tietämyksenhallinnassa korostuu ihmisten kohtaamista tukevien kontekstien tarjoaminen (epäselvyyden ja monitulkintaisuuden kohtaaminen). Sen sijaan, että lähestymistapoja asetettaisiin paremmuusjärjes-

tykseen, olennaista on sen yksinkertaisen seikan ymmärtäminen, että erilaiset tilanteet vaativat erilaisiin lähestymistapoihin perustuvien tietämyksenhallinnan keinojen hyödyntämistä.

Käsillä olevan tutkimuksen yhtenä heikkoutena on valitun tutkimusmenetelmän tuottamien tulosten kapea-alaisuus. Tutkimusmenetelmänä kyselytutkimus oli kuitenkin tietoinen valinta, johon päädyttiin siksi, että niin saavutettiin tulosten vertailtavuus vuoden 2002 tutkimukseen sekä laaja kohderyhmän tavoittaminen. Jatkotutkimuksessa näkökulmia tullaan syventämään haastattelututkimuksen ja tiiviimmän yritys yhteistyön kautta, sekä tekemällä vertailevaa tutkimusta suurten ja pienten yritysten välillä.

Yksi mahdollinen jatkokehitysaiheio on yhteistyössä yritysten kanssa toteutettavat pilotti-projektit, joissa implementoidaan vaihtoehtoisia toimintamalleja tiedon ja osaamisen hallintaan sekä tehdään vertailevaa toimintatutkimusta pilottien vaikuttavuudesta. Tämän lähestymistavan lisäksi tutkimuksessa saatua yleiskuvaa tietämyksenhallinnan nykytilasta – ja sen ympärillä edelleen olemassa olevasta hämmennys-tilasta – on syytä syventää teemahaastattelujen avulla. Nämä menetelmät mahdollistavat syvemmän ymmärryksen tutkittavasta ilmiöstä, joka itsessään on jo moniulotteinen ja monitulkintainen.

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PUBLICATION II

**Knowledge management for open innovation: Comparing research results
between SMEs and large companies**

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KNOWLEDGE MANAGEMENT FOR OPEN INNOVATION: COMPARING RESEARCH RESULTS BETWEEN SMEs AND LARGE COMPANIES

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Knowledge co-creation and effective knowledge sharing boost innovativeness in companies. However, rapidly developing technologies and constant changes in the business environment challenge the companies' practices for knowledge management (KM). The purpose of this paper is to compare the key KM practices and their effect on open innovation between the small- and medium-sized companies (SMEs) and the large companies, and as empirical focus, comparing them through quantitative survey and complementary qualitative interviews. The results indicate that large companies are more externally open to innovate than SMEs and the large companies also value open dialog and knowledge sharing more. Whereas, SMEs seem to rely more on developing their internal practices to support innovativeness. In the both company sizes technology is used rather poorly to support access to open data and networks. The identified factors provide insights for developing KM practices that support open innovation in varying sizes of companies.

Keywords: Knowledge management; innovation; openness; network; large companies; small and medium-sized enterprises.

Introduction

Knowledge is typically a firm's central resource and the source of competitive advantage (Stewart, 1997; Brooking, 1999; McCune, 1999; Teece, 2000; Fleisher and Bensoussan, 2002; Laihonen *et al.*, 2013; Aggestam, 2015). An overall goal of knowledge management (KM) is to utilise information and competencies

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effectively to allow organisations to anticipate, implement, adapt and develop their operations (Dalkir, 2013), both inside the organisation and across inter-organisational boundaries. In this way, it has been argued that KM also sets a path towards open innovation (Lichtenthaler, 2011; Zheng *et al.*, 2011; Lakemond *et al.*, 2016). Several scholars (Brunswick and Vanhaverbeke, 2015; Dahler and Gann, 2010; Chesbrough, 2003) argue that both external knowledge and ideas as well as internal capacities are important for open innovation activities. Thus, both the external and internal ideas and paths are valuable for open innovation, even though the concept of open innovation is more often used to refer to the innovation processes between inter-organisational boundaries. It can be argued that the internal activities are also critical to open innovation, especially in terms of open knowledge sharing between the individuals, teams and different organisational units. Some studies, like Henkel (2006), even point out openness as something revealing ideas previously hidden inside organisations. In this paper concentration is on these internal activities and practices supporting open innovation, thus referring more on the organisational and technological uncertainties and challenges related to innovations than on the commercial ones (Freeman and Soete, 1997; Hall *et al.*, 2011).

KM has already received a great deal of attention among both academics and managers for over two decades. Nonaka and Takeuchi (1995) provoked discussion about the importance of knowledge creation, and both Grant (1996) and Spender (1996) presented the idea of a knowledge-based view of the firm. The multidisciplinary approach to the field of KM (e.g., Maier, 2002; Dalkir, 2013; management science, information science, organisation science, sociology, and psychology) has yielded a situation in which KM can be seen as a quite comprehensive and many-sided phenomenon; it has also led to a somewhat blurred nature of the field. Hence, much research has been done on the development of the field's core concepts (Huber, 1991; Nonaka and Takeuchi, 1995; Hansen, 1999; Stähle and Grönroos, 1999; Alavi and Leidner, 2001; Bartol and Srivastava, 2002; Maier, 2002; van Burg *et al.*, 2008; Wang and Noe, 2010), but also its relation to innovation management (Ortt and Smits, 2006; Lichtenthaler, 2011; Zheng *et al.*, 2011).

This paper focuses more on the internal KM practices, but the external sources of knowledge are also taken into account through a network perspective. The aim of this study is to compare the key KM and open innovation practices and challenges between small- and medium-sized companies (SMEs) and large companies. A similar kind of study was carried out in Finland over 10 years ago (Hannula *et al.*, 2003), pinpointing the biggest challenges of KM and their impact on innovativeness and productivity. The present study argues that despite of all the technological development happening during the last 10 years, the challenges that the companies face in KM and open innovation are still nearly the same than they were in 14 years ago — why?

The paper structure begins the theoretical premises of KM. As empirical research, the paper continues by presenting the methodological choices of the study and its comparative empirical analyses between SMEs and large enterprises. In the conclusion section, the key results of the study are highlighted, and directions for further studies are opened up.

Theoretical Insights

Knowledge differs from other resources in a company. By nature, knowledge accumulates and is dynamic over time, and knowledge does not cause additional costs (Prahalad and Hamel, 1990; Leonard-Barton, 1995; Shapiro and Varian, 1999; Nonaka *et al.*, 2001; Dalkir, 2013). Knowledge can also be hard to grasp (von Krogh and Roos, 1995). Therefore, solid knowledge resources can separate a company from its competitors in a manner that is difficult to copy. Thus, KM (see e.g., Nonaka and Takeuchi, 1995; Grant, 1996) can be argued to offer a set of principles and tools to support work in the modern networked society (Valkokari, 2007).

To utilise knowledge effectively, it should be designed, acquired, developed, and utilised well (Nordhaug, 1994; Nonaka and Takeuchi, 1995; Hislop, 2013). To have proper KM processes, organisations must build physical, social, and resource-allocation structures (Teece, 1998). However, the definition, discovery, and use of knowledge are often found to be challenging (Ståhle and Grönroos, 1999; Dalkir, 2013), not least because it is difficult for organisations to recognise relevant knowledge or to identify how technology could be used to support knowledge utilisation. It can be said that the main idea in KM is the effective diffusion and promotion of the reuse of existing resources (Wah, 2000), as well as the management of the sharing and application of knowledge and the improvement of knowledge creation (Marchand and Davenport, 2000; Hislop, 2013). In order to create new knowledge in organisations, effective sharing and integration of knowledge is a necessity. According to Krogh *et al.* (2001), companies must find a way to inform the possibilities of knowledge exchange and the benefits to be obtained, as well as to motivate personnel to transfer knowledge.

Regarding the above, continuous human resource development and systematic learning goals are needed to support the adoption of new knowledge and technology. Management and leadership skills play essential roles in supporting organisational work, especially in change situations. Lakemond *et al.* (2016) highlight the important of the project management and knowledge matching through the innovation process. While it is important to take care of an effective project management, especially in the beginning of the process, it is also essential

to take care that knowledge-matching procedures are related to performance in every stage. In general, management can also have a huge influence on the smoothness of the work of personnel and the productivity of the company, but also the birth of potential knowledge-sharing barriers within organisations (Kukko and Virtanen, 2008; Matson and Prusak, 2010; Kukko, 2012), which is one common and remarkable issue that diminishes innovativeness of the company. Ho (2009) expressed that strategy and leadership, organisational culture, organisational incentive systems and information technology (IT) are the key factors enabling efficient knowledge utilisation and support within organisations.

Technology can be viewed from the perspectives of different organisational functions (see e.g., Benson and Andrew, 1993; Kivimaa and Mickwitz, 2006), but to the role of technology in knowledge development. Technology should be understood at both the organisational and the individual level (Frambach and Schillewaert, 2002) and it is important to identify technological possibilities through technology forecasting to maintain competitiveness (Kostoff *et al.*, 2004). Knowledge sharing and technology utilisation can be explored as suggested by Khalifa and Davison (2006), from the viewpoint of the adoption of IT in SMEs. As Brunswicker and Vanhaverbeke (2015) state, the role of SMEs play growing role in open innovation, even though its relevance in literature seems to be more focused on large enterprises. The utilisation of technology and information integration, like data mining, was possible as early as the 1990s (Larson, 1998); however, our ability to utilise these data with KM is still limited. Technology definition and technology utilisation involve constant revisions to organisation processes, and not only because of the rapidly changing technologies and operational environment, but also because of the new kinds of customer demands and the need for new employee competences (Daim and Oliver, 2008). In addition, understanding partners' technological skills and capabilities supports open innovation (Lakemond *et al.*, 2016).

However, effective utilisation of technology is not sufficient to ensure KM success. Behind any successful KM process, development should be clear strategic thinking. A KM strategy is defined as a general, issue-based approach to defining operational strategy and objectives with specialised KM principles and approaches (Dalkir, 2005). Like KM strategy, a well-defined, goal-oriented innovation strategy supports company's future business opportunities and the possibilities to explore new technologies or capabilities to aim new markets (i.e., Brunswicker and Vanhaverbeke, 2015). Environmental changes drive companies to develop their business activities, which means that they need to identify, assess and map their existing knowledge strengths and determine which kinds of KM strategies and systematic processes to apply to support the work of their personnel. (Hansen *et al.*, 1999; Seeley and Dietrick, 1999; Zack, 1999; von Krogh *et al.*, 2001; Ortt and

Smits, 2006) but also of their network partners (Schilling, 2010). This is especially true as customers become increasingly involved in companies, their technology systems and their knowledge creation and innovation processes (see e.g., Krogh *et al.*, 2001). Instead of storing information and knowledge explicitly, KM that supports open innovation should link people to one another in order to cultivate person-to-person knowledge sharing. Through this strategy, organisations could create and stimulate networks among people in order to share and study their individual skills, experiences and expertise (Scheepers *et al.*, 2004), which are in central role of open innovation (Chesbrough, 2003). This kind of approach would also support the idea of Cassiman and Valentini (2016) of integrating the inward and outward knowledge transfers to foster open innovation. However, divergent networks and changing technologies cause uncertainties that need to be recognized and concerned as part of a KM strategy.

Empirical Examination

Sample and data collection

The research focuses to explore the use of KM in different-sized companies in Finland and the effect on open innovation capability. The study was carried out as a quantitative survey with qualitative interviews. The quantitative methods enabled effective data gathering from large company groups and the interviews verified the quantitative results. For theory verifications and generalisations, quantitative research generally employs a survey design (Creswell, 2003), which has also been utilised in this research.

The respondents' industries included manufacturing and construction, wholesale and retail trade and finance and services. The researchers wanted to get both human and technical perspectives; thus, representatives from the HR and the ICT functions were contacted. Of the large companies' respondents, 84% ($n = 36$) represented companies with more than 2500 employees. The SMEs ($n = 22$) were divided such that eight companies had less than 100 employees, five less than 300 and three had more than 300 employees. Six of the companies did not report their employee numbers. In total, the sample was collected from 58 companies via 51 Internet-based questionnaire responses and seven structured phone interviews from SMEs from June to November 2014.

Measures

The questionnaire was divided into different themes covering the various aspects of KM. The first theme addressed the organisational structure and strategic capability, since these forms the backbone of KM in organisations. This aspect

included questions on decision-making practices, feedback and confidence, technology utilisation and organisation structures and their support for knowledge sharing. The second theme focused on organisational process capabilities: IT utilisation, information and competence acquisition, development and implementation. The third part explored organisational effectiveness and innovation capability. All the previous themes were asked on a five-point Likert-type scale. When evaluated internal consistency of the scales, Cronbach's alpha coefficient indicated a good internal consistency level ($\alpha > 0.60$).

The data were statistically analysed using SPSS and the interviews were analysed with content analysis. Frequencies were used to examine the distribution of responses and for certain analysis were made into sum variables. For regression analyses were chosen Spearman's rho with the stepwise method and with explorative use because Spearman's rho allows slightly variance diffusion (Wied *et al.*, 2014).

The authors are aware of the low response rate and therefore analyses with highly statistical significant results are considered. Because of the low response rate, the results can be considered descriptive, rather than universal.

The measurement of knowledge utilisation and development in the companies in general are explained next and after that companies' technology utilisation. KM challenges and development targets that the companies' face are measured before the statistical significance levels of open dialog and open knowledge access on company innovation. The last measurement of this paper is expressed of internal and external networks effect on innovation capacity.

Measuring knowledge utilisation and development

Processes are important when operationalising KM in practice. The companies' process capabilities were investigated with regard to communication technology utilisation, information and competence procurement, knowledge sharing, organising and developing, and information and competence implementation.

The data was operationalised into internal and external information utilisation with respect to the information, the competence obtained and the application. In this study, internal information includes knowledge required for internal process operations. External information includes communications with partners and contacts, as well as information that comes from outside the company. KM development was analyzed by drawing in descriptions of information and communication technology utilisation and of how organisations were able to utilise new and old knowledge constructively. In large companies the method was principal component analysis and rotation method Varimax with Kaiser Normalisation. The factor loadings smaller than 0.60 were not a part of the component. Based on these

Table 1. Rotated component matrix (sum variable) for usage of knowledge and IT in large company organisations (% , n = 36) and in SME organisations (% , n = 15).

	1	2	3	4	5	Cannot say total
<i>Large Companies</i>						
Use of internal data and information		3	36	50	11	100
Use of external data and information		5	14	58	23	100
Knowledge and competence development		3	31	47	19	100
<i>SMEs</i>						
Use of internal data and information			40	60		100
Use of external data and information			30	60	10	100
Knowledge and competence development			40	60		100

Note: Scale 1 = Totally disagree, 2 = Somewhat disagree, 3 = Neutral, 4 = Somewhat agree, 5 = Totally agree.

Source: Helander *et al.* (2015).

large companies’ components the sum variables were made for three items: Use of internal data and information, use of external data and information and knowledge and competence development. In Table 1 it is showed how different size Finnish companies utilise knowledge and information systems.

Table 1 indicates that the respondents’ image of available data and information utilisation and knowledge and competence development is that the companies utilise actively. Let us keep this in mind when exploring information technology utilisation, KM challenges and development targets and innovation.

Measuring information technology utilisation

Information and system technologies suggest many possibilities to improve processes in companies. Technology utilisation was classified with Likert-scale from 1 “Not in use” to 5 “Active use” and “Can’t say”. The results are expressed with graphic how the large enterprises (Fig. 1) and SMEs (Fig. 2) use the certain databases or the information systems.

The graphic indicates that both the large companies and SMEs input their information systems utilisation to operational systems while personnel’s competence and innovation databases are not in active use.

Measuring KM challenges and development targets

The respondents were asked to rate the challenges and development targets of KM in general. The importance of 17 challenges and development targets were asked on a five-point Likert-type scale. The respondents evaluated how they thought

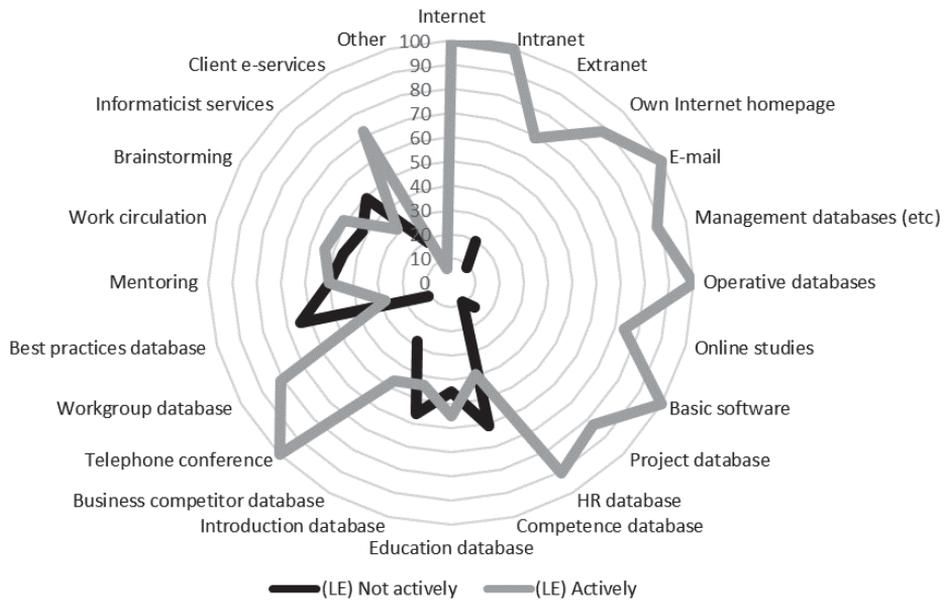


Fig. 1. Usage of information systems among large enterprises (% , N = 36).

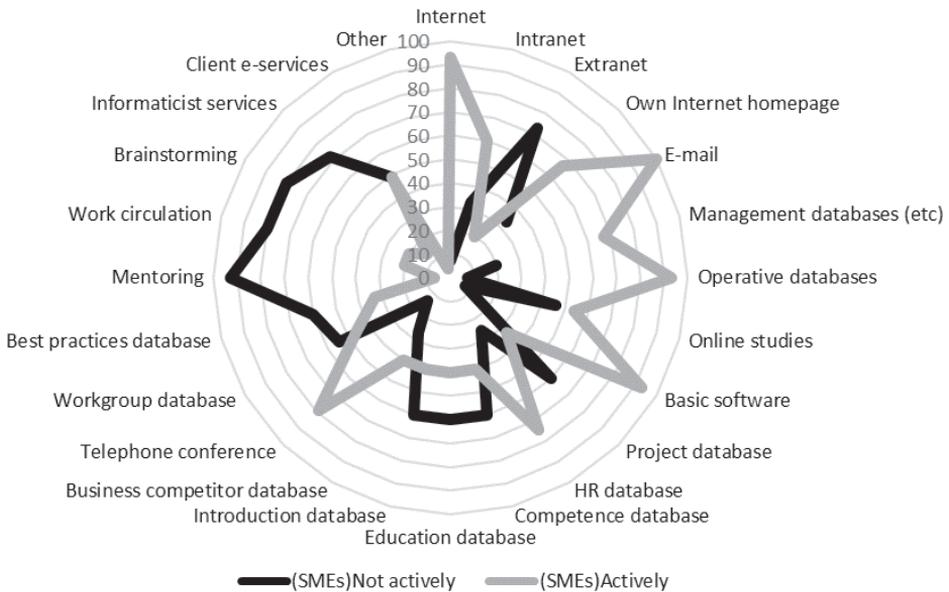


Fig. 2. Usage of information systems among SMEs (% , N = 15).

about challenges in their company with value 1 “Not challenge at all” and value 5 “A big challenge”. Cronbach’s alpha indicated a good internal consistency for the factors ($\alpha = 0.927$). The challenges are expressed in Fig. 3 large enterprises and Fig. 4 SMEs.

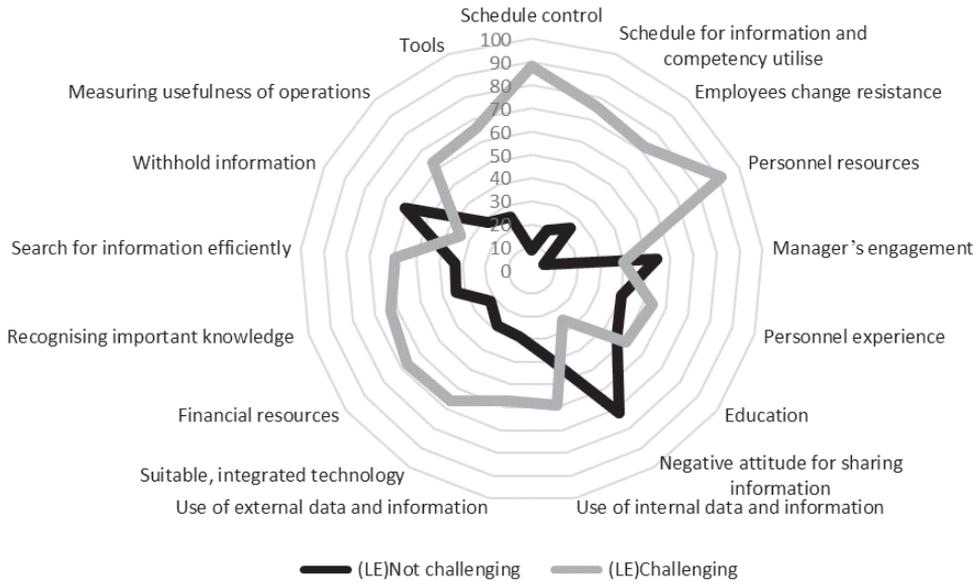


Fig. 3. Organisational challenges in large enterprises (% , N = 36).

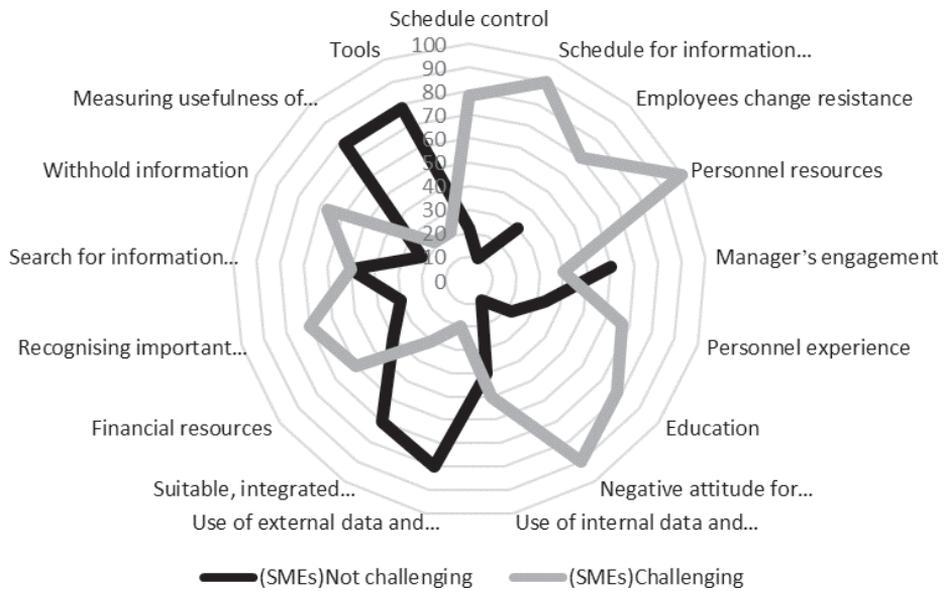


Fig. 4. Organisational challenges in SMEs (% , N = 15).

Figure 3 demonstrates large companies and Figure 4 SMEs the kinds of challenges organisations faced in KM. Based on the collected responses, the biggest challenge in both company sizes is concerned personnel resources.

The development targets were evaluated with value 1 “Not development target at all”, while 5 meant that there was a big necessity of the development for certain

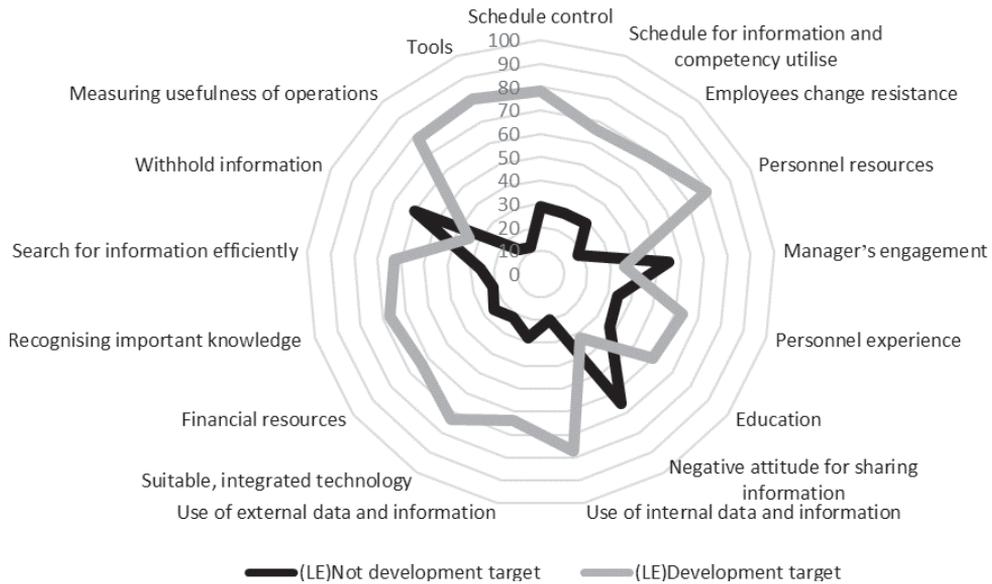


Fig. 5. Organisational development targets in large enterprises (% , $N = 36$).

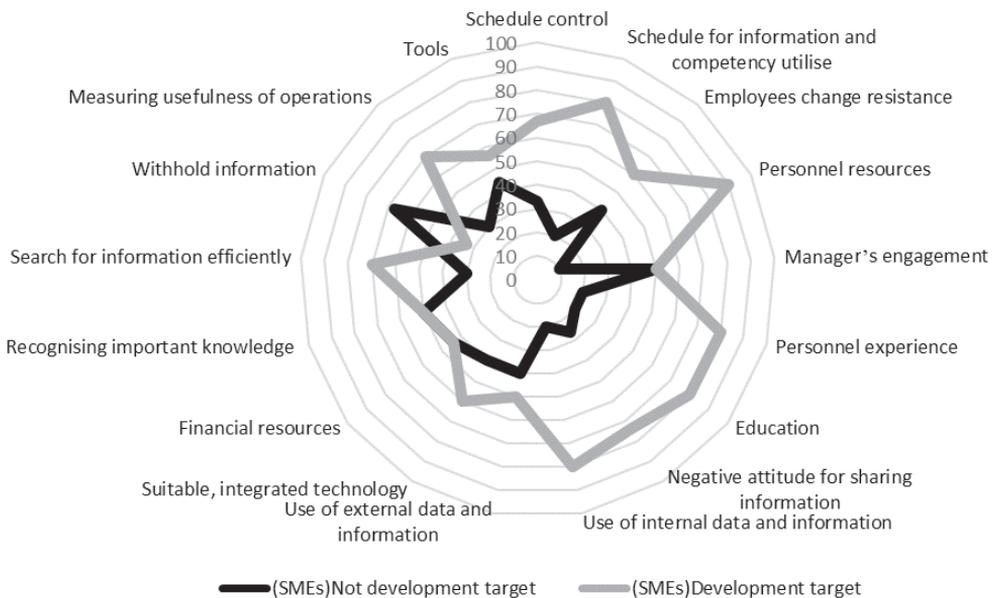


Fig. 6. Organisational development targets in SMEs (% , $N = 15$).

issue in the company (Fig. 5 and Fig. 6). 17 factors identified a good internal consistency (Cronbach alpha $\alpha = 0.938$).

Most important targets for KM development were beside personnel resources internal knowledge utilisation in both company sizes.

Measuring the effect of openness and networking on company's innovation capability

Sum variables comprise six items: open knowledge dialog, open knowledge availability, internal and external networks, which internal consistence was good ($\alpha > 0.68$), and organisation's innovation and innovation capability of organisation. Cronbach's alpha indicated these dependent sum variables a good internal consistence level ($\alpha > 0.80$). Regression analyses were conducted on these sum variables to identify correlations between items. The correlations are expressed in Table 2.

Correlations show the direct effect on companies's innovation. Open access to information and competence information explained 64% of the innovation systematic variable range in large companies ($\beta = 0.802, p < 0.001$), while in small and medium size enterprises the explanation was 75% ($\beta = 0.865, p = 0.001$). However, open dialog in SMEs did not explain innovation at all, whereas the fact of open dialog in large companies seems to positively affect company innovation, ($\beta = 0.778, p < 0.001$). Information communication technology was used in large companies to accumulate and share internal knowledge, which was more formally information. This verifies the point that knowledge sharing with teams and between teams was not the main way. SMEs face-to-face and conversation contacts were the main mean to knowledge sharing, being interaction that is more personal. However, their teamwork focused most on operational development. Even though there were technology systems in large companies, except operational systems they were not used effectively. SMEs needed support with technology systems, as for data mining, knowledge sharing and knowledge implementation (Ilvonen *et al.*, 2016).

Table 2. Spearman's rho correlations.

	Correlation internal networks		Correlation external networks		Correlation open dialog		Correlation open access to knowledge	
	r	r^2	r	r^2	r	r^2	r	r^2
Variable innovation capability large companies	0.474**	0.28	0.507**	0.32				
Variable innovation capability SMEs	-0.118	—	-0.262	—				
Variable innovation large companies					0.791**	0.61	0.719**	0.64
Variable innovation SMEs					0.357	—	0.790*	0.75
Cronbach's alpha	0.696		0.747		0.873		0.679	

Notes: $N = 51$, method Spearman's rho stepwise, **correlations significant at $p < 0.005$, * = at level $p < 0.01$. r^2 = explanation of the systematic variable range at level $p < 0.001$.

Findings indicate that only large companies find that network effects on innovation capability. External network was a stronger agent for the innovation

capability (32% explanation of systematic variable range, $\beta = 0.566$, $p < 0.001$) than the internal network (28%, $\beta = 0.532$, $p = 0.001$). Large companies utilised external ICT widely with their customers and partners and networking was quite active. All the same, there was uncertainty of network practices and knowledge sharing practices from knowledge security aspect. SMEs' external ICT benefits were realised through Internet or emails with customers and partners. SMEs' network was entered on the certain profession or employee. The information that was gathered from the external network was shared in teams or meetings by managers (Ilvonen *et al.*, 2016)

In all, both the online questionnaire and the complementary interviews addressed open dialog and open access and companies' networks effect on innovation capability within the broader frame of KM. Earlier researches express that both knowledge management strategy and innovation strategy are needed that information and the skill resources of the company can conduct to goals that are settled (e.g., Scheepers *et al.*, 2004; Dalkir, 2005; Ho, 2009; Brunswicker and Vanhaverbeke, 2015) In large companies, strategy based development was the main goal for KM. SMEs though that professional competence need to ensure with KM, especially self-responsibility in professionalism was emphasised. Even as, KM as company strategy awareness was not as a goal among responses. That may lead to ambiguity that can appears as KM challenges that are explained next.

Results

In the following, the key findings of the empirical study are examined. The question can be produced: how the companies in varying sizes can succeed in open innovation? This question is answered in the following results paragraph.

KM challenges and development targets

Based on the collected responses, the biggest challenge in large enterprises (Fig. 3) concerned personnel resources, the second biggest concerned keeping schedules, and the third biggest concerned organisations' internal information and competency utilisation. A total of 40% of the respondents stated that it was challenging to integrate suitable technology into processes.

As Fig. 4 illustrated, the biggest challenge for SMEs in KM was personnel resources besides internal information utilisation and the exploitation of time resources for information and competence. The second challenge was the efficiency of knowledge acquisition and administration with negative attitude for sharing information. The respondents specified that because of the enormous

amount of information, it is essential to identify the relevant information. They hoped that IT systems could facilitate this process. They also specified that competence management should be implemented within organisations' daily processes.

What aspects did the companies underline as requiring development? Figure 5 demonstrates development targets of the large enterprises. The most important targets with regard to KM development were personnel resources and internal knowledge utilisation. The many indicators of this study confirm that KM utilisation, or the recognition of resources, was not that effective with regard to organisational potential. The second most important development target was change resistance and schedule management, but it seemed to be important to measure usefulness of operations as well. As a challenge, change resistance in KM was number four.

With regard to development targets in KM, SMEs (Fig. 6) recognised, firstly, personnel and time resources for information and competence utilisation. The second most important development target was internal knowledge utilisation. The responses revealed more potential in SMEs' organisations to input resources for identifying knowledge. Furthermore, personnel's negative attitudes related to knowledge sharing were one development target. The respondents wished that their organisations would devote more effort to communication development. The third named development target was human resources and training programs.

Information technology utilisation

The following results explain how actively large companies and SMEs utilise information technology. As Fig. 1 demonstrates, in large enterprises, information systems, particularly operational databases, are used actively in process management. Furthermore, project management systems are utilised well. Human resource databases were used by all large companies sampled. Intranets were considered an efficient way to deliver information. With regard to education and competence databases, the results showed that activity levels were low or that companies did not have these systems at all. Positively, perhaps online learning environments were used actively; however, some of the companies did not have online learning systems.

Technology in large enterprises was used actively for external communication. All of the companies used the Internet actively. One explanation could be that the companies had their own web pages, as well as (possibly) web services and interactions with customers. Customer databases were also used actively. Figure 2 illustrated that SMEs' information technology utilisation activity in process management was 66% due to operational systems. SMEs seldom used project

management systems (PMSs). However, SMEs used technology for external communication well. Electronic customer services were used in 28% of the studied SMEs and extranets for external communications were used very seldom.

With regard to the possibilities for digitalisation utilisation, the SMEs took the first steps. However, the understanding of the definition about digitalisation was not always clear. Some of the respondents stated that implementation depends on an individual's skills to utilise digitalisation. Some of the companies had plans, but their implementation had failed.

It can be noted that organisations invest real-time information (in operations) and external connections information management (for clients or outside interactions) instead of internal information processes and competence development systems (which were used inactively). As such, one can ask, based on the research findings whether the respondents' understandings of KM development were unrealistic comparison with the use of information systems activity.

KM for innovation, openness and networks

The results suggest that KM's main function is to ensure that the company has relevant business information and competence resources for operations. With KM, the purpose is to advance communication and common understanding with personnel. The respondents emphasised the need to listen to others, the ability to compromise and the capacity to work together to reach set goals.

In large companies, real-time information, easy-to-find information, and learning at work explained 49% of the organisations' internal information utilisation variable range. Information in the right place, finding the information, noticing proposals for improvements and updating processes and instructions explained only 10% of this range. In SMEs, internal data and information management was ensured through good instructions and daily co-operation among different departments and personnel.

However, the respondents stated that there was a need to develop in internal knowledge assimilation and verify knowledge implementation. In some operations, the companies had the responsibility to receive information, but there was no checking process to ensure that the knowledge shared was also utilised in processes. The respondents emphasised the responsibility of superiors and employees to verify that the knowledge is implemented in processes and that the documents and information are updated.

The use of external data and information, based on large companies' responses, had a higher level than the use of internal information. Organisations' existing processes concerning external information on new products and services, competitors, markets and information explained 35% of the organisations' external

information utilisation variable range. Moreover, networks with new ideas, the reverence of new employees, and new employees' knowledge and competence were included this component. It seems that there is a connection between employers and their support for employee networks ($r = 516, n = 36, p < 0.005$). However, 6% of the respondents stated that they did not know whether there was a process for supplying information on new products, services, competitors, or processes for communication with partners.

Among SMEs' it seems that external information procuring is focused on certain business units and actors in relation to networks, new ideas, the knowledge of new employees and the utilisation of this knowledge. Knowledge development, together with customers and co-operators, was seen to be very important and networks were constructed through co-operations with other business units situated in different localities or, for example, by participation in training programs outside the organisation.

Concerning open access to knowledge, networks and innovations, our study illustrates that organisations do not take the effective advance of technology of data. There may be limited access e.g., competence databases or data systems are not in active use that could improve on data utilisation and encourage the new ideas. Also networking donot seem to be a strategic operating model, which means that networking may rest of the singular unit or an energetic employee. Based on rather recent OECD report (2015) comparing Nordic countries' companies' ability to utilise external knowledge in innovation processes, it seems that Norway and Denmark utilise market knowledge (e.g., suppliers, customers, competitors) most effectively, while Finland and Sweden utilise this knowledge least effectively. However, Norway and Finland utilise institutional sources (e.g., higher education and the government) the most effectively, while Denmark and Sweden utilise such sources least effectively. In Finland, large companies, in particular, collaborate on innovation with higher education or research institutions one and a half times more than those in Sweden (which is second). Finnish SMEs are also the most active in collaboration. Norway is in the third place and Denmark is in fourth place (OECD, 2015, p. 142–145).

Innovation as co-creation

Management was thought to be commitment to KM, in general. However, there was perceptible that strategy work and management were seen from up-to-down practices. For that reason, more involving of the employee to strategy planning and implementation processes was desired. It would promote the common goal sharing but employee development of their own work. All the same, management may lead to smoother leadership practices and identify those lacks of skill resources that are needed in changing industry.

The level of knowledge development in large companies was seen to reflect a rather good level. Strategy-based consistency for the evaluation of competency, utilisation and development explained 51% of the KM development variable range. However, there is no efficient way to utilise the new information that comes with new employees. New information and competence development with teamwork also had a low level, explaining only 10% of the KM development variable range.

SME respondents thought that knowledge development was quite good. Central aspects were development discussions and goals set together with superiors and employees. Some of the companies engaged in competence mapping internally, and some of the companies used external consults. The main point was that competence evaluation needs to be an ongoing process and that competence needs to be complemented with internal training or external education. A big challenge for SMEs was that the training and development programs used were not implemented successfully, mostly because employees were not engaged in the implementation. Especially SMEs thought that the experiences of the employee were not enough and that education planning was needed in long-term strategy. Essential was to integrate the existing knowledge, external knowledge and experience of the employee and skills to create new knowledge and promote new practices.

Surprising, work circulation was used quite seldom (53%), with 30% of the companies using this approach seldom or not at all. Developing and working in groups was seen as one important way for the transfer of competence. The use of competence mapping and team co-operation was also verified to be a substitute system in these organisations. However, the companies did not have any systematic practice for how to utilise new employees' knowledge. Introduction was the key function and the respondents emphasised the responsibility of superiors and other employees to identify new knowledge and implementations. However, introductions were seen as employers teaching in an up-to-down manner, not as bottom-up knowledge sharing that could boost innovativeness more. Knowledge sharing systematically toward open innovation may succeed only if the critique of the external information decrease in both company sizes. Above all, SMEs identified withhold information challenges and weak external information utilisation. However, they did not define those as a development target.

Innovativeness is construed of many functions of the company. Large enterprises have resources more for research and development (R&D) while for SMEs innovations may occur from the unexpected direction, e.g., from technology or new business area. SMEs can by expanding their network co-operation get access to wider co-creation of new knowledge (e.g., [Verhees and Meulenberg, 2004](#)). Expertise that is not possessed can be acquired from the network partners.

In all, based on the research findings, it is possible to identify several rather important development areas and targets in KM in different company sizes.

However, development needs are also always require resources. When we compare the various Nordic countries, it is clear that Finland has the second highest R&D expenditures on information industries in the entire OECD area. Other Nordic countries' expenditures are approximately half or less of those of Finland (OECD, 2015, p. 160). As the OECD report stated, "Information and communication technologies (ICTs) are key enablers of innovation throughout the economy" (2015, p. 160). In Nordic countries, Finland is first in terms of SMEs that produce or process marketing or organisational innovation at the same time, coming before Sweden, Denmark and Norway. However, with regard to large enterprises, Denmark is first in terms of mixed modes of innovation. Next are Finland, Sweden and Norway (OECD, 2015, p. 162).

Conclusions

This study examined the KM practices and challenges in different company sizes and their effect on open innovation. The results verified those of earlier studies carried out in the Finnish context (see e.g., Hannula *et al.*, 2003) concerning the biggest challenges of KM: companies have to face challenges defining what KM really means for their organisational processes and, further, how to develop systematic KM practices and build a KM strategy. These findings get support also from Lakemond *et al.* (2016) finding of the significance of knowledge matching and its positive effect during the innovation process: knowledge really matters and combining external knowledge and resources with internal capabilities creates a good ground for collaborating innovation work. Identifying those factors that cause uncertainty among employees may offer a set of management activities that support innovation practices (e.g., Jalonen, 2012). As Ortt and Smits (2006) states, building a KM strategy that includes uncertainty management, organisation structural aspects, possibility for learning and continuous environment scanning may lead to the "entrepreneurial nature of innovation". It means that companies also need to devote effort to strategy implementation and not only on the managerial level but open dialog between the different organisation levels in order to support innovation capability. (IBID.) Furthermore, as earlier studies (Lakemond *et al.*, 2016; West and Bogers, 2014) have stated, an effective company strategy requires an engaging open innovation process. We believe that combining external knowledge and resources with internal capabilities creates a good ground for collaborating innovation work. Matching partners' technological competencies and knowledge, an effective project management and open communication with company's own expertise and innovation process, implementation and commercialisation can be successful.

Such investments are a central way to achieve innovativeness in companies. A proper KM strategy would indicate the key practices that support open knowledge sharing — focusing both on internal and external knowledge sharing. For external knowledge sharing technology can bring new kind of support, but based on our study both the large companies and the SMEs have not fully taken use of the potential of technology for knowledge sharing, e.g., in the form of digital platforms. However, companies do not survive in the markets alone but need collaborative networks, both internal and external. Schilling (2010) states that especially “inter-firm networks are an important engine of innovation”. However, they also need management effort in order to be successful, as Lakemond *et al.* (2016) state.

The results indicate that large companies are more externally open to innovate than SMEs and that they also value open dialog and knowledge sharing more. As Brunswicker and Vanhaverbeke (2015) state, one possibility might be that SMEs have only little understanding of the internal component of openness. Understanding this requires managerial capabilities in both strategic and operational levels. The study also shows that the use of technology to support the access to open data and networks is rather poorly used in both company sizes. Technical changes lead to other problems that need to be tackled to avoid uncertainties (Hall *et al.*, 2011) and open dialog for the fear of technology adoption can guide for forward experiment with new ideas. The uncertainty tackle with learning processes can release those “dynamic capabilities” that Schilling (2010) calls for.

Our study has inherent limitations. First, our data were collected from an average of half of the 50 largest companies and from a small cluster of SMEs in Finland. Even though the results reflect the same kinds of specifics, the thesis should be seen as descriptive, rather than universal. Second, the sample is quite small; therefore, the results should be rechecked with additional analysis methods.

This study identified some correlations for KM challenges and open innovation capabilities. Our contribution to the open innovation research field is that we emphasise for discussion that despite all the technological improvement in recent years, there is still lack of such solutions and practices that would promote innovation entrepreneurship. In future studies, there is need to more carefully study the development of KM as an inter-organisational practice in a globalised and networked business environment. Additionally, KM should be further studied as a practice that helps organisations to develop and maintain their innovation capability. There is also a need for both academic and empirical research about open innovation in SME context.

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PUBLICATION

III

Why don't one maximise databases for manufacturing innovation?

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Why don't one maximizes database utilization in product and service development in manufacturing?

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Structured Abstract

Purpose This case study purpose is to identify those factors that could promote external or organization internal information system data utilization, customer co-creation with external networks. The focus of this case study is on how organization can utilize existing databases with identified best practices to create added value for the customer in order and supply processes.

Design/methodology/approach This paper describes the pilot of the case study that explicates the status or restrictions and challenges of the databases' utilization. These descriptors are derived from the literature and the pilot survey of the identified challenges.

Originality/value This methodology puts in evidence that more effort could be dedicated developing organization internal practices. Identified challenges guide the core operators in sale and marketing and product development into integral practices for order and supply processes to realize customer oriented and productive processes.

Practical implications Through this study, the function is to expand understanding how the databases are capitalized to create added value together with the customer. The forthcoming process model guides how to use databases efficiently internally but also with the customers.

Keywords – technology adoption, database, customer oriented approach, practice, development

Paper type – Academic Research Paper

1. Introduction

The global business world is full of information and it is available. Therefore, it is very important to utilize and use information as efficiently as possible to be able to convert information for business purposes. Companies are facing challenges due to the competition and need for quicker responses to market demands. This forces organizations to find new ways to act, run their daily processes and produce innovations to maintain competitiveness.

The conceptual definitions of innovation differ with research area, like the innovation of the idea of a new device or process that are implemented, innovation can emerge in different situations and sources (Schilling 2010) or innovation as culture that in the employee aim at to be innovative (Dobni 2008). Organizational ability for innovations can be appointed innovativeness as risk taking (Denrell and March, 2001) or individual pioneers that try to promote change with personal characteristic or attribute dependent behavior (Hurt et al., 1977). Wang and Ahamed (2004) identified the product, market, process, behavioral and strategic innovativeness those areas that define the overall innovativeness of the organization, of which process innovativeness is the vital condition in innovation capability altogether. In this paper, innovation definition is leaning on Rogers' (2003) description of "an idea, practice or object perceived by its adopter to be new and an improvement" that is realized in manufacturing product and service design context.

Knowledge management improves processes in organization, like collaborative decision making, innovation, collective and individual learning. These organizational processes create as the process outcome better products, services and relationships and decisions as well as organizational behaviors and these issues and process outcomes lead to improved organizational performance.

In organization knowledge processes we refine, storage, share, transfer, create, acquire and re-use information. (E.g. Nonaka and Takeuchi, 1995). Through efficient and good planning of knowledge management processes, we increase and improve the processes of innovation, individual and collaborative learning, as well as decision making processes within organization (e.g. Moustaghfir and Schiuma, 2013), and improve our organizational performance and behavior on the level of decisions, services, processes and relationships. Vital issue for achieving the best possible result is to find causes for disturbance factors in knowledge management and organizational processes. We need to find new practices and methods of improving these processes within organization. (King, 2009)

When bringing knowledge to product and service perspective in organization environment, it can be said that new products and efficiencies are difficult to sustain. Utilizing knowledge we provide a sustainable advantage. Competitors can in the period of time match the quality and price of a market leader's current service or product. When that happens, the knowledge intensive, rich and knowledge managing company will proceed on to a new level of creativity, efficiency and quality. The knowledge advantage is sustainable because when efficiently used, knowledge increasing returns and continuing advantages. Knowledge increases when used as ideas and will breed new ideas. Knowledge, which is shared, stays with the giver and at the same time enriches the receiver. The potential key information for new ideas will be found the stock of knowledge. This stock is in any organization practically limitless if the people in the organization are given opportunities to talk, think and to learn with one another. (Davenport and Prusak, 2014)

The fast development of the information technology systems (ITS) lead the change of the organizational practices in general and require rapid technology adoption in manufacturing processes to maintain competitiveness. (Schilling, 2010) The baseline of this paper case study is that the employee don't utilize the existing database for innovative solutions in the customer oriented co-creation and product and service innovation. They do not recognize those possibilities that the system can offer or what are their own capabilities to utilize technology (Ramamurthy 1995) in their marketing and sale and product development functions. There may be technology resistance behind (Joshi, 1991; Martinko et. al. 1996; Lapointe and Rivard., 2005) but the other side of the coin is technology adoption (Kim and Kankanhalli, 2009). When the coin is flipped, the reasons behind the behavior are based on the individual evaluation of the technology and choice (e.g. Laumer and Eckhardt, 2012). Jalonen (2012) has identified lack of focus on the factors that in innovation processes engender uncertainty. His argument is that in the innovation processes actions are to be made under "unknown uncertainty" conditions that arise "from incomplete information, but also from ambiguous and equivocal information about innovation" (ibid).

Especially information systems (IS) research field has identified technology usage models but fewer researches are focused on those barriers that hinder maximizing available data and information. (Lapointe and Rivard 2005) Managerial aspect or managers as starter in technology implementation and innovation processes are often the focus in innovation or technology adoption literature (Ramamurthy, 1995; Kothandaraman et. al, 2001; Martensen et al., 2007; Jundt et al., 2015) but management in engineering change need to

analyze to support innovation processes as well. (Tavcar and Duhovnik, 2005) However, individual and his decision making with choices enable technology acceptance in the end (Kim and Kankanhalli, 2009) and individual need to be accountable to the possibilities in the change situation (Dobni, 2008). As Laumer and Eckhardt (2012) notice, individuals with diverse experiences need to investigate more to provide company's technology and information utilization.

This paper combine Bhattacharjee and Hikmet model of technology acceptance and resistance (2007) and organizational change (Oreg, 2003; Laumer and Eckhardt, 2012) literature with value creation literature to discover explanations why individuals reject information databases that could help them to advance knowledge sharing and innovation practices in product and service development.

This pilot case study purpose is to identify those factors that could promote external or organization internal information system data utilization, customer co-creation with external networks. The focus is on how organization can utilize existing databases with identified best practices to create added value for the customer in order and supply processes. The sale and marketing and product development groups, who are working on the customer interface, are in core, using databases to create new concepts, products and marketing material for support sales, and that could initiate the employee to pro-innovation thinking.

The paper is organized as follows. First, we describe some reasons why technology possibilities do not become the optimal resource. Next, we add customer value creation for innovation processes and introduce the measurements of information technology and customer value creation to make organization innovativeness. Our pilot case study sample and measurement are declared before the results. Finally, we deduce the practical and theoretical implications of our study.

2. Technology utilization in innovation process

Technologies, organizations and social structures and practices adjust transformation continuously during technology implementation (DeSanctis and Poole, 1994). The IT database of the case company includes the customer segments with the different industries, package solutions and newness with detailed information and reports and future analyses of the industry development. However, the employee do not recognize those possibilities that the system can offer in their marketing, sale and product development functions. The

customer-oriented data could promote new product improvement, direct marketing to core target group and broaden understanding about the customer (Kothandaraman and Wilson, 2001). The case company innovation process and product and service development process (Figure 1) is described so that we could ensure that every unit would follow the same footsteps when doing their own development and innovation actions, and information would be systematically collected and shared to others.

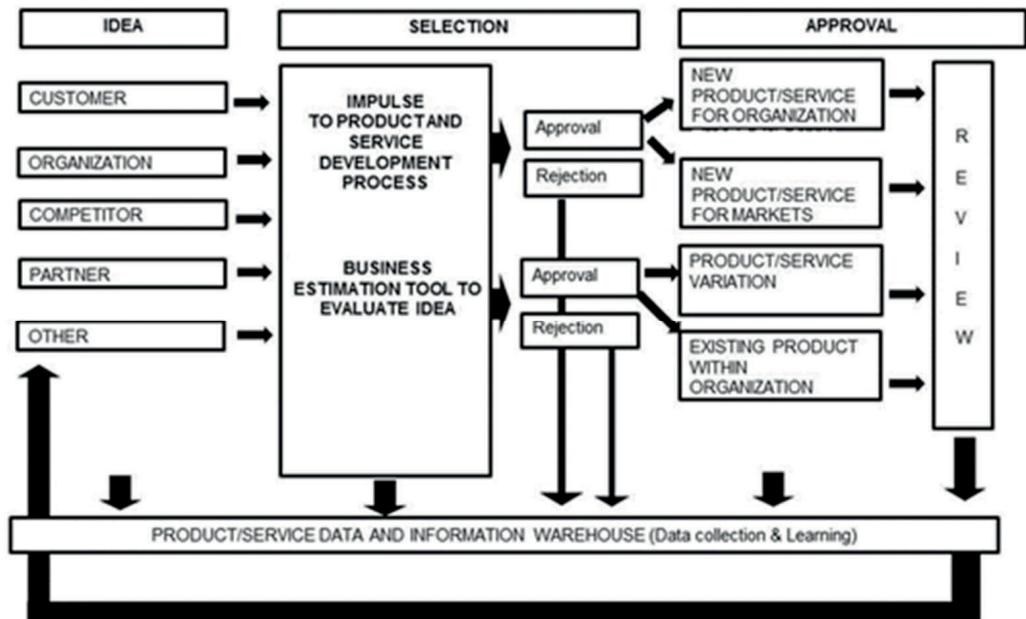


Figure 1. Product and Service Development process.

The product development process includes four phases: Idea, Selection, Approval and Review. Ideas can be received from the customer, internally within company through internal development ideas, personnel having problem solving ideas etc. Competitors may have some good ideas which can be suitable for taking further development to process. Ideas can be also given by other partners, suppliers or even for example government through laws and legislative.

After the idea is received, next step is to make pre-evaluation whether the idea is something that can be seen as worth to develop further. After this evaluation if the idea has passed, it is categorized by the type of the newness of the idea (new product for the

company portfolio, the new product for the markets, product variation or existing product within company) and passed further for review (Figure 2).

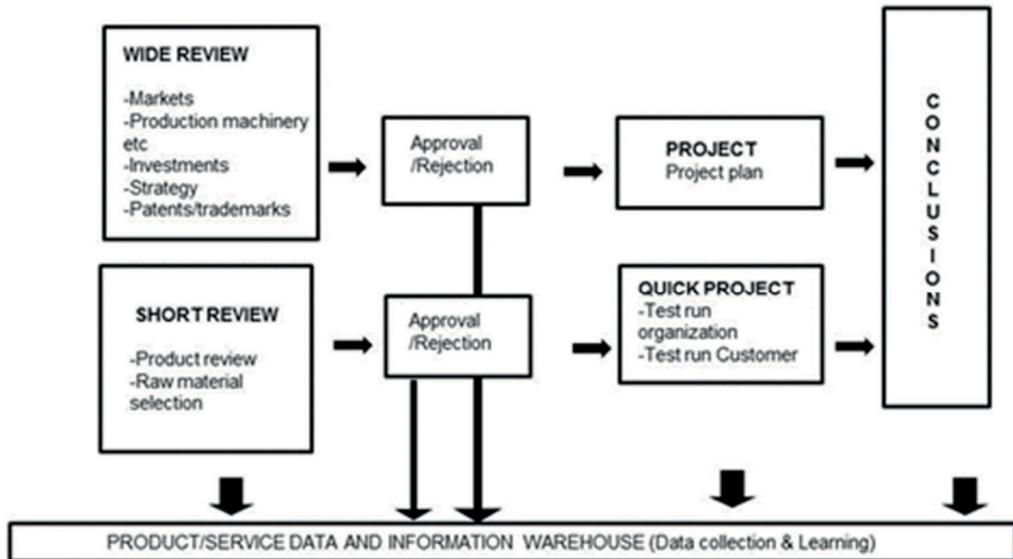


Figure 2. Review on Product and Service Development process.

On the review phase depending on the newness of the idea, evaluations are to be done with two different scopes. If the idea is seen NEW (new to the markets or for the company's product portfolio), product review is to be done very extensive. Markets will be reviewed and needed production equipment are to be reviewed, as well as needed investments. The strategy and decisions done on each level will be checked and reviewed whether the new product will support company's strategy. The needs of the product brand, as well as patent or trademark, will be reviewed at this phase. After this detailed phases, the project is to be launched with the specific project plan.

If the idea is less new, the existing product of variation of it, product review is to be done lightly with basic product definitions and material decisions. After this, tests are to be done within the organization and customer to verify the product. When all projects are at the phase that tests and all needed approvals are finalized, conclusions should be summarized what are the findings of the project; why it was or not the commercialized,

how, what or were the main lessons learned themes and subjects are. The process definition at organization level is not enough to be adopted at the individual level.

Rogers' innovation diffusion theory is one strong basics of organizational level technology adoption theories. Rogers' express five technological attributes that effect on individual adoption decision: relative advantage, technology compatibility, complexity, trialability and observability. (Rogers, 2003) Jundt et al. (2015) thematized adaptive performance as external impacts that cause changes, optimize performance despite changes, both proactive and reactive performance to forthcoming change and the organization level resource of the required competence to achieve performance objectives that are settled.

Early information technology implementation researchers have recognized reasons how and why technology resistance appears in technology implementation (Joshi, 1991). Lapointe and Rivard identified as resistance modes: the behavior, the object of resistance, subject that resists (an individual or a group), perceived threats that are reacted to and initial conditions e.g. regarding social power relations (2005). New technology induces distinct reactions (Martinko et al., 1996) and emotions (Beaudry and Pinsonneault, 2010), and Martinko et al. propose throughout the attributional explanation model by examining organizational internal and external factors that resistance appeared indifference, lack of interest or an active resistance behavior. (1996) Individual evaluates the forthcoming change analyzing benefits and losses comparing outputs between himself, organization levels and other technology users (Joshi, 1991) but determines the possibilities and threats of the new information technology (IT) (Beaudry and Pinsonneault, 2010).

3. Value co-creation in innovation process

External-firm networks are increasingly considered as one significant part of firms' customer value creation. However, Kothandaraman et al. argue that the future competition will change the focus from network level to firm level and the value-creation process with core competence need to be understood as comprehensive processes (2001). The co-creation value process needs an interaction between the customer and supplier in product and service level but also in process level from order to delivery.

What are value creating networks? There are definitions like supply chains or market networks, value chain or value nets (ibid). When defining customer value, it can be defined so that it presents the trade-off between sacrifices and benefits from provider's relationship

and product resources of which customers think and believe to be facilitating their goals. At the same time, quite often customer value changes because customers are changing their own expectations. This aspect is a critical challenge for the providers. Failing to meet customer expectations may lead to dissatisfaction and terminate the customer relationship. (Blocker et al., 2011)

Value and value propositions have become very important factors when organizations are defining and renewing their processes to be more competitive on the markets. Anderson et al (2006) has classified value for resonating focus, all benefits and favorable points of difference. Resonating focus consists of one or two points of differences whose improvement will deliver the biggest value for the customer for the near future and answers to question “ what is the most worthwhile for our firm to remember about your offering “. All benefits mean those all benefits customers received from market offering and answers to question “why should our company purchase your offering? “ Favorable points of difference consist of all the favorable points of differences that a market offering has relative to the next best alternative, and answers to the question “why should our company purchase from you instead of your competitor? “ (Anderson et al., 2006)

New product development needs a customer and a market. Jalonen classified uncertainty that occurs in the market into customer behavior, the uncertainty of competitors’ behavior and the competing products and services in the market (2012). Gutman (1982) emphasis with his Means-End Chain Model that to create understanding how the individual consumer’s and group level customer’s choice of the product or service facilitates to the desired customer expectations and value.

4. The measurement of the innovation process

Ramamurthy emphasizes that IT-system or capacity utilization measurement is useful when the use of the system is participatory (1995). Oreg’s routine seeking of the individual seemed to be the strongest component of resistance to change, and further could predict one’s negative attitude to try on new technology (2003). Tavcar and Duhovnik (2005) explored less attention paid to process and developmental design improve accents based on “product complexity analysis, design level and change engineering.” Change engineering management is constructed of concurrent engineering methods, communication practices, organization and changes in different phases, how the processes

are understood, how decisions are made and how the information systems support organization processes (ibid.)

To understand and measure customer value, firms need to revise and understand their marketing processes (Kothandaraman, 2001). The multi benefit model of choice by Kothandaraman et al. consider individual benefits and firm performance in supply but the value is reflected of customer expectations and weight of benefits. Value network analyses guide the firm to identify the network state or weaknesses and improve the firm position in the network. (Ibid) Regarding value orientation Dobni (2008) examined employee's activity to interaction and for new ideas and common understanding about the best process practices creating value. However, Dobni measured customer and market orientation from the new product and service development capability of the flexibility aspect, like Oreg (2003) suggests their indicator to application with considering consumer behavior.

In all, to promote innovation processes the next researches show an example to which is worth to pay attention. Hurt et al. the baseline for the innovation measurement was individual willingness to change and innovate (1977), the organizational learning to improve capabilities and innovation propensity (Dobni, 2008) and the flexibility and forward way to update old thinking and practices. (Wang, 2004)

4.1. Sample and data collection

This paper express the pilot survey for the smaller respondent group in the case company of those actors which interact with the customer interface, consisting of sale, marketing and customer service actors of 10 respondents because this paper focus is on the external network value creation in product and service design. The later stage the sample is going to include the rest of the units of the internal processes of the case company.

The study was carried out as a quantitative survey during March and April 2017 during one and a half week. For theory verifications and generalizations, quantitative research generally employs a survey design (Creswell 2003), which has been utilized in this research. The data was statistically analysed using SPSS. Frequencies were used to examine the distribution of responses.

4.2. Measures

The survey was based on previous, validated researches with the similarities of the content to this study (e.g. Oreg, 2003; Tavcar et al., 2005; Dobni, 2008). The questionnaire was divided into the themes of the technology adoption and customer value creation that promotes innovation practices. The first theme addressed the understanding and the clarity of the organization technology processes covering the various functions of technology as such, communication practices, organization structure to support development processes, process definition in change situations and the IT-systems that enable knowledge sharing. The second theme focused on knowledge utilization and knowledge sharing. The third part explored organizational flexibility and development, while the last part thematized value creation processes.

5. Results and discussion

The results are expressed as follows: first technology change management in the company is introduced in general, next the information platforms utilization and thereafter how the customer value creation is succeeded.

Engineering change management (Tavcar et al., 2005 model) in the company was very homologous in every criterion: concurrent engineering methods, communication practices, organization and changes in different phases, how the processes are understood, how decisions are made and how the information systems support organization processes. The rank was between 5.1 and 6 of the scales from one to ten (Figure. 3).

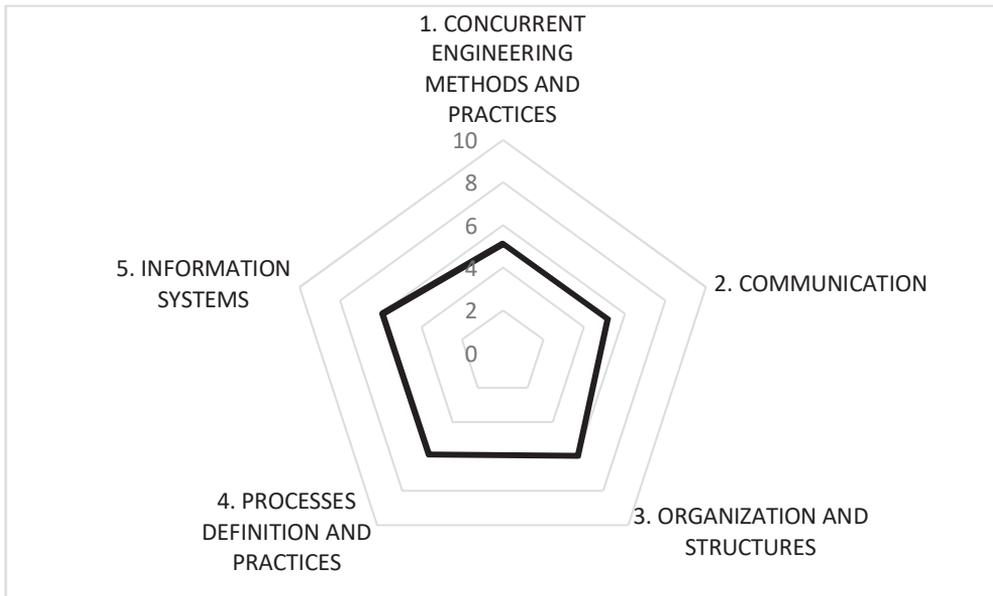


Figure 3. Customer value-creation in innovation process in the case company

Despite the respondents did not give very high scores when evaluated the general technology change management, technology, structures and practices of the company seem to support the innovation processes manifold. Tavcar et al. (2005) showed that access to data especially in the design process and open communication are needed in the change implementation process.

The information systems and database utilization was asked of six existing systems with the scale of zero to ten. Only the company production systems were utilized well though the different unit systems were not integrated. That makes the challenge for the market and sale people because the comprehensive customer history is not visible. Even though the respondents think that the company's practices are flexible to turnabout when necessary with the customer demands. The databases of innovation and ready-made products were quite unknown for the respondents. However, the one who has used the system saw the good potential especially in the customer appointment. The real time information sharing platform was seen very potential in customer interaction and co-creation to exhibit the products and services of the company. The reporting databases were seen very useful which promotes the marketing and sales men work. The biggest gap for the utilization of the databases seemed to be passivity, either the respondents did not know the system or the

explanation was the lack of time resources. Lapointe and Rivard's model explained that individual behavior and resistance in early stage IT implementation to focus on rather than the group entity. (2005) However, Jundt et al. (2015) noticed that earlier studies do necessary not verify that individual differences underpin adaptability in general (e.g. new knowledge and skills).

However, the most potential customer value co-creation environment was seen the place where the staff and the customers gather and develop the products together into the necessity of the customers. Ramamurthy expressed that systematic planning model could support to consider organization productivity and technological potential but support those attitudes to technology utilization that promote innovation practices (1995) with the customers.

External pre-interaction with e.g. with retailers, distributors or suppliers was not very active to promote value creation. The emphasis is that employee identify what in the process produces value for the customer and in what processes need to be at best to create value. The respondents think that there are no resources enough to forecast competitive and industry environment. Jalonen (2012) emphasis that market uncertainty can occur from the customers, competitors or from other products and services in the market. As Kothandaraman et al. notes, information is becoming the environment (2001), and it has to be considered as integrated into the firm's processes.

Martinsen et al. (2007) noticed in her research that the biggest gaps in the innovativeness of the firms were the lack of the continuous scanning of the possible forthcoming change, the activity of new knowledge and skills sharing, the attitude and willingness to adopt external ideas or create innovations with external partnerships. Their results reveal that focusing on leadership and innovativeness could promote innovation results. (Ibid)

6. Conclusion and theoretical and practical implications

This pilot study identified some challenges in information database utilization that influence on case company innovation practices. Generally, the case company's processes are very functional in business. Operational systems and databases are utilized well but product and innovation databases could be capitalized more for the customer value creation. The access to the information systems and data that are needed is to be ensured as well.

However, for company internal innovation processes and practices could be dedicated more effort and more bravely build customer co-creation opportunities with the partners. For theoretical contribution, our study modifies Martensen et al. (2007) leadership focus on his “conceptual model for measuring innovation excellence” combining people and leadership as one transformer – self-starter, beside the partners and resources in the innovation process while strategic planning is the ongoing process during the innovation process (Figure 4).

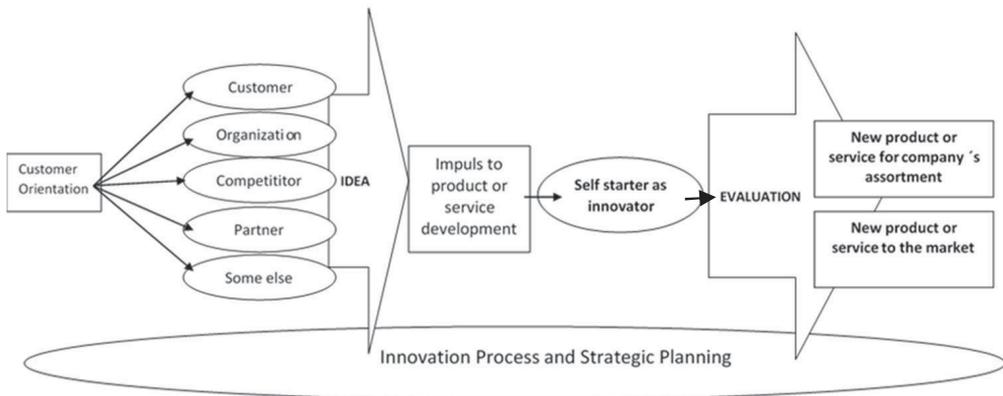


Figure 4. Customer value-creation in innovation process in the case company. (Modified Martensen et al, 2007).

Under innovation uncertainty, as Wang et al. (2004) states, “measuring overall innovativeness brescribes the underlying elements of innovation outcomes.” The elderly studies advocate their theoretical status because latter studies repeatedly focus on them (E.g. Hurt, 1977; Joshi, 1991; Martinko, 1996; Denrell et al., 2001; Lapointe et al., 2005; Dobni, 2008; Kim et al., 2009; Lauemr et al., 2012) and thus can guide for the continuity development of the practices. For practical implication, this pilot study guided the research to the next step. From the customer interface challenges in the product and service development process that are identified, are regarded to the self-starter as the innovator in the internal organization practices. The pilot study outcomes are compared that how the customer interaction challenges are understood at organization internal process level and how those individual tasks and choice effect on customer value creation and product and service development. For company level the next step research need to explore how to identify those practices that support individual level innovation capability.

Our research has inherent limitations. The sample is limited to certain organization functions, marketing and sale representatives in certain company. Even though the results reflect the same kinds of specifics, the thesis should be seen as descriptive, rather than universal. Second, the sample is very small, being pilot study, so the results need to establish with next step broader internal organization process research.

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PUBLICATION IV

Information initiates to future – if used

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Information initiates to future – if used*

Extended Abstract

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ABSTRACT

This study purpose is to identify those practices and methods that the Finnish large companies have in future forecast. The paper describes that are the companies doing forecast, with what methods and how faraway to the future. These descriptors are derived from the literature and regarded if the theory methods are concentered in the companies' practices. The result puts in evidence that while the forecast methods being discursive, more effort could be dedicated to ensure of the comprehensive analyses of economy, social and technical perspective. Through this study, the function is to expand understanding how the forecast methods are utilized in Finnish companies.

CCS CONCEPTS

• Data → Information

KEYWORDS

Future, data, utilization, analyzes, large enterprises

1 INTRODUCTION

Strategic planning is made of inter alia financial, operational, informational and technological aspects. Data and information for planning can be received of different sources, open access, they can be purchased from the research companies or readymade reports, trend analyses and scenarios [1] but the companies' own storages consist of valuable history and current information as well.

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The amount of information has increased explosively [2] and as Kothandaraman et al. [3] states, information is nowadays the environment while before it has been a part of the environment. However, to get reliable future planning, it is essential to define that how to evaluate the data and information, how to analyze them and how to deal the planning forward. [1] Not only good planning but the strategy adoption stage and implementation are as important. Strategic planning is not always preparation for the positive future but developing plans for emergency situations [4].

Future scanning has increased among large companies not least of the competitive market but to the endeavor uncertainty of the company environment. [2] The business is crucial: on the other hand, the companies need rapidly to react changes and customer demands, and the other hand pro-active preparing for the future is needed. Future scanning is partly a bit of the past but the forthcoming future planning is never the same because of human judgement and unpredictable effects [4] and you need to look back far enough to get rid of the certainty feeling [5]. Therefore, it is essential that in the practice field the future analysis can be done with theoretically sophisticated methods and not simplified those methods of getting some kind of explanation [4].

There are difficulties to identify technological possibilities or even maximize technology utilization in the companies. [6] If the possibilities are identified, the challenge is to appraise the business value of the technology, especially early-stage technology [7]. Technology planning is more than just technical analysis but different industry sector and competence resource analysis and strategic planning needs to be integrated with science and technology but business and product aspect as well [8].

In the spring 2017 Dr. Joseph Reger [9] made approximately among 1000 information technology designers and decision makers seminar a quick inquiry. He asked: "If you could choose a 'super power' for your business, what would it be?" The alternatives were a) always make the best decision, b) X-Ray vision of everything in your organization, c) read your customers' minds, d) immunity to risks and threats and finally e) see into the future. The result of 69 % of the respondents' future orientation (alternative e) was amazed Dr. Reger. The seminar was held all over the world and Finnish responses were unique according to Dr. Reger. When thinking future forecast and all previous alternatives, they are all those elements that need to be analyzed and scanned to maintain competitive advance, evaluate risks and evaluate for the future.

The aim of this study is to explore, are the Finnish 50 largest company making future analyses, what kind of analyses and for how

long ahead. The present study argues that future scanning is needed more and integrate the present knowledge of the organization to the strategic planning. The optimal outcome can be obtained if the strategic planning is transparent so the staff of the company can assume the desired targets.

The article structure begins the theoretical premises of future analyses. As empirical research, the paper continues by presenting the methodological choices of the study and its empirical analyses of large enterprises. In the conclusion section, the key results of the study are highlighted and directions for further studies are opened up.

2 THEORETICAL INSIGHT WHAT FUTURE ANALYSIS IS

2.1 Knowledge the base of analysis

Knowledge, data, information and competence, is the base of the analysis [10]. Nonaka and Takeuchi disclose that knowledge creation is to be construed of three element: how organization actors can express their new knowledge and how to integrate individual knowledge into organization level. The third element is significant for future analysis, the consciousness of the new orientation or alternative meaning and to avoid knowledge redundancy, they emphasis for dialog and communication. [11] Herring's Key Intelligence Topics model (KIT) able the companies to identify intelligence needs for strategic decision making but quick to react to competitor and environment activities as well. [12] However, KIT's core is more in managerial level interaction while this paper focuses on every organization level information sharing more.

Especially open data has become useful source for the companies in analyses [13]. Concurrently, the practitioners do not have systematic practices to process the information. (Ibid.) It is essential to identify the relevant information from the data and information stream and intelligence support the choice process [14]. With competitive intelligence (CI) defined by Fleisher and Bensoussan, the companies process information about markets and environment to promote company's performance [15]. Technology intelligence (TI) is a structured process that engenders "business-sensitive information" [16]. Both CI and TI have the same kind of information process which is executable into other analyses methods as well: planning based on requirements and direction on targets, collecting data and information, analyzing data and knowledge and dissemination the results forward action. Furthermore, CI –model has the evaluation phase. [15], [16]

In all, the companies need to acquire the knowledge from different sources. Different actors in the company can see the information from different aspect, e.g. from their professional aspect [16]. Innovated organization need to create new knowledge from internal resources to outward to redefine their operational environment. [11] The most challenging is to define the vision: what kind of knowledge the company need and how to motivate the individual level for knowledge acquiring. Therefore, the company need to be sensitive to external signals to create knowledge and further innovation. The knowledge as such does not promote innovation. (Ibid.) The focus of the analysis should be what the

company does not know rather than on resources and "controlling what they already know" [17].

2.2 What is future analysis?

The future planning is made to support decision making, handle with uncertainty and risks in business environment and identify opportunities [5] or to maximize gain or minimize losses in future conditions [4], [10]. Martino (ibid.) defines that with forecast can be calculated or estimated things or events beforehand based on information. The future can be explained or made predictions for some time range [18]. As such, foresight is a 5-25 year time horizon strategic toolbox that produce information for government and industry decision makers [19].

There are different ways to meet the future. One can face the future by overriding future signals and not forecast at all, which is not a sustainable agency. Other way is to think that anything can happen, and the action to influence the forthcoming direction is passive. The golden past does not promote new changes and therefore the future is ignored in this attitude. The next way is also based on the good old practices and better new is construed upon the old. However, this model fails to recognize other alternatives around. The last way is to react to crisis. This model tries to minimize the problem or crisis that has already arrived. [10]

How to guess what will the future bring? Evaluation and exploring of the future starts by understanding the challenge or problem, identifying the company goals in the development process or scanning the company environment: how the market or industry sectors are transforming, what and how the competitors are producing products or services for the markets or how are the forthcoming political decisions effecting on company businesses. [18], [20], [1] The next methods by Martino [10] may give some steers how the future visions can be explored. Extrapolation is based on the history models, time cycles or trends and the past time series information guides to future forecast. Leading indicators utilize one past time series for forthcoming time series behavior, e.g. certain time series in certain moment in the future. Causal models include information on cause and effect, and the cause effect of the linkages of the case is known beforehand. The last model of Martino is the probabilistic method that produces a range of possible alternatives, e.g. 20 % probability of the certain event to happen in the future.

2.3 Methods for future analyses

There are dozens of methods of analyze the future. However, this paper expresses only some of them. Usually, methods are combined to get the wider view of organization functions and those factors that effect on. The systemic analysis, selection and action based on the forecast are in core. Available data and information should be provided of the independent source and with several people to avoid biases as well [1]

Literature review is usually used analyze of theoretical aspect: theory, practices that are refined to theory and previous researches. Workshops are events that enable participants (developers, decision makers and investors) to analyze and make the sense of information and with the different group tools work for the desired target but

especially future workshops are the way to go ahead from the future plan to action. [7], [19]

How far should the future planning forward look that the plan is useful? Essential is when the company wants that the effects of the necessary actions of the plan to be realized [10], [18]. The time span depends on company challenge and target and the resources that are available for the evaluation, planning and implementation of the vision onward to action.

Combining different forecast method attempt to diminish the weaknesses of one method and expand different perspectives in the analyze [21]. The evaluation criterion can't be the same e.g. from technologic, economic and production development forecast. However, the forecasts influence each other. Therefore the aspects need to expand to other functions that the future cone is not too narrow. (Ibid.)

2.3.1. Environment analysis

The environment scanning can help the company to identify the state of the company in environment and encourage looking at from outside from the company to inside perspective, or to analyze their customers and end users, suppliers and vendors, market sectors and competitors and technological development but other environmental effects like government regulations and policies as well. The scanning needed to be made at many organization level not only by management level. External monitoring is needed more in rapidly changing and the competitive market, especially if the company is highly dependent on external partners. [1]

The end-user is part of the environment. Thus, user scenarios are important as well. Fenwick et al. emphasis that user scenarios could ensure “the inclusion of all possible relevant user needs” and that the product fulfills those needs [22]. Scenario-based planning helps also to perceive the uncertainty, usually group made unknown future vision. However, the most relevant and critical uncertainties need to select to get useful scenarios. Trend analysis gives a rough idea of the mix of the past and present and the idea is to develop the future vision. Delphi method is the professional group which gather together several times to develop the consensus of the future. This method is usually slow but the efficient tool e.g. at the beginning of the foresight. However, weak signals or forthcoming trends may miss.

2.3.2 Economy analysis

The financial markets are uncertain and influenced by many different reason, like global economy, political decisions, overheated stock market, certain industry sector transitions and technological innovations that change product demand and customer behavior. [4] The business analyses need to evaluate from the wider aspect of the organization functions, e.g. technology and operational effects beside financial analyses [23].

However, forecast the economy future can also fail. Business collapses may even from experts fail or on the other hand, unpredictable success can astonish, e.g. the successful product in totally different target group than premeditated. The statistical regularity from the past does not take account of unexpected occurrence but allow preparation in advance. Nevertheless, statistical events can be modeled that how long the certain time span

may last. [4] New product innovations may lose their momentums because of lack of organization resources. Therefore tools for the market analyze are needed, and to justify development resources the business cases need to be built.

2.3.3. Technology analysis

Technology foresight is defined with many aspects, like Carlson, that it may be done once or an ongoing process or “at the single business, group, whole company, or even the industry level” being the backbone for “forecasting, strategic planning, R&D strategy, and decision-making when linked to the business” [24]. Technology scanning can be made either producer, the user or technology adoption point of view. [25], [26] When analyzing the future, the organization need to evaluate that is the forthcoming or new technology mature enough to deploy to the processes of the organization and evaluation criterion that are settled are the core. [26] Technology forecast enables organization to identify possible technology opportunities for the business [24], [27], to monitor technology development with patent analysis [21] or discover the forthcoming technology like machines, procedures or techniques [10].

One way to scan technological choices is to use Technology Roadmap (TRM). The map makes visible the starting point and desired target but the critical choices between the technology development and implementation process. Roadmaps are usually the long-term view of the future, e.g. the next generation technology analyze, but may be subjective opinions of possible or the likely future. However, roadmaps can be a bridge between different organization units as well, e.g. R&D being separate unit in the company [18]. Kappel offers roadmaps to be as “forecast of what is possible or likely to happen, as well as plans that articulate the course of action”, and the development process may be a journey and even more important than the outcome [21]. However, there must be logic to a forecast and the evaluators and decision makers need to be able to be critical to the forecast [5]. In all, there need to be the simultaneous analysis of markets, products and technologies together in road mapping [28].

Technology Roadmap benefits are that need, drivers and how to fulfill them with products and services can be identified, what technologies can promote fulfilling, establish this evaluation process and how plans promote to develop the technologies and allocate resources to implement the plans. [8] Even though roadmaps are usually associated in technology forecasting they contain organizational and personal perspectives as well [18].

All analyses that are made should end up on some vision. Vision should be a desired picture of the future that is appealed to the values, hopes and present reality by organization members and other stakeholders. Identified importance and environmental influence on the company can be addressed with vision to guide for best practices, decisions and strategy planning. [1] The plans made of scanning aim to promote the decision making both quality and timeliness [27]. What kind of future analyses the 50 largest Finnish companies are doing? The empirical part is expressed next.

3 EMPIRICAL EXAMINATION AND RESULTS

3.1 Measures

The survey was targeted the 50 biggest company in Finland [29]. The criterion for the list is revenue. The aim was to explore are those companies doing the future research. There were five questions in the survey because the purpose was to get the general picture of the companies' future research. If the answer to the future research was yes, the respondent asked to clarify what kind of research they are doing and how far away. If the answer was no, the respondent were asked whether he could explain why not the company do future research in his function area.

Selected attributes that were included in the on-line survey were based on literature and Daim and Kocaoglu's [20] study. The evaluated aspects were economic, production and development and the technology viewpoint. The companies' future analysis were asked with following research questions:

- Is the company doing future analysis in economic, production and information technology areas?
- What evaluation methodologies do the company use?
- How far ahead do the company do future analysis?

The companies were contacted via email from previous different function management level of 108 contacts spring 2017. The response rate was 15 %, which can be regarded low. Therefore, the results should be seen as descriptive, rather than universal. However, remarkable was that the financial managers were the biggest response group, while information technology group was the second and production and development group answered least.

3.2 Results

How the Finnish companies are anticipated for the future is expressed next.

3.2.1 Future research

The companies were asked if they were doing future research or not from economic, product and development or information systems and technology functions. Nine economy respondents, three production functions and four information systems representatives told that the company made future research while only one economy representative told that they were not doing future research.

The information sources were emphasized on external data, information or studies and the future analyses were seen as part of the strategy development process. The result adheres to Herrings' KITT functional categories that the companies evaluate: "Strategic decisions and actions, Early-warning topics and Description of the key players" [12]. The responses reflect that there is consciousness in the companies where the new direction should target. The future analyses can give strengthening that knowledge. However, as Herring notes, different analyses areas (e.g. economical and business, technological or human central areas) often need to be combined to get the overall picture of the analyses or phenomena.

3.2.2 Future analysis methods

When asking, what kind of methods the companies were using for future research the variation was discursive. Environment analyses included industry scanning and general environment development. Political amendment programs were monitored

dynamically rather than analysed. Risks analyses were the strongest area in the future research. However, the analyses subject vary, e.g. political risks or regulations, raw materials, global market or the exchange rate were analyzed. Scenarios and market analysis among technology development analysis were the second utilized methods. Surprisingly, technology analyses were not defined more precisely. Market and risk analyses, the product and raw material pricing report can be the estimate for the productiveness and current situation control. Even if both current situation and future evaluation are needed, Kanter emphasizes focus on unknown knowledge. [17] Trend and economy analysis were used as well. Especially Megatrends and customer behavior transformation and customer perspective were analyzed. The methods that are used in the Finnish companies are expressed in Figure 1.

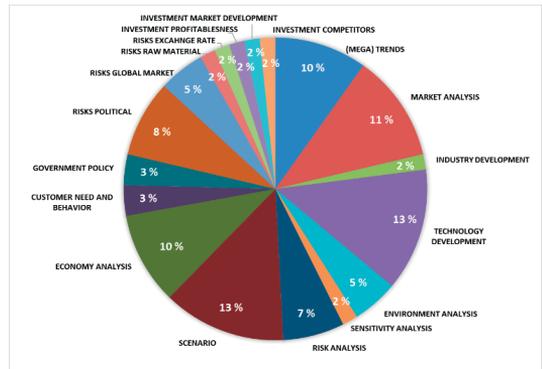


Figure 1: Used future research methods in Finnish companies (n=16).

As Figure 1 illustrates, the methodological choices varied among the sample companies. Daim et al. [20] saw in their study that financial methods were utilized well in future research. The same kind of situation was in this sample. Daim et al. continue that technological scanning may overlook the impact on financial sector (ibid.) Thus, it is essential to analyze overall organization functions that effect on each other.

3.2.3 Forecast period

The respondents specified the estimation time for the future with purposes of different kind and of analyses methods. The time range was from short-term analyzes for long period scenarios. The forecast was made generally from five to ten years in these companies. The long period, over ten year scenarios were the second common time span while from one to five years was made least. However, the differences between these time periods were minimal. Figure 2.

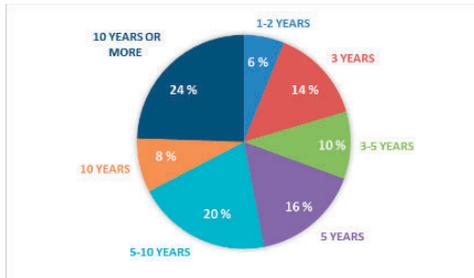


Figure 2: Forecast period in Finnish companies (n=16).

Over ten years forecast was defined for big investment analyses, mega trends, scenarios and technology forecasts, even from twenty to thirty years ahead in strategy planning. Less than five year analyses were done for instance for customer expenditure or customer behavior analysis and economic forecasts.

However, the forecast may failure as well. One reason for failure may be relying on one strong information or rather ignoring details or relying on two strong allusions of information than weak signals [5]. The other aspect is that sometimes business success it is impossible to anticipate [4]. Kappel's [18] study identified that the companies may think about several future possibilities but will choose only one. People may imagine several future alternatives but people tend to underestimate usually one event (usually rare) which may lead to serious situation [4].

4 CONCLUSIONS

This study examined the future forecast practices in Finnish large companies. The main focus on this paper being on future forecast theory and methodological introduction, it can be expressed that the companies in this sample really utilize various forecast methods. Especially economy and market analyses among long distance scenarios and risk analyses were used well.

Carlson [24] states that "Technology Foresight process starts with (and returns to) overall business strategy". However, is the technology point of view got much too powerful role in future forecasting? It seems that more and more technology is the basement of innovation, social and economic development, and the technology forecast gets increasingly annotation than needs to analyze beside social and economic aspect. The company is effected even more of its' environment and networks, both the national or regional level but industry or other company level, as Zgurovskii et al. express. [30] The strategy needs to be made visible among the staff that the common vision and targets can be reached.

Like Makridakis et al. [4] states, in future studies it has been made great models that help practitioners and decision makers to handle and prepare for uncertainty. However, there is three advice to handle uncertainty: accepting the world of uncertainty where operated, assessing the uncertainty level meet with and augmenting the uncertainty range. (Ibid.) There may be a situation that the forecast is impossible to make [5] and that it is to be accepted to avoid mistakes.

Also time range is important. As Saffo [5] reminds one need to look back to history "at least twice as far as you are looking forward". This study companies identified only those analyses that are looking forward. Mostly the times span was from five to ten year but long period scenarios were part of their strategic planning as well. It is important to know the past and current situation to determine the future.

The value of the forecast comes when the forecast is executable and allows somebody to promote company practices better. It is essential that the desired outcome can come true only if the forecast is accepted by the members of the organization, as Martino expresses. [10] The highlight of Gerstner [31] guides the forecast implementation: The new business forecast and strategy can spread only if the old practices don't impair the implementation.

This study has inherent limitations. First, the data were collected from a small sample of the 50 largest companies in Finland therefore, the thesis should be seen as descriptive, rather than universal. Second, the inquiry was very simple, thus, the results give only the general picture of the future forecast in Finnish companies. The results did not reveal distinctly where the companies acquired the data or information, how much they utilized open data, how they processed or integrated data and information with existing knowledge and furthermore, what kind of dialog they had of the analyze and vision. Therefore, more deeply exploring need to be done to expand the sample and to get generalization. There is also a need for both academic and empirical research about more deeply explore, how far backward the companies look and how they succeed with their forecasts.

This study identified some practices that the Finnish large companies have in future forecast. The contribution to open data and data science field is that even more efforts need to put on the available data and information utilization to forecast the future. It is impossible to know what the future will be but the companies can prepare for coming. The practices that promote to react sudden occurrence but general industry transformation.

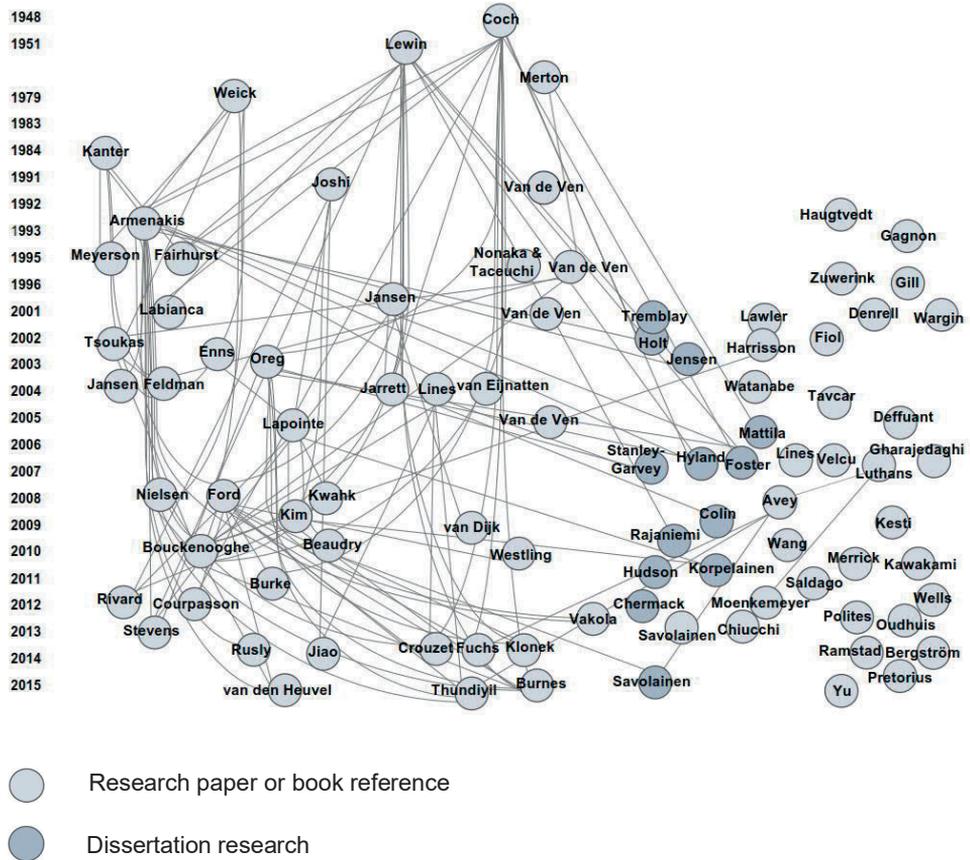
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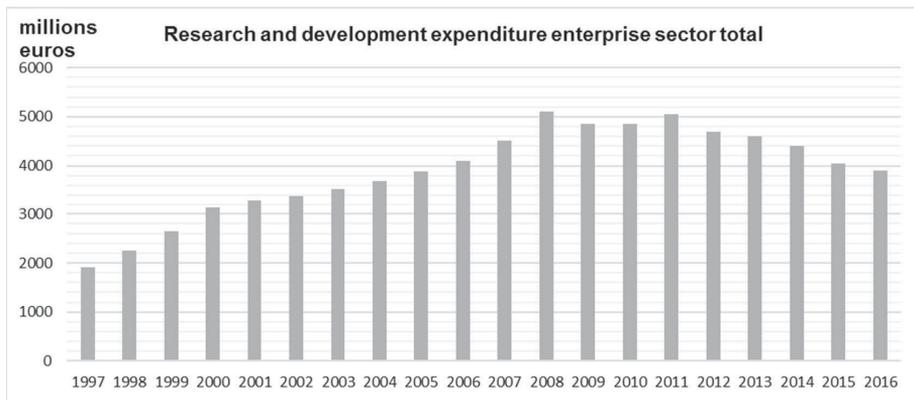
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APPENDICES

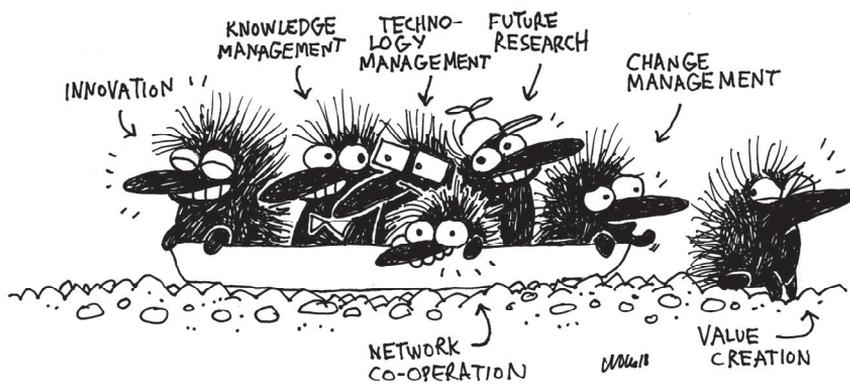
Appendix 1. The literature review references and co-citation network between the authors.



Appendix 2. Research and development expenditure in Finland 1997-2016.



Source: Statistics Finland / Research and development
(Uploaded 9.2.2018 Findicator).



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