LUT University

KNOWLEDGE MANAGEMENT APPROACH IN FORESIGHT RESEARCH

A systematic literature review

TIIVISTELMÄ

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Tietojohtaminen ennakoinnin tutkimuksessa - Systemaattinen kirjallisuuskatsaus

Tiedolla on yhä keskeisempi asema organisaatioiden arvonluonnin perustana sekä osana organisaatioiden prosesseja ja käytäntöjä. Tämän kehityksen myötä myös tietojohtamisen merkitys on korostunut. Tiedon kasvavan merkityksen ohella nopeasti muuttuva toimintaympäristö vaatii organisaatioilta yhä enemmän valmiutta ja kykyä vastata muutoksiin. Ennakointi voidaan nähdä keskeisenä välineenä organisaatioiden toimintaympäristön muutosten identifioinnissa sekä muutosten edellyttämien toimenpiteiden yksilöimisessä. Ennakointi muodostaa myös potentiaalisen tutkimuskohteen tietojohtamisen näkökulmasta lähteville tarkasteluille. Tietojohtamisen ja ennakoinnin näkökulmia yhdistävä tutkimus ja systemaattinen tarkastelu näiden kahden tutkimusalueen yhteyksistä on kuitenkin vielä varsin vähäistä.

Tämän pro gradu -tutkielman tavoitteena on selvittää, miten tietojohtamisen tarkastelunäkökulmat ovat edustettuna ennakoinnin tutkimuksessa. Tutkimus toteutetaan systemaattisena kirjallisuuskatsauksena, jonka keskiössä on tutkimusasetelman kannalta relevantin tutkimuskirjallisuuden kerääminen ja analysointi valitussa viitekehyksessä. Tutkimuksen teoreettinen viitekehys rakentuu tietojohtamisen keskeisten teoreettisten elementtien ja näkökulmien erittelystä. Lisäksi viitekehystä täydennetään kuvaamalla ennakoinnin peruskäsitteitä sekä luomalla katsaus ennakoinnin tutkimukseen. Tutkimuksen tuloksena kuvataan tietojohtamiseen kytkeytyvien teorioiden hyödyntämisen yleisyyttä ennakoinnin tutkimuksessa. Lisäksi tutkimuksessa tuotetaan kattava kuvaus tavoista, joilla tietojohtamiseen tutkimusalueeseen kytkeytyviä teorioita hyödynnetään ennakoinnin tutkimuksessa. Tutkimus luo tätä kautta yhteyttä tietojohtamisen ja ennakoinnin tutkimusalueiden välille sekä syventää aiempaa ymmärrystä tietojohtamisen ja ennakoinnin keskeisten näkökulmien välisistä suhteista.

ABSTRACT

Knowledge has been broadly recognized as a key resource for value creation in modern organizations. Knowledge has become an integral element of organizational processes and practices. This has also meant that knowledge management has developed into one of the focal perspectives to modern organizations. At the same time, rapidly evolving environment calls for preparedness for the future and the capability to response to changes. Foresight activities form a basis for detecting changes in operational environment and defining appropriate responses to these changes. Foresight may also be seen as a potential area of investigation originated from the knowledge management perspective. However, the integrative examination of knowledge management and foresight seems to be quite scarce and a systematic investigation on the connection of these two areas of research is still lacking.

The objective of this thesis is to study how the knowledge management approach is represented in foresight research. The study is conducted as a systematic literature review focusing on gathering the relevant literature on the topic and reviewing analytically the selected literature in specified framework. The theoretical framework of the study is built on the explication of the central elements of knowledge management related theory. Furthermore, the framework is complemented by outlining the basic concepts of foresight and providing a general description of the research conducted in the field of foresight. The results of the study demonstrate the coverage of knowledge management related theories in foresight studies and point out areas that are scarcely studied in this respect. In addition, the study provides a comprehensive overview on how knowledge management related theories are applied in foresight research. The study builds a connection between the research areas of foresight and knowledge management and deepens the understanding on the relation between the central perspectives of knowledge management and foresight.

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1. INTRODUCTION

1.1 Background of the study

During the last decades knowledge management has developed into one of the focal perspectives to modern organizations. This development has evolved hand in hand with the emergence of knowledge-based economy. A commonly stressed view behind this development defines knowledge as a central strategic resource that has to be managed and developed (Davenport & Prusak, 1998; Grant, 1996; Von Krogh, 1998; Zack, 1999). On the whole, value creation has become increasingly dependent on knowledge and the broader landscape of organizations has been shaped by the continuously growing significance of knowledge. By this development knowledge has become an integral element of organizational processes, practices, and routines. Alongside with the practical significance of knowledge management, there has been a growing interest towards academic research within this area. Knowledge management as an academic discipline has been described as a relatively young area of research which still has had a significant impact among researchers and practitioners (Serenko, 2013).

Like knowledge management, the domain of foresight may be distinguished as an emerging field of research and practice that may be associated to the key managerial approaches required in modern environment. In general, foresight activities are seen as a mean for identifying the drivers of environmental change and determining responses and solutions to these changes (Gordon et al., 2020; Iden et al., 2017). Foresight capabilities or the right kind of "future preparedness" has been seen as an important asset in securing the vitality of an organization (Rohrbeck & Kum, 2018). The need for preparedness for discontinuous changes has also been amplified due to the developments that have shaped the operating environment more volatile, uncertain, complex, and ambiguous posing also new kind of requirements for organizations (Bennett & Lemoine, 2014).

Given the fact that knowledge plays a central role also in foresight processes, foresight may also be seen as a potential area of investigation originated from the knowledge management perspective. Knowledge management has been described as a multidimensional field of study which could offer a basis for examination reaching other domains as well (Holsapple & Wu, 2008; Ragab & Amr, 2013). From this point of departure, the application of integrative perspective covering these two domains could have significant contribution for both of them. However, the integrative examination of knowledge management and foresight seems to be quite rare. Furthermore, a systematic investigation on the connection of these two areas of research is still lacking.

This study addresses this research gap by exploring the representation of knowledge management approach in foresight research. The study is conducted as a systematic literature review focusing on gathering the relevant literature on the topic and reviewing analytically the selected literature in specified framework. The overall objective of this study is to deepen the understanding on how the knowledge management perspective is incorporated into foresight studies and describe systematically how the knowledge management approach is built up in foresight research.

1.2 Research gaps addressed by the study

Although there has been some discussion on the connection and possible junctures of knowledge management and foresight research, a systematic investigation into the incorporation of these two research perspectives is still lacking. While the integration of these two areas is considered fruitful, there is no comprehensive analysis on the current state of the literature combining these two domains. However, few previous studies have already shed some light on the topic. For instance, Boozt et. al. (2019b) discuss the connection between knowledge management and foresight highlighting the linkage between these two areas as a structuring perspective to knowledge-based economy. Nevertheless, this article may be considered merely an introductory review on the topic. Another example of a study that takes to some extent an integrative perspective covering these two domains

is the article of Kaivo-oja (2012) which discusses the junctures of some knowledge management theories and weak signal analysis. Even if the study offers a valuable examination, it does not provide a comprehensive view on the integration of knowledge management and foresight perspectives.

There is also research that clearly has proximity to this study but with a different scope. Especially the connection of foresight and innovation has been studied widely with some summarizing reviews on the topic as well. For example, Adegbile et.al. (2017) provides a comprehensive review of the influence of strategic foresight on innovation. Despite the close relation to knowledge management approach, innovation management may be considered alternative perspective to knowledge-based value creation rather than a core area of knowledge management.

Regarding foresight research there have been introduced some wide-ranging reviews in order to reach comprehensive picture on the research area. This has been the case concerning especially foresight in organizational settings (ie. corporate foresight or strategic foresight). For example, revies by Rohrbeck et.al. (2015) and subsequently Gordon et.al. (2020) have explored this research area and built a comprehensive view on the current state and historical development of the field. Furthermore, the view on the current state of this research stream has been complement by Iden et.al. (2017) whose review enhances the understanding on the addressed subject themes and theoretical frameworks, as well as the research methods applied in the studies. However, despite the advantage made in this respect, the representation of knowledge management in foresight research has not been discussed in these studies.

When looking at the previous studies it seems that the exploration of the subject addressed in this study has been non-existent also within the knowledge management research. Even though knowledge management research has been reviewed from different perspectives (e.g. Costa & Monteiro, 2016; Durst & Edvardsson, 2012; Fakhar Manesh et al., 2021; Serenko, 2013; Serenko & Dumay, 2015) the perspective that covers issues related foresight seems to be lacking also within this side of research. Thus, the research gap may be identified from this perspective as well.

1.3   Objectives of the study

The overall objective of this study is to broaden the understanding on how the knowledge management approach is represented in foresight research. More specifically, the aim is to provide a comprehensive view on the manner in which knowledge management is incorporated into foresight studies and describe systematically the concepts that are used to build up a knowledge management approach. Within this context, the concept of knowledge management approach is used to refer to the use of knowledge management related theoretical elements in framing research and building up the theoretical background of a study. Based on these objectives, the study aims to build a connection between these two research areas and provide understanding on the relation between the central perspectives of knowledge management and foresight. The study is conducted as a systematic literature review following the methodological principles described in chapter 4. From this point of departure this study focuses on the following main research question:

How is the knowledge management approach represented in foresight research?

This research question is answered through the following sub-questions.

1. *What theoretical perspectives related to knowledge management are represented in foresight research?*

2. *How are these theoretical perspectives applied in foresight research?*

To answer the first sub-question, an overview of the foresight research coupled with knowledge management is provided. The primary aim in this regard is to describe which of the theoretical elements defined in the framework of this study are used and a how frequently they are used. Besides this, the examination at this point aims to provide a general description of the studies and focuses on issues such as the year of publication, the source of publication, and the type of applied research design. The second sub-question is covered

firstly by describing the role of the knowledge management related theories in foresight research. Furthermore, the question is answered through an in-depth analysis of selected foresight studies. Within this elaboration the aim is to provide a description of the use of the theoretical concepts defined in the framework of this study.

1.4   Structure of the study

The study is consisted of six main chapters. Following the introduction, the central aspects of the framework is discussed. The basic premises, core concepts and theoretical foundations of knowledge management, which all forms a fundamental basis for the framework of this study, are discussed in the second chapter. The third chapter is also building up the theoretical background of the study by focusing on the central perspectives and concepts of foresight and offering an overview on foresight research. By this elaboration the central aspects of foresight and studies on foresight are depicted. The fourth main chapter includes the description of the systematic literature review approach applied in this study. The central findings of the literature review are described in the fifth chapter. The final main chapter summarizes the findings and answers to the research questions, and furthermore, discusses the central contributions and limitations of the study. The structure of the study is described in figure 1.

Figure 1. The structure of the study

1. Introduction

- Frames the study and presents the freamwork and reseach questions

2. Knowledge management

- Defines the theoretical backround of the study and discusses the elements of the framework in detail

3. Foresight

- Describes the central perspectives and concepts of foresight and offers an overview on foresight research

4. Research approach

- Describes the metohod applied in the study

5. Results

- Describes the findings of literature review

6. Discussion and Conclusions

- Summarizes the central findings, discusses the conclusions and limitations of the study

1.5   Theoretical framework of the study

Since the central purpose of this study is to investigate the representation of knowledge management approach and the use of knowledge management related concepts in foresight studies, an essential part of the theoretical framework of this study is built on the explication of the central elements of knowledge management theory. In this respect, the theoretical framework can be described as layers forming together an overall conceptual perspective for this study. These layers are labeled as foundation, paradigms, perspectives, and core concepts (Figure 2).

Figure 2. The theoretical framework of the study
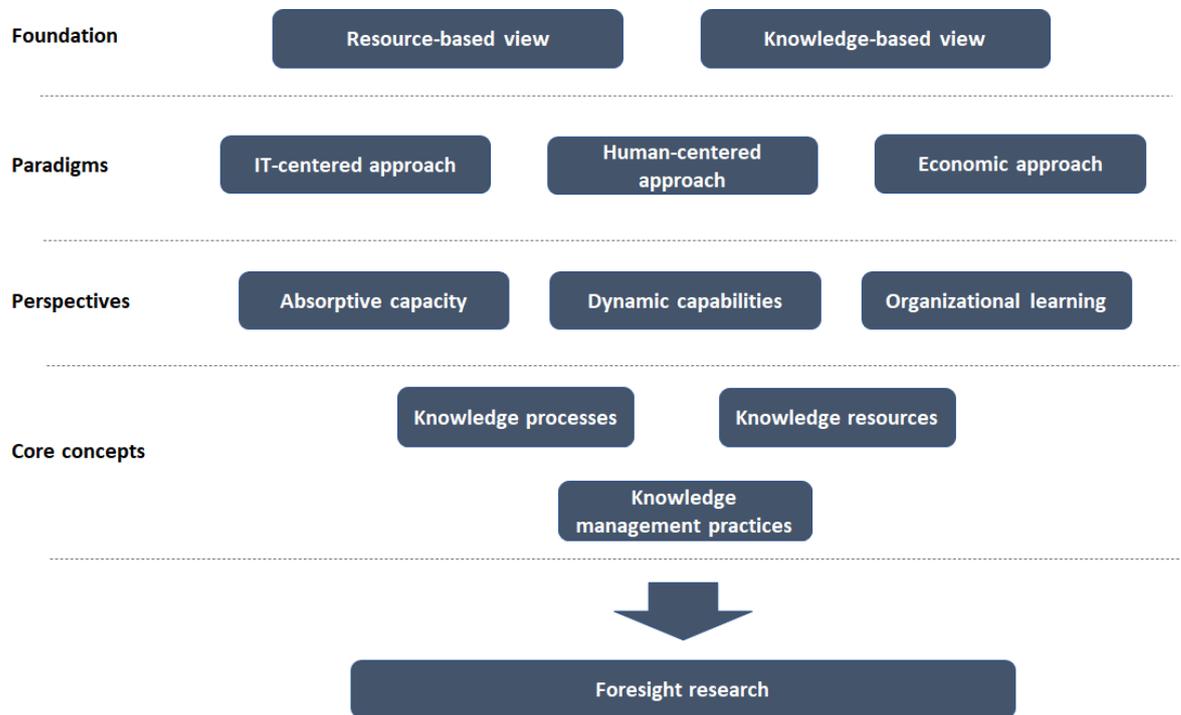
The foundation of knowledge management is outlined here consisting primarily of the basic premises of resource-based view (RBV) and the knowledge-based view of the firm (KBV). While both of these theoretical views offer reasoning for knowledge management, the KBV puts forward the basic premise stressing knowledge as the most significant resource for value creation. The foundation built on these theoretical perspectives also highlights the significance of the capability to develop and utilize knowledge resources.

Knowledge management can be approached from the viewpoint laid out by the categorization of different knowledge management paradigms. The distinction used in this study distinguishes three ideal type paradigms representing particular orientations and approaches used in knowledge management. This classification offers one possible standpoint for analyzing how knowledge management related issues are dealt with.

Besides the core concepts of knowledge management, a few conceptual perspectives related to the fundamental elements of knowledge management have been identified. These perspectives may be understood linking closely to the key issues and theoretical

foundations of knowledge management and are therefore included in the framework used in this study. Thus, the inclusion of these conceptual elements can be considered a mean to ensure the coverage of the framework. From certain point of view, both dynamic capabilities and absorptive capacity may be considered composing of knowledge processes. Organizational learning has been included in the framework as a perspective to knowledge management especially due to the significance of this research stream within knowledge management. Organizational learning may also be seen as a perspective to the knowledge processes and to the knowledge-based value creation. Hence, including this concept provides one more potential point of reference in analyzing the occurrence of knowledge management approach in foresight research.

The core concepts of knowledge management forms also the core of the theoretical framework of this study. In this regard, the framework is based especially on the holistic knowledge management framework introduced by Heisig (2009) and the further elaboration of knowledge management literature concerning these core concepts. The core concepts used in the framework include knowledge processes, knowledge management practices and knowledge resources. These concepts are understood as fundamental elements of knowledge-based value creation and, thus, the core of the knowledge management as well. Each of these core concepts offers a perspective for examining how knowledge management is represented in foresight research.

Finally, the research area of foresight is outlined in order to define the overall framework of the study. For the purposes of this study, an adequate foundation is laid by describing the basic concepts and layers of foresight and the general structure of foresight process. This part of the framework is also complemented with a general description of the research conducted in the field of foresight.

2. KNOWLEDGE MANAGEMENT

The description of the basic premises, core concepts and theoretical foundations of knowledge management forms a fundamental basis for the framework of this study. Thus, in this chapter the focus is on the elements labelled as "foundation", "perspectives", "paradigms" and "core concepts" in the framework depicted in chapter 1.5. Besides the elaboration regarding these elements, an overview on the broader approaches and research areas in knowledge management is provided.

2.1   Resource-based view and knowledge based-view

The emergence of the resource-based view of the firm (RBV) and the knowledge-based view of the firm (KBV) has had a significant impact on the development of knowledge management. Knowledge management, as a discipline and a practical managerial approach, may be understood as a response especially to the basic argument of KBV which recognizes knowledge as the most important strategic resource for organizations operating in modern knowledge intensive environment. (e.g. Handzic, 2017.) Hence, understanding the theoretical point of views put forward by RBV and KBV is also important for defining the basic concepts and perspectives of knowledge management.

According to the central idea of the RBV, an organization's competitive advantage originates primarily from the resources that it possesses. It is also stated that organizations differ due to the heterogenous distribution of strategic resources which, in turn, explains the differences in the performance of the organizations within the same field. (Barney, 1991; Wernerfelt, 1984.) The RBV assumes also that resources may be immobile across organizations and, due to this, the heterogeneity may be lasting over time (Barney, 1991). Furthermore, the RBV suggests that there are specific resources that can be seen strategically important. Important resources in this regard are valuable, rare, inimitable, and non-substitutable. A resource may be considered valuable if it enables organization to exploit

opportunities or neutralize threats in organizations operating environment. (Barney, 1991.) Rareness refers to a resource that provides competitive advantage and is not simultaneously available for other organizations to be utilized. Inimitable resource is a resource that has its basis on unique historical conditions, or the relationship of the resource and competitive advantage is characterized by causal ambiguity or social complexity. Finally, a resource is non-substitutable if there is not any strategically equivalent valuable resource available. (Barney, 1991.)

Despite the unarguable contribution of the RBV, the view has been challenged from different perspectives. For example, the inability to explain the source of competitive advantage in a dynamic and rapidly changing environment has been seen as one of the main deficits of the RBV (Easterby-Smith & Prieto, 2008; Eisenhardt & Martin, 2000). As the limitations of the RBV became under critical conversation, the concept of dynamic capabilities was introduced. The focus of the dynamic capability approach is on describing how organizations may create and maintain competitive advantage in dynamic environment. It stresses the responsiveness and innovation coupled with capability to deploy internal and external competencies and resources as a basis for value creation and competitive advantage (Teece et al., 1997). As a basic description of dynamic capabilities Teece et al. (1997, p. 516) state: "dynamic capabilities are the firm's ability to integrate, build, and reconfigure internal and external competences to address rapidly changing environments". Thus, this approach stresses the processes and routines by which firms may achieve new resource configurations in a changing environment. This capability may occur, for example, as a capability to integrate different resources, reconfigure and reapply resources or create new resources. (Eisenhardt & Martin, 2000.)

An important viewpoint in this regard is also that the value of dynamic capabilities lies in the way by which these capabilities are deployed more than in the capabilities itself (Easterby-Smith & Prieto, 2008). On the other hand, the nature of the dynamic capabilities has also been defined by describing dynamic capabilities as capabilities dedicated to the modification of operational routines. Consequently, the difference between dynamic and operational capabilities is highlighted from this perspective. Furthermore, the essence of the dynamic capability in this sense lies in their capability to change resources,

competences, and routines. (Easterby-Smith & Prieto, 2008, 237.) As regards to the relationship between the concept of dynamic capabilities and knowledge management approach some viewpoints have been brought out. For example, Nielsen (2006) views dynamic capabilities as integrated sets of knowledge management activities that change the state of organization's knowledge resources. A similar view is also adopted in this study: the concept of dynamic capabilities is considered providing a perspective to organization's knowledge processes and knowledge-based value creation.

The central theoretical foundation of knowledge management may be located in the knowledge-based view. The KBV deploys the central idea of the RBV and focuses on the internal characteristics of the organization as a foundation of competitive advantage (Grant, 1996). However, departing from the RBV, the KBV proposes that knowledge, in particular, forms the most important strategic resource for the competitive advantage. In addition, especially the combination and integration of different kind of specialized knowledge are seen in the core of value creation (Grant, 1996; Kogut & Zander, 1992). The KBV also emphasizes that the performance of an organization is essentially dependent from the ability to develop and utilize knowledge (Grant, 1996; Spender, 1996). Taking this idea further, acquiring, creating, sharing, and applying knowledge appear as fundamental capabilities for creating competitive advantage (Davenport & Prusak, 1998, p.13; Nonaka & Takeuchi, 1995, p. 49-50; Von Krogh, 1998.) The KBV's emphasis on the utilization of existing knowledge resources and the development of knowledge reflects also the basic idea of dynamic capabilities. However, a subtle difference may be pointed out between the perspectives of the KBV and dynamic capabilities. These two approaches may be considered having similar interests and ideas, but they represent different stream of research with different emphases on the issue (Pöyhönen, 2004, p. 79-80).

2.2   Knowledge management paradigms and areas of knowledge management research

Knowledge management has been described as a heterogenous and multi-dimensional field overlapping with other domains as well. Furthermore, knowledge management may

be seen as a continuously developing field of research with different historical develop-
ment phases emphasizing different aspects and key concepts (Handzic, 2017; Metaxiotis et
al., 2005; Serenko, 2013; Snowden, 2002). The nature of knowledge management may also
be grasped by differentiating the research streams, paradigms and schools within the dis-
cipline. Typically, a distinction has been made between two main paradigms of knowledge
management that have their roots in different academic traditions: the technology-cen-
tered paradigm and the human-centered paradigm (Gloet & Berrell, 2003; Hazlett et al.,
2005; Serenko, 2013).

Gloet and Berrell (2003) describe these two paradigms as information technology paradigm
and humanist paradigm, while Hazlett et.al. (2005) use quite similarly the distinction of
organic and computational paradigm of knowledge management. The technology-centered
paradigm focuses on the collection, storage, and manipulation of explicit data putting much
less weight on the human-related dimensions of these processes. In turn, the human-cen-
tered paradigm highlights the importance of learning and organizational processes of
knowledge management as well as the deployment of tacit knowledge as an organizational
resource. This paradigm also stresses the role of individuals, social groups, and organiza-
tional culture in knowledge processes. (Gloet & Berrell, 2003; Hazlett et al., 2005.) These
two paradigms of knowledge management are also reflected in two different strategies for
managing knowledge. The division between the codification strategy and the personaliza-
tion strategy may be considered a central distinction in this respect. The codification strat-
egy refers to the approach which focuses on the careful codification and storage and reuse
of knowledge, while the personalization strategy concentrates on supporting dissemination
and deployment of tacit knowledge through the dialogue between individuals (Hansen et
al., 1999).

The basic distinction of knowledge management paradigms may be complemented with a
taxonomy consisting of three different streams of knowledge management. Earl (2001) dif-
ferentiates technocratic, economic and behavioral schools as broader schools of
knowledge management approaches. The identified schools are considered ideal types rep-
resenting particular orientation. This means also that the schools are not necessarily

mutually exclusive, and they may occur simultaneously even within same organization. (Earl, 2001.) The technocratic school may be considered an equivalent concept for the fore-mentioned technology-centered paradigm with its emphasis on technological solutions at the core of knowledge management. Alike the human-centered paradigm, behavioral school focuses on the organizational aspects and the interaction of individuals. Differentiating from the twofold basic distinction of knowledge management paradigms, this taxonomy extends the outlook on knowledge management by adding the economic school as the third main approach of knowledge management. This school highlights the exploitation and protection of organization's intellectual assets as a foundation of economic success (Earl, 2001). The academic tradition based on the concept of intellectual capital may be regarded as an architype of this school of thought as it stresses organization's intellectual assets as a basis for value creation (Handzic, 2017). Based on the above described basic paradigms of knowledge management and the division of different knowledge management schools, a following categorization of knowledge management approaches is used in this study (Table 1).

Table 1. Knowledge management approaches and their key features

IT-centered	Human-centered	Economic / IC
• Technological solutions at the core of KM • Collection, storage and manipulation of explicit knowledge • Utilization of IT-systems and tools	• Emphasis on people, interaction and organizational issues • Importance of tacit knowledge is highlighted • The role of individuals and groups in knowledge processes	• Knowledge as an asset and competitive resource • Protection and exploitation of intellectual assets • Measurement and deployment of intellectual capital

The essence of knowledge management may also be approached by identifying the key areas of knowledge management research. Ragab and Amr (2013) divide knowledge management into five different areas in their review: Ontology of Knowledge and KM, Knowledge Management Systems, Role of IT, Managerial and Social issues, and Knowledge Measurement. The category of ontology of knowledge and KM includes studies concerning

especially the definitions, types and characteristics of knowledge and knowledge management. The research focusing on knowledge management systems deals in general with the managerial, technical, and organizational system structured to support the implementation of knowledge management. The research focusing on the role of IT covers the issues related to the design and implementation of IT-based solutions in KM while the research dealing with the managerial and social issues in KM is interested especially in the relationship between knowledge management and other managerial and cultural aspects of an organization, and on the other hand, the social aspects of knowledge management, particularly knowledge sharing and distribution. Finally, knowledge measurement, which is identified as a fifth category of this KM research taxonomy, consists of approaches that are typically coupled with the tradition of intellectual capital research. (Ragab & Amr, 2013.)

2.3   Knowledge management framework

The basic principles of the KBV encapsulate the fundamental idea and objective of knowledge management. From the practical point of view, knowledge management can be defined as "a set of management activities that enable the firm to deliver value from its knowledge assets" (Andreeva & Kianto, 2012, p. 619). By developing this definition further, knowledge management can be seen dealing with the processes and practices by which organization develops and applies its knowledge resources (e.g. Davenport & Prusak, 1998; H. Lee & Choi, 2003; Nonaka et al., 2000). This definition brings out the basic elements of knowledge management as well, namely, knowledge processes, knowledge management practices and knowledge resources.

Within the entity formed by these three basic concepts, knowledge management practices may be regarded as activities supporting knowledge processes and also as enablers of the value creation actualizing through knowledge processes (eg. Chen & Fong, 2015; Heisig, 2009; H. Lee & Choi, 2003). The division into knowledge processes and knowledge management practices highlights the essential difference between these two basic concepts. Knowledge processes are something that naturally occur in knowledge intensive

organizations irrespectively of managerial efforts, while knowledge management practices, in general, refer to intentional management of knowledge (Andreeva & Kianto, 2012). The conceptual difference between knowledge processes and knowledge management practices is also reflected in the division of empirical research: research has been focused usually either on the knowledge processes or knowledge management practices (Hussinki, Kianto et al., 2017). Besides knowledge processes and knowledge management practices, knowledge resources form a central element of knowledge management framework. In general, knowledge resources can be defined as intangible resources that can be potentially used in origination's value creation (Kianto et al., 2014). In addition to the above described basic elements of knowledge management, some of the knowledge management models stress also the environmental and structural factors, such as culture, technology and organizational structures, that affect the success of knowledge management (Gold et al., 2001; Heisig, 2009; Holsapple & Joshi, 2000; Metaxiotis et al., 2005).

Hesig's (2009) GPO-framework for knowledge management provides a comprehensive view on the key concepts of knowledge management offering also a solid theoretical basis for this study (Figure 3). This framework has been formed based on the analysis of 160 KM frameworks form both scientific and practical contexts. The framework consists of three different layers: 1) Business focus includes the business processes which forms the context of application and generation of knowledge. 2) Knowledge focus refers to the systematic handling of knowledge (i.e. the knowledge processes of knowledge creation, knowledge storage, knowledge sharing, and knowledge application) integrated in business processes. Within this layer knowledge is understood as a resource applied in the business processes and as a product generated in business processes. 3) Enabler focus includes the factors influencing and enabling successful and sustainable knowledge management. These factors are related to resources and practices and are divided into six different categories: organization and roles, information technology, leadership and strategy, human resources management and controlling. (Heisig, 2009.)
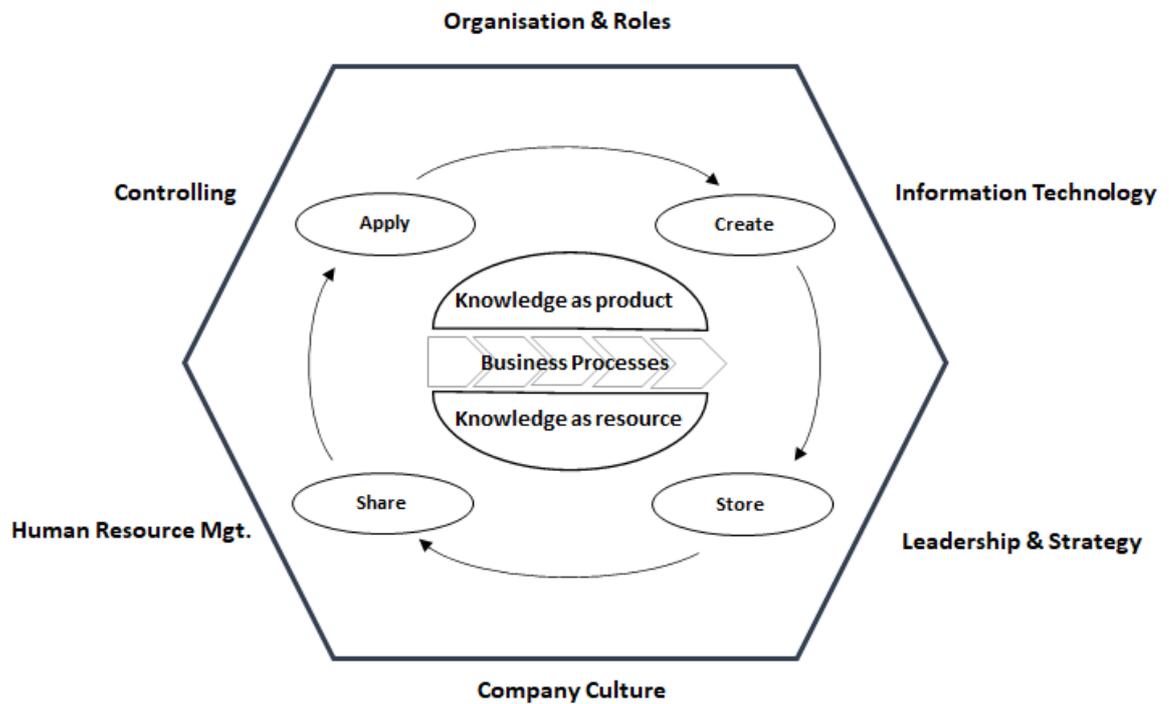
Figure 3. Knowledge management framework (GPO-WM) (Heisig, 2009, 15).

This framework forms a well-founded perspective for this study especially due to its capability to provide a holistic view on the elements of knowledge management. In the following, knowledge processes, knowledge management practices and knowledge resources are elaborated further to provide a more detailed picture of these basic elements of knowledge management.

2.4   Knowledge processes

The organizational activities focused on knowledge-based value creation can be described as a system consisting of interconnected knowledge processes. The concept of knowledge process refers generally to the processes that are designated to handle and apply organization's knowledge resources. Although these processes may be elaborated as analytically separated processes, they should also be understood interrelated with each other. (Bhatt, 2000; Heisig, 2009.) Despite the fact that knowledge processes are identified commonly as

a fundamental element of knowledge-based value creation and knowledge management, an established taxonomy of knowledge processes cannot be pointed out.

For the purposes of this study it is reasonable to define a set of processes that covers a wide variety of knowledge processes but still offers a structured perspective. A comprehensive taxonomy of knowledge processes is provided in Heisig's (2009) classification which describes the commonly accepted and used knowledge processes. This classification includes the processes of knowledge application, knowledge identification, knowledge creation, knowledge acquisition, knowledge sharing and knowledge storage. This classification has significant adequacy for this study as well since it is formulated based on a comprehensive analysis of existing KM frameworks. Consequently, it has an ability to grasp the knowledge processes despite the conceptual heterogeneity and ambiguity. In Heisig's final classification knowledge identification was excluded because it did not reach the majority of analyzed knowledge management frameworks. However, since the coverage of knowledge processes is seen as an important issue in the context of this study, knowledge identification is included in the classification used in this study.

The knowledge processes and their meaning in the overall framework of knowledge management are elaborated in the following. Even if organizational learning is regarded merely as a perspective to knowledge management and knowledge processes, the concept of organizational learning is also discussed in the following in addition to the above-mentioned knowledge processes. This is primarily a structural choice but, on the other hand, it is based on the notion that organizational learning, as a theoretical concept, has close connections to other knowledge processes and according to some views may even be seen as one of the knowledge processes.

Knowledge creation

Knowledge creation within organizations refers commonly to the creation of new concepts, ideas, products or processes and, in general, to the creation of new knowledge for solving problems (Alavi & Leidner, 2001; Nonaka et al., 2000; Von Krogh, 1998). As regards organizational knowledge creation, it is also essential that the knowledge created by individuals

can be connected with an organization's knowledge system (Nonaka et al., 2006). The model of dynamic knowledge creation developed by Nonaka, and subsequently applied by Nonaka and Takeuchi, provides a widely used theoretical model of knowledge creation. The model consists of three main elements: knowledge creation process (SECI-process), the shared context for knowledge creation (Ba) and knowledge assets. The essence of the model derives from the idea suggesting that organizational knowledge creation actualizes in interaction between tacit and explicit knowledge through the conversion of these two types of knowledge. Through this conversion process organization expands its knowledge assets. (Nonaka et al., 2000.) The dynamic knowledge creation model identifies four different types of knowledge conversion: socialisation, externalisation, combination and internalisation. Socialisation refers to knowledge creation where tacit knowledge is conversed to new tacit knowledge through shared experiences. Externalisation refers to the process where tacit knowledge is articulated into explicit knowledge, which, in turn, allows knowledge to be shared with others. Combination is defined as a process of converting explicit knowledge into new explicit knowledge by synthetising, combining, editing, or processing knowledge. Finally, internalisation is understood as creation of new tacit knowledge from explicit knowledge as individuals embody the shared explicit knowledge into tacit knowledge. (Nonaka, 1991; Nonaka et al., 2000.)

Although knowledge creation as such is a relatively unproblematic concept and commonly accepted, alternative terms, which may still be considered referring to the process of knowledge creation, has also been introduced in the knowledge management literature. These corresponding terms brought out in Heisig's (2009) analysis on KM frameworks are, for instance, knowledge generation and knowledge development. It is also important to make a distinction between knowledge creation and innovation. The difference between these two can be derived from the use of the concepts: while knowledge creation refers to the development of new knowledge, innovation may be understood as a result of application of new knowledge (Andreeva & Kianto, 2011). Thus, innovation process may be seen as an outcome of organization's knowledge processes. This viewpoint also suggests that the knowledge processes operate as innovation antecedents. The close relationship of knowledge creation and innovation is also reflected in the empirical evidence which implies

that knowledge creation is the main knowledge process impacting on innovation while it is also mediating the impact of other knowledge processes on innovation. (Andreeva & Kianto, 2011.) The view adopted in this study follow the distinction described above, and therefore, the concept of innovation is excluded from the conceptual framework despite its close linkage to central concepts of knowledge management.

Knowledge application

Knowledge application has been commonly identified as one of the central knowledge processes of a knowledge-intensive organization (e.g. Alavi & Leidner, 2001; Gold et al., 2001; V. Lee et al., 2013). The concept of knowledge application refers to the deployment of existing knowledge, for example, in organization's products, processes and services (Bhatt, 2001). On the other hand, knowledge application has also been described generally as responsiveness to the information that organization posses (V. Lee et al., 2013). Regarding the prerequisites of knowledge application, it has also been stressed that it must be easy to locate right kind of knowledge in the right form in order to sustain the possible competitive advantage that knowledge provides (Bhatt, 2001).

Identifying knowledge application as one of the key processes of the knowledge-based value creation highlights the central idea of knowledge management that stresses the importance of active utilization and development of knowledge resources. This thought has also been referred to with the dynamic view of intellectual capital. The dynamic view underlines the intentional and systematic management of intangible resources of an organization contrary to the static view of intellectual capital which view the knowledge merely as static asset of an organization. The dynamic view focuses on the organizational capabilities to leverage and develop knowledge resources for value creation. (Kianto, 2007; Kianto et al., 2014.) The idea of dynamic leverage and development of existing resources has also been emphasized in the research literature of dynamic capabilities (e.g. Eisenhardt & Martin, 2000; Teece et al., 1997). A wider conceptual background for the process of knowledge application may also be connected to the perspective of absorptive capacity which stresses

organization's ability to identify, acquire, assimilate, and apply new knowledge (Cohen & Levinthal, 1990; Zahra & George, 2002).

Knowledge sharing

Knowledge sharing refers to the transfer of knowledge between different actors throughout different organizational levels (Alavi & Leidner, 2001; Bhatt, 2001). Knowledge sharing may occur through formal and informal mechanisms, and the shared knowledge may vary from the tacit know-how embodied in individuals to the explicit knowledge shared by different modes of documented and codified knowledge (Alavi & Leidner, 2001; Bhatt, 2001; Cummings, 2004). Knowledge sharing has been examined from various perspectives, covering, for example, environmental factors connected on knowledge sharing and motivational factors impacting on knowledge sharing (Wang & Noe, 2010). In some cases, the concept of knowledge sharing has been seen differing from the concepts of knowledge transfer and knowledge exchange (e.g. Wang & Noe, 2010), however, in this study these concepts are used interchangeably referring to the same knowledge process.

Regarding knowledge sharing within organizations, it is essential that knowledge is distributed to the locations where it is needed and can be used (Alavi & Leidner, 2001). This is also related to the general view that stresses the importance of knowledge sharing for knowledge-based value creation (e.g. Grant, 1996; Kogut & Zander, 1992). In this regard knowledge sharing can also be described as a factor that enables organizations to apply the existing knowledge (Andreeva & Kianto, 2011). The significance of knowledge sharing comes obvious also with the views that define knowledge sharing as an integral part of knowledge creation process. Probably the best-known example of this view is the forementioned Nonaka's (1991) dynamic knowledge creation model which gives an important role for knowledge sharing in certain modes of knowledge creation process (see also Nonaka et al., 2000).

Knowledge storage

Knowledge-based value creation and the capability to apply knowledge resources require well-functioning practices of knowledge storage. The main purpose of knowledge storage is to build and maintain organizational knowledge base, reduce the loss of knowledge resources, and to enable the later utilization of knowledge (e.g. Durst & Edvardsson, 2012; V. Lee et al., 2013). The importance of stored and documented knowledge may also be described from the perspective of knowledge creation process. For example, in the dynamic knowledge creation model, existing knowledge resources are considered as inputs and moderators of knowledge creation process (Nonaka et al., 2000). While the concepts of systemic knowledge assets refer to the "systemized and packaged explicit knowledge", the conceptual knowledge assets consist of "explicit knowledge articulated through images, symbols, and language" (Nonaka et al., 2000, 20). Both systemic knowledge assets and conceptual knowledge assets may also be seen as a form of knowledge resulting from knowledge storage practices.

In practice, the tools for storing explicit knowledge are, for example, databases, data warehouse solutions, document management systems, operative information systems, and intranet (Alavi & Leidner, 2001; Cerchione & Esposito, 2017). Some knowledge management models refer to knowledge storage with analogous concepts, such as, knowledge retention, knowledge capture, or knowledge codification (Heisig, 2009). The concept of organizational memory has also been used interrelated with the process of knowledge storage. Organizational memory can be described as the means by which the knowledge from the past influences on the organizational activities in present (Stein & Zwass, 1995). In addition, organizational memory may be understood as a part of the knowledge stocks which lies in the non-human artifacts of the organization including, for example, systems, processes and strategy (Bontis et al., 2002). Finally, the process of knowledge storage may also be understood form the perspective of knowledge management strategies. In this regard, the codification strategy reflects the importance of codifying and storing knowledge for the reuse of knowledge.

Knowledge acquisition

Knowledge acquisition, as a knowledge process, refers to the acquisition of knowledge from external sources (K. Fink & Ploder, 2009; Zahra & George, 2002). Some definitions include internal knowledge creation in the process of knowledge acquisition as well (e.g. Chen & Fong, 2015; Gold et al., 2001). Since the knowledge creation is considered as a separate knowledge processes in this study, the knowledge acquisition is used only for referring to the acquisition of external knowledge. However, in practice these processes interrelate, and the conceptual division should be understood only as an analytical tool.

The acquisition of external knowledge may be realized through various different channels. Knowledge can be acquired from several sources, such as, from other organizations, suppliers, customers, or alliances and joint ventures (Darroch, 2003; Zahra & George, 2002). In some cases, knowledge acquisition may also be seen as a resource-saving alternative to knowledge creation, while in some cases the knowledge acquired form external sources is a necessary knowledge resource for the value creation (Bhatt, 2000). Knowledge acquisition is also regarded as an important element for the innovation capability. It is suggested that firms that are capable to acquire, assimilate and apply are also more innovative (Cohen & Levinthal, 1990). As knowledge acquisition forms an essential part of this kind capability, it is also included in the concept of absorptive capacity (Cohen & Levinthal, 1990; Zahra & George, 2002).

Knowledge identification

The process of knowledge identification is strongly related to the process of knowledge acquisition and is often defined as a part of that process. However, a part of research literature defines knowledge identification as a separate knowledge process (e.g. Chen & Fong, 2015; Durst & Edvardsson, 2012; K. Fink & Ploder, 2009; Heisig, 2009). Knowledge identification may be understood as identification of knowledge and knowledge resources necessary for the organization. This process also includes the identification of the existing knowledge possessed in organization, which forms a starting point for assessing what kind of knowledge is needed. (Durst & Edvardsson, 2012.) Knowledge identification is also used

to refer more generally to the identification of external stimuli (e.g. Chen & Fong, 2015). The significance of knowledge identification may also be understood in the framework of absorptive capacity. The identification of valuable knowledge precedes knowledge acquisition and utilization of knowledge, and thus, may be considered a part of the processes building up absorptive capacity (Todorova & Durisin, 2007).

Organizational learning

For describing the field and the core concepts of knowledge management one viewpoint may be based on the concept of organizational learning. Although the literature of organizational learning has formed an independent academic tradition, it clearly overlaps with knowledge management perspective (Vera & Crossan, 2003, p. 127). Bontis et al. (2002) clarify the relationship of knowledge management and organizational learning by defining knowledge management as management of organization's knowledge resources (stocks), whereas organizational learning provides means to understand how the stocks of knowledge are changing over time. Crossan et al. (2012, p. 154) provides a general definition for organizational learning by stating that "organizational learning is the process of change in individual and shared thought and action, which is affected by and embedded in the institutions of the organization". This definition is also considered adequate for the purposes of this study.

Organizational learning can also be seen as an alternative perspective to knowledge processes occurring within an organization. This interpretation comes especially along with viewpoint that sees organizational learning consisting of knowledge processes, such as, knowledge acquisition, knowledge creation, and knowledge sharing (e.g. Huber, 1991; Vera & Crossan, 2003, s. 137). On the other hand, organizational learning has been defined as an outcome of knowledge processes. For example, Lee, S. et al. (2012) depict organizational learning as an intermediate outcome between knowledge management and organizational performance.

Besides the views that highlight the integral connection between knowledge processes and organizational learning, knowledge processes are also considered an essential topic area in

research on organizational learning. Based on this notion, it has been argued that organizational learning has been conceptually absorbed by knowledge management research. (Castaneda et al., 2018.) Although the explication of the relationship of knowledge management and organizational learning calls for deeper elaboration, the description of overlapping nature of these two concepts suffices for the purposes of this study. Hence, organizational learning provides one possible conceptual perspective to the identification of central themes and issues of knowledge management.

2.5 Knowledge management practices

Although understanding knowledge processes is important for describing the knowledge-based value creation, the managerial impact of research focusing solely on knowledge processes is limited (Andreeva & Kianto, 2012). On the other hand, there has also been conceptual ambiguity between processes and practices amongst knowledge management literature. In addition, it has also been noticed that compared to the research focusing on knowledge processes, knowledge management practices are under-researched. Due to the shortage of research focusing on the knowledge management practices, an established model of knowledge management practices cannot be identified. (Inkinen, 2016a, p. 30.)

Following the general definition by Andreeva and Kianto (2012, p. 619), knowledge management practices are understood as "management practices which support the efficient and effective management of knowledge for organizational benefits". This definition refers also to the idea of knowledge management practices as an enabler of knowledge-based value creation (Andreeva & Kianto, 2012; Inkinen et al., 2015; Kianto et al., 2014). From this point of departure, knowledge management practices may also be seen analogous to the management mechanisms of intellectual capital which refer to the managerial activities that organizations use to control their intellectual resources (Kianto et al., 2014). However, a subtle difference between knowledge management practices and intellectual capital management has been brought out. In this regard, knowledge management practices focus more on the identification and control of intellectual capital, while intellectual

management approaches usually stress the identification and reporting of intellectual capital (Inkinen, 2016a, p. 30).

A perspective labeled knowledge governance approach may also be considered similar to the concept of knowledge management practices. This approach stresses as a point of departure that the knowledge processes of an organization may be influenced by the governance mechanisms related especially to the formal aspects of organization that can be manipulated by management (Foss, 2007). These formal mechanisms include, for example, different kind of HRM practices, information systems and other coordination mechanisms (Foss, 2007). Knowledge management practices has also been included into the concepts of knowledge management enablers and the critical success factors of knowledge management. For example, based on the analysis of knowledge management frameworks, Heisig (2009) identifies human-oriented factors organizational aspects, information technology and management processes as the main dimensions of the success factors of knowledge management. Within this categorization the human-orient factors include culture, people, and leadership, while organizational aspects consist of processes and structures, and management processes includes sub-categories of strategy and control.

Inkinen et al. (2015) contribute the holistic view on the knowledge management practices by introducing a comprehensive categorization of knowledge management practices. This categorization has ten main categories: supervisory work, knowledge protection, strategic management of knowledge and competence, learning mechanisms, information technology practices, work organizing, and four dimensions of human resource management practices, including recruiting, training and development, performance appraisal, and compensation practices (Table 2).

Table 2. The categorization of knowledge management practices (Inkinen et al., 2015; Inkinen, 2016a, p. 30-33)

Category	Description and examples
Supervisory work	Example-setting and visions by leaders, establishing a trustful and respectful environment
Strategic KM	Identifying strategic knowledge, measuring strategic knowledge resources, development of a KM strategy
Knowledge protection	Protection of the strategically valuable knowledge resources
Learning mechanisms	Mentoring programs, collection and utilization of best practices
IT practices	Utilization of IT-tools (e.g. intranet, electronic document and records management, virtual conferencing, and business intelligence tools) to leverage knowledge resources
Work organizing	Organizational design, facilitating the leverage of knowledge resources through coordination of work and division of responsibilities
Recruiting	Knowledge-based recruiting focusing on the candidate's relevant expertise, learning and development potential, and social skills.
Training and development	Pro-active planning and implementation of courses, seminars, and training programs
Performance appraisals	Knowledge-based performance appraisal focusing on how an employee has performed regarding knowledge sharing, knowledge creation and application of knowledge acquired from others
Compensation practices	Compensating employees for their activity in knowledge sharing, creation, and utilization

2.6   Knowledge resources

An essential question in the context of knowledge management regards the nature of knowledge as a resource of value creation. At least two streams of management literature have been identified in this regard: the one with epistemological approach and the other discussing knowledge as an organizational asset that has to be managed to improve organizational performance (Marr et al., 2004).

The "knowledge hierarchy" provides an often-quoted perspective to knowledge by defining a hierarchical view on data, information, knowledge and wisdom. While data is considered raw symbols representing properties of objects without any clear meaning, relevance or purpose as such, information is inferred from data as the data is endowed with meaning, for example, by giving a context or structure for the data. Knowledge, in turn, may be regarded as interpreted information enriched by experiences, values, and contextual information. Wisdom represents the highest level of the hierarchy referring, in general, to evaluated understanding. (e.g. Davenport & Prusak, 1998, p. 2-6; Rowley, 2007.)

Another profound perspective to knowledge is provided by the categorization of explicit and tacit knowledge. Explicit knowledge refers to knowledge that can be expressed in formal and systematic language and shared, for example, in forms such as data, specifications, and manuals. Explicit data is also relatively easily processed, transmitted, and stored. Tacit knowledge is personal and hard to formalize and it is also deeply rooted in action, procedures and routines. An important notion in this regard is also that tacit knowledge is difficult to communicate and share to others. (e.g. Nonaka et al., 2000.) This distinction is found also critical for the premise of knowledge-based view since these two types on knowledge differs in how they can be utilized in knowledge-based value creation within organizations (Grant, 1996). Furthermore, the distinction may be held substantial for understanding dynamic knowledge creation in organizations (Nonaka, 1991).

In addition to these perspectives, several different approaches to knowledge has been introduced. For instance, Alavi and Leidner (2001) distinguish the perspectives of knowledge as a state of mind, knowledge as an object, knowledge as a process, knowledge as a condition of having access to information, and knowledge as a capability. What is important here is that these different knowledge perspectives have also different implications to the management of knowledge (Table 3). Alavi and Leidner (2001) state, for example, that if knowledge is perceived as an object or access to information it the focus is on building and managing knowledge stocks, whereas the perspective of knowledge as a process leads to managing knowledge flows and knowledge processes. This notion reflects also, to some extent, the forementioned division of different knowledge management approaches and paradigms, and knowledge management strategies (see also C. Lee et al., 2012).

Table 3. Knowledge perspectives and their implications for KM (Alavi & Leidner, 2001, p. 111)

Perspective	Description	Implications for knowledge management
Knowledge vis-a-vis data and information	Data is facts, raw numbers. Information is processed/interpreted data. Knowledge is personalized information.	KM focuses on exposing individuals to potentially useful information and facilitating assimilation of information
State of mind (State of knowing and understanding)	Knowledge is the state of knowing and understanding.	KM involves enhancing individual's learning and understanding through provision of information
Object (object to be stored and manipulated)	Knowledge is an object to be stored and manipulated.	Key KM issue is building and managing knowledge stocks
Process	Knowledge is a process of applying expertise.	KM focus is on knowledge flows and the process of creation, sharing, and distributing knowledge
Access to information	Knowledge is a condition of access to information.	KM focus is organized access to and retrieval of content
Capability	Knowledge is the potential to influence action.	KM is about building core competencies and understanding strategic know-how

In order to grasp the central aspects of knowledge management it is necessary to refer to the concept of intellectual capital. This is important for the purposes of this study also because intellectual capital research forms a significant stream of research within knowledge management. Although in some occasions knowledge management and intellectual capital research is treated as separate fields of studies, these two areas can be described as intertwined perspectives to knowledge-intensive organizations (Garcia-Perez et al., 2020; Hussinki, Ritala et al., 2017; Kianto et al., 2014). In general, the relationship between intellectual capital and knowledge management can be described arguing that intellectual capital is about intangible assets that forms the basis for organization's value creation whereas knowledge management regards the development and utilization of those assets (Kianto ym., 2014). This definition relates also to the distinction of static and dynamic view of

intellectual capital. The static view of intellectual capital refers to the view that understands knowledge assets as capital in given point of time. The dynamic view, in turn, stresses the management of these intangible resources and focuses on the managerial activities dealing with the knowledge assets and knowledge-based value creation. What is also emphasized by this distinction, is that, while possessing intangible resources is central to value creation potential, it is necessary to have appropriate managerial means in place to enable value creation based on these resources. (Kianto, 2007; Kianto et al., 2014.)

The interaction between intellectual capital assets and knowledge management practices in value creation may be framed as different kind of possible relationships. For example, Kianto et al. (2014) present a set of different possible relationships for the variables of intellectual capital, knowledge management practices and organizational performance. However, they suggest that from the intuitive perspective the most reasonable option would be the relationship model where knowledge management practices moderate the effect of intellectual capital assets on organizational performance.

Intellectual capital is often divided into three main categories (Figure 4): human capital, relational capital and structural capital (e.g. Bontis, 1998; Roos & Roos, 1997; Stewart, 1997).
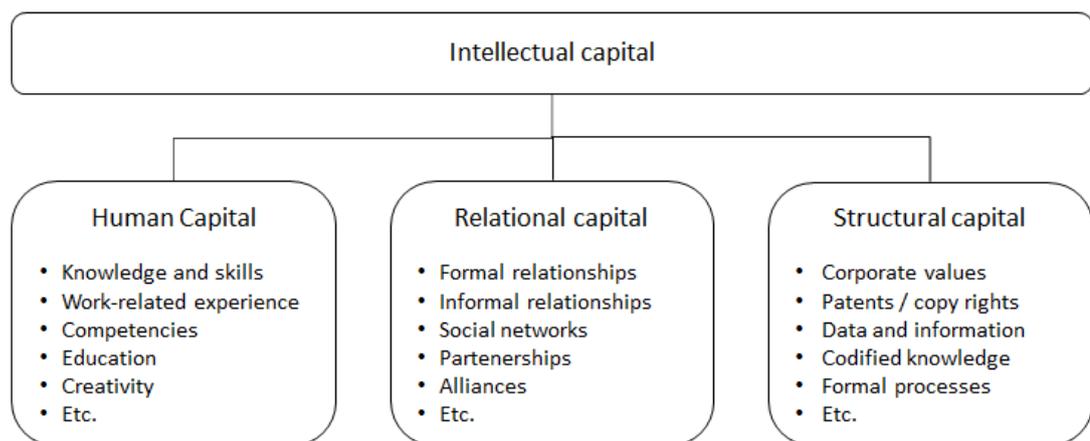
Figure 4. Classification of intellectual capital (adapted from Marr, 2008, 5)

Within this categorization human capital consists of intangible assets embodied in individuals, such as, expertise of employees, attitudes, and know-how. Relational capital covers

the resources that include, for example, relations to the customers and suppliers, networks and alliances, and the knowledge embedded in these relationships. Structural capital, in turn, refers especially to the non-human resources which typically are considered as a capital owned by the organization. These types of resources are, for instance, information systems, processes and intellectual property rights. (Marr et al., 2004; Roos & Roos, 1997; Stewart, 1997, p. 76-77.)

3. FORESIGHT

Since the purpose of this study is to examine the representation of knowledge management approach in foresight studies, the framework of this study is defined also by outlining the research area of foresight besides the conceptual elaboration regarding knowledge management. Based on the foresight literature, the central perspectives and concepts of foresight are discussed in the following. After this elaboration, a general description of foresight research is provided in the end of this chapter.

3.1 Foresight – concepts and approaches

In general, foresight may be understood as a systematic effort to understand the future by applying the futures and foresight practices (Gordon et al., 2020; Iden et al., 2017; Kuosa, 2011, p. 5). The central objective of foresight is to identify and interpret emerging changes and response to these changes. In this sense, foresight is defined by a dual purpose consisting of the observation of the drivers that induce future changes and determining responses and solutions to these changes (Gordon et al., 2020; Iden et al., 2017). Foresight should also be differentiated from predictive foreseeing or producing exact forecasts for the future contingencies. The concept of foresight entails the idea of preparedness and prudence and also the objective to understand the drivers changing the future. Furthermore, the nature of foresight is depicted by the notion that foresight activities is often integrated into policy making and strategic planning on different levels. (Kuosa, 2011, p. 6; Martin, 2010; Miles, 2010; Slaughter, 1995, p. 47-51.) The idea of alternative futures has also been integrated into the concept of foresight instead of providing only the most likely scenario of the future (Kuosa, 2011, p. 6; Martin, 2010). In addition to these descriptions, foresight has been seen characterized by interactive and participatory elements. These elements are manifested in dialogues aspects that commit stakeholders to foresight process (Kuosa, 2011, p. 9).

Foresight may be used in various contexts with different scopes and objectives. Foresight has been used as an analytical tool, for example, in public policy making in national and regional contexts, in organizational contexts, and in the context of science and technology (e.g. Dufva et al., 2015; Kuosa, 2011, p. 137-184; Martin, 2010; Miles, 2010). From a systemic perspective, foresight can be described as a multi-layered system, where the nature and contributions of foresight activities may be examined on different layers and contexts. Dufva et al. (2015) describe a foresight system consisting of four different ideal layers: landscape, innovation system, organization, and individual. The landscape layer refers to the broader environment that entails the trends and drivers which may often be global by nature. On the level of innovation system the focus is especially on the dynamics and functioning of the system comprising of sub-systems and different actors. In this context foresight may, for instance, support networking, specifying joint actions and ensuring the overall performance of innovation system. On the organization layer foresight focuses on the organizations' capabilities for survival and renewal, and on creating organizational responses to the changes in operational environment. This level is referred often by the terms of corporate foresight or strategic foresight. Finally, on the individual level foresight is involved with individual learning and capability development. On the other hand, individuals are also considered a key to creating change within organization or innovation system. (Dufva et al., 2015.)

Foresight approaches have also been categorized by the ideal types that differ in how futures knowledge is perceived. These categorizations may be understood as a complementary, and to some extent overlapping, perspective to above described categorization of foresight levels. From this perspective, Dufva (2015, p. 23) defines three different approaches, though, the aspects of each approach exist often simultaneously in foresight exercises. Policy-oriented foresight has its focus on providing policy-makers with descriptions of alternative futures and giving recommendations for actions to be taken in order to reach the desirable future. Capacity building foresight, in turn, focuses usually on organizational or regional level with the objective to anticipate future developments and building capacity to respond to them. Transformative foresight stresses the shaping of the future and the facilitation of change instead of only describing the alternative futures. This approach has

also a strong emphasis on the empowerment of participants and, on the other hand, un-covering the values and assumptions of different stakeholders. (Dufva, 2015, p. 23.)

3.2   Foresight process and methods

Foresight activities can be outlined as a process consisting of different phases. Horton (1999) divides foresight process into three phases where each of them adds value to the process until the value is realized at the end of the process (Figure 5).
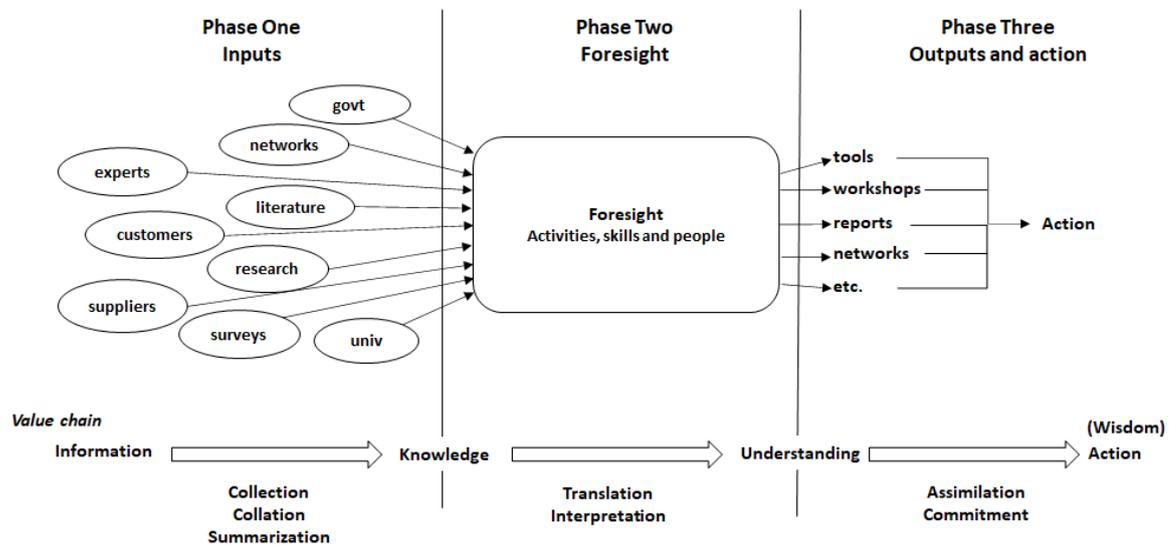
Figure 5. A successful foresight process (Horton, 1999)

The first phase, called inputs, starts with the collection of information where information, such as information on early signs or future trends, is collected from a wide range of sources. The methods used in this phase includes for example Delphi-surveys, brainstorm-ing sessions and environmental scanning. This is followed by the collation of collected in-formation conducted to produce a structure and form to the information and to ignore irrelevant information. After this, the information is summarized by using methods such as scenario building, graphical comparisons and cross impact analysis. The second phase in-cludes the translation and interpretation of collected information. The information

summarized in the first phase is translated into a language that is understood by the organization. This kind of translation is needed, for example, when the collected information is in technical or economic or legal language. The interpretation of translated knowledge is considered forming the core of the foresight process. In this step the knowledge refined in the previous phases is converted into understanding by using, for example, road maps and scenarios. Horton states that this interpretation is "all about teasing out the implications of the various possible future views for a particular organization". A successful interpretation provides strategies and actions which can be implemented in order to response the future changes and the possible futures revealed in the process. The third phase of the process consists of assimilation and commitment. In this phase, the understanding created in previous phase is assimilated and converted to action. (Horton, 1999, p. 6-8.) Although there is a variety of other process models describing the foresight activity (e.g. Kuosa, 2011; Voros, 2003) that might be considered to enriching the process description provided above, the depicted process model may be taken as a sufficient point of reference for this study. Indeed, what is noteworthy from the perspective of this study, is the way that the presented process model describes the flow and refinement of knowledge within the process.

3.3   Strategic foresight in organizations

Foresight conducted in the context of organizations may be considered central area for this study due to the strong emphasis of organizational perspective in knowledge management. This level of foresight activities is often referred with the concepts of strategic foresight, corporate foresight and organizational foresight, also using these concepts more or less interchangeably (Gordon et al., 2020; Iden et al., 2017; Kuosa, 2011, s. 51). Following this view, these three terms are used interchangeably also in this study.

Iden et al. (2017) defines strategic foresight as an effort to understand the future and application of that understanding to the strategic activities and decision-making in organizations. Respectively, Kuosa (2011, p. 54) describes strategic foresight as a process that advances a person's or organization's ability to understand emerging phenomena that are linked to alternative decisions and, based on that understanding, enables to make better

informed decisions regarding long-term objectives. This study follows the definition provided by Gordon et al. (2020, p. 1-2) which describes organizational foresight and corporate foresight as "identifying, observing, and interpreting factors that induce change, determining possible organization-specific implications, and triggering appropriate organizational responses" In this definition foresight is used to refer all forms of organizations including for-profit, non-profit and wide-purpose organizations. Thus, corporate foresight and organizational foresight refer generally to the internal foresight of an organization by which it strives to fulfill its purpose and achieve success. (Gordon et al., 2020.)

One way to shed light on the strategic foresight in organizations is to describe the elements of foresight capability. For example, a model developed by Rohrbeck (see Rohrbeck et al., 2015, p. 4-5.) includes five dimensions that each focuses on different questions regarding the organizational foresight capability: "1.) Information usage: how does a firm sense and absorb data? 2.) Method sophistication: how are methods used to interpret data? 3.) People and networks: how data is translated through informal means into actionable insights? 4) Organization: how is data translated through formal mechanisms such as processes into actionable insights? 5.) Culture: how do aspects of organizational culture promote or prevent the translation from data into actionable insights?"

3.4 Foresight research

In general, foresight research reflects the diversity of perspectives, levels and modes of foresight activities conducted in practical settings. The practice of foresight and the foresight literature have broadened to cover several themes and conceptual approaches as the field has evolved (e.g. Dufva et al., 2015). There have been also some efforts to develop a comprehensive view on the foresight research. For example, Lu et al. (2016) use the term "broad foresight" to refer to all the terms that are relevant to foresight and identify six different research groups under this label. Rohrbeck et al. (2015) differentiate two streams of research, one focusing on the policy advising measures and processes on national level and the other, labelled as corporate foresight, dealing with the strategic foresight in organizational contexts. More specifically they identified three main groups within foresight

research. The first group, corporate foresight, includes studies dealing with strategic foresight in organizations. Second group is labeled as strategic foresight for policy making and it is often dealing with informing the science, technology and innovation policies. The third identified group includes general articles dealing with methods or processes that can be applied in both domains. (Rohrbeck et al., 2015.) Although there are some general descriptions and reviews on foresight research, one may consider that there is still a need for an in-depth analysis on this field of research.

A major stream of research under the broader scope of foresight research has been dealing with the issues related to strategic foresight in organizations. This stream of research has had rapid growth which have also resulted some challenges. The development of the research stream has been characterized by ambiguous terminologies, the weakly organized academic field and weak linkage to debates in general management journals. (Rohrbeck et al., 2015.) In general, a recent trend in corporate foresight research has been focusing increasingly on ways to create an integrated corporate foresight practice (Gordon et al., 2020; Rohrbeck et al., 2015). More specifically, Rohrbeck et al. (2015) identify four main themes within the current corporate foresight research. The largest thematic group consists of studies that examines the organization of corporate foresight with the objective to provide normative recommendations on how corporate foresight should be organized. The second group includes studies focusing on individual and collective cognition for corporate foresight. The academic discussion within this theme has its roots in environmental scanning literature but the focus has moved from sensing phase to the sense-making phase of corporate foresight. The third group of research is considered an emerging theme that has its focus on corporate foresight in networked organizations. Finally, the fourth identified category, labeled as an emergent category as well, includes studies focusing on quantifying the contribution of corporate foresight, for example, in the light of organization's performance. (Rohrbeck et al., 2015.) Besides these thematic categories, other recently studied central themes in this research area have been dealing with, for instance, questions of strategic advantage and the roles of corporate foresight in creating innovation capability (Gordon et al., 2020).

In their review article Iden et al. (2017) provide another comprehensive view on the research of strategic foresight in organizations. They differentiate three subject categories of research: adoption, approach, and outcome. The questions related to the methods of foresight were identified as the most popular theme of the approach-category and as well within the whole research area. Other frequently studied topics within these three wider categories were, for example, organization of strategic foresight and experiences in the context of critical success factors. Some interesting notions were made also regarding the theoretical frameworks used in the research articles. The majority of the reviewed articles (42 %) was lacking a specific theoretical foundation while 25 % of the articles was applying strategic thinking and theory, including strategic management, strategic flexibility, strategic planning, strategic conversations, and dynamic capability theory. Other identified theoretical frameworks used in the studies were, for instance, from the areas of organizational theories and innovation management. (Iden et al., 2017.) As regards these results, especially the finding concerning the theoretical frameworks used in the research articles has relevance to this study. For example, the use of the dynamic capability theory as a theoretical framework suggests at least some kind of occurrence of knowledge management related issues in foresight research.

4. REASEARCH APPROACH

4.1 Systematic literature review as a method

The research approach and methods applied in this study are defined based on the central objectives of the study. Since the main purpose of this study is to examine how the knowledge management approach is represented in the foresight research, it is conducted as a systematic literature review. In general, literature review is about selecting and studying available literature on a particular topic to provide a comprehensive understanding on the nature of the topic and how it has been investigated (Aveyard, 2014, p. 2; Hart, 1998, p. 13). The importance of the literature review as a method and inherent part of scientific research lies in its ability to facilitate the analysis and synthesis of research on a particular topic (Aveyard, 2014, p. 10). Literature review may also be understood as a tool for manging the diversity of knowledge, mapping and assessing the existing research literature on particular topic and providing research questions in order to develop the existing body of knowledge (Tranfield et al., 2003).

What characterizes specifically systematic literature review, is the objective to identify comprehensively all the available literature relevant to a particular topic by a replicable and transparent process that aims to minimize any kind of unwanted bias (Aveyard, 2014, p. 10; Tranfield et al., 2003). Systematic literature review has been described by the features such as the use of strict protocol to ensure systematic review process, predefined questions, and comprehensive search strategy that ensures the comprehensiveness of the process. Furthermore, the formulation and use of inclusion and exclusion criteria define the methodological nature of systematic literature review. These criteria enable to assess the relevance of literature for a particular topic and ensures that only the relevant literature is included in review. This will also serve the objective to ensure the quality and validity of the selected literature. (Aveyard, 2014, p. 10-11.)

4.2 Literature search and selection process

As stated above, a pre-defined search strategy and clear and transparent search process form the basis of systematic literature review. These requirements were fulfilled in this study by defining the main phases for the search and selection process, as well as the inclusion and exclusion criteria for the literature. The literature selection process was conducted by utilizing the process model used by Inkinen (2016b). The process divided into seven different phases as described below (Figure 6). Before the actual selection process, the data base utilized in the literature search was defined. The Scopus database was selected to be used especially due to the notion that it is considered offering a wide range of academic journals and being capable of accurate keyword searches (Falagas et al., 2008).
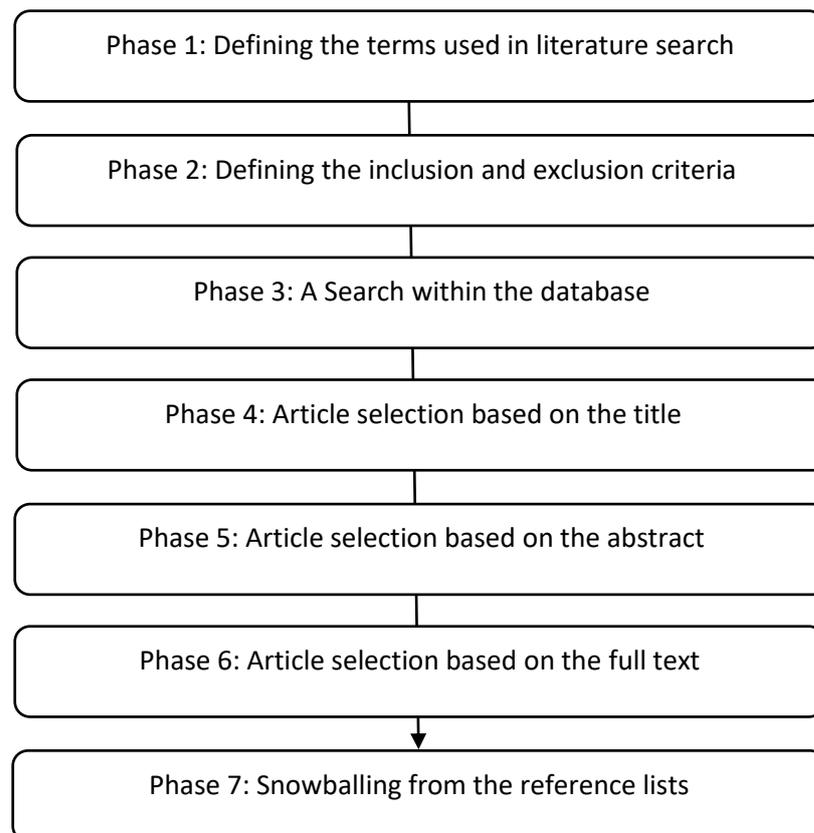
Figure 6. The literature search and selection process

Phase 1: Defining the terms used in literature search. The main driver in defining the search terms of literature search was the objective to reach a wide coverage of possible terms referring to the central aspects of knowledge management. Although the basic elements of knowledge management have been accepted widely, the terms used to refer to these elements vary, especially regarding the knowledge processes (Heisig, 2009). From this point of departure, a wide range of key terms related to basic elements of knowledge management was identified to be used in the search. Besides the core concepts of knowledge management – related to knowledge processes, KM practices and knowledge resources – the set of search terms was supplemented with the terms of dynamic capability, absorptive capability and organizational learning. Regarding foresight, the generic terms of "foresight", "strategic foresight", "corporate foresight", "organizational foresight" were used to direct the scope to foresight research. The following key terms and their alternatives were used in the literature search (table 4).

Table 4. The search terms used in the study

Key term	Alternative terms
Foresight	Strategic foresight, Corporate foresight, Organizational foresight
Knowledge management	-
Knowledge management practices	-
Knowledge activities	-
Knowledge processes	-
Knowledge creation	Knowledge development
Knowledge sharing	Knowledge transfer, Knowledge distribution
Knowledge storage	Knowledge retention, Knowledge capture, Knowledge codification
Knowledge application	Knowledge use, Knowledge utilization
Knowledge identification	-
Knowledge acquisition	Knowledge adoption
Intellectual capital	Intangible resources
Organizational learning	-
Dynamic capabilities	-
Absorptive capacity	-

Phase 2: Defining the inclusion and exclusion criteria. The definition of inclusion and exclusion criteria was made in order to increase the validity of the literature search and the analysis based on the literature selection. First, only peer-reviewed journals articles were included to ensure the scientific quality of the analyzed literature. This meant that for example conference proceedings and book chapters were excluded from the final selection.

The relevance of the selected literature was also ensured by including only the articles dealing with both foresight and knowledge management. This was found essential, since only the articles dealing with both of the key areas provide relevant literature for the study. These criteria meant concretely that the articles had to be connected clearly to the research area of foresight by focusing on foresight, and besides on this, they had to operate with at least some of the conceptual elements of knowledge management defined in the framework of this study. The use of these criteria meant that discussion of the key concepts defined in the framework was required of the articles. Consequently, some of the articles were opted out since they did not operate explicitly with the knowledge management related theories even if they might have had some kind of connection to the theoretical perspectives and themes of knowledge management at general level.

Finally, only articles written in English were included to add the transparency and to enable comprehensiveness of the literature. The inclusion criteria are summed up in the table 5. These criteria were supplemented with the exclusion criteria (Table 6) to ensure that the selected studies were relevant, available and in full-length.

Table 5. The inclusion criteria used in literature selection

Criteria	Reason for inclusion
Peer-reviewed journal articles	Ensures the necessary quality of the relevant literature
Articles written in English	Adds transparency of the review, enables the thorough comprehension of the literature
Articles about foresight	Ensures the inclusion of articles relevant to the research questions
Articles about knowledge management	Ensures the inclusion of articles relevant to the research questions

Table 6. The exclusion criteria used in literature selection

Criteria	Reason for exclusion
Articles don't not explicitly discuss with the key concepts defined in the framework despite of referring implicitly to some of the key concepts.	Articles don't have required relevance for the research question.
Not full-length peer-reviewed journal articles / full text is not available	Articles don't meet the scientific quality standards

Phase 3: A Search within the database. The initial search was conducted in April 2021. To find the relevant articles the actual search string was developed based on all of the search terms identified in table 4. The search string was built by using OR and AND operators so that search would cover the articles connected to some of the foresight related search terms and some of the knowledge management search terms. The search string was targeted to article titles, abstracts and keywords. The search was not limited to any specific subject area to ensure the full coverage of relevant articles. At this phase the articles that were not published in academic journals (e.g. conference proceedings and book chapters) were also excluded. This phase resulted 119 potentially relevant articles.

Phase 4: Article selection based on the title. At this phase of the selection process the articles were screened by title. The articles that was clearly unsuitable for the inclusion criteria were excluded from the further phases. After this phase the number of potential articles was 107.

Phase 5: Article selection based on the abstract. At this phase the remaining articles were explored and selected to further phases based on the abstracts. This phase enabled limit the selection to articles based on a more detailed information on the central content of the articles. After this phase 53 articles were remaining.

Phase 6: Article selection based on the full text. After qualifying potential articles based on the abstracts the full text was read carefully and assessed against the inclusion criteria and the framework and research questions of the study. The final selection based on the full texts was in some of the cases challenging due to the diverging use of the theoretical concepts identified in the framework. This was especially the case with some knowledge

management related concepts and theories, such as dynamic capabilities, as some of the studies used the concept only as a minor citation while other studies were building the whole research model on the theories in question. Regarding the challenging cases the significance of a particular theory or concept was evaluated in relation to the content of the study and based on that the article was either included in or excluded from the final selection. After this phase the number of articles was reduced to 24.

Phase 7: Snowballing from the reference lists. The final phase focused on identifying potentially relevant articles based on the reference list of the selected articles. This examination produced four articles raising the final number of included articles to 28.

Analysis of the selected research literature. In order to answer the research questions an in-depth analysis of the selected literature was conducted. For answering the first sub-question the studies were categorized based on the addressed knowledge management theory and subject area. Thus, this part of analysis based on the identification of applied theories and the coding of studies based on this. The coding strategies and the applied analytical approaches are described in detail as reporting the results of the analysis. Regarding the second sub-question, the focus was on an analytical elaboration of the selected articles.

5. RESULTS

In this chapter the focus is on the central findings of the review and analysis of the selected literature. The findings are reported in the following aiming at providing answers for the posed research questions. In the first sub-section the findings are reported primarily against to the question regarding what theoretical perspectives related to knowledge management are represented in foresight studies. The second sub-section is focusing on describing how knowledge management related theoretical concepts are used in the reviewed studies, covering thus the second research sub-question.

5.1   Descriptive findings

In order to provide answers to the first research question, an overview on the foresight research coupled with knowledge management approach is provided in the following. At first, this overview focuses on the general information on the publications exploring how the reviewed studies are distributed by the year of publication and source. In addition, a summary of the methods used in the studies is provided. Furthermore, this overview focuses on the type of foresight research represented in the studies and the role and coverage of knowledge management related background theories used in the studies. By this examination the purpose is to provide a general description of how knowledge management approach is represented in the reviewed studies. A comprehensive list of the articles and a summary of this part of analysis are provided in appendix 1.

5.1.1   General description of the reviewed studies

The literature search and selection process produced a shortlist of 28 articles. All of the selected studies were published after the year 2000, and majority of them between 2010

and 2020. This reflects the novelty of the research theme and, on the other hand, is in line with the fact that knowledge management is a relatively young research area (Serenko, 2013; Serenko & Dumay, 2015). The distribution of publication years reflects also the notion that the linkage between these two research areas has been getting stronger during the recent 20 years (Bootz et al., 2019b). The number of publications by year of publication is described in figure 7.
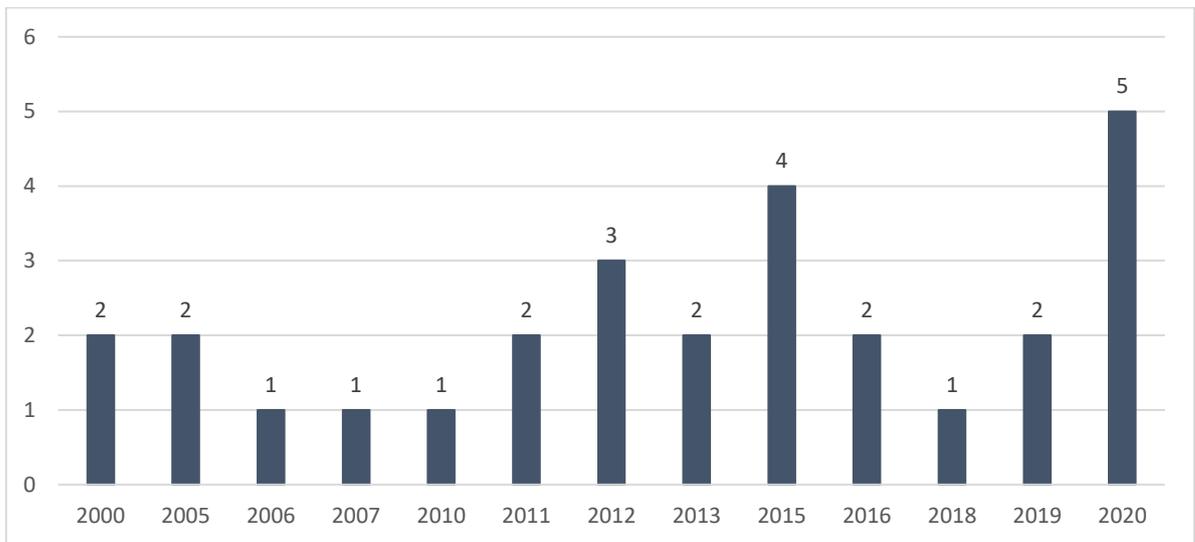
Figure 7. The number of publications per year

When examining the number of publications by journals, the dominance of Technological Forecasting and Strategic management is clear. In general, the majority of the selected studies is published in the publications focused on futures studies and foresight. However, journals specialized in some other fields of study are also represented with few occasions. The overall distribution of studies by scientific journal is depicted in figure 8.
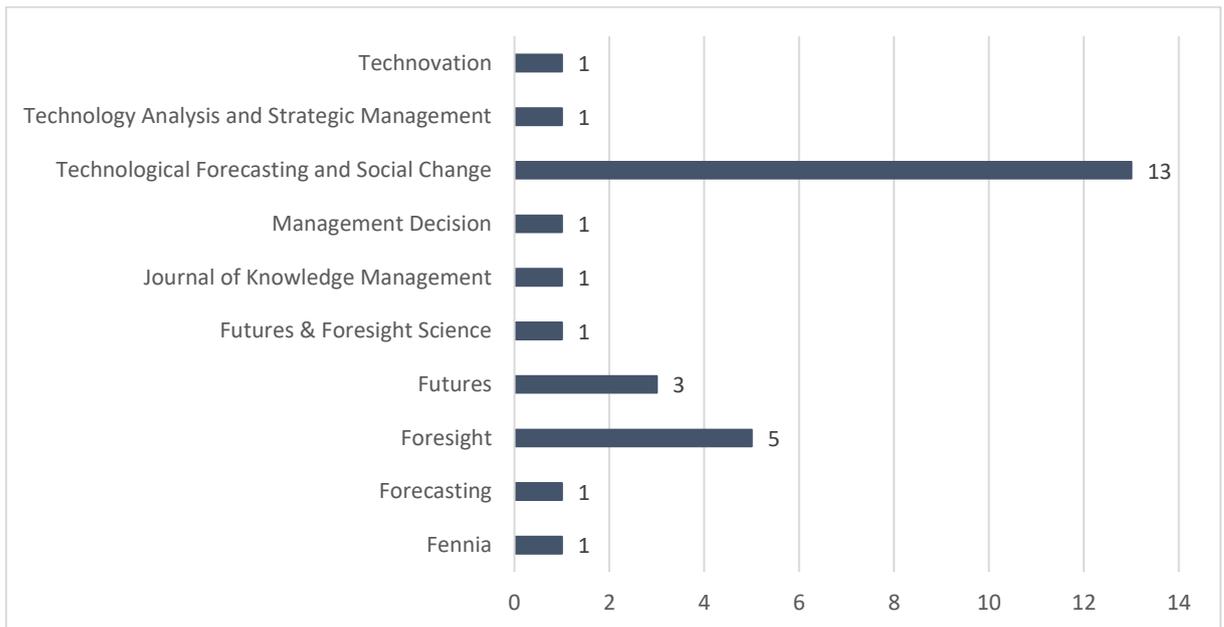
Figure 8. The number of publications by journal

5.1.2 Methods used in the studies

To deepen the understanding on the general features of the selected articles, they were elaborated regarding the methodology used in the studies. Following the literature review conducted by Iden et al. (2017), the studies were first categorized into two main categories: conceptual and empirical, where empirical research includes studies with some form of empirical data collection and analysis and conceptual research is understood as studies that formulate concepts, models and frameworks. Empirical studies were further categorized, in this case, into the sub-categories of survey, interviews, case study and other qualitative. Four of the empirical studies were utilizing methods from two sub-categories, so in these cases the study was categorized into both categories. Most of the articles (68 %) were based on the empirical study, and in this category case study was the most frequently applied research approach. The overall results are summarized in table 7.

Table 7. Research design applied in the studies

Research design	Number of publications
Conceptual	9

Empirical
    • Survey
    • Interviews
    • Case study
    • Other qualitative
 	
Four of the empirical studies are included in two of the sub-categories
	19
	8
	5
	9
	1

5.1.3 Research area within foresight research

The selected studies were analyzed and categorized based on the stream of research that they are representing within the research area of foresight. The categorization formed by Rohrbeck et al. (2015) was used here as a point of departure. This categorization is consisted of three categories: "Corporate foresight" refers to studies that discuss strategic foresight in organizations. "Strategic foresight for policy making" includes studies that are typically dealing with informing the science, technology and innovation policies. "General articles" covers the studies that are, for example, dealing with the methods or processes and could be applied in both of the previous domains. While the knowledge management related issues addressed in these studies could be almost entirely applied in both organizational settings and policy-making context, the studies were included in the category of general articles only if they frame the foresight related issues in a way that support this kind of categorization. The overall distribution of the studies is shown in figure 9.
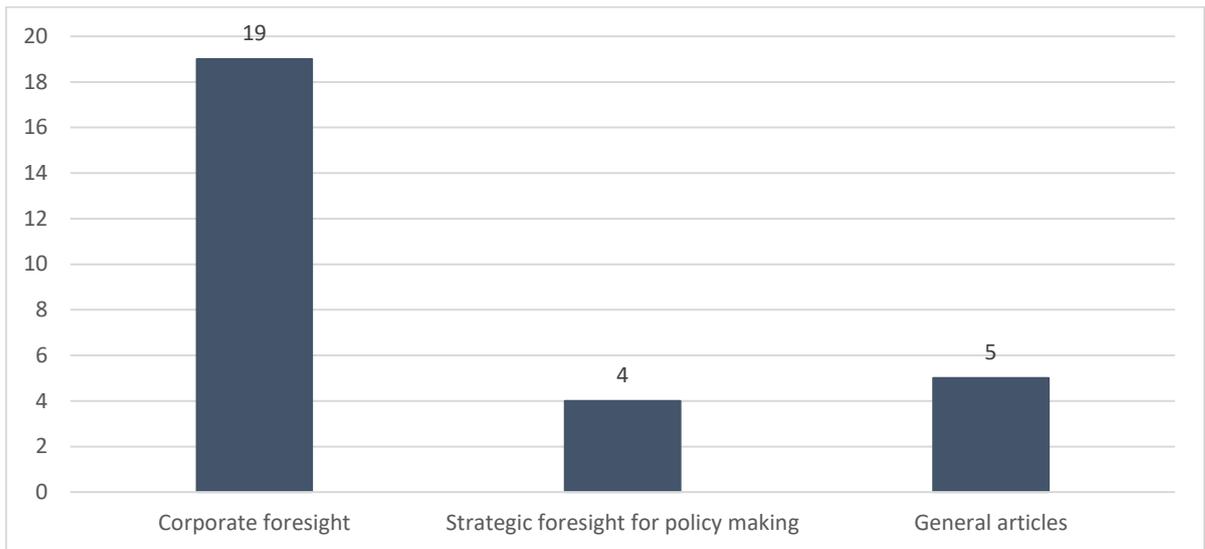
Figure 9. Type of foresight research represented in reviewed studies

Corporate foresight was turned out to be most frequently studied area within the reviewed articles. Altogether 19 articles were included in this category. These articles were dealing with, for example, acquiring and utilizing futures knowledge in organizational processes (Pouru et al., 2019), value creation of corporate foresight (Rohrbeck, 2012; Rohrbeck & Schwarz, 2013) or the impact of foresight on organizational learning (Bootz, 2010; Bootz et al., 2019a). Four articles were included under the category "strategic foresight for policy making". These articles were discussing, for instance, absorptive capacity of future oriented knowledge in regional innovation networks (Uotila et al., 2006) and knowledge translation in the context of national foresight programmes (Major & Cordey-Hayes, 2000b). Finally, five of the articles were labelled as "general articles". The research themes among these articles were concerning, for example, knowledge creation in foresight context (Dufva & Ahlqvist, 2015) and knowledge sharing and knowledge creation in expert teams working with foresight (Karlsen & Karlsen, 2007)

5.1.4 The role of knowledge management related theories

To investigate how the relationship between foresight and knowledge management has been studied, the articles were categorized by the use of knowledge management related theories. The analysis was conducted following the example of Roberts et al. (2012). The three categories in this respect were "Provides theoretical support", "Used in a hypothesis, proposition, or the research model" and "Forms the theoretical base for the article". The fourth category used by Roberts et al. (2012) "Referenced as a background or minor citation" was excluded as redundant since the studies in this category was already ruled out in the literature selection process as they did not have relevance for the study. The number of publications in each of these categories is summarized in figure 10.

Figure 10. The role of knowledge management related theories

The category "Provides theoretical support" covers the articles that use the theory in question to develop the logic for th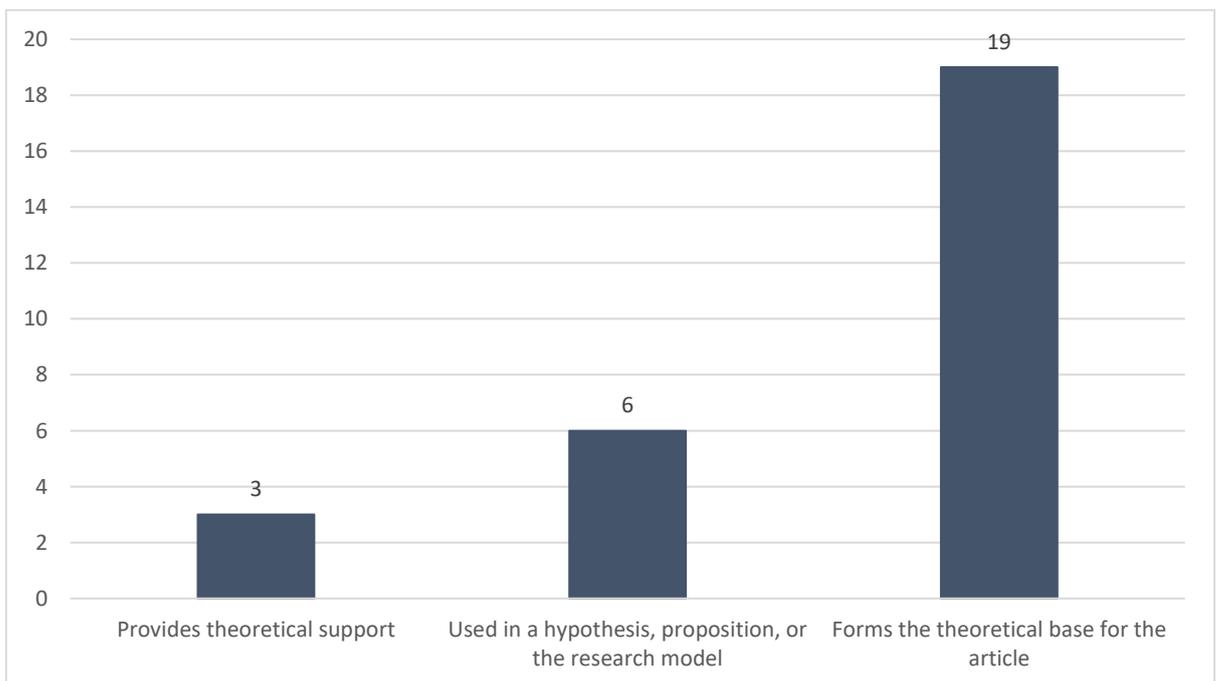e propositions or hypothesis presented in the article (Roberts et al., 2012). Three of the articles were labeled to represent this type of use of theories. For

instance, Vecchiatio (2012) fell into this category as the concept of dynamic capabilities is mainly used to discuss the results of the study. Another example is a study of Rohrbeck and Gemünden (2011) where dynamic capability theory has a role in framing the actual subject of the study. Articles in the category "Used in a hypothesis, proposition, or the research model" use explicitly the theory in question in a proposition or hypothesis or in the research model (Roberts et al., 2012). Six of the reviewed studies were included in this category. For example, Yoon et al. (2018) present hypothesis on the positive impact of foresight on organizational learning while studying the relationship between foresight and innovativeness.

The third category "Forms the theoretical base for the article" was used for the articles that use the theory in question to motivate entire study. The prominent characteristic of these studies is that without the use of the particular theory they would be significantly different or would not exist (Roberts et al., 2012). A clear majority of reviewed articles (19 articles) represents this category. These articles were profoundly built on the knowledge management related theories that are represented in the framework of this study. For instance, Dufva and Ahlqvist (2015), Uotila et al. (2005) and Karlsen and Karlsen (2007) use the dynamic knowledge creation theory (SECI-model) as a very central element of their frameworks and a point of departure for the study as a whole. Similarly, Haarhaus and Liening (2020), Ramírez et al. (2013), Schwartz et al. (2020) and Semke and Tiberius (2020) base their study strongly on the dynamic capability theory.

5.1.5 Coverage of knowledge management related theories and subject areas

As to the first research question, the analysis concerned especially what knowledge management related theoretical elements and subject areas are addressed in the reviewed studies. This elaboration was conducted against the framework depicted in chapter 1.5 and further discussed in chapter 2 and 3. Thus, the task at this point was to identify the theory or conceptual construct used in the studies and categorize the studies based on that. The categorization was primarily unproblematic but in some cases the studies utilized more

than just a single theory. More specifically, one study fell into two categories and one into three categories, as the theories and subjects were evenly represented in the studies.

The reviewed articles were sorted into following main categories: KM core concepts, absorptive capacity, dynamic capabilities and organizational learning. The category of KM core concepts includes the articles that focus on some of the three constituting elements of knowledge management theory, namely knowledge processes, knowledge resources (ie. intellectual capital) and knowledge management practices. In addition, the articles that utilize general knowledge management frameworks were included in this category. Thus, the research literature in this category is divided into sub-categories according to the specific theoretical element used in the study. The categories of absorptive capacity, dynamic capabilities and organizational learning represent the articles that lean on these theoretical areas. The overall distribution of the main categories is shown in figure 11.
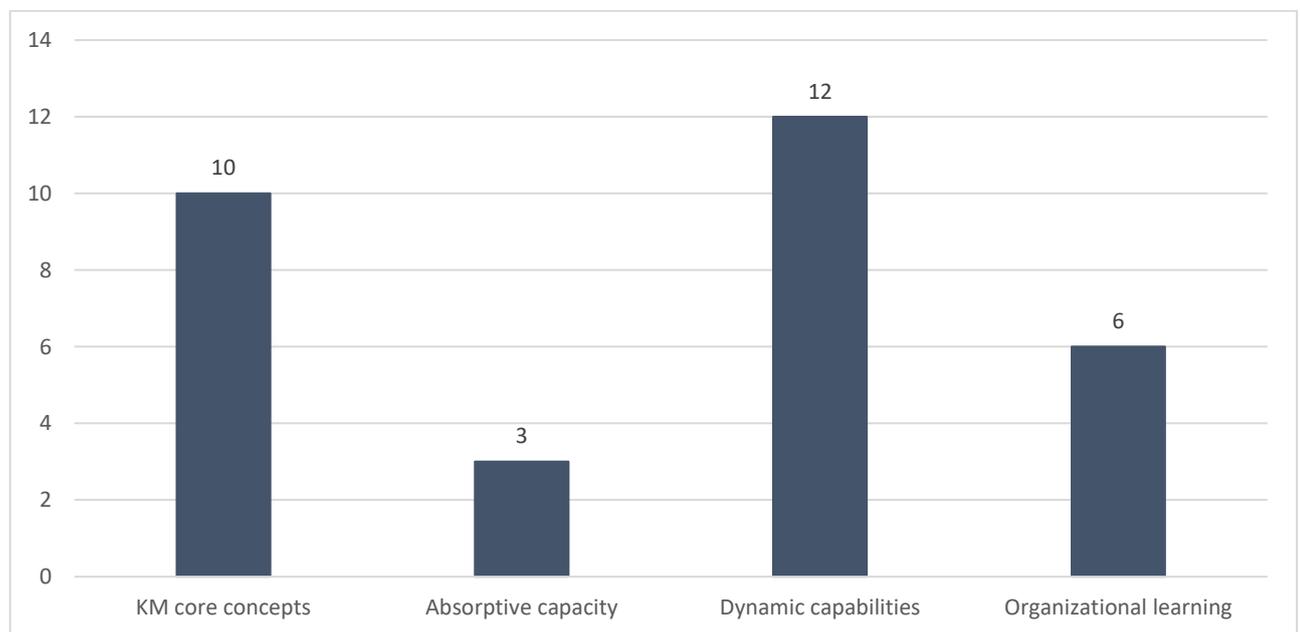

Figure 11. Applied knowledge management related theories

The two most frequently studied main areas were dynamic capabilities and knowledge management core concepts: dynamic capabilities were represented by 12 studies and KM

core concepts by 10 studies. The perspective of organizational learning was represented by 6 studies and absorptive capacity were in the focus of 3 studies.

Within the category of knowledge management core concepts, the most frequently applied theoretical framework was related to knowledge creation. Altogether, four articles had their focus on knowledge creation in foresight context. However, one of these studies was utilizing only partly the concept of knowledge creation and connected the examination also to the areas of organizational learning and dynamic capabilities. Regarding knowledge processes, two of the studies were focusing on knowledge transfer. As some of the perspectives included in the framework of this study, especially absorptive capacity and organizational learning, are understood also as a perspective to knowledge processes, knowledge processes were also discussed in some of the reviewed studies representing these theoretical perspectives. In these cases, the studies were categorized by this broader theoretical perspective (e.g. absorptive capacity). Furthermore, some of the studies were implicitly referring to some of the knowledge processes, however, these cases were not taken into account in the categorization.

Two studies focusing on intellectual capital was also labelled into the main category of knowledge management core concepts. Furthermore, this category includes two studies that are using either general framework of knowledge management or knowledge management systems. A central characteristic of these studies is that they are discussing knowledge management or knowledge management in general without specifying the focus further, for example to knowledge processes. Finally, based on this part of analysis, it turned out that none of the articles was explicitly focusing on knowledge management practices. However, in some cases the studies were referring to practices that may be understood in relation to the concepts of knowledge management practices as well.

5.2 Knowledge management approach in foresight research

In this chapter the use of knowledge management related concepts and theories are described in detail. This description aims at providing a comprehensive understanding on how

the conceptual elements identified in the framework of this study are represented in studies on foresight. Thus, the purpose is to describe the use of the knowledge management related concepts rather than actual results of the reviewed literature, even though in some cases the results are discussed as well. The elaboration in this chapter is divided based on the theoretical elements utilized in the reviewed studies: knowledge management core concepts, organizational learning, absorptive capacity and dynamic capabilities. A summary of the central findings is provided at the end of each thematic section.

5.2.1 The core concepts of knowledge management and foresight

Knowledge management frameworks and foresight

Some of the reviewed studies used the concept of knowledge management or knowledge management system as a central theoretical element instead of any specific knowledge management concept, such as knowledge processes or intellectual capital. Even though these studies were not purely based on knowledge management frameworks, they were distinguished as a separate category of research as they all presented some kind of a general definition on knowledge management as a point of departure.

For instance, Nascimento et. al. (2020) present a conceptual model of the dynamic interactions between strategic foresight, knowledge management and emerging technologies. The definition of knowledge management adopted in the study stresses the management of knowledge creation and knowledge utilization for the long-time benefit of the company. Furthermore, authors depict knowledge acquisition, dissemination and application as central dimension of knowledge management and build on the explicit definitions of these concepts. In this sense, this point of departure stresses the knowledge process view instead of presenting a framework that would also include knowledge management practices. Furthermore, they describe the relation of knowledge management and foresight as a dynamic two-way relationship where both of these activities have influence on each other. In this framework knowledge management is also seen essential for the foresight due to the diversity and complexity of knowledge: knowledge management enables understanding and

applying knowledge in foresight process, and it underpins the decision-making process under strategic foresight. The authors propose that knowledge management influences on foresight also through processes of knowledge acquisition, integration of different knowledge and facilitation of organizational creativity.

Another example of a study that leans explicitly on the knowledge management research tradition is the study of Kaivo-oja (2012) which focuses on the linkage between knowledge management frameworks and weak signal analysis. The author adopts the view that defines knowledge management "as the deliberate design of processes, tools, structures, etc., meant to increase, renew, share, or improve the use of knowledge represented in any of the structural, human and social elements of intellectual capital" (Kaivo-oja, 2012, p. 207). Several knowledge management frameworks and their potential connection to weak signal analysis are discussed in the study. However, in this case the focus is merely on the application of separate theories rather than holistic knowledge management frameworks. Furthermore, some general notions regarding foresight and knowledge management systems are brought out in the study. In this regard, the author leans on the distinction between personalization strategy and codification strategy and uses this distinction as basis for discussing on different tools and methods used in weak signal analysis. For example, weak signal analysis may be based on the use of codified knowledge stored in databases and the use of information technology in deploying the data repositories. Furthermore, the author suggests that weak signal analysis can be based on both the personalization strategy, for example by utilizing virtual communities in defining weak signals. Thus, the approach used in the study depicts knowledge management as a possible enabler of foresight activities.

Knowledge processes and foresight

Part of the reviewed studies focused on knowledge processes that are fundamental in foresight activities. A clearly distinguished stream of research in this regard covers the research that investigates knowledge creation in the context of foresight. The use of tacit-explicit knowledge division and dynamic knowledge creation model (SECI-model) as a central theoretical background and analytical framework is common to these studies. However, some

of the studies use a modified version of the model by adding (Dufva & Ahlqvist, 2015; Uotila et al., 2005) or replacing (Karlsen & Karlsen, 2007) either the modes of knowledge or knowledge conversions used in the model.

In most of these studies the relationship between knowledge management and foresight becomes defined by the view which stresses that foresight may be understood as a mode of knowledge creation. For example, Dufva and Ahlqvist (2015) define knowledge creation as a fundamental element of foresight process and focus their analysis on how knowledge about future is created in foresight process. Their target is especially to investigate the micro-level social dynamics of a foresight workshop and the dynamic of knowledge creation. Even if the article of Kaivo-oja (2012) is considered representing an approach that builds on knowledge management frameworks in general, it connects to the knowledge creation theory by discussing the knowledge matrix and the model of knowledge creation presented by Nonaka and Takeuchi (SECI-model) in the context of weak signal analysis. From this perspective, the author suggests that the weak signals may be understood taking either the form of tacit or explicit knowledge. Furthermore, the author proposes that the modes of knowledge conversions may be seen as a conceptual tool also in the context of weak signals.

A same kind of approach is also represented in the article of Uotila et. al. (2005) which discusses the challenges in incorporating future-oriented knowledge produced in foresight processes to regional and organizational level. By taking the dynamic knowledge creation model (SECI-model) as a starting point, the authors present a revisited model of knowledge creation. They add two forms of knowledge conversion to the initial SECI-model: conversion of self-transcending knowledge to tacit knowledge (visualization) and the conversion of tacit knowledge to self-transcending knowledge (potentialisation). By self-transcending knowledge they refer to the tacit knowledge that has not yet been embodied. The knowledge creation context for the first-mentioned process is called "imagination ba" and for the second process "futurising ba". The authors point out that different type of futures knowledge may be seen central in conversion process of visualization (from self-transcending to tacit) and the conversion context of "imagination ba". Furthermore, they exemplify this by describing how scenario work and delphi-method may be deployed in visualsation.

The authors suggest that these two foresight methods can be utilized also in potentialisation and futurising ba.

The intertwined nature of knowledge creation and foresight is depicted also in Vecchiato's (2015) study on the relationship between foresight and strategic agility. In this regard the main notion concerns the knowledge creation theory by Nonaka and Takeuchi (1995) and the concepts of organizational memory and "memory of the future". By memory of the future the author refers to the concepts of different futures and alternative paths to future which also form a basis for anticipation and long-term planning as they support extracting meaningful information. Foresight process is depicted as a process where changes in the external environment is elaborated collectively in organization which, in turn, enhances the overall knowledge creation process by fostering the knowledge conversions. The author (Vecchiato, 2015, p. 31) conclude that "(...) strategic foresight lays the foundations for an ongoing process through which new knowledge (tacit and explicit) about changes in the external environment is continuously gained and the 'memories of the future' of the organization are continuously updated and revised by its members through the collective processes of socialization, articulation, combination and internalization."

The process of knowledge sharing gets elaborated more specifically in two articles by Major and Cordey-Hayes (2000a; 2000b). Besides these articles, the article by Karlsen and Karlsen (2007) refer also to knowledge sharing as focusing on knowledge creation in expert teams working with foresight. Major and Cordey-Hayes (2000a; 2000b) use the concepts of knowledge transfer and knowledge translation and present a model of knowledge translation to describe the holistic knowledge transfer process. The approach represented in both of the studies of Major and Cordey-Hayes stresses the role of knowledge transfer as a part of holistic process where future knowledge is finally being utilized.

Besides the above described connections to knowledge processes, some of the studies cover also knowledge identification, knowledge acquisition and knowledge application. These processes are discussed especially in the studies that take absorptive capacity as a central theoretical perspective. The processes are described as an inherent part of absorptive capacity which is defined consisting of sequential processes of acquiring, assimilating, transforming and exploiting knowledge (Baškarada et al., 2016; Pouru et al., 2019; Uotila

et al., 2006). Furthermore, besides on focusing on knowledge creation, the study of Uotila et al. (2006) refers also to knowledge application in the context of innovation networks. Similarly, the articles of Major and Cordey-Hayes (2000a; 2000b) cover issues that are related also to the application of future knowledge.

On the other hand, also the perspective of dynamic capabilities may be considered highlighting the importance of knowledge identification. Sensing as a central element of dynamic capabilities (e.g. Heger & Boman, 2015; Semke & Tiberius, 2020) has clearly conceptual proximity to knowledge identification. Some of the studies focusing on organizational learning refers also to knowledge processes as a constituent of organizational learning (Baškarada et al., 2016; Bootz et al., 2019a). Knowledge acquisition, sharing and application is also reflected in the studies that represent more holistically and explicitly knowledge management approach. For example, Nascimento et. al. (2020) include knowledge acquisition, dissemination and application as central elements of the approach represented in their study.

Intellectual capital perspective and foresight

As described in previously in this study, knowledge resources may be positioned at the core of knowledge management together with the knowledge processes and knowledge management practices. An essential research stream focusing on knowledge resources is represented in research area of intellectual capital. Hence, foresight studies using the concepts and theories of intellectual capital represent a connection to the core area of knowledge management.

Two of the reviewed studies positioned into this research stream. Fink et. al. (2005) demonstrate how the taxonomy of intellectual capital may be utilized in developing resource-specific strategy scenarios. Furthermore, they present a model that combines the market scenarios (scenarios regarding the possible developments in organization's external environment) and strategic scenarios (scenarios regarding organization's strategic options related goals and resources). In this sense the model stresses the importance of assessing the potential of organizational resources to address the changes in external environment.

Furthermore, the authors propose that the internal scenarios are complementing the external scenarios and thus supporting strategic foresight.

Another article combining foresight and intellectual capital approach is provided by Elena-Pérez et. al. (2011) whose conceptual study explores the possibility to combine foresight and intellectual capital management in higher education institutions. Within the integrated use of these approaches, foresight is seen especially as a method for providing long-term strategic vision while intellectual capital management provides a tool to strategically manage resources and activities to accomplish those strategic future visions. Furthermore, the authors stress that these two approaches should be used in a symbiotic way.

Overall, these studies are linked to knowledge management research since they utilize the concepts of intellectual capital and intellectual capital management as theoretical background. The way that the knowledge management approach is represented in these studies is characterized by the combination of foresight and intellectual capital perspective. A central focus in this respect is also on describing how these two perspectives may create value for organization.

Knowledge management practices and foresight

Knowledge management practices as explicitly defined theoretical element is not represented by any of the reviewed studies. However, some of the studies referred implicitly to practices that may be seen in relation to knowledge management practices. In this regard strategic knowledge management as a category of knowledge management practice is implicitly brought out especially in studies that focuses on intellectual capital management and foresight (Elena-Pérez et al., 2011; A. Fink et al., 2005). Also the studies utilizing the concept of dynamic capabilities build implicitly a relation to strategic knowledge management as they stress the development of the organization's resource base in response to the changes in operating environment (e.g. Rohrbeck & Gemünden, 2011; Semke & Tiberius, 2020).

Some of the studies refer also to practices that have relevance in the category of IT practices. This perspective is present, for example, in the views that exemplify the use of data

bases in foresight activities (Kaivo-oja, 2012) and the use of electronical platforms in foresight processes (Karlsen & Karlsen, 2007). Furthermore, the utilization of virtual communities of practice in foresight process, suggested by Kaivo-oja (2012), fall into the knowledge management practice categories of IT practices and work organizing. Some kind of connectedness may also be found related to learning mechanisms and training and development as knowledge management practices in the studies that focuses on learning and foresight (Rhisiart et al., 2015) and the development of capabilities (Schwarz et al., 2020).

The central findings regarding the studies using core concepts of knowledge management are summarized in table 8.

Table 8. The core concepts of knowledge management in foresight studies

Central findings
Knowledge management frameworks   - The use of knowledge management frameworks is scarce, there is also considerable variation in the use of these frameworks.   - In these cases, knowledge management is often depicted as an enabler for foresight.
Knowledge processes   - Foresight is studied especially in relation to knowledge creation. However, knowledge sharing, knowledge identification, knowledge acquisition and knowledge application are also discussed in foresight studies.   - The relationship between knowledge management and foresight is manifested most prominently thorough the elaboration of knowledge creation processes in the context of foresight.   - Knowledge creation is understood as a central element of foresight and foresight may also be supported by facilitating this process.   - The concept of knowledge transfer is used mainly to describe how future knowledge may be utilized.   - The foresight studies connected to overarching perspectives, such as absorptive capacity, dynamic capabilities and organizational learning, refer also to knowledge processes such as knowledge identification, knowledge acquisition, knowledge sharing and knowledge application.
Intellectual capital / Intellectual capital management   - Knowledge management approach is represented in foresight studies by utilizing the concept of intellectual capital and intellectual capital management as a theoretical background.   - In these cases, the focus is especially on describing how the combination of intellectual capital management and foresight may create value for an organization.
Knowledge management practices   - Knowledge management practices are not explicitly studied in any of the studies. These practices are only implicitly referred.   - Strategic knowledge management as a category of knowledge management practices has the strongest relevance in reviewed studies.

5.2.2 Organizational learning and foresight

The studies that build the knowledge management approach by using the concept of organizational learning formed one stream of research among the analyzed articles. Some of these articles refer also to other knowledge management related concepts, such as absorptive capacity and dynamic capabilities, which reflects the overlapping nature of these concepts (e.g. Vera et al., 2012). The impact of foresight on organizational learning is one of the key research themes in the articles that utilize organizational learning theories (Baškarada et al., 2016; Bootz, 2010; Bootz et al., 2019a; Yoon et al., 2018). In this sense the relationship between these two elements is depicted in a way that stresses the enabling role of foresight in organizational learning.

Some of the studies stress the view where organizational learning gets defined through knowledge intensive processes (Baškarada et al., 2016; Bootz et al., 2019a). For example, Bootz et al. (2019a, p. 93) define organizational learning as "knowledge creation processes, the distribution of the latter within the organization and their inclusion in practices". In this sense the authors highlight three different elements of organizational learning: knowledge creation, knowledge dissemination and inclusion in the practices. The study itself utilizes and further-develops a typology of different foresight practices with different impact on organizational learning (Bootz et al., 2019a).

A conceptual article of Baškarada et al. (2016) discusses how foresight affects individual and organizational learning. The authors use the concept of absorptive capacity to frame the four different broad foresight capabilities and discuss the relation of these constructs to individual and organizational learning. Organizational learning is defined in the article by referring to knowledge acquisition, information distribution, information interpretation and organizational memory as constitutive elements of organizational learning.

Yoon et. al. (2018) lean also on the concept of organizational learning. They propose that corporate foresight is positively related to organizational learning. This relation is also confirmed by the empirical examination conducted in the study. The article uses the concept of integrative capabilities referring to the need to combine and develop new resources to maintain competitive advantage in changing environment. Based on the discussion on the

RBV and dynamic capabilities theory the authors propose that the positive relationship between corporate foresight and organizational learning is moderated by integrative capabilities. This moderation effect is also confirmed in the empirical part of the study. Finally, organizational learning is considered an intermediate process through which corporate foresight can improve innovation. Thus, the authors propose that organizational learning mediates the relationship between corporate foresight and innovativeness of an organization. This hypothesis is also supported by the results gained in the empirical examination of the study.

Burt and Nair (2020) describe this relationship bit differently. They focus on how organizational learning emanating from scenarios generate strategic foresight. However, despite the differences, this approach refers also to a relationship where foresight practices, in this case scenarios, have impact on organizational learning. The results based on their longitudinal field-study indicate that unlearning rather than learning helped generate the strategic foresight. The authors present a model where scenario planning lead to organizational learning process. However, within this learning process unlearning has a crucial role.

The central findings regarding the studies using theories related to organizational learning are summarized in table 9.

Table 9. Organizational learning in foresight studies

Central findings
- The impact of foresight on organizational learning is the key theme in studies focusing on organizational learning and foresight.   - The studies represent an approach which stresses the enabling role of foresight in organizational learning.

5.2.3 Absorptive capacity and foresight

The concept of absorptive capacity formed a central theoretical base in some of the cases. The concept of absorptive capacity used in these studies refers to the process of acquisition, assimilation, transformation and exploitation of knowledge as a core of absorptive capacity (Pouru et al., 2019; Uotila et al., 2006). Focusing on these processes is also the way that the relationship between the perspectives of foresight and knowledge management is being built in these studies.

Two of these studies use the model of absorptive capacity as a framework for analysis conducted in the study. While Pouru et. al (2019) use it as framework for analyzing the acquisition and utilization of futures knowledge, Uotila et al (2006) apply it as a framework for investigating the promotion of visionary capability and innovative capability in regional innovation systems, focusing also on the absorptive capacity regarding future-oriented knowledge. As pointed out above, the article of Baškarada et al. (2016) uses the model of absorptive capacity as a key theoretical point of departure integrated to the concept of organizational learning. The authors use the elements of absorptive capacity - acquisition, assimilation, transformation and exploitation – as a point of departure for discussing the characteristics of a foresight process in relation to individual and organizational learning.

What is common to these studies as well is the lack of explicit definition of knowledge management. Thus, in this sense these studies do not have strong connection to the knowledge management research tradition. However, due to the central role of the concept of absorptive capacity these studies deal with issues that are essential also for knowledge management. These issues include especially views to the knowledge processes, such as, knowledge acquisition and knowledge application. The analysis of these studies showed that absorptive capacity may be understood also in the context of future knowledge. In this sense foresight may be enhanced by developing the absorptive capacity, ie. capabilities to acquire and utilize knowledge.

The central findings regarding the studies using the concept of absorptive capacity are summarized in table 10.

Table 10. Absorptive capacity in foresight studies

Central findings
- The focus on knowledge processes connects the studies to knowledge management research.   - Absorptive capacity may be understood in the context of future-oriented knowledge - Foresight may be supported by developing absorptive capacity.

5.2.4 Dynamic capabilities and foresight

A significant part of the reviewed studies lay their theoretical foundation on the theory of dynamic capabilities. In many cases, these articles take the notion of unstable and rapidly changing environment as a point of departure (e.g. Haarhaus & Liening, 2020; Ramírez et al., 2013). Similar to the articles that utilize absorptive capacity as a central theoretical construct, these articles did not present any explicit definition on knowledge management. Thus, these articles don't integrate to the core of the knowledge management research stream either. The knowledge management approach represented in these studies is merely build through the explication of the relationship between foresight and dynamic capabilities

Some of the articles use the concept of dynamic capabilities more as a wider background for framing the study, discussing the results of the study and providing theoretical support than as a basis for actual research model (Rohrbeck & Gemünden, 2011; Vecchiato, 2015; Vecchiato, 2012). However, these articles also point out the connection between foresight and dynamic capabilities. For example, Vecchiato (2015, p. 34) elaborates the relationship between corporate foresight and strategic agility, i.e. capability to respond to changes in the external environment, and discusses the conclusions in relation to the dynamic capability approach: "Strategic foresight, through its input into the firm's capacities to learn about its shifting environment, involve precisely the microfoundations of dynamic capabilities".

A theme that connects the approach represented in these studies to knowledge management perspective concerns the renewal of organization's resource base. In many cases the theoretical discussion is extended to the resource-based view and to the need to revisit this view by dynamic approach which stresses the capabilities to modify and develop resource-base in high-velocity environments (e.g. Haarhaus & Liening, 2020; Rhisiart et al., 2015). While investigating the roles of corporate foresight in enhancing the innovation capability, Rohrbeck and Gemuünden (2011) refer to foresight as a potential element of dynamic capabilities needed in turbulent environment. They point out the assumption regarding the supporting role of corporate foresight in renewing the strategic resources of an organization. Indeed, this general notion regarding the role of foresight in renewal of strategic resources is essential also from the perspective of knowledge management as it may be understood referring also to the elemental need to manage and develop the knowledge resources of an organization. This view is also highlighted in the study by Semke & Tiberius (2020) as they bring out the connection between corporate foresight and renewal of the organization's resource base. Regarding this connection they conclude that "(…) not only DCs can be used to explain how companies leverage their resource base, but also CF enables a firm to detect a need to renew its resource portfolio with the long-term goal of sustaining firm performance and competitiveness" (Semke & Tiberius, 2020, p. 188).

A frequently used point of departure in these studies is the proposition that foresight supports dynamic capabilities. Some of the studies provide also empirical support for this proposition from certain perspectives (e.g. Haarhaus & Liening, 2020; Schwarz et al., 2020). For instance, Haarhaus and Liening (2020) investigate the impact of strategic foresight on dynamic capabilities focusing especially strategic flexibility and decision rationality as two distinct types of dynamic capabilities, and furthermore, analyze how environmental uncertainty moderates the impact of strategic foresight. Based on the empirical analysis they suggest that strategic foresight has a direct positive impact on both of the dynamic capabilities in question, ie. strategic flexibility and decision rationality. Furthermore, their results support the assumption regarding the moderation effect of the degree of environmental uncertainty in the case of strategic flexibility. Schwarz et. al. (2020), in turn, explore how foresight practices contribute to the outcomes of dynamic capabilities ie. the success

in innovating, the success in forming new strategies based on trends and the success in shifting resources into new strategies. The study provides empirical support for the hypothesis that foresight practices and training support dynamic capabilities. In this sense the study suggests that foresight practices may be seen as additional micro-foundations of dynamic capabilities.

The division of sensing, seizing and reconfiguration as the key elements of dynamic capability turned out to be a widely used framework for investigating the relation relationship between foresight and dynamic capabilities. Within this framework sensing refers activities that involves for example environmental scanning while seizing is about formulating responses and acting based on the insights gained by sensing, and finally sensing and seizing enable reconfiguration of assets (e.g. Heger & Boman, 2015; Semke & Tiberius, 2020). The key characteristic of the approach represented in these studies is that it specifies how foresight enhances dynamic capabilities – and eventually, how foresight may be supporting the renewal of the resource base of an organization. For example, Heger and Boman (2015) use this model of dynamic capabilities as a framework and analyzes the value of networked foresight. They conclude that foresight has an impact especially on sensing dynamic capability.

The connection between foresight and dynamic capability of sensing is highlighted by some other studies as well. For example, Rhisart (2015) brings out the connection between foresight and individual learning, and how this impacts on dynamic capabilities. In this respect one central conclusion is that the foresight can support sensing capabilities. Semke and Tiberius (2020) focus also on the relationship between corporate foresight and dynamic capabilities. Regarding the subset of dynamic capabilities, they conclude based on their analysis that corporate foresight primarily corresponds to sensing activities. Ramírez et.al. (2013), in turn, investigate how scenario planning and early warning scanning work as dynamic capability and how they together form a co-specialization dynamic capability. Based on their analysis the authors suggest that the scenario planning and early warning scanning help to frame and reframe managerial attention, which in turn supports seizing issues and preparing reconfiguration decisions.

Finally, the relationship between foresight and dynamic capabilities is discussed also in the framework of value creation. Articles by Rohrbeck and Schwarz (2013) and Rohrbeck (2012) focuses on value creation of strategic foresight. Both of the articles present a process model of dynamic capabilities as a framework for discussing the contributions of strategic foresight. According to the model, the process consists of (1) search and selection of new resources, (2) decision-making as to their adoption, (3) configuration and deployment, and (4) implementation (Rohrbeck & Schwarz, 2013; Rohrbeck, 2012). Rohrbeck and Schwarz (2013) suggest that strategic foresight potentially support each of the phases of the process of dynamic capability while the enhanced perception, which is also related to search and selection of new resources, is the most prominent value contribution in this respect.

The central findings regarding the studies using the concept of dynamic capabilities are summarized in table 11.

Table 11. Dynamic capabilities in foresight studies

Central findings
- The concept of dynamic capabilities is used as a wider theoretical background connecting foresight to the central issues of knowledge management.   - Dynamic capabilities as sensing, seizing, reconfiguring is used as an analytical framework. Foresight is connected especially to sensing capabilities.   - The process model of dynamic capabilities is also used as a framework. Within this framework the most prominent contribution of foresight is related to search and selection of new resources.

6. DISCUSSION AND CONCLUSIONS

The main objective of this study was to find out how the knowledge management approach is represented in foresight research. In order to fulfill this objective, the findings of the study are discussed in the following. Thus, the purpose is to discuss the findings in the light of the theoretical background of this study and provide reasoned answers to the posed research questions. The chapter consists of four parts: the first one focuses on answering the main research question by discussing the findings related to the two sub-questions. Within this discussion the key conclusions of the study are also pointed out. The second section summarizes the limitations of the study, while the third section presents an over-view on the theoretical contributions and possible areas of future research. The final con-clusion of the study is provided in the end of the chapter.

6.1   Answering the research questions

6.1.1   Knowledge management related theories and subject areas in foresight research

On the whole, when elaborating the findings in the theoretical framework of the study, a central conclusion is that all of the key layers and key theoretical elements are represented in foresight studies. However, the occurrence of these theoretical elements varies signifi-cantly.

The most frequently applied theoretical background was related to dynamic capabilities theory. This theory area was represented in 12 (43 %) studies. Regarding the use of dynamic capabilities, the results is in line with the conclusions made Iden et al. (2017) who identified a group of foresight studies that applies theories related to strategic thinking which were also a category for the dynamic capabilities theory. Thus, this type of research seems to have at least some kind of a foothold among foresight studies.

When bundling together the articles that use some of the core concepts of knowledge management or general KM frameworks, ten of the reviewed studies were representing this category. Consequently, the application of this kind of theoretical background is almost as frequent as it is in the case of dynamic capabilities theory. However, when looking at the occurrence of theory areas without bundling the knowledge management core concepts together, dynamic capabilities framework was clearly the most frequently applied theoretical perspective. Within the category of knowledge management core concepts, the studies addressing some of the knowledge processes were the most prominent stream of research. This reflects the dominance of this research theme in knowledge management research in general (e.g. Serenko & Dumay, 2015).

The utilization of knowledge management frameworks turned out to be quite scarce in foresight research. Only few studies use explicit concepts of knowledge management in order to build the theoretical base for the study or define a research model. In turn, knowledge creation distinguished as one of the key research themes within the category of knowledge management core concepts. Regarding the other knowledge processes, knowledge sharing, knowledge identification, knowledge acquisition and knowledge application were also addressed in reviewed studies. In general, these results are aligned with Heisig's (2009) findings regarding the most frequently used knowledge management activities in KM frameworks.

However, what is noteworthy is the lack of explicit examination of knowledge management practices. None of the studies was representing this kind of approach. This may be due to the fact that this part of knowledge management is not clearly established even in the research area of knowledge management and there is some conceptual ambiguity regarding processes and practices (Inkinen, 2016a, p. 30). Besides the knowledge processes and knowledge management practices, the third key element of knowledge management theory, knowledge resources, was discussed through the intellectual capital perspective by two studies. However, the importance of knowledge resources and the development of resource-base was referred in general in many of the articles, especially by the ones that were focusing on dynamic capabilities. This echoes to the fundamental reasoning of knowledge management which stresses the application and development of knowledge

resources (e.g. Davenport & Prusak, 1998) as well as the same idea brought out by dynamic view of intellectual capital (Kianto et al., 2014).

From the perspective of foresight research, a central finding concerns the distribution of the studies by the specific research area within foresight research. In this respect research on foresight in organizational settings (corporate foresight) was clearly most broadly represented research stream. This is not surprising, since organizational settings form a central context for knowledge management, ie. knowledge management is to a great extent about managing and developing knowledge in organizations (e.g. Davenport & Prusak, 1998; Nonaka & Takeuchi, 1995). On the other hand, the prominence of corporate foresight in the reviewed studies is in line with the development of foresight research area as a whole, as corporate foresight has been considered as significant stream of research among contemporary foresight research (Gordon et al., 2020; Rohrbeck et al., 2015).

Altogether, it seems that knowledge management is represented in foresight studies rather through the theoretical elements that are on the periphery of knowledge management than through the core concepts of knowledge management. Specifically, this means that the theoretical constructs which were labelled as "perspectives" in the framework of this study (ie. absorptive capacity, dynamic capability and organizational learning) are together more frequently addressed that the concept and theories related to knowledge processes, knowledge resources or knowledge management practices.

Conclusion 1: Knowledge management is represented in foresight research through the core concepts of knowledge management, and through the theories of absorptive capacity, organizational learning and dynamic capabilities

Conclusion 2: Knowledge management is represented in foresight research most frequently through the perspective of dynamic capability.

6.1.2   The use of knowledge management approach in foresight studies

One of the research questions posed in this study was concerning the use of knowledge management related theoretical elements in foresight studies. This question was answered through the analysis and description of the studies. Besides this elaboration, the descriptive findings regarding the role of the knowledge management theories in foresight studies created a basis for answering this question.

Regarding the role of the knowledge management related theories a central finding was that the theories have most frequently essential role in studies that are incorporating knowledge management approach in foresight research. This was pointed out by the categorization, which showed that in 19 studies (68 %) utilized knowledge management theory was motivating entire study and formed a theoretical base for the study, instead of using the theories in more restricted role. This perception may be seen supporting the proposition of the significant linkage between the areas of foresight and knowledge management (Bootz et al., 2019b).

The use of knowledge management frameworks was scarce and varying. In general, the use of knowledge management frameworks meant the use of explicit definition on knowledge management and framing the study based on this. Compared, for example, to the holistic knowledge management framework introduced by Heisig (2009), the frameworks were covering primarily only the layer of knowledge processes while the enabler focus was not paid attention to. Overall, the process view was emphasized in the reviewed studies.

Despite the scarce use of actual knowledge management frameworks, the fundamental idea of knowledge management was represented in many instances. This notion refers to acknowledging knowledge resources as a fundamental constituent of value creation and the importance of managing and developing those resources (e.g. Davenport & Prusak, 1998). This idea came through most evidently in studies that were dealing with dynamic capabilities and foresight. On the whole, the reviewed studies reflect the role of knowledge processes in knowledge-based value creation. This relates to the basic framework of knowledge management, where knowledge processes are presented at the heart of knowledge management (e.g. Heisig, 2009).

Concerning the knowledge processes, the studies were covering most prominently the process of knowledge creation. All of the studies in this area were utilizing the theory of dynamic knowledge creation. This finding is also aligned with the previous results regarding the popularity of dynamic knowledge creation theory in knowledge management research (Serenko & Dumay, 2015). The use of knowledge creation theories also reflects the idea of knowledge conversions in the heart of knowledge-based value creation (Nonaka, 1991; Nonaka et al., 2000). On the whole, knowledge creation theories were used especially aiming at reaching deeper understanding of the foresight processes. This, in turn, reflects the constitutive role of knowledge creation in foresight processes.

The concept of knowledge sharing was used especially in referring to a holistic process where the knowledge produced in foresight activities become transferred between actors and finally utilized. This kind of approach reflects the viewpoints regarding the importance of knowledge sharing in knowledge-based value creation (e.g. Grant, 1996; Kogut & Zander, 1992) and utilization of existing resources (Andreeva & Kianto, 2011). Knowledge sharing was also referred in the context of future knowledge creation which in turn relates to the view that considers knowledge sharing having an elemental role in some modes of knowledge creation (Nonaka, 1991; Nonaka et al., 2000). Furthermore, knowledge processes were investigated in the reviewed studies connected to broader perspectives, such as absorptive capacity and dynamic capabilities. This is aligned especially with the considerations that stress the overlapping nature of knowledge management, absorptive capacity and dynamic capabilities (Nielsen, 2006; Vera et al., 2012).

When assessing the use of the theoretical frameworks related especially to knowledge resources, the combination of intellectual capital perspective and foresight perspective characterize the way by which this theoretical area is represented in foresight studies. This kind of approach stresses also the value that the integrative utilization of these two perspectives may provide to organizations. What is also important notion in this regard, is that the overall importance of intellectual capital and the management of these intangible resources is acknowledged in the studies. This view comes also close to the dynamic view of the intellectual capital (Kianto et al., 2014) since it stresses the identification of opportunities to develop or utilize existing resources. Finally, regarding the use of the core concepts of

knowledge management, it is noteworthy that knowledge management practices as explicitly defined theoretical element is not represented by any of the analyzed studies. However, some of the studies discussed activities that may have some kind of relevance to knowledge management practices labeled as strategic knowledge management (see Inkinen, 2016a, p. 30-33).

Conclusion 3: The core concepts of knowledge management is represented in foresight research especially through the knowledge process view.

Organizational learning was identified as a one of the possible perspectives to knowledge management in the framework of this study. This theoretical perspective is also clearly represented in foresight studies, even if the occurrence of this kind of approach is relatively slight. Organizational learning was depicted especially as an outcome of foresight activities. On the other hand, organizational learning was also depicted actualizing through knowledge-based processes. In this sense these conceptualizations are similar to the approaches where organizational learning is understood in terms of knowledge processes (e.g. Huber, 1991; Vera et al., 2012, p. 163) or defined as an outcome of knowledge processes (S. Lee et al., 2012).

Conclusion 4: Organizational learning is primarily depicted as a possible outcome of foresight in foresight research.

When it comes to the use of the absorptive capacity theory a central finding was that the concept of absorptive capacity is commonly used as framework in discussing the processes of acquisition, assimilation, transformation and exploitation of knowledge. Thus, this kind of approach incorporates the central ideas of absorptive capacity (e.g. Cohen & Levinthal, 1990; Zahra & George, 2002) to the foresight context and also connects to the knowledge management models that position these knowledge processes at the center of the

knowledge-based value creation (e.g. Gold et al., 2001; Heisig, 2009; V. Lee et al., 2013). In this sense, knowledge management is quite strongly represented in these studies. Overall, the central conclusion based on these studies is also that absorptive capacity may be understood in the context of future-oriented knowledge.

Conclusion 5: Absorptive capacity is used in foresight research to describe the acquisition, assimilation, transformation and exploitation of future-oriented knowledge.

As pointed out above, dynamic capabilities theory is the most frequently used knowledge management related theory in foresight studies. However, one may consider this approach more as an approach of strategic management than knowledge management, but nevertheless dynamic capabilities may also be understood related closely to the central issues of knowledge management (Vera et al., 2012, p. 162). This relation is also reflected on several occasions in the studies dealing with dynamic capabilities and foresight. The findings regarding these studies showed also that foresight is connected especially to the sensing capability ie. a capability to identify opportunities and threats. A central conclusion in this regard is also that, within the approach utilizing dynamic capabilities theory, foresight is connected to the renewal of organization's resource base through search and selection of new resources. This, in turn, reflects the capability to change resources and competences and routines which is defined as one of the central features of dynamic capabilities (Easterby-Smith & Prieto, 2008). This idea may be understood having high relevance especially in the context of knowledge-intensive economy, and thus, in the area of knowledge management as well.

Conclusion 6: Within the framework of dynamic capabilities foresight is connected especially to the sensing capability.

6.2 Limitations

There are also some limiting factors that should be considered when assessing the results and the conclusions of this study. The limitations of the study derive primarily from the methodological choices and the implementation of systematic review process. First, the literature search was conducted using solely Scopus database. The utilization of other databases could have produced different kind of literature selection to be examined in review process. Furthermore, even if the selection of the keywords used in the literature search was quite broad, some potentially relevant articles may have been missed due to the choices made regarding the keywords. Also targeting the search string to article titles, abstract and keywords may be considered as a possible limiting factor regarding the literature selection produced by the search process.

Besides the search process, the limitations of the study arise also from the selection process. First, different inclusion and exclusion criteria would have naturally produced a different kind of result with the literature selection. For example, the selection of reviewed literature would have been different if the studies that discuss only implicitly the themes relevant to this study had also been included instead of requiring explicit discussion on these themes. Furthermore, even if the selection was based on the pre-defined inclusion and exclusion criteria, there is also a possibility that the judgements and interpretations made by the reviewer affects the final result of literature selection.

6.3 Theoretical contributions and possible areas of future research

The objective of this study was to explore how the knowledge management approach is represented in foresight research. By fulfilling this objective, the study was also aimed at building a connection between the research areas of foresight and knowledge management and enhancing the understanding on the relation between the central perspectives of knowledge management and foresight. One of the central contributions of this study arises from this point of departure as the study demonstrated and discussed in a systematic

manner how these two research perspectives is interconnected in foresight studies. The conclusions pointed out in this study enhanced the understanding on the connection between these two areas.

Furthermore, the study broadened previous understanding on knowledge management as a multidimensional field of research that may also be seen in close relation to some other domains (Ragab & Amr, 2013) and supported the view of knowledge management as a potential unifying foundation for other disciplines as well (Holsapple & Wu, 2008). The study demonstrated how foresight, as knowledge-based activity, may be grasped by the conceptual tools provided by the knowledge management research, and contributed the understanding on the interconnectedness of these two perspectives also in that way. In this sense this study also reinforced the view on knowledge management as a significant approach in understanding knowledge-based value creation and development and utilization of organization's knowledge resources (e.g. Davenport & Prusak, 1998; Nonaka & Takeuchi, 1995). Overall, this study contributed both foresight and knowledge management literature by providing a structured view on the representation of knowledge management approach in foresight research.

This study was successful also in providing a comprehensive understanding on coverage of knowledge management related foresight research. Thus, it revealed to what extent the knowledge management related theories and subject areas are addressed by foresight research. By doing this, the study also pointed out the areas that are scarcely researched in this respect. Furthermore, the study increased the understanding how theoretical knowledge on knowledge management is applied in foresight research. This study enriched the novel discussion on the relationship between knowledge management and foresight also in this respect.

The study also provided a solid basis for pointing out the possible areas of future research. In general, future research could be more focused on the application of the core concepts of knowledge management in research on foresight. This would strengthen the overall understanding on the knowledge management in the context of foresight. The results of this study showed that the holistic way of addressing knowledge management is still quite scarce in foresight research. Thus, it would be useful to grasp the foresight activities based

on a more holistic knowledge management framework that would identify the interlinked nature of knowledge processes and the role of managerial practices and other enabling factors in this context.

One interesting avenue of future research opens up from the perspective of intellectual capital. As future oriented knowledge (i.e. the knowledge applied and produced in foresight processes) may be understood also an important knowledge asset of a modern organization, it would be useful to investigate how these resources could be managed and developed as a mode of intellectual capital. Furthermore, intellectual capital perspective could be also applied in exploring how the knowledge resources in broad sense (e.g. human capital, relational capital and structural capital) build up capabilities for foresight activities and how this underlying resource base could be developed and managed.

An area for future research may be identified in the context of knowledge management practices. Even if the foresight research covers to some extent the perspective of managerial activities, it would be fruitful to explore the possibilities of knowledge management practices to advance the knowledge-based processes that forms a basis for foresight activities. Although knowledge processes are discussed in some of the foresight studies, there is still clearly room for further investigation. For instance, knowledge sharing and knowledge application within organizations could be further elaborated in order to increase the understanding of the factors that are significant for the success of these processes.

To sum up, this area of research holds on many interesting possible avenues for future research. It could be stated that this research area is still in an emerging phase of its lifecycle. The suggestions for the key themes for future research are summed up in table 12.

Table 12. Suggestions for the areas of future research

Suggestions for future research
Application of holistic knowledge management framework in understanding foresight: This approach would enrich the understanding on the interlinkage of knowledge processes in foresight activities and the role of managerial practices and enabling factors affecting these processes.   **Application of intellectual capital perspective:** Both conceptual and empirical investigation on the role of intellectual capital in building foresight capabilities; Exploration of managing and developing organization's future-oriented knowledge as a knowledge asset.   **The role of knowledge management practices in enhancing the foresight activities:** Empirical investigation on how knowledge management practices may advance the knowledge processes in foresight context.   **Deeper elaboration of knowledge processes in foresight context:** Further empirical investigation especially on knowledge sharing and knowledge application processes in foresight context.

6.4 Conclusion

This study examined the representation of knowledge management approach in foresight studies. The aim was to provide a comprehensive view on how knowledge management is incorporated into foresight studies and describe systematically the concepts that are used to build up the knowledge management approach. The study was conducted as a systematic literature review in order to fulfill its objective and provide answers to the posed research questions. The study demonstrated the overall coverage of knowledge management theories in foresight studies and pointed out areas that are scarcely studied in this respect. Furthermore, this study provided comprehensive understanding on how the knowledge management related theories are used in foresight research. By this examination the study built a connection between the research areas of foresight and knowledge management and deepened the understanding on the relation between the central perspectives of knowledge management and foresight. The study also pointed out some potential directions for future research. On the whole, the study showed that the integration of knowledge management and foresight perspectives offers a valuable point of departure for further research.

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APPENDIX 1

The summarized results of systematic literature analysis

Author(s)/Article	Main focus/subject	Main KM related background theory	Research design	Role of KM related theory	Type of foresight research
Baškarada, S., Shrimpton, D. & Ng, S. (2016). Learning through foresight. Foresight, 18(4), 414-433.	How foresight affects individual and organizational learning.	Organizational learning / Absorptive capacity	Empirical	Forms the theoretical base for the article	Corporate foresight
Bootz, J. (2010). Strategic foresight and organizational learning: A survey and critical analysis. Technological Forecasting and Social Change, 77(9), 1588-1594.	The impact of foresight on organizational learning.	Organizational learning	Conceptual	Forms the theoretical base for the article	Corporate foresight
Bootz, J., Monti, R., Durance, P., Pacini, V. & Chapuy, P. (2019). The links between French school of foresight and organizational learning: An assessment of developments in the last ten years. Technological Forecasting and Social Change, 140, 92-104.	Foresight practices and their impact on organizational learning.	Organizational learning	Empirical	Forms the theoretical base for the article	Corporate foresight
Burt, G. & Nair, A. K. (2020). Rigidities of imagination in scenario planning: Strategic foresight through 'Unlearning'. Technological Forecasting and Social Change, 153	How strategic foresight emerges from the organizational learning process that unfolds during scenario planning	Organizational learning	Empirical	Forms the theoretical base for the article	Corporate foresight
Dufva, M. & Ahlqvist, T. (2015). Knowledge creation dynamics in foresight: A knowledge typology and exploratory method to analyse foresight workshops. Technological Forecasting and Social Change, 94, 251-268.	How knowledge about future is created in foresight process	Knowledge creation	Empirical	Forms the theoretical base for the article	General articles
Elena-Pérez, S., Saritas, O., Pook, K. & Warden, C. (2011). Ready for the future? Universities' capabilities to strategically manage their intellectual capital. Foresight, 13(2), 31-48.	Combination of foresight and intellectual capital management in higher education institutions.	Intellectual capital management	Conceptual	Forms the theoretical base for the article	Corporate foresight
Fink, A., Marr, B., Siebe, A. & Kuhle, J. (2005). The future scorecard: Combining external and internal scenarios to create strategic foresight. Management Decision, 43(3), 360-381.	Enhancing strategic foresight by combining external and internal scenarios (resource-based approach)	Intellectual capital management	Conceptual	Forms the theoretical base for the article	Corporate foresight
Haarhaus, T. & Liening, A. (2020). Building dynamic capabilities to cope with environmental uncertainty: The role of strategic foresight. Technological Forecasting and Social Change, 155	The impact of strategic foresight on dynamic capabilities (strategic flexibility and decision rationality)	Dynamic capabilities	Empirical	Forms the theoretical base for the article	Corporate foresight

Heger, T. & Boman, M. (2015). Net-worked foresight-The case of EIT ICT Labs. Technological Forecasting and Social Change, 101, 147-164.	The value of net-worked foresight.	Dynamic ca-pabilities	Empirical	Used in a hypothesis, proposition, or the re-search model	General articles
Kaivo-oja, J. (2012). Weak signals analysis, knowledge management theory and systemic socio-cultural transitions. Futures, 44(3), 206-217.	The linkage between knowledge manage-ment frameworks and weak signal anal-ysis.	Knowledge manage-ment	Conceptual	Forms the theoretical base for the article	General articles
Karlsen, J. E. & Karlsen, H. (2007). Expert groups as production units for shared knowledge in energy foresights. Foresight, 9(1), 37-49.	Knowledge sharing and knowledge crea-tion in expert teams working with fore-sight.	Knowledge creation	Empirical	Forms the theoretical base for the article	General articles
Major, E. & Cordey-Hayes, M. (2000a). Engaging the business sup-port network to give SMEs the ben-efit of Foresight. Technovation, 20(11), 589-602.	Knowledge transfer and the intermediary role of the business support community in improving interac-tion between the foresight programme and SMEs	Knowledge transfer	Empirical	Forms the theoretical base for the article	Strategic foresight for policy making
Major, E. & Cordey-Hayes, M. (2000b). Knowledge translation: A new perspective on knowledge transfer and foresight. Foresight, 2(4), 411-423.	A model of knowledge transla-tion to describe the holistic knowledge transfer process.	Knowledge transfer	Conceptual	Forms the theoretical base for the article	Strategic foresight for policy making
Nascimento, L. S., Reichert, F. M., Janissek-Muniz, R. & Zawislak, P. A. (2020). Dynamic interactions among knowledge management, strategic foresight and emerging technologies. Journal of Knowledge Management, 25(2), 275-297.	The dynamic interac-tions among knowledge manage-ment, strategic fore-sight and emerging technologies	Knowledge manage-ment	Conceptual	Forms the theoretical base for the article	Corporate foresight
Pouru, L., Dufva, M. & Niinisalo, T. (2019). Creating organisational fu-tures knowledge in Finnish compa-nies. Technological Forecasting and Social Change, 140, 84-91.	How companies ac-quire futures knowledge and utilize it in organizational processes.	Absorptive capacity	Empirical	Used in a hypothesis, proposition, or the re-search model	Corporate foresight
Ramírez, R., Österman, R. & Grönquist, D. (2013). Scenarios and early warnings as dynamic capabili-ties to frame managerial attention. Technological Forecasting and So-cial Change, 80(4), 825-838.	How scenario plan-ning and early warn-ing scanning work as dynamic capability and how they to-gether form a co-spe-cialization dynamic capability.	Dynamic ca-pabilities	Empirical	Forms the theoretical base for the article	Corporate foresight
Rhisiart, M., Miller, R. & Brooks, S. (2015). Learning to use the future: Developing foresight capabilities through scenario processes. Tech-nological Forecasting and Social Change, 101, 124-133.	Influence of strategic foresight processes on learning, cognition and capabilities	Dynamic ca-pabilities	Empirical	Provides theoretical support	General articles
Rohrbeck, R. & Gemünden, H. G. (2011). Corporate foresight: Its three roles in enhancing the inno-vation capacity of a firm. Techno-logical Forecasting and Social Change, 78(2), 231-243.	The roles of corpo-rate foresight in en-hancing the innova-tion capacity of a firm.	Dynamic ca-pabilities	Empirical	Provides theoretical support	Corporate foresight

Rohrbeck, R. & Schwarz, J. O. (2013). The value contribution of strategic foresight: Insights from an empirical study of large European companies. Technological Forecasting and Social Change, 80(8), 1593-1606.	Identification of potential value contributions of strategic foresight and empirical assessment of the value contributions in large multinational firms.	Dynamic capabilities	Empirical	Used in a hypothesis, proposition, or the research model	Corporate foresight
Rohrbeck, R. (2012). Exploring value creation from corporate-foresight activities. Futures, 44(5), 440-452.	Identification of potential value contributions of strategic foresight though literature review.	Dynamic capabilities	Conceptual	Used in a hypothesis, proposition, or the research model	Corporate foresight
Schwarz, J. O., Rohrbeck, R. & Wach, B. (2020). Corporate foresight as a microfoundation of dynamic capabilities. Futures & Foresight Science, 2(2), e28.	How foresight practices contribute to the outcomes of dynamic capabilities.	Dynamic capabilities	Empirical	Forms the theoretical base for the article	Corporate foresight
Semke, L. & Tiberius, V. (2020). Corporate Foresight and Dynamic Capabilities: An Exploratory Study	The relationship between corporate foresight and dynamic capabilities.	Dynamic capabilities	Empirical	Forms the theoretical base for the article	Corporate foresight
Uotila, T., Harmaakorpi, V. & Melkas, H. (2006). A method for assessing absorptive capacity of a regional innovation system. Fennia, 184(1), 49-58.	Absorptive capacity of future oriented knowledge in regional innovation networks.	Absorptive capacity	Empirical	Forms the theoretical base for the article	Strategic foresight for policy making
Uotila, T., Melkas, H. & Harmaakorpi, V. (2005). Incorporating futures research into regional knowledge creation and management. Futures, 37(8), 849-866.	The challenges in incorporating future-oriented knowledge produced in foresight processes to regional and organizational level.	Knowledge creation	Conceptual	Forms the theoretical base for the article	Strategic foresight for policy making
Vagnoni, E. & Khoddami, S. (2016). Designing competitivity activity model through the strategic agility approach in a turbulent environment. Foresight, 18(6), 625-648.	Strategic agility based on dynamic capabilities	Dynamic capabilities	Empirical	Used in a hypothesis, proposition, or the research model	Corporate foresight
Vecchiato, R. (2012). Environmental uncertainty, foresight and strategic decision making: An integrated study. Technological Forecasting and Social Change, 79(3), 436-447.	The coordination and utilization of foresight practices and techniques in coping with environmental uncertainty	Dynamic capabilities	Empirical	Provides theoretical support	Corporate foresight
Vecchiato, R. (2015). Creating value through foresight: First mover advantages and strategic agility. Technological Forecasting and Social Change, 101, 25-36.	The relationship between corporate foresight and strategic agility.	Knowledge creation / organizational learning / dynamic capabilities	Conceptual	Forms the theoretical base for the article	Corporate foresight
Yoon, J., Kim, Y., Vonortas, N. S. & Han, S. W. (2018). Corporate foresight and innovation: the effects of integrative capabilities and organisational learning. Technology Analysis and Strategic Management, 30(6), 633-645.	A model describing the influence of corporate foresight on innovativeness	Organizational learning	Empirical	Used in a hypothesis, proposition, or the research model	Corporate foresight