jamk.fi

Author(s): Saukkonen, Juha; Kreus, Pia

Title: Extending the Concept of Knowledge Management into Innovation and New Business Creation

Version: final draft

HUOM! TÄMÄ ON RINNAKKAISTALLENNE

Tekijä(t): Saukkonen, Juha; Kreus, Pia

Otsikko: Extending the Concept of Knowledge Management into Innovation and New Business Creation

Versio: final draft

Category: 3: Creativity and Innovation

Title of paper: EXTENDING THE CONCEPT OF KNOWLEDGE MANAGEMENT INTO INNOVATION AND NEW BUSINESS CREATION

Full Name and Job Title of the First Author: Senior Lecturer Juha Saukkonen

Your Institution: JAMK University of Applied Sciences, Jyväskylä, Finland

Your Full Address: Rajakatu 35, FI- 40200 FINLAND

Tel: +358400230619

Email: juha.saukkonen@jamk.fi

Full Name and Job title of other authors if any: Senior Lecturer Pia Kreus

Institution: JAMK University of Applied Sciences, Jyväskylä, Finland

Full Address: Rajakatu 35, FI- 40200 FINLAND

Tel: +358400964551

Email: pia.kreus@jamk.fi

Keywords (up to 5):

knowledge, anticipation, IPR, creativity, innovation

1. ABSTRACT

Knowledge management (KM) is a widely-used term in management science of 2000's. The key essence of KM can be coined e.g. as a *"purposeful management of activities and processes for leveraging knowledge to keep and improve competitive positioning by using well individual and collective knowledge resources of the firm and its stakeholders"* (CEN, 2004).

Majority of the KM discussion and research has focused on recognition, expression and dissemination of knowledge as it manifests itself in the present day of an organization. Research has focused on tangible knowledge artefacts such as Patents, Utility models, Trademarks, Licenses. The processes of creation and maintenance of knowledge are used more often by companies as protective measures rather than as dynamic tools for new value creation. Furthermore, the concepts and practices of futures research and anticipation are rarely studied as vital parts of KM.

The paper at hand studies the views and strategies of Small- and Medium-sized companies in Finland in their reach for managing present and future-related knowledge by means of qualitative research. The authors propose a double-dichotomy framework of alternative approaches and dimensions for KM. The framework is derived from the analysis of material collected by semi-structured interviews with the people responsible for KM processes in 10 companies. Authors also point out the needs for further research on the field.

Keywords: innovation, knowledge, anticipation, foresight, value creation

2. Introduction

Success and survival companies is largely dependent on their capability to innovate new products, services and business models (Hurley, Hult, and Knight, 2005; Siguaw, Simpson, and Enz, 2006). The pace of change is increasing, as noted e.g. by Fine (1999) with the concept of "increased clockspeed", underlining the importance for swift action on knowledge. New knowledge often manifests itself in the form of new technologies, and this urges companies to develop new business models to fully benefit from the novel knowledge (McInnes, 2005).

As a response to these challenges the concept of Knowledge Management (KM) has emerged. Wiig (2000) suggested that "as for other management directions, it is expected that KM will be integrated into the basket of effective management tools, and hence disappear as a separate effort". To a certain extent the widespread adoption of KM *concept* has taken place, but gaps exist between the theory and practice of Knowledge Management (Hung et al., 2011). Thus, further development and testing of models is necessary. Hung et al. (ibid.) proposed that instead of a holistic activity KM should be regarded as a process that can be divided into sub-processes. The sub-processes are; knowledge creation, knowledge storage, knowledge sharing, and knowledge application. A major part of literature and research on KM has been focusing on development and testing of firms' maturity in their KM models. Nowacki and Bashnik (2016) concluded that firms show very little innovativeness in the way they manage knowledge. This implies that there is a risk of routinizing the KM activity, instead of using KM as a search method for improved competitive advantage.

The KM models, tasks, roles and responsibilities have been mostly designed for large companies with ample HR and data management resources. As Cerchione and Esposito (2017) noted, SMEs are entities without a strategy of their own for processes of knowledge management, and it is not that clear what knowledge management systems they apply. SMEs also have various ways in organizing for KM, both within company as well as with the network of the firm. Holzinger et al. (2014) state that to stimulate fresh ideas and encourage multidisciplinarity domain experts from diverse areas should be brought together for an impactful KM work.

Also the futures dimension - the tools and practices of futures research and anticipation - are rarely integrated systematically into KM. Hines and Gold (2015) make a remark that the integration of foresight work embedded into corporate culture and work processes is still relatively rare, despite its potential to create an impact and add value. As a solution Hines and Gold (ibid.) propose creation of a separate "futurist" role into the organization, to ensure foresight is included in the KM. However, SMEs are not likely to afford a separate function for foresight-task, it should rather be integrated into general KM work.

This paper starts with the assumptions that SMES have a variety of ways of performing both KM, and also foresight as an element of KM. They also have various ways in organizing KM, both within company as well as with the network of the firm. At start the researchers also assumed that certain typologies of current practices and suggestions for integration and improvement of KM processes can be proposed based on research findings.

The paper is organized as follows: After abstract and introduction (chapters 1 and 2), Chapter 3 presents the objectives set for the research and research questions. Chapter 4 (Literature review) introduces the main concepts and processes of KM and foresight as expressed in earlier research. Chapter 5 describes the methodological choices and implementation of the empirical research, the results of which are presented in Chapter 6. Chapters 7 to 9 discuss the research process and quality as well as points out implications of the study and directions for further research.

3. Research objectives

This research set out to explore the knowledge management practices in knowledge- and technology-based growth-aspiring SMEs. The research also aimed at shedding light on justification the people responsible for KM give to their choices.

In addition the research aimed at contributing to the prior-art knowledge of SMEs performing knowledge management. The aim was to find out whether there is something specific in this cohort of companies that would add to the knowledge pool of the KM phenomenon. These findings and emerging frameworks could potentially be used to improve knowledge management process in SMEs.

Since the earlier practice, research and publications of the two researchers is a combination of IP management and futures foresight, this paper also aims at seeing how these two areas coexist inside knowledge management practice.

The research questions set for the research process were;

1. How is knowledge management conceptualized by SMEs and what are the KM trends affecting SMEs?
2. What are the actions and processes of KM performed by the growth-aspiring technology- and knowledge-based SMEs?
3. What are roles of SME´s internal functions as well as the role of external partners in KM?
4. For both questions 2 and 3; what are the reasons and forces affecting the choices made in KM practice?

4. Literature review

4.1. Knowledge – definition and related concepts

Research related to knowledge is vast and spreads into the scientific areas of philosophy, educational and organizational sciences as well as to business management. At its roots, knowledge can be defined in various ways. As an example, organizational knowledge creation theory defines knowledge in three parts, indicating that it has complementary properties. First, knowledge is justified true belief. Individuals justify the truthfulness of their beliefs based on their interactions with the world (Nonaka 1994, Nonaka et al. 2006). Second, knowledge is (i) the actuality of skillful action (we recognize that someone has knowledge through their performance of a task) and/or (ii) the potentiality of defining a situation so as to permit (skillful) action (Stehr 1992, 1994). Knowledge allows humans to define, prepare, shape, and learn to solve a task or problem (von Krogh et al. 2000). Third, knowledge is explicit and tacit along a continuum (Nonaka 1991, 1994).

An ample body of research has been built on the DIKW taxonomy (Zeleny 1987, Ackoff 1989, Baskarada and Koronios 2013, Cooper 2014) that makes a distinction between Data, Information, Knowledge and Wisdom. Rowley (2007) stated that there are many competing definitions for each of these constituents and it can also be stated that the lines between the categories blur. Rowley also added one more layer to the "knowledge pyramid" (Figure 1 below); Intelligence.

When applying the DIKW (or DIKIW) model, it is vital to note that the different layers are not fully independent. For an organization quality of work done and results achieved in one layer affects the following layers.

Figure 1: DIKIW-hierarchy, based on Rowley (2007)

This study uses the conceptualization of Rowley, where he defines the core essence of each category top-down as follows: (ibid., bolding by the authors of this paper) ": Wisdom is the ability to increase effectiveness. **Intelligence is the ability to increase efficiency. Knowledge is know-how, and is what makes possible the transformation of information into instructions.** Information provides answers to "who, what, where and when" questions. Data are defined as symbols that represent properties of objects, events and their environment".

In this study authors have combined the intelligence and knowledge categories of Rowley. For this study the knowledge management means *the practices and tools used to turn achieved information into action to improve efficiency for the future success in business*. The layer of Information in the framework is not limited only to interpretation of facts based on recorded data of the past and present – but following the ideas of de Jouvenel (1967) these *facta* should be expanded with *futura*, images of mind (of potential future facts) that can also be labelled as anticipation.

4.2. Knowledge Management as a process

Knowledge management, as discussed above, is a concept of many competing definitions. The conceptualization of KM naturally does not suffice to a practitioner, as concepts need to get implemented. For that purpose, research has proposed models of KM process. Shahzad et al. (2016) concluded that 1) there is a significant positive impact of system-oriented KM systems strategy on KM process capabilities, creativity and organizational performance. 2) KM processes have significant impact on organizational creativity and performance. 3) Organizational creativity has also been identified as having a strong significant impact on organizational performance.

Knowledge management process models are not of short supply, and the differences in the content and scope of the models come from many variables. One dimension studied is whether the knowledge being managed is from internal (to the firm) or external sources. Menon and Pfeffer

(2003) reported tendency of organizational members to more likely value knowledge from external rather than internal sources. A potential reason for that is that valuation of externally sourced knowledge eliminates the members' status to the information evaluation i.e. positions of power within the organization. On the other hand, Darr et al. (1995) concluded that knowledge coming from units of the same organization transfers and improves the performance of a unit studied more likely than knowledge coming from external sources (Darr et al. 1995). The applicability of the knowledge might be more straight-forward as it is coming from people and units who share the same business scope. However, this may lead to ignorance of novel ideas and new angles for future success that an independent external source might provide. This dilemma is especially relevant for SMEs to consider, as their own resource scarcity forces them to rely a lot to external sources of knowledge.

4.3 Foresight and anticipation as knowledge processes

Foresight is a theme that pertains to a wider concept of futures research. For Kuusi et al. (2015) *futures research* means those studies that are set for pragmatically valid knowledge concerning possible, potential futures. The sub-concept of *future foresight* by Kuusi et al. (ibid.) covers the more pragmatic side of future studies: method-based debates and analyses of different futures. Foresight practices and processes add value to the strategy formulation. Dufva and Ahlqvist (2014) claim that a foresight process is an effort where different stakeholders jointly explore futures and interpret them to formulate actions in present tense. To facilitate knowledge-to-action process, tools such as technology roadmapping (TRM), radical technology inquirer (RTI) and technology radar (TR) have been developed.

In wider sense an organization engaged in quest for knowledge of potential futures is incorporating *anticipation*. Anticipation serves as an umbrella term that covers different processes and practices. Poli (ibid.) summarized the key components for the discipline of anticipation implemented across sciences as follows:

1) In anticipation one will be faced with calculable risks and incalculable uncertainties

2) There is a difference between the distant future and future in the present, the latter one referring to the future as projection of the past and former one to "proper" anticipation, allowing also discontinuities

3) There are continuous and discontinuous/ruptured futures

4) Systems and organizations vary in their capability to use futures

5) Anticipations take place in many layers (e.g.. social and psychological) and are of different types - like explicit and implicit.

This paper focuses especially in the points 2 and 4 in Poli's list of components and tries to shed light on intensity, processes and capabilities that SMEs possess in including anticipation-related elements to their KM function.

Future change is often but not solely caused by technological advancement. It also affects more functions within a company than just technology. Anticipation of technology is used across industries and by organizations of different sizes and development stages. Prior-art research on technology anticipation is SMEs indicates there is a lot of unused potential. Boghani et al. (2008) pointed out that nascent ventures who learn and apply technology anticipation processes generate stronger R&D proposals and increase their odds to get funding. On the other hand, a research in UK by Farukh et al. (2001) indicated that only 10 % of manufacturing firms studied were applying the most common technique - technology roadmapping - and even that did not always take place in a repetitive and continuous process. Even the more engaged ones reported they have challenges in starting anticipation processes and keeping the processes alive. These findings underline the need for conceptual and practical development of technology foresight deployment in SMES.

Anticipation is a process that deals with high amount and magnitude of uncertainty. The negative aspect of that fact is that some of the findings of anticipative work and ideas built on those will have no use in the future that will unfold. The multitude of options and high uncertainty have been traditionally linked to the beginning of the innovation process, coined e.g. to the term of "fuzzy front end of innovation" (Thanasopon et al., 2015). Adoption of anticipatory/foresight practices to KM means that the fuzziness and open-endedness is present across different stages of research and development processes where new and unique knowledge and solutions are sought (Saukkonen & Bayiere, 2017). Sung and Choi (2012) found out that the positive effects of knowledge utilization where stronger when teams were exposed to high environmental uncertainty.

The need to combine elements of knowledge management on the existing knowledge and reaching for new knowledge is a topic addressed in the scholarly writings from the very early era of knowledge management literature. Back in 1990, Cohen and Levinthal defined an approach that they call absorptive capacity that would allow an enterprise to fully utilize their knowledge potential. According to Cohen and Levinthal (ibid.) firms must "leverage their existing knowledge and create new knowledge that favorably positions them in their chosen markets. In order to accomplish this, firms must develop an "absorptive capacity" - the ability to use prior knowledge to recognize the value of new information, assimilate it, and apply it to create new knowledge and capabilities".

4.4. Specific context of the study: knowledge- and technology-based SMEs

SMEs are recognized as the most important engine of net job growth in most economies. Most often their ability to employ is fueled by the growth achieved. Their continuous growth requires expansion to international markets. In countries with limited size of domestic markets such as Denmark, Estonia and Portugal the share of total exports generated by micro- to small-sized companies of 1 to 49 employees is as high as 30 % (Eurostat, 2014).

Both the source of competitive advantage (knowledge and technology) as well the nature of a global market opportunity and competition require measures in KM. Different stage models of company growth (e.g. Greiner, 1972; Marmer et al., 2011) confirm the view that in order to grow and evolve companies' strengths related to their knowledge vary across stages. During the growth trajectory there are needs both for knowledge protection as well as knowledge dissemination within the company. Also the knowledge management action with members within the business ecosystem a company is a needed.

The need of managing uncertainty by acquiring and transforming knowledge becomes evident in the definitions given to startups i.e. young companies with potential to fast and scalable growth. Blank (2010) and Ries (2011) underline the concepts of novelty, uncertainty and search as fundamental characteristics of these firms. Most of the companies in the sample of the empirical part of this study fall into the start-up category of SMEs, highly dependent on successful KM that includes creation of new knowledge.

5. Research methodology

For this study the qualitative, explotatory approach was chosen as the issue area studied was presumed to be complex and rich. Also the sheer amount of different concepts and frameworks used for KM concept studied requested data gathering by live discussions with respondents. This in order to ensure shared interpretations of the questions and terms in the data gathering phase. In this type of study it is not a viable option to define processes in variables expressed in numerical measures. As Black (1994) state: "Unlike quantitative research, qualitative approach seeks to answer the "what" question, not the "how often" one." Also "…qualitative methods take a holistic perspective which preserves the complexities of human behavior" (ibid.).

The research target was partly conceptual. Authors aimed at understanding the phenomenon and derive typologies and propose new frameworks for further study. Young (1995) proposed that an important parameter of conceptual research is an attempt to systematically give clarity to concepts. Conceptual research is used to either develop new concepts or alternatively to reinterpret existing ones (Kothari, 2008, Leuzinger-Bohleber and Fischmann, 2006). Thus conceptual research take the concepts themselves as a research object. Conceptual researchers investigate e.g. the origins, meanings and usage of concepts. The researchers aimed at shedding light on how practitioners in

SMEs have internalized the KM concept and processes, what factors have affected their ideas of related concepts and how the concepts, tasks and roles of KM have been externalized within the company and with its network partners.

The researchers collected the data via in-depth interviews with 10 Finnish SME-companies, all of which can be categorized to knowledge/technology-based companies. All interviews were recorded, transcribed and subjected to content analysis. In the analysis the principle of researcher triangulation to enhance the research process (Kitto et al., 2008) was used. The two authors first independently reviewed the material collected and rearranged, formulated their own conclusions from the data, that were then synthesized for a joint view.

6. Findings

6.1. The changing landscape of knowledge

What might be the new conceptualization of knowledge and its relation to other concepts in a modern context? Based on the study in the era of digitalization the sheer amount and availability of data creates a potentially wider base for the original DIKIW hierarchy pyramid than the one presented in the literature review (see Figure 1). However, this abundance of data that can be retrieved and rearranged across various information systems of the company and its stakeholders can cause a problem in itself. The defining "3 V´s " characteristic of the modern concept of Big Data (e.g. Sagiroglu and Senanc, 2013) remind that in what comes to data we live in the era of volume, variety and velocity. The size of data can be too massive, have too much variety of format and b etoo fluctuating to be correctly acted upon. This abundance may also harm the ability of a firm to move into the higher levels of the hierarchy. This new context of massive data would need capabilities of information and knowledge capabilities that have been outspeeded by the hypergrowth of data. The modern DIWIK model illustration has the shape shown in Figure 2. Due to the width and depth of the data only part of it can be used and acted upon. Even more importantly, only a part of it is useful for the future-related decision-making, development and creativity, in other words some of the expanded data is waste. The imbalance between amount of data and capabilities/resources for its use can also lead some important data ending up in unwanted waste, thus hurting the future knowledge capacity of the SME firm.
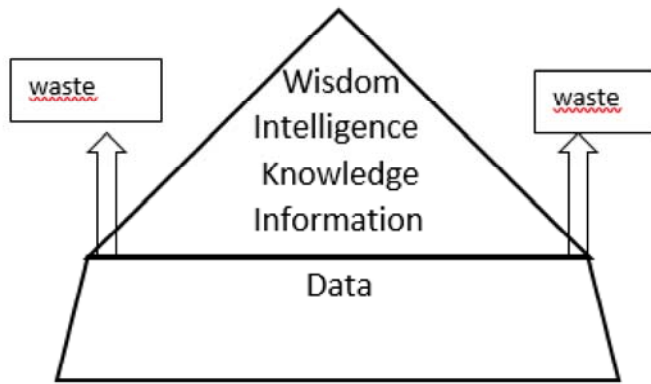
Figure 2. The new hierarchy of DIKIW? (by authors)

Especially when reaching out for future knowledge, the widened time horizon opens up a growing array of options of future development (market trends, technologies). The product and service development in companies typically aims at narrowing the options and making choices of the technologies and features to be included to the products and services rolled out. This idea of narrowing down has been described as "innovation funnel" (Dunphy et al., 1996). The evaluation of relevant knowledge happens inside the "planning horizon" of the companies (Kuusi et al., 2015). On the contrary, the future-oriented knowledge search happens on the "scanning horizon" (Kuusi et al., ibid.) and has the shape of a widening funnel. As stated by Saukkonen and Bayiere (2017), a firm has a dilemma of operating within two funnels that act in a contradictory way in what comes to narrowing vs. widening the options. This a major challenge for technology and knowledge based SMEs. Just like the data describing the past actions of the company and markets has "waste" in it, so does the scanning of futures produce future-informed data that proves to be waste first at some later stage. Either the envisioned future does not happen, or proves to be irrelevant to the company at that point of time when it occurs.

As a summary of finding from empirical study it can be stated, that companies and people responsible of KM in them do identify the challenges of data accumulation vs. usage, but are short of fast and cost-efficient enough methods to work on the growing sets of data. This confirms the researcher´s conceptual proposal of reshaped pyramid of DIKIW-model.

6.2. Knowledge management processes and their use in SMEs

The content analysis of the primary data collected with qualitative method both gave view on 1) what are the KM processes identified by actors in SMEs and 2) how common their use is in the SME sample.

The interviewees described both the processes taking place at the moment as well as reflected the processes thought over, discussed and planned for the future in their organizations.

The researchers conclude that the processes identified can be categorized using two axis, where one axis concerns whether the process is done internally in the company or does it also include external actors as stakeholders (axis of dimension). The other axis makes a distinction in the processes that are "purely" operational/opportunistic) vs. having more of a strategic view inbuilt into them (axis of approach). The difference between the two may be best described using Mintzberg's framework where management contains decisions that are a) opportunistic/fully operational i.e. decisions on current situation and with the prevailing knowledge and recourses, and where decisions have a weak linkage to future decisions, at least by the time they are made and b) strategic decision-making that happens still in somewhat predictable conditions but in a timeframe that allows rearranging and acquisition of (some) additional resources.

The findings placed to the framework consisting of this double-dichotomy (Figure 3), indicates that SMEs tend to act in KM is mostly in internal and operational layers. The companies have identified and were planning processes with more strategic and outreaching nature, but they were rarely taken in use. Despite the view that internal and operational KM creates a solid base for future innovations (Olander et al., 2014), the linkages between operational and strategic knowledge management processes were not strong. Also Olander et al. (ibid.) in earlier research identified this need to move in KM beyond protective measures such as patenting and data security, but that good operational governance works as a foundation that should help in dealing with future uncertainties. So the cohesion between layers would be needed.

The findings also reveal the tendency to act on the protective side of knowledge management compared to the dissemination of knowledge. However, most companies expressed intention to more externally focused actions in KM and more strategic view to be added to the KM. This in order to enhance the organization's (and its network's) capabilities to keep innovating and creating new value in the future. However, these recognized needs had in just a few occasions turned into action. The reasons for the inertia included lack of time and personnel as well as lack of clarity in role division between different parties when acting in KM. In one occasion the co-creative approach had even led to a loss of IPR to a customer, so the realistic answer to "protect or disseminate" question is a combination of both solutions.
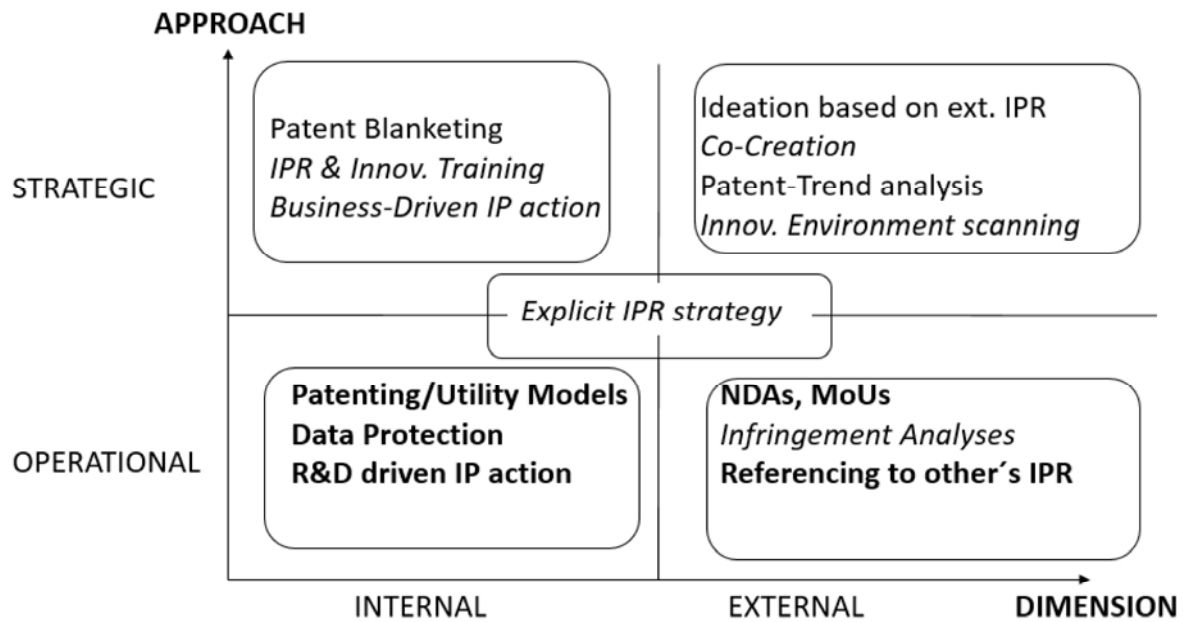
Figure 3: Taxonomy and width of usage of KM processes in the sample (Legend: **Bold font** = commonly used; *Italic font* = used by some; plain font = identified but not yet in use)

When interpreting the taxonomy it is vital to notice that the different quadrants are not alternatives. A holistic KM strategy and action can and should include elements of all sections, like is the case with many successful firms.

6.3. Factors affecting the KM concepts and processes in SMEs

Another interesting question was: Where do the choices of KM processes come from? Is there a clear view not only on *what* is done in KM in SMEs but also *why* just these processes take place? The study also aimed at finding out *what are the future plans for enhancing KM* and *why just those development steps* are in discussion or making?

The researchers identified a pattern that has been discussed in earlier research, the impact of the key persons inside the SMEs. They have a personal effect on KM and innovation processes taken in use and also in the way these processes are performed. Churchill and Lewis (1983) noted that in the life-cycle of a company in the early stages the owner-founders´ abilities were crucial, but subjected to go lower in importance over time. Hauschildt and Schewe (2000) described the role of key persons to be the ones of gatekeepers and/or promotors, but did not link the role of key persons to the time dimension.

This research revealed that a) key person´s effect in KM scope and practice in SMEs is crucial and b) the KM choices and actions by them are largely based on *legacy*. As Xie et al (2018) put it, spin-offs carry the legacy of their parent firms. This was clearly seen in teams that had spun off from larger entities to start a personal entrepreneurial endeavor as well as SMEs that had started as a

new venture arm of a bigger corporate entity. The *organizational legacy* clearly has an impact on KM in SMEs.

Another type of legacy is related to the individual that is central to KM process in an SME. Their *career legacy* – the motivation that drives them and the impact they most aim at having (Hinds et al., 2015) affects what the SME will focus on. Their strengths and weaknesses become the ones of the company. This legacy is a combination of their education, work history and knowledge possessed. Naturally this can act in favor of an SME. In some of the cases in the sample the core team members came from a strong research institute background, so they bought the KM practices that go beyond an average SME level with the. This phenomenon at the same time makes SMEs vulnerable as changes in personnel can mean sudden loss of KM and innovation capabilities. The role of the key persons' career legacy can also mean myopia – distant objects seem too blurry whereas nearby objects are seen well and they are easier to cope with. This ignorance of new knowledge that does not pertain to the area of the person's legacy area can be the negative KM effect of legacy.

Other dimensions of knowledge management that arise from the research data is the formality/informality as well as explicit/implicit nature of the processes of KM. Typically SMEs have a relatively high degree of formality and explicitness in the processes that focus on the protection and maintenance of firm´s own and existing knowledge. Processes and principles most often exist for internal and operational issues related to the known. There are process descriptions and procedures for knowledge that is clearly definable and thus can be said to enjoy a certain level of certainty (i.e. "facta"). The more uncertain the knowledge is e.g. when it is of an external source, is future- and upcoming innovation –related (i.e. "futura"), the more informal the KM processes are.. Also more implicit are the processes to the people acting with that knowledge. Researchers identified processes and core ideas for acting with uncertain type of knowledge – that often acts as an important spark for innovation and new value creation – but they resided in minds of just a few people in organization. Most respondents expressed intention or at least interest to formalize the processes and move forward towards more externally-linked and strategic action in KM. This enhanced role of external partners was expressed to take place in both knowledge protection as well as in the quest for new knowledge. Action taken to those identified directions was however scarce.

External partners were used in many cases to assess a new product or functionality in what comes to knowledge artefacts (like evaluation of patentability and writing process for a patent/utility). This move to the external dimension may however miss some of its potential if the KM action is only focused on individual and operational knowledge item. So, controversially, using external resources and thus enlarging the pool of people working on firm's knowledge may even be counterproductive for innovation, if the external resources are not used also to act on uncertain

and future-related action. The external members and their knowledge should be brought in to serve also the strategic dimension of KM.

7. Discussion

This research contributes to the earlier findings in the literature of knowledge management, SMEs' growth and innovation. The findings support the earlier views that SMEs fall short in their knowledge management processes in comparison with larger and more mature companies. The SMEs in the sample recognized the needs to improve KM processes to better serve their ongoing creativity and innovation. Due to lack of resources many of the identified development steps were not yet taken.

The dilemma of modern management of overwhelming, volatile and fast-changing data became evident when studying the sample population of growth-aspiring technology- and knowledge-based SMEs. The abundance in sources and amount of knowledge that potentially would serve for innovation and competitiveness is exceeding the capabilities of the organization to handle it. Even more so when acting with external and future-related knowledge is in scope.

The challenges of KM for SMEs in a modern context are at least threefold: 1) SME's ability to act on knowledge depends heavily on its core people. They make the choices on what and how to act upon in KM. The rationale of their choices is often based on the organizational and career legacy that may not be relevant to the current environment. 2) When KM processes get outsourced to company partners in SME's network, the accumulation of knowledge and knowledge –related capabilities and/or proprietorship of knowledge may get negatively affected 3) Volatile nature of knowledge and increased uncertainty of knowledge may lead SME companies to settle in vaguely defined and communicated KM processes. This in its turn may harm the strategic and operational cohesion of the firm's internal resources in KM. This together with a fact that SMEs by definition are resource-scarce created a major challenge for SMEs in KM.

The research confirmed also the earlier findings of KM transforming towards a function that is strategically oriented and bound to external network members. There still is a gap between the intentions to implementation in this respect.

8. Implications (for learning, research policy, practice, for networking)

The research in hand pointed out both the current solutions of KM in growth-aspiring SMEs as well as challenges in it. The results propose that the challenges of full-scale and high-impact KM (that

serves for both protection, utilization, dissemination and further development of knowledge) seem to be growing at higher rate than the resources for them in SMEs. The authors were able to recognize the following streams of further research and development needs both to practitioners of KM as well as to researchers and scholars of it.

- Processes and tools for screening and choosing relevant items from a growing pool of data (present and future-oriented data) are needed
- SMEs knowledge management processes with more of a strategic undercurrent than the current operational/opportunistic actions is needed. This would allow SMEs to direct and synchronize the scarce resources to best serve for creativity and innovation leading to improved future competitiveness
- There is a lack of approachable models for the interplay between a SME and its network partners. These models would include models of choice of partners and criteria for it; roles, right and responsibilities of each party. These models are needed to maintain the correct balance between sharing and proprietorship of knowledge.

To reach these aims the authors of this paper suggest both conceptual and processual development to take place, as well as case-based research to test the appropriateness of the new models developed.

9. Concluding Observations

This research set out with and exploratory approach most focusing on the conceptualizations, processes and development directions of KM as part of creativity and innovation management in SMEs. The study did not set to test any prior models, as they were inductively created as a result from the primary data from the empirical qualitative research. Further research could study e.g. more in detail any of the four quadrants of the Focus-Dimension typology in Figure 3: Operational-Internal, Operational-External, Strategic-Internal, Strategic-External or address more specifically one or more of the above-mentioned development needs: 1) Tools for screening and choice of KM process alternatives 2) Alignment, articulation and communication of a cohesive KM strategy 3) Networked operations in KM.

The sample of this research consisted of Finnish SMEs with a knowledge- and technology-base. These type of companies operate typically in international market environment with international competition. Therefore it may be justified to conclude that the key findings would repeat in other contexts for same kind and size of companies. To confirm this it would be recommendable to repeat the study either in other context or study more specifically companies in one or two fields of industry. This would shed light on whether to there are some business-specific issues in KM and its relation to innovativeness and creativity that this research could not reveal.

REFERENCES:

Ackoff, R. L. 1989. From data to wisdom. *Journal of Applied Systems Analysis,* 16, 3-9.

Baskarada, S., & Koronios, A. (2013). Data, information, knowledge, wisdom (DIKW): a semiotic theoretical and empirical exploration of the hierarchy and its quality dimension.

Black, N. (1994). Why we need qualitative research. Journal of Epidemiology and Community Health, 48(5), 425

Blank, S. (2010) "What´s a Startup? First Principles. (25.01.2010)", [Online], Available: http://steveblank.com/2010/01/25/whats-a-startup-first-principles/ (1st June, 2015)

Boghani, A.B., K. Long, and R. Jonash. 2008. "Technology Intelligence and Monitoring System (TIMS)." White Paper, Monitor Innovation, Monitor Group, Cambridge, MA

CEN (2004), European Guide to good Practice in Knowledge Management – CWA 14924-5. Part 5: KM Terminology, COMITÉ EUROPÉEN DE NORMALISATION, Brussels.

Cerchione, R., & Esposito, E. (2017). Using knowledge management systems: A taxonomy of SME strategies. *International Journal of Information Management*, *37*(1), 1551-1562.

Churchill, N.C. and Lewis, V.L. (1983) "The five stages of small business growth", *Harvard Business Review*, [Online], Available: http://www.researchgate.net/profile/Virginia_Lewis2/publication/228315536_The_Five_Stages_of_ Small_Business_Growth/links/00b495163f77e0bf82000000.pdf (5th May 2018)

Cohen, W., and Levinthal, D. Absorptive capacity: a new perspective on learning and innovation. Administrative Science Quarterly, 35, 1 (1990), 128-152.

Cooper, P. (2014). Data, information, knowledge and wisdom. *Anaesthesia & Intensive Care Medicine*, *15*(1), 44-45.

Darr, E., L. Argote, D. Epple. 1995. The acquisition, transfer and depreciation of knowledge in service organizations: Productivity in franchises. Management Science. 41 1750-1762

Dufva, Mikko, and Toni Ahlqvist. "Knowledge creation dynamics in foresight: A knowledge typology and exploratory method to analyse foresight workshops." Technological Forecasting and Social Change 94 (2015): 251-268

Dunphy, S. M., Herbig, P. R., & Howes, M. E. (1996). The innovation funnel. *Technological Forecasting and Social Change*, *53*(3), 279-292.

Greiner, Larry E. (1972) "Evolution and revolution as organizations grow", *Harvard Business Review* pp. 37-46.

Hines, A., & Gold, J. (2015). An organizational futurist role for integrating foresight into corporations. *Technological Forecasting and Social Change*, *101*, 99-111.

Holzinger, A., Dehmer, M., & Jurisica, I. (2014). Knowledge discovery and interactive data mining in bioinformatics-state-of-the-art, future challenges and research directions. *BMC bioinformatics*, *15*(6), I1.

Hurley, R. F., Hult, G. T. M., & Knight, G. A. (2005). Innovativeness and capacity to innovate in a complexity of firm-level relationships: A response to Woodside (2004). Industrial Marketing Management, 34(3), 281- 283.

Hung, Y. H., Chou, S. C. T., & Tzeng, G. H. (2011). Knowledge management adoption and assessment for SMEs by a novel MCDM approach. *Decision support systems*, *51*(2), 270-291.

Farrukh, C., Dissel,M., Jackson,K., Phaal, R. and Probert, D. (2009). "Valuing Technology Along a Timeline of Technological Maturity." International Journal of Technology Management, 48(1):42-55.

Fine, C. H. (1999). Industry clockspeed and competency chain design: An introductory essay. In *Automation in Automotive Industries* (pp. 6-10). Springer, Berlin, Heidelberg.

Gordon, T.J. (2003). Science and Techology Roadmapping. Chapter 18 in Futures research methodology, Version 2.0 [Z]. *Millennium Project of the American Council for the United Nations University*.

Hauschildt, J., & Schewe, G. (2000). Gatekeeper and process promotor: key persons in agile and innovative organizations. *International Journal of Agile Management Systems*, *2*(2), 96-103.

Hinds, P. S., Britton, D. R., Coleman, L., Engh, E., Humbel, T. K., Keller, S., ... & Walczak, D. (2015). Creating a career legacy map to help assure meaningful work in nursing. *Nursing outlook*, *63*(2), 211-218.

Kitto, S. C., Chesters, J., & Grbich, C. (2008). Quality in qualitative research. *Medical journal of Australia*, *188*(4), 243.

Kothari, C. (2008) Research methodology: Methods and techniques. New Age International, Delhi.

Kuusi, O., Cuhls, K. and Steinmüller, K. (2015) "The futures map and its quality criteria." E*uropean Journal of Futures Research* 3.1 (2015): 1-14.

Leuzinger-Bohleber, M. & Fischmann, T. (2006). What is conceptual research in psychoanalysis? *International Journal of Psycho-analysis*, 87 (5) (2006), pp. 1355-1386

MacInnes, I. (2005). Dynamic business model framework for emerging technologies. *International Journal of Services Technology and Management*, 6(1), 3-19.

Marmer M., Herrmann, B.L., Dogrultan E. and Berman R. (2011) "A New framework for understanding why start-up succeed", *Start-Up Genome Report.* [Online], Available: http://gallery.mailchimp.com/8c534f3b5ad611c0ff8aeccd5/files/Startup_Genome_Report_version_2.1.pdf (15th February 2014)

Menon, T., J. Pfeffer. 2003. Valuing internal versus external knowledge. Management Sci. 49(4) 497-513.

Nonaka, I. 1991. The knowledge-creating company. Harvard Bus. Rev. 69(6) 96-104.

Nonaka, I. 1994. A dynamic theory of organizational knowledge creation. Organ. Sci. 5(1) 14-37.

Nonaka, I., G. von Krogh, S. Voelpel. 2006. Organizational knowledge creation theory: Evolutionary paths and future advances. Organ. Stud. 27(8) 1179-1208

Nowacki, R., & Bachnik, K. (2016). Innovations within knowledge management. *Journal of Business Research*, *69*(5), 1577-1581.

Olander, H., Vanhala, M., & Hurmelinna-Laukkanen, P. (2014). Reasons for choosing mechanisms to protect knowledge and innovations. *Management Decision*, *52*(2), 207-229.

Poli, Roberto. "Anticipation: a new thread for the human and social sciences?." Cadum 2.3 (2014): 23.

Ries E. (2011) *The Lean Start-Up*, Crown Publishing

Rowley, J. 2007. The wisdom hierarchy: representations of the DIKW hierarchy. *Journal of Information Science*, 33, 163–180

Sagiroglu, S., & Sinanc, D. (2013, May). Big data: A review. In *Collaboration Technologies and Systems (CTS), 2013 International Conference on* (pp. 42-47). IEEE

Saukkonen, J. & Bayiere, A. (2017). Torn between funnels: start-up entrepreneurs' dilemma of getting started and preparing for change. In: Conference proceedings, volume 2: research and reflective papers. 15th International Entrepreneurship Forum (IEF) conference. Ed. J. Mitra. Essex: University of Essex. IEF Conference Proceedings, 414-433.

Shahzad, K., Bajwa, S. U., Siddiqi, A. F. I., Ahmid, F., & Raza Sultani, A. (2016). Integrating knowledge management (KM) strategies and processes to enhance organizational creativity and performance: An empirical investigation. *Journal of Modelling in Management*, *11*(1), 154-179.

Siguaw, J. A., P. M. Simpson, and C. A. Enz. (2006). Conceptualizing innovation orientation: A framework for study and integration of innovation research. Journal of Product Innovation Management 23 (6)

Stehr, N. 1992. Practical Knowledge: Applying the Social Sciences. Sage, Thousand Oaks, CA.

Stehr, N. 1994. Knowledge Societies. Sage, Thousand Oaks, CA.

Sung, S. Y., & Choi, J. N. (2012). Effects of team knowledge management on the creativity and financial performance of organizational teams. *Organizational Behavior and Human Decision Processes*, *118*(1), 4-13.

Thanasopon, B., Papadopoulos, T., & Vidgen, R. (2016). The role of openness in the fuzzy front-end of service innovation. *Technovation*, *47*, 32-46.

Von Krogh, G., K. Ichijo, I. Nonaka. 2000. Enabling Knowledge Creation: How to Unlock the Mystery of Tacit Knowledge and Release the Power of Innovation. Oxford University Press, New York.

Wiig, K. M. (2000). *Knowledge management: an emerging discipline rooted in a long history* (pp. 3-26). Boston: Butterworth-Heinemann. 556–74.

Willyard, C.H., (1987). Motorola's technology roadmap process. Research management, pp.13-19.

Xie, X., O'Neill, H., & Tan, J. (2018). Post-Entry Diversification in a Shifting Institutional Environment: How Strategy Patterns Differ for De Novo and Corporate Spin-Off Ventures. *Journal of Small Business Management*, *56*, 281-296.

Yew Wong, K., & Aspinwall, E. (2005). An empirical study of the important factors for knowledge-management adoption in the SME sector. *Journal of knowledge management*, *9*(3), 64-82.

Young, R (1995) Conceptual research. Changes: An International Journal of Psychology and Psychotherapy, 13 (1995), pp. 145-148

Zeleny, M. 1987. Management support systems: towards integrated knowledge management. *Human Systems Management,* 7, 59-70.