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Conceptual development in face-to-face interaction: creating knowledge in a co-creation workshop

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Introduction. In this study, conceptual development and interactive practices related to it in face-to-face discussions of a working community to find out, how new knowledge on an issue important for the working community is created in organizational settings.
Method. Ethnographic approach is used to examine the process of knowledge creation. Videotaped face-to-face discussions are analysed in a detail to analyse the conceptual development and interactive practices related to it.
Analysis. Face-to-face discussions are analysed in the light of conversation analysis and the relevance of the discussions in the longer knowledge creation process is analysed by using ethnographic knowledge of the work in the community.
Results. The results indicate, that the new conceptual combinations, extensions and reframings were used frequently especially to build bridges between people coming from different backgrounds. In addition, their use allowed the participants to develop ideas concerning new technological solutions.
Conclusions. Examining dialogues is essential in understanding knowledge processes in organizations. However, it is concluded, that longer phases of discussions and other knowledge processes in organizations should be included in the analysis, to be able to understand the relevance of the face-to-face discussions.

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Introduction

In recent years, the rapidly changing societal environment and the rise of new technological solutions and tools have challenged organizations to find new ways to their working practices. As organizations have to develop new products and practices to cope with the competitive markets, they need abilities and tools to question old habits and to create new knowledge. (Nonaka, 1994; Cook and Brown, 1999.) Interaction between employers is crucial in sharing information and knowledge of the problems and challenges, but also in getting to know what kind of information, knowledge and skills the others possess. In the field of knowledge management, the research of knowledge creation has been emphasised in recent decades, and

especially the role of interaction in the process of knowledge creation has been underlined (Nonaka, 1994; Nonaka and Takeuchi, 1995; Choo, 1998). However, interaction as such has not often been adequately conceptualised to understand what actually is meant by it and what kind of a process it is (Tsoukas, 2009; Suorsa and Huotari, 2014). Furthermore, even if the importance of interaction and discussions has been acknowledged, the actual dialogues has not been much empirically examined in a detail to understand, what kinds of dialogical processes are involved in the creation of new knowledge in the organizational settings.

In this study, the aim is to examine conceptual development and related interactive practices in face-to-face discussions of a working community to find out how new knowledge on an issue important for the working community is created in organizational settings. In the background of this study is the conceptualisation of organizational knowledge creation in face-to-face discussions (Tsoukas, 2009) and an understanding of the concept of knowledge in the field of information studies. This study explores how Tsoukas's theoretically deep model functions as a basis for empirical research on interaction. Conceptual development is examined in relation to a close analysis of the interaction to understand what kinds of interactive practices promote the development of new knowledge, and to illustrate how these complex phenomena can be examined by combining the analysis of longer knowledge processes with the detailed analysis of the conversations (see e.g., McKenzie, 2009; Savolainen, 2019).

This study is focused on knowledge-creating interaction in the context of research and development work, and universities. Solving such global issues as climate change requires knowledge creation in multidisciplinary research communities. In addition, as many of the problems are connected to the development in the private sector and markets, the role of private organizations in the development process is crucial. Thus, work in research communities is promoted globally, but as the size of the research groups increases and the participants are from various fields and backgrounds, collaboration is also more challenging. The empirical examination of the knowledge-creating interaction is conducted in the multidisciplinary and multi-organizational research community, which is developing new solutions for smart energy markets related to the production and use of renewable energy resources. The focus of this study is in the creation of new knowledge on the concept of virtual utility, which is one of the key factors to be understood and developed in the research community as it seeks to reach its goals. The main focus is on a co-creation workshop organized to bring together members of the community from several different knowledge domains.

The study's research questions are:

1) How are the phenomena of conceptual combination, conceptual expansion and conceptual reframing involved in creating new knowledge related to a virtual utility?
2) What kinds of interactive practices are supporting conceptual development of the virtual utility?

The examination, focused on the dialogues and interaction, also exposes the links between knowledge creation and other information and knowledge processes, such as information and knowledge sharing and use (Huotari and Wilson, 2001; Savolainen, 2009). Ever since 1990's, there has been a debate on the use of the concept of knowledge and relevance of the concept of knowledge management (e.g., Streatfield and Wilson, 1999; Wilson 2002, 2005; Bouthillier and Shearer, 2002). This debate has focused on the question of whether knowledge can be managed or not. It has been argued that knowledge as a phenomenon is unmanageable (Streatfield and Wilson, 1999; Wilson, 2002), and that knowledge is so personal and private a phenomenon that it is unethical to handle it as a resource of an organization (see e.g., Wilson, 2002; Keen and Tan, 2007). In this study, these problematics are one of the starting points of the examination, and the creation of new knowledge is understood as a shared, dialogical event. This study contributes to this body of research by introducing a way to conceptualise and examine the collaborative nature of knowledge creation, therefore, clarifying the fundaments of the debate.

Theoretical background

Knowledge creation in interaction

Knowledge management has been developed because of the need to manage and organize knowledge processes in organizations, which strive to succeed and evolve in the ever-changing world. Becerra-

Fernandez and Leidner (2008, p. 3–4) state: '*It has been argued that the most vital resource of today's enterprise is the collective knowledge residing in the minds of the organization's employees, customers, and vendors*'. Thus, a vast amount of research has been conducted to develop the means to converge the knowledge residing in the minds of human beings to benefit the whole organization. This kind of an approach is connected to the concepts of tacit and explicit knowledge (see Nonaka, 1994), and has had many consequences on the development of knowledge management as a field of research and practice. Research on organizational knowledge creation has been extensive in the past decades, since Nonaka and his colleagues introduced their model of strategic knowledge creation (Socialisation, Externalisation, Combination, Internalisation, SECI-model), based on the notion of tacit and explicit knowledge as convertible elements (Nonaka, 1994; Nonaka and Takeuchi 1995). Ever since, this model has given researchers means to examine the processes of creating new knowledge by identifying different types of knowledge and its flows in different contexts and communities (e.g., Martin-de-Castro et al,. 2008; Anand et al., 2010; van Helden et al, 2010; Ramírez et al., 2012). However, the definitions of tacit, implicit and explicit knowledge have also inspired scholars to criticize and further develop the ideas of knowledge creation in interaction (Cook and Brown, 1999; Gueldenberg and Helting, 2007; Morner and von Krogh, 2009; Tsoukas, 2009; Suorsa and Huotari, 2014). Day explicates the problematics of KM related to the concept of knowledge as follows:

> 'The idea of a dichotomy between "implicit" or "tacit" and "explicit" knowledge has been one of the guiding concepts in Knowledge Management (KM). This dichotomy has provided a theoretical base, but it has, arguably, acted as a limit to Knowledge Management's further theoretical and practical development.' (Day, 2005, p. 630)

Hence, the definition of knowledge as something private and un-communicable (Day, 2005) has had implications on how knowledge processes and especially knowledge creation have been examined (see Suorsa and Huotari, 2014).

However, in recent years, there has been a material turn in the field of organizational studies, emphasising the fact, that organizations are concrete, physical places, and organizational practices are outcomes of concretely acting and discussing human beings, who in their action and discussions share, transfer and create knowledge. (Carlile et al., 2013; Küpers, 2015). In the field of information research, this is related to a wider development, where the social and contextual aspects of knowledge processes have been studied increasingly, and the importance of collaboration and context have been acknowledged (see e.g., Ingwersen and Jarvelin, 2005; Talja et al., 2005; Hansen and Jarvelin, 2005; Savolainen, 2009, 2019). In the research of knowledge creation, there has been a quite unified understanding of the basic logics of the creation of new knowledge in a process, where previous knowledge is questioned and reconstructed in interaction. However, the definitions of interaction as a concept vary, and stay often relatively vague. (Suorsa and Huotari, 2014.)

In the recent studies focusing on more detailed definitions of knowledge-creating interaction, three different ways of conceptualising it were found (Suorsa and Huotari, 2014). First of all, interaction can be defined as a movement, for example, by Cook and Brown (1999) in their widely used study, which illustrates how epistemological separation of the forms of knowledge allows us to define knowledge processes as movements between different types of knowledge and between knowledge and knowing. This creates new knowledge, which manifests itself in human action. In this view, interactive movement happens between knowledge and action, the individuals and their worlds, and also between two individuals in a conversation, as their previous experiences formulate the interpretations made (Cook and Brown, 1999). Therefore, the concept of interaction describes movement in general, which makes it hard to grasp.

Another way to use interaction is to describe it on a very common level as a basis for communities, as do Morner and von Krogh (2009). In their view, interaction is described as constant acts of communication, which function as a basic construction for the whole activity in a certain organization. The basis for all knowledge creation is tradition, meaning the entity of everything already known in the community. This approach emphasises the importance of interaction both in understanding the single process of knowledge creation and as a function of an organization in general. The importance of language and meaning creation is also underlined. However, Morner and von Krogh's description places little emphasis on the perceived reality in communication (see Talja et al., 2005). The third approach is that of Tsoukas (2009), who considers interaction as a dialogue between people, in a way which is linked with the material turn and based partially on phenomenological understanding of the world (see also Tsoukas, 2011). Tsoukas's approach gives means to examine dialogues and conceptual development related to knowledge creation and is investigated further

in this study, as it has not been used extensively in empirical research (Avenier and Cajaiba, 2012; Suorsa, 2017b).

Conceptual and modal levels in the dialogical knowledge creation

Scholars emphasising the dialogical nature of the knowledge creation (Tsoukas, 2009) or language as a focal point in the development of shared understanding (Gadamer, 2004; Sawyer, 2003, 2007), have developed means to examine the conceptual changes happening in the interactive events. In Tsoukas's dialogical approach knowledge creation is seen as a highly linguistic process, as the new knowledge is seen as new conceptual distinctions that have been produced in concrete dialogical acts. Tsoukas defines the concept of dialogue as follows:

> A dialogue is a joint activity between at least two speech partners, in which a turn-taking sequence of verbal messages is exchanged between them, aiming to fulfill a collective goal... At its most general, dialogue aims at removing some kind of unsettledness (or perplexity) experienced by the parties involved, through their reasoning together by verbal exchanges. The typical pattern in a dialogue is that of turn-taking, in which partners alternate between the roles of speakers and listeners. (Tsoukas, 2009, p. 943)

Tsoukas focuses on the notion that, in a dialogue, people are engaged in quite concrete, linguistic processes, where turn-taking, listening, answering, and formulating own thoughts are seen as manifests of being in a shared event of knowledge creation, where also more implicit phenomena are involved. Hence, in Tsoukas's conception, the dialogical, linguistic process of developing new conceptual distinctions, is facilitated in the human relations and also non-spoken, quite implicit phenomena, which are needed in a productive dialogue. Therefore, knowledge-creating interaction can be understood both in terms of conceptual development and modality of interaction. In the conceptualization of the process of organizational knowledge creation, these both dimensions are intertwined and affecting the process simultaneously (Tsoukas, 2009).

Essential in understanding the relevance of the discussions in examining organizational knowledge creation is to define how dialogues can be part of developing new knowledge, both on a conceptual and a practical level. Every dialogue has the possibility to be productive if the participants influence each other (Tsoukas, 2009, p. 943). This means, that participants have to be willing to challenge their own opinions and previous knowledge, which comes close to a hermeneutic understanding of being in an open and shared state of conversation (see also Suorsa and Huotari, 2014; Topp, 2000). This kind of willingness is linked with the idea of participants' abilities to be reflective and also self-critical (see also Mitchell and Nicholas, 2006; Mitchell et al., 2009); an element that Tsoukas calls *self-distanciation*

> Thus, self-distanciation occurs through each interlocutor reflexively understanding her own utterances, prompted by the utterances of the other... New distinctions emerge insofar as both interlocutors may take a distance from their previously held views and a new common sensibility emerges. (Tsoukas, 2009, p. 944)

Hence, knowledge-creating interaction is viewed as explicit discussion, where participants can understand their own utterances only after hearing the others' answers. On the other hand, the productivity of the dialogue is also dependent on the modality of interaction, which means that the act of being in discussion, as such, has several dimensions, which promote the development of an open and shared state: '*in making an utterance, A not only states something, but by doing so he tacitly conveys an attitude or orientation to the kind of relationship he has or wants to have with interlocutor B*' (Tsoukas, 2009, p. 944). Hence, taking turns, listening and answering can be seen as decisions and acts, which themselves have meanings, manifested in the course of actions as the discussion flows. These kinds of phenomena lend themselves quite naturally to conversation analytic research, which focuses on the action and the structures of interaction, and by those means, examines how the participants achieve an intersubjective understanding, without analysing any hidden meanings (e.g., Sacks et al., 1974; Sacks, 1992a, 1992b; see also Savolainen, 2019). This kind of an approach gives means to focus on the modality of interactive practices such as listening and taking turns in discussion, also taking into account the embodied actions.

On the level of describing the development of the content of the talk, Tsoukas has defined three phenomena of conceptual development, which occur in dialogical events, when the mode of being in interaction is that of

self-distanciation: conceptual combination, conceptual expansion and conceptual reframing (Tsoukas, 2009, p. 946). These have been derived especially from the work of Sawyer (2007). Conceptual combination occurs, as concepts are combined in a new way. This can mean really simple and mundane combinations of nouns and adjectives, but when combining well-known concepts creatively, the discussion can be shifted to new directions (Tsoukas, 2009, p. 946). Conceptual expansion means using concepts in different contexts and meanings, and thus creating new distinctions and connections between concepts and conceptions, for example by developing analogues (Tsoukas, 2009, p. 947). A third way of creating conceptual change is conceptual reframing, where reclassifying ar shifting an emphasis from one membership to another (Tsoukas, 2009, p. 247). With the help of these forms of conceptual development in face-to-face discussions, new distinctions and thus new knowledge is created. Therefore, a framework can be formed to combine the conceptual development of new ideas and concepts in discussions with the examination of interaction. The framework is illustrated in Figure 1.

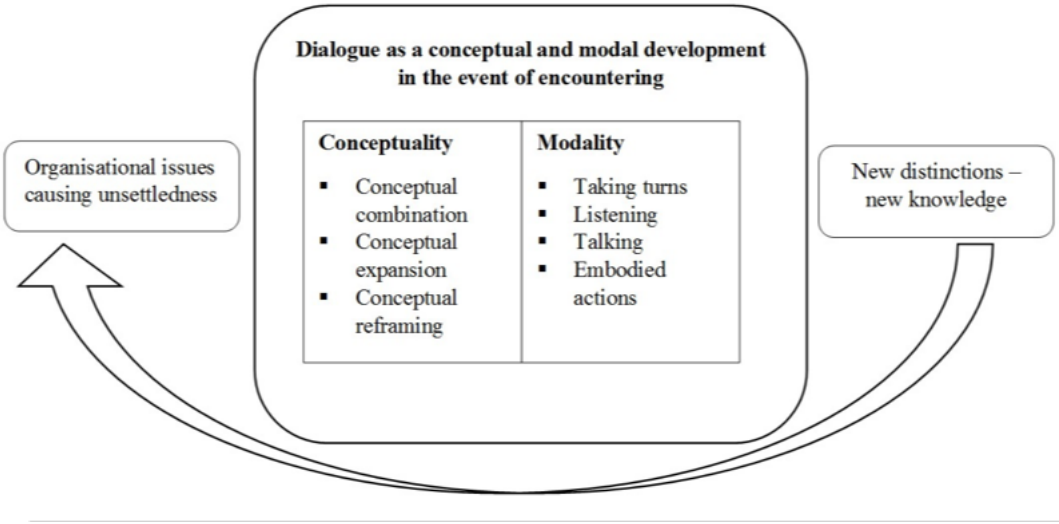

Figure 1: A framework for examining knowledge-creating interaction in this study – a part of Tsoukas' (2009) model included.

This framework is the basis of the empirical examination of knowledge-creating interaction in this study.

Methods and data

Research environment and methods

In this study, knowledge-creating interaction is examined in the multi-disciplinary research community, which consisted of researchers from two Finnish universities and three other research organizations. The researchers formed five research groups from the disciplines of energy economics, computer science engineering, meteorology, information systems sciences, and information studies. There were a total of over forty members, as well as two strategic partners, and an Advisory Board, consisting of members of fifteen private companies. The goal of the community was outlined in the research plan:

> The goal of the... research project is to seek solutions for using solar and wind power as extensively and cost-effectively as possible. The project combines market mechanisms with next-generation ICT and digital services, and more accurate weather forecasts. The management and optimization of renewable, small-scale energy production and cloud services will be made more efficient. The outcome will be a modern online store for selling and buying consumer electricity and small-scale electricity production. (D1)

To reach its goals, the community organizes several co-creation workshops and meetings, which have been the only way to meet each other face-to-face, as in their everyday life the community members are located in several different locations.

In this study,the ethnographic approach is used to examine knowledge-creating discussions related to virtual utility and the methods used were developed to be consistent with the theoretical framework (Figure 1). The main focus is on knowledge-creating interaction in a single co-creation workshop, which was organized by the leaders of the research community, the members of the Information and Communication Sciences Research Group, and a company specialised in facilitating workshops. In the workshop, there were members of each research group and members of the Advisory Board and strategic partners present, in total about thirty participants. The goal of the workshop was to create a concept for a virtual utility, based on participants' knowledge of current energy markets, consumers, technology and circumstances. Deriving from Tsoukas's conceptions of conceptual expansion, combination and reframing, the aim was to examine how the new concepts needed for developing a virtual utility were created in discussions. The focus was thus on video analysis of the discussions conducted between the community members in the workshop, inspired by the detailed nature of multimodal conversation analysis (Mondada, 2016).

Data used in this study

The data collection in this study has been conducted on two levels. The author has followed the work of the research community from its beginning in autumn 2015 and observed the events where knowledge has been shared and created, writing a field diary from the events. In addition, the joint events, such as meetings of the community and its workshops have been videotaped. After it became clear that virtual utility as a concept was crucial in achieving the main goals of the community, the researcher investigated the interactions concerning the conception of virtual utility in the community, such as e-mails, discussion threads and documents produced in that process. This process culminated in a workshop, organized to develop ideas and conceptions related to virtual utility. In this study, the main focus is in the data collected in that workshop. Thus, we have two sets of data: 1) main data: video data from workshop of the research community and 2) background data: observations, field diary and documents of the work of the community during 2015-2018.

Data set 1 consists of video material gathered from a one-day workshop. The thirty participants were divided into four groups so, that each group would have both researchers and members of the Advisory Board or strategic partners. The joint presentations and discussions were recorded by two video cameras to allow examination of interaction from different angles. Each of the group discussions were recorded separately. In total, this resulted in about twelve hours of video materials. In the examples provided in next chapter, the speakers are marked with RES (researcher) and AB (member of the Advisory Board). In case there are several researchers participating the discussion, they are numbered accordingly. The facilitators, who were occasionally involved in the discussions are marked as FAC.

Data set 2 consists of background material needed in to understand the goals of the community and the relevance of the interactive events, examined in this study. It includes the observational data and field diary from the work of the community and covers the period from autumn 2015 to autumn 2018, referred to by OD. In addition, it includes documents produced by the community, referred to by codes D1-D24. Documents include agendas and memos from the meetings, e-mails, plans, reports and presentations of the community.

Analysis of the data

The analysis of the data was conducted in four phases, which were needed to find out the relevant phenomena and sequences from the vast amount of ethnographic and video materials. The phases were: 1) finding a focus by analysing the ethnographic data, 2) analysis of the content of the discussions to find phenomena of conceptual combination, expansion and reframing, 3) analysis of the multimodal interaction to examine how the concepts were developed, and 4) analysis of the relevance of those discussions from the point of view of organizational knowledge creation process in a long run by examining the ethnographic data of the whole process.

The different types of data required different analytical methods. The analysis of the video data pursued at first to identify the moments of interaction related to the examined phenomena from the data. Second, the analysis focused on examining the selected sequences in a detail by utilising aspects of conversation analysis (e.g., Mondada, 2016; Stivers and Sidnell, 2012). In that analysis, both the content of the conversations and the multimodal interaction were taken into account. These data were analysed, based on the framework

illustrated in Figure 1: 1) in terms of Tsoukas's concepts of conceptual combination, extension and reframing and 2) in terms of the modality of the discussions, to answer the research questions (see Figure 1). However, a detailed analysis of the conversations is beyond the scope of this study. Therefore, the selected extracts of the discussions presented in this article were modified closer to clean verbatim to help the reading (cf. Stivers and Sidnell, 2012), and any reference to names or specific locations were replaced with XXX.

The content of the documents and the field diary were analysed to gain an understanding concerning the goals and practices of the community, as well as the development of a virtual utility. The purpose of this analysis was to gain a general understanding of the development of the community and to examine the development of the concept of virtual utility before and after the workshop day, to understand the relevance of the discussions analysed.

Results

The results of this study illustrate, how knowledge-creating interaction can be analysed in terms of conceptual combination, conceptual expansion and conceptual reframing (Tsoukas, 2009), and how the new concepts are developed in interactive practices.

The process of developing the concept of virtual utility in the community

The analysis of all the data was necessary to develop an understanding of the knowledge creation process related to virtual utility in the research community and to find out the relevance of the analysed discussions. The process of analysis, as well as the temporal process of developing a virtual utility are illustrated in Figure 2.

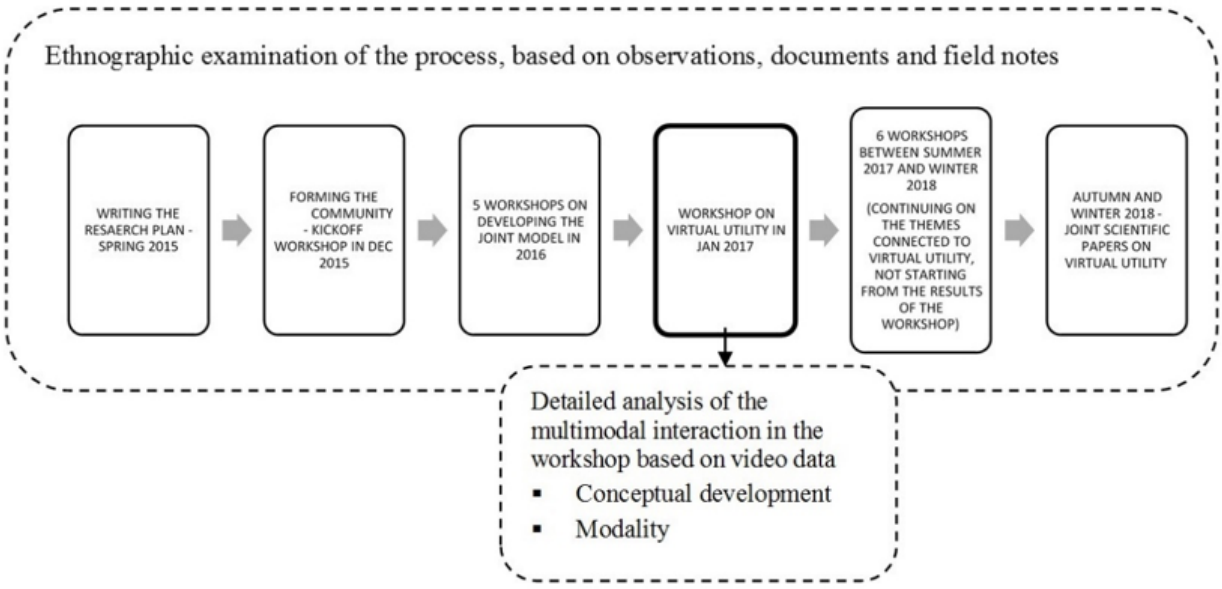

Figure 2: The process of developing a virtual utility and its analysis in this study.

It could be said that Tsoukas's idea of organizational issues causing unsettledness as a starting point of the knowledge creation process was manifested in the community's work. The need to develop new ways to organize energy systems, also by developing virtual utilities had been present in previous discussions (OD), presentations and meetings of the community, starting from the first joint meeting of the community. The researchers had been writing a research plan, which clearly stated this need (D1). However, there were many previous experiences on the fact that it was not easy to develop practical solutions to virtual utility in the discussions (OD). In addition, there were several previous discussions, where people from different domains could see that they had different levels of understanding of certain key issues related to virtual utility, and that they had information to share. Hence, the workshop concentrating only on developing concepts of virtual utility was organized.

In addition to all these elements causing unsettledness, the state of affairs had been investigated from the viewpoint of the markets and private organizations (D6), the results of which were shared on the morning of the workshop (D5). Furthermore, the first half of the workshop day was organized so that there were several lectures concerning some key problems related to the state of art in the energy system (D2-D4). Thus, several issues caused unsettledness and the need to create new knowledge, and the discussions in the workshop were intense and concentrated on solving the problems related to virtual utilities. After the workshop, the results of each group were written down and shared on the community's joint platform (D7). However, the development of the concept of virtual utility and research connected to it (D8-D10) did not directly utilise those documents afterwards, but the knowledge created in the workshop was, on some occasions, a basis for new developments in the community and thus supported more implicitly the work in the community (OD). Closer examination of these developments is outside the focus of this study.

Conceptual development in face-to-face discussions

In the analysis of the video data, the development of new knowledge on virtual utility was most often related to past knowledge of some of the participants, which was first shared and then functioned as a basis for creating new ideas and conceptions. In addition, the analysis illustrated, that the development of new conceptual distinctions was in a crucial role in the interactive process of creating new knowledge in the dialogues, as they gave the participants means to combine their knowledge creatively and to understand the phenomena in a new light.

Conceptual combination

Conceptual combination in the sense of combining two concepts in a new way is as such a phenomenon, which occurred in the dialogues relatively frequently, as combining adjectives and substantives is a normal part of every discussion. Hence, it was important to analyse, which kinds of combinations were new in this context: this was possible when relating the video data to the ethnographic data of the working in the research community in the long run. In the end, in the sequences where the participants together got to develop something shared and new, the creation of totally new conceptual combinations was quite rare. This could be related to the fact that the whole concept of virtual utility could be seen as a conceptual combination, and the participants aimed often to understand what kinds of concepts, practices, and phenomena were involved in its development. Hence, the phenomenon of conceptual combination related to virtual utility was observed only a few times. Below, in Table 1, there is an illustration of one of this kind of discussion, where a new conceptual combination emerges.

Table 1: Example 1 - Conceptual combination suggesting secondary virtual delivery company.

Relation to virtual utility	Suggesting that the virtual utility would be secondary in nature.
Dialogue	RES1: So they said, that we have energy capacity in the networks, so we create **a secondary aa virtual aa delivery company** AB: Yes, a secondary RES1: Yes, it uses that spare capacity that is in the system, an electricity market of its own, which is not under the monopoly RES2: Would it be (lets say geographic...) FAC: (Secondary, virtual) RES1: Yes, you see, we have the power lines, we have the electricity network, of which only 15% is used, where we now create this kind of a virtual delivery company, which uses the existing spare capacity AB: That which is not used now? RES1: Continues developing the idea further…
Knowledge creation process	Understanding, how the virtual utility could be organized to utilise the spare capacity of the networks and to aim at a service, which would not be for the most critical electricity needs.

In this example, a researcher formulates the idea of a secondary virtual delivery company. This new conceptual combination gives the participants means to find solutions to the problem related to the development of the virtual utilities: their position in the energy markets and their function as not the most reliable producer of energy. In this example, we can see how the participants take the idea into consideration by repeating the concept, and immediately strive to understand what RES1 means by it, by asking questions and clarifications. This example illustrates also one most crucial phenomenon related to dialogical knowledge creation in our data: the new conceptual distinction is not developed as a single turn or utterance, but it is developed in interaction by other participants considering the concept and concentrating in it explicitly.

Another type of developing new conceptual combination in our data was related to the contradictions between the traditional way of understanding energy production and new possibilities of understanding it as multifaceted and virtual in nature. In the next example, two researchers and a member of the Advisory Board are figuring out some fundamental elements of the concept of virtual utility they are developing. That conceptual combination leads them to re-evaluate their own thinking on virtual and concrete communities as a basis for the utility (see Table 2).

Table 2: Example 2 - Conceptual combination suggesting peer-to-peer space.

Relation to virtual utility	Peer-to-peer element in the virtual utility as a service, where the customers would also be producers of the energy.
Dialogue	AB1: mm (writes down something), so here people sell to each other RES1: Yes (4,0) FAC: What problems does it solve and from which points of views? AB1: So is it peer, peer-to-peer? RES1: Peer-to-peer, peer-to-peer network, peer-to-peer selling, (**peer-to-peer space**) RES2: (If it would be) some region, like a local energy, a local energy company would belong in it RES1: Let's take RES2: They have that river going there (shows with her hands) RES1: Let's take, say, XXX (a local town) Energy RES2: Or any river, XXX (a local river) River company, where there are people RES1: Yeah, Yeah
Knowledge creation process	Combining the idea of peer-to-peer service with the idea of virtual utility being both virtual and physical space in nature.

This sequence starts, as the member of the Advisory Board asks for a confirmation to his understanding, that they are developing a concept of virtual utility, which is based on the idea of people selling energy to each other, which is immediately confirmed by RES1. However, AB1 continues ask for a clarification by asking, if it is peer-to-peer (using the English term also in a Finnish discussion). To respond to this, RES1 not only confirm the suggestion, but also starts to test different conceptual combinations, and ends up to a new combination: peer-to-peer space. This new conceptual combination gives the participants means to, quite surprisingly, start to imagine, how the virtual utility could still be local, connected to the physical place and energy production. Also this example illustrates, how new conceptual knowledge is developed in interaction and constructed turn by turn. In addition, this example illustrates, how using new concepts together allow participants to enter to a totally new area of discussion without losing touch to the previously discussed thematic. Hence, the historical and hermeneutic nature of conceptual knowledge creation comes concretely illustrated.

Conceptual expansion

Conceptual expansion was seen frequently in the discussions in the video data. It could be seen that the participants were striving to find common ground and gain understanding of each other's fields by suggesting new ways to define and conceptualise the phenomenon and conceptions related to virtual utility. The analysis suggested that the difficulty of the issues in question and the eagerness of the participants to understand each other's resulted in dialogues, where familiar concepts were expanded to explain some key phenomena in developing virtual utility. The analysis also illustrated that, in knowledge-creating interaction,

the new conceptual expansions led into the development of the concept of virtual utility by allowing the participants to find new ideas and formulations by reflecting them in the light of another, more known concept. This kind of process is illustrated below, where a researcher and a member of a private organization are discussing about what exactly a virtual utility would mean (see Table 3).

Table 3: Example 3 - Conceptual expansion giving means for technological development of the electricity network.

Relation to virtual utility	Controlling of the electricity network like traffic control in railways.
Dialogue	AB: Where do we need the local company, other than transferring network? RES: (1,0) … it is also needed because of the **control, controlling of the network** AB: Is it needed RES: You cannot just pump the energy into the network, it can be getting too busy, there could be problems (gives a list of problems), the actual management of the network is still in the local company AB: So similarly as in (like) RES: (So it develops here) (shows the paper) AB: **(in) the railway network there is the traffic control** RES: Yes, so here in the platform there is this kind of a no go, green light, red light, which is given by the electricity company AB: (draws to the paper) So it has only the role of managing the rails (2,0) RES: But it has to give an allowance to the trips AB: It has to give allowance to the trips RES: So that every passenger can fit into the train AB: Yes (writes something down and continues to develop the idea of managing the virtual utility concretely)
Knowledge creation process	Developing means to create a technological solution to the electricity network in virtual utility

In this extract, the participants succeed in finding a shared understanding of the need for controlling the electricity network by using a metaphor of traffic control in railways. Significant in this example is, that the participants can, with the help of the idea of traffic control, create new ideas of how to design the controlling of the electricity network, by talking about trains and rails, instead of quite complicated structures of electricity network.

As seen above, conceptual expansion can function on a metaphoric level to bring together different fields and enhance the development of shared understanding in discussions, where the participants have different knowledge bases and fields of expertise, but simultaneously have shared knowledge in living everyday life in the same culture. However, conceptual expansion can be also non-metaphoric, finding connections between similar kinds of phenomena. In the next example, this is illustrated in a quite simple way, as one participant starts the ideation by relating the ideas concerning virtual utility to a phenomenon more known by both, namely the co-operative society of telecommunications (see Table 4).

Table 4: Example 4 - Conceptual expansion suggesting co-operative society as a basis for virtual utility.

Relation to virtual utility	Developing a community for producing and selling energy by comparing it with co-operative societies already operating in the field of telecommunications.
Dialogue	AB: So is there a service, where you could, so to speak, if you buy solar panels to your summer cottage, so can you joint into some in internet RES: There are, really small, like in XXX (a local town) some **solar power co-operative society**. AB: So this kind of like **a co-operative society of telecommunications**? RES: Yes AB: Is there a service, where, like RES: (I don't think so) AB: (you can) in internet buy a package, let's say X square meters of panel, put them to

	your roof and joint in in internet like live, so how much have you sold today RES: the question is am I allowed, if I put the panels on my roof, even sell (looks challenging the others, and the discussion continues on the legislation and rules).
Knowledge creation process	Creating a possible concept for the basis of the whole service as a co-operative society.

In this example, the joint understanding of the co-operative societies of telecommunications gives the participants means to start to think, what a similar kind of a service could be like in the field of virtual electricity markets, and this conceptual expansion sharpens their focus to the real problem in this field: the restrictions and legislation prohibiting the selling of energy in co-operative societies. By this expansion, the participants can use their previous knowledge of co-operatives to understand the whole system and its basic logics.

All in all, in the virtual utility discussions, conceptual expansion was related to the fact that the participants came from different fields and the content of the discussions was often quite specific and related to the special knowledge of some of the experts. Hence, by using analogues and metaphors, they could test their own understanding and help to find the common ground.

Conceptual reframing

The analysis of the video data illustrated that the phenomenon of conceptual reframing was seen as using the same concepts in different contexts. In the discussions, where the participants were from different backgrounds, the usability of same concepts in different fields was tested in several occasions, either by explicitly asking the possibility for reframing or by suggesting new conceptual reframing as part of expressing how one had understood the connections between the fields in question. Hence, the analysis shows that this phenomenon was particularly useful in the discussions in this kind of a multi-professional and multi-organizational community, and its relevance in creating new knowledge was in combining the knowledge from different fields to form a joint understanding of a certain topic. This is illustrated in the next example, where a meteorologist is introducing a central problem in forming a virtual utility based on the variable, weather dependent renewable energy production: the uncertainty of the weather forecasts, which is then compared with the element of uncertainty in stock markets, a field which is familiar to the Advisory Board member (see Table 5).

Table 5: Example 5 - Conceptual reframing of the concept of uncertainty.

Relation to virtual utility	Uncertainty of the weather is a challenge to the virtual utility, as the production of renewable energy is dependent on radiation, wind etc – having accurate weather forecasts would make the whole system more reliable
Dialogue	RES: (has been talking for a while) … these are weather models, and we can with certain types of disturbances stimulate the **uncertainties** (in the weather forecasts), which we know there are... AB: (Yeah) RES: ...and it is dependent on the weather, that how many different scenarios we have, AB: (Yes) RES: ...sometimes the atmosphere is chaotic, and a small disturbance is distributed into many different scenarios. So there is kind of an inherent uncertainty AB: So this is a kind of, you could compare this with, like, like stock markets, where the **uncertainty** is sometimes greater and nobody knows, where the markets are developing RES: Yes, yes! AB: So... (Continues to talk about the risks in the markets).
Knowledge creation process	Understanding how the concept of uncertainty is linked with the basic problem in developing virtual utility and gradually clarifying, how this uncertainty can be a positive element in the system.

In this extract, the reframing of the concept of uncertainty happens interactively as both participants give each other time and space for explicating how they understand uncertainty in the context of developing a virtual utility. Preceding this interactive sequence, the meteorologist has been talking about the basics of

doing weather forecasts in different kinds of circumstances, where sometimes the level of uncertainty is high, and sometimes low, and the Board member has been listening and encouraging him to continue by multimodal means for interaction and by making positive sounds and nodding. In this extract, he finally is able to make his conclusion and compare the phenomenon with uncertainty in stock markets. To understand this example of conceptual reframing in terms of knowledge creation, it is important to note that the meaning of the dialogue is in explicating, if the reframing conducted is understood by both participants. In this example, the meteorologist agrees explicitly by answering eagerly 'Yes, Yes' to the suggestion of the Board member. However, only after analysing what is discussed after this sequence, we can see whether the participants really are at the same page with the new conceptualisation: in this case the mutual understanding is crucial, as the concept of uncertainty and the ways in which it can be used positively becomes a key component in the participants' development of the virtual utility.

Thus, the analysis of all the conceptual phenomena examined in this section shows that the first suggestion of new conceptual development is just a starting point of a complex and multimodal process, where the new concept is negotiated, tested and developed further. In this process, the new concept can give the participants means to understand the phenomenon at hands in a new light. However, the context of this study highlights the importance of finding suitable combinations, expansions and reframings, as seen in Example 6, where the participants get ideas from the management of railway traffic to the management of the virtual utility. This is also illustrated in the next extract, where the participants have moved from talking about uncertainty to talking about risks. In this discussion, risks concerning the uncertainties of weather forecasting are reframed, as the participants strive to figure out, what kinds of risks there is to the consumers, if the weather forecast fails (see Table 6).

Table 6: Example 6 - Conceptual reframing developed to understand the risks involved in virtual utility.

Relation to virtual utility	Risks in weather forecasting produce risks in the whole system of virtual utility, as the price of the energy is not calculated correctly.
Dialogue	AB: and the sensibility for variation is kind of much, much greater, and the production, that **risk in production**, the assessment of the risk level, so to define, what is the level of risk we are moving now, RES: Yeah, AB: And the production is forecasted, RES: Yeah, and of course that, if I continue processing the idea here, so if we think about the user here, so (continues to think aloud and wonder in a long talk, what would the consumers do, if they get a risky forecast) AB: I would think... that we would have a XXX (name of a technology company) virtual utility, which utilises the energy weather forecast, and we know how much we have our own production in the XXX (name of a technology company) network..., so it would be optimized only by the prize: is it profitable to use own production, is it profitable to buy from the markets, how much to consume, should I load my electric car or un-load it RES: Yes, yes, so in that sense this (points at a post-it where the notes of the discussion are) is one of the components, this production, so that the user would be pissed off, if the forecast is wrong, as all the decisions are based on it, AB: So in the worst case scenario if it happened (points at the post-it and explains, what would happen if the forecast would be wrong and the consumer would have to load the electric car on a higher price), so it is a slap in the face from two directions (laughs), RES: Damn it is a complex system (both laughing), AB: But the algorithm, which is calculating the risk, it doesn't have to define it by itself, but you can set the risk level defined by the producer of the service by yourself, as you install the system, so **when the forecast is risky**, you play safe and don't count on your own production, RES: So the expected result (reads the post-its) for the service producer of consumer is to find some level of risk that is agreed on... AB: **So we find in the calculation a suitable risk level, so the uncertainty is utilised in the calculation** (RES writes down the notes)
Knowledge creation	The understanding of how the elements of uncertainty can be utilised as a positive element in developing the virtual utility by calculating different risk levels informing the customers on

process the risky forecasts.

In this example, the participants co-create the reframing of the concept of risks and can then use that shared understanding of risks in the development of a central part of the virtual utility on a level, which is no longer only possible in discussions, but also on the more detailed level of planning the actual functionalities of a real concept of virtual utility. This is seen in the discussion, where the concepts used are sharpened and the participants start to think the solution from a point of view of a concrete technological system and use a typical example of a consumer with an electric car. Hence, the development is both highly practical and scientific, which is enabled by both conceptual and relational or modal features of the discussion.

Interactive practices promoting knowledge creation

The analysis of the interaction in the sequences, where new conceptual distinctions emerged, indicated, that there were several different and quite opposite ways of being in the dialogue, each being purposeful in that context and thus productive in terms of creating new knowledge. When analysing the turn taking in the dialogues, different interactive practices and the content of the knowledge the participants were bringing into the dialogues, three main types of dialogues could be identified: 1) knowledge was created together so, that both participants explicitly brought some new element to the discussion, 2) knowledge was explicated by some of the participants, and the process was supported by the comments of the others, 3) knowledge was explicated as a monology or thinking aloud, which was then discussed together.

When **explicitly developing the content**, the participants were engaged in a dialogue by explicitly giving some ideas, concepts or thoughts to the discussions and thus developing a new idea. This kind of a way of discussing was quite surprisingly not so often used. In addition, this kind of explicitly dialogical process could be seen to form two different types, in relation to the information shared and used: 1) giving elements for developing a joint idea, meaning suggesting concepts and ideas, as in Example 2, where the participants together create a new concept: peer-to-peer-space, and 2) suggesting different ways to understand the suggested concept, meaning sharpening already given elements by giving examples and showing similarities, as e.g., in Example 5.

In the sequences of **implicitly developing the content** one of the participants brought the actual conceptual content to the dialogues and was thus the only one to contribute explicitly to the development of the idea or knowledge on virtual utility. However, the role of the others was often highlighted, as they asked relevant questions, clarifications, and showed agreement by repeating the suggested concepts and ideas. As seen in Example 1, this kind of interactive practice was often crucial in developing the ideas further, as the concepts were strengthened and kept alive just with these kinds of means.

Furthermore, it was noted that the development of new conceptual distinctions involved in some occasions sequences, where the pace of turn-taking and dialogue was quite unbalanced, because one of the participants took time to explain and further develop an idea close to his or her area of expertise. In these kinds of sequences, the issues at hand were quite specific and knowledge shared was in the core of the concept of virtual utility and the goals of the research community in general (OD), such as weather forecasting or the market mechanism currently used in the national energy companies (D6). It could be observed that, while only one of the participants was talking aloud, the situations were highly dialogical, when taking into account the non-verbal, multimodal interaction. Hence, it could be seen, **supporting thinking aloud** was one crucial interactive practice, which was established by showing the interest in listening actively, writing notes, and nodding. In addition, the participant talking, had a habit of taking pauses, looking the others and offering places for comments and questions. This kind of sequence and its ending is seen in Example 5, where a lengthy monologue of a meteorologist is preceding the development of a new conceptual reframing, which is possible only because the other participant has had time to listen and make conclusions on a quite complex theme.

In practice, these dialogue types varied in different discussions, and the participants were able to move from the more monological type to very explicitly dialogical type, as the shared development of the ideas progressed. Hence, it was observed that one of the most crucial elements in this process was the participants' ability to understand the shared nature of the dialogue and to act in a way that supported the process. In addition, in each dialogue type, the process was linked with the conceptual development of the idea related to virtual utility and concepts used to describe it.

Discussion and conclusions

This study has been investigating how new, conceptual knowledge is created in face-to-face interaction and how interactive practices support the process. The results of this study indicate that by taking into account the conceptual development and the content of the discussions we can understand how new knowledge related to virtual utility was created in the workshop examined. It could be suggested that the analysis of the new conceptual combinations, extensions and reframings fostering knowledge creation was relevant and possible only by taking into account their novelty in that particular context, as the phenomena as such were defined by Tsoukas on so general a level that they could be found occurring naturally really often as people combine words as they talk in various ways. Their significance in fostering knowledge creation was seen only when analysing interaction related to them, as the relevant conceptual combinations, expansions and reframings were discussed and clarified by repeating, asking for more information and suggesting new meanings by other participants.

In addition, it was noted, that the meanings carried with the concepts used in new ways and new contexts gave the participants means to develop the conception of virtual utility. Especially, the participants were referring to well-known technological conceptions to figure out how to create new technological solutions in the context of energy. Hence, it could be suggested that this kind of context and issue at hand lends itself naturally to conceptual development, especially by reframing and extending. The development of totally new concepts by conceptual combination, on the contrary, was not so often used, as the whole issue at hand, i.e., developing a virtual utility, was a new conceptual combination as such, and the challenge for the participants was to share knowledge on related issues, and to create new knowledge based on that. Hence, it was noted that this way of combining different knowledge bases was crucial in the development of new knowledge, as it created opportunities to build bridges between already known and new information. Furthermore, by using different interactive practices the participants could clarify their ideas and also reassure that they shared the same understanding of the idea discussed.

The analysis of the modality of interaction in the sequences where new conceptual distinctions were developed revealed that new concepts were created in various kinds of discussions: 1) by explicitly developing of the content of the idea together by combining knowledge and conceptions of the participants, 2) by implicit development of the content, where one of the participants formulated the idea and the others supported that development by listening, asking and clarifying, and 3) by supporting each other to think aloud, which was seen when analysing the interaction multimodally, taking into account bodily movements, gestures and gazes. From the point of view of knowledge creation, the most crucial element in all these discussions was the participants ability to take into consideration the new conceptual developments encountered by concentrating on what was suggested, asking more, clarifying the others' ideas and bringing new elements to the discussions. Hence, it could be argued that, when combining all the levels of analysis, the results indicate that there are no general tips or general techniques that would support the creation of new knowledge in any situation. On the contrary, the results of this study indicate that the real potential in developing means to support knowledge-creating interaction is in the importance of listening and being present in the dialogical situation, to be open to the others and the situation. This is in line with the phenomenological background of Tsoukas's idea of knowledge creation (Tsoukas, 2009, 2011), further developed from the phenomenological point of view by Suorsa (2017a).

This study has its limitations. The empirical analysis of the discussions was conducted in one specific context and the phenomenon should be examined in different organizational environments to get a broader picture. In addition, knowledge-creating interaction was examined in a workshop, where the participants were committed to shared development of new concepts, and the phenomenon should also be examined in everyday situations in organizations. Furthermore, there were limitations concerning the analysis of interaction data, and especially the notion of the multimodality of knowledge-creating discussions calls for further investigation with more detailed conversation analytic approach (see McKenzie, 2009; Savolainen, 2019). In addition, the embodied nature of being in interaction could be further elaborated in relation to recent research on embodiment and affectivity (Värlander, 2008; Küpers, 2015; Keilty and Leazer, 2018).

The results of this study has theoretical and methodological implications. Thus far, Tsoukas's (2009) approach has been acknowledged as useful and insightful (Avenier and Cajaiba, 2012), but it has not been used to examine discussions on a large scale, not just as individual examples. The results of this study

suggest that the longer phases of discussions and other knowledge processes in organizations should be included in the analysis, to be able to understand the relevance of the face-to-face discussions. As our results indicate, examining knowledge creation by analysing single discussions is not enough; there should be deeper understanding of the organizational knowledge and its change in the process. This means that the discussions should be analysed in their context by examining what happens before and after them, as the changes both on organizational and individual level are temporal and only visible as a longer process, as seen in Tsoukas's model. Hence, to understand the meaningfulness of the dialogues in the creation of new organizational knowledge, we have to analyse both the structure of the dialogue and its content, not separately but together. The relevance of the face-to-face discussions in the process of creating new organizational knowledge can be understood by analysing 1) the relevance of the content of discussions – how they are related to the goals of the community and the issues relevant in the certain context, 2) conceptual development and multimodal interaction in the face-to-face discussions, and 3) the relevance of the discussion in the organizational knowledge creation process as a whole by taking into account the outcomes of the discussions. In future, this method should be tested and further developed in different organizations and communities to investigate the differences and similarities of the interactional phenomena in different contexts.

The examination of the face-to-face discussions and relating them to the data of the longer knowledge creation processes connected with the development of the virtual utility in the research community, we could see one quite problematic feature of dialogical knowledge creation: in the face-to-face discussions many interesting and highly valuable new conceptions were developed, but many of them did not live long in the community after the workshop day. This should be examined in future studies of the knowledge creation processes in the research community, to find out how new scientific knowledge and research papers are developed. The results of this study illustrate the problematics of face-to-face knowledge creation in organizational settings, as the new knowledge is hard to share and use. Hence, it could be argued, that the results of this study highlight the importance of knowledge management in facilitating knowledge processes and taking into account the organizational knowledge creation as a process, which should continue also after the dialogical events of knowledge creation (Choo, 1998; Savolainen, 2009). In future, computer-supported interaction should also be studied as one of the ways to communicate in the knowledge creation process (Wagner et al., 2014; Barcker, 2015; Baralou and Tsoukas 2015). In addition, the relevance of the workshops and co-creation events in the process on knowledge creation should be investigated further to enhance their effectivity and significance from the point of view of the organizations and working communities.

The analysis of the discussions also illustrated clearly, how the process of creating new knowledge is intertwined with the other knowledge processes, such as knowledge and information sharing and use, as seen in all the examples where the sequences involve asking and clarifying. The results of this study indicated that the participants had to first share their knowledge on their specific fields, before starting to interactively create a new, shared understanding of the issues at hand. Therefore, the examination of the dialogues and actual face-to-face discussions illustrated the complex nature of the defining knowledge and information as distinctive concepts (see Miller, 2002; Bouthillier and Shearer, 2002; Wilson, 2002; Tsoukas, 2011). In addition, the division to implicit and explicit knowledge can be critically re-evaluated, as the multimodality of the conceptual development is taken into account. The theoretical and methodological implications of this should be further investigated, to be able to understand the premises of the research of knowledge and information processes even better.

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