Knowledge-creating interaction and Information Literacy in organizations - an empirical study in the context of research and development project

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Abstract. The aim of this study is to contribute to the understanding of Information Literacy (IL) in relation to knowledge creation in organizational settings. IL is understood as a practice realized in the course of action, emphasizing the social and interactive aspects of the phenomenon. There is a need to increase understanding of the role of IL in knowledge processes and develop methods for empirical examination. We suggest an approach for examining IL in knowledge creation and present results of a qualitative study on interaction in a multidisciplinary research consortium. The findings suggest that knowledge creation relates to the abilities of using various sources of information and understanding the relevance of the suggested information in the discussions. The outcomes can be used in developing the methods of examining IL and in enhancing abilities to create new knowledge and collaborate in organizations.

Keywords: Information literacy, knowledge creation, organizations, interaction.

1 Introduction

As the work life is more and more based on collaboration and teamwork, the employees' capabilities to interact with each other in a productive and professional manner is crucial. There are plenty of guides and courses on how to be a good team worker, how to contribute to the joint discussion and working processes with a proper attitude. In workplaces, collaborative knowledge creation is crucial for solving complex problems, instead of relying on the already existing information [1, 2]. Here, capacities to share, use and evaluate information are important. The aim of this study is to contribute to the understanding of how information is used in the creation of new knowledge [3, 4], and how Information Literacy (IL) contributes to the process. As such, IL has been vastly studied in the contexts of schools, health, and everyday life, and in recent years, its importance at workplaces has been acknowledged, for example as a part of workplace learning and performing various work tasks and daily practices [5, 6]. However, the role of IL in the knowledge creation processes needs methodological and empirical examination, which takes into account the interactive and practice-based dimension.

In this study, IL is understood as a practice realized in the course of action, emphasizing the social and interactive aspects of the phenomenon [7]. Both knowledge creation and IL are often examined on a macro level, whereas the examination on a micro level, focusing on interactive working situations, is rare [4]. This study fills in this gap by examining empirically how IL manifests in knowledge-creating interaction in an organizational workshop developing new energy concepts. The research questions are: 1. How is information literacy manifested in the interactive situations of co-creation of new ideas: 1a. What kind of information is brought into the workshop discussions, and 1b. How is the information evaluated in the discussions. We focus on examining multi-modal interaction in discussions and illustrate how IL is an ongoing activity, intertwined with knowledge creation.

2 Theoretical background: Knowledge creation and IL

In organizations, the capacities to develop new solutions, practices and products are essential. In today's work life, this is a collaborative and information-intensive process. Collaboration refers to an activity where two or more persons are working together with a task to achieve a shared goal, to search for a solution or to produce a change in practices [8]. In developing something new, such as new working practices or products, the creation of new knowledge needed for that requires interaction and collaboration, but also use of coherent information and knowledge. It is not enough that group members just share their knowledge, they also need to jointly build on each other's understanding, by explaining, arguing, or questioning [4, 9]. Also, some basic interactional practices, such as listening to each other and giving everybody a possibility to talk, enhance collaboration at work [4]. The processes and practices, especially when creating new solutions or solving specific problems, are often related to the seeking, sharing and using information. In these processes, new knowledge is created. [10] In knowledge-based work, this is connected to the capacities to use information and evaluate its value in the certain context [11].

This study derives from the dialogical knowledge creation research, where knowledge creation is understood as an interactive process, in which people find new connections and meanings while encountering new information or knowledge [4, 12, 13]. Here, interaction between people is crucial, as creating new knowledge requires encountering something new and combining existing knowledge and information in a new way [3, 4, 13]. Knowledge-creating interaction can be promoted by paying attention to the circumstances of work, such as giving room for discussions and critical pondering of different solutions [14]. Being open to new ideas and the other's views [15], as well as critical to one's own prejudices and to the information gained [16, 4] foster creating new knowledge. Hence, being able to evaluate and use information in discussions is important. Here, we can see the connections between knowledge creation and IL.

IL as a concept has been developed under the past 50 years as the role of information and knowledge in the society has changed. The need to emphasize the capacities to

search correct and suitable information in various situations led to the rise of the practice and research of IL, focusing especially on teaching in schools and higher education, and many guidelines and frameworks have been developed. One of the most impactful concepts has been that of ACRL. The first ACRL standards in 1989 focused on the skills of evaluating the relevance of the information, understanding the origins of the used information sources and learning the ways to work with information sources ethically. In 2015, a new framework [17] was launched, and IL defined as: *"the set of integrated abilities encompassing the reflective discovery of information, the understanding of how information is produced and valued, and the use of information in creating new knowledge and participating ethically in communities of learning." [17]* In the Framework, IL is seen through knowledge processes, which describe information literate way of acting with information through six frames, focusing on authority as constructed, information creation as a process, information having value, research as inquiry, scholarship as conversation and searching as strategic exploration. In these descriptions, a reflective and contextual view on IL is highlighted.

To promote IL at work has been one of the core goals in the IL training and conceptualizations, also in the Framework [17]. In addition, information and knowledge creation has been acknowledged as one of the core aims of an information literate person. However, the scholars in the field of IL have pointed out that focusing on information often connects the examination to the evaluation of certain information sources, published or on-line [18]. This is not always relevant in the context of workplaces, where information is more embedded in actions, skills and experienced conduct of working, not so much on seeking accurate scientific references. However, as the work in many knowledge-based organizations is based on using scientific information to develop new ideas, there is a need to understand the practice of evaluating the feasibility of information in the course of action. Here, especially interactive nature of knowledge-work needs more attention [7].

In recent years, IL in the workplaces has been examined as a social phenomenon, not defined in terms of IL as in education, but as a phenomenon manifested in action and interaction in certain contexts [19], such as in relation to organizational culture [5] and leadership [20]. In understanding the social nature of IL, the notion of IL as practice [19, 21] is of importance: IL is connected to the developing experience of various information sources and their rootedness in the world and its structures, and this experience enables people to act in their environments. Hence, IL can be understood as a fundamentally social and interactive phenomenon: *"Information literacy is constituted through the connections that exist between people, artifacts, texts and bodily experiences that enable individuals to develop both subjective and intersubjective positions. Information literacy is a way of knowing the many environments that constitute an individual being in the world."* [21] Here, IL is connected to the premises of human beings and the development of humans and their environment as a unified system – the same premises can be found in the dialogical knowledge creation research introduced above [4, 12, 13].

As Tuominen, Savolainen and Talja [22] have noted, there is a lack of studies of IL which focus on humans interacting with each other while conducting various tasks and actions at work empirically. In this study, we fill in this gap and use the holistic understanding [19, 21] introduced above as a basis for examination. This view is supported by the understanding of the context as Information Landscapes, which highlight the personal, but also partly shared way of being and taking advantage of the information available in certain situations [21]. That connects well to the dialogical understanding of knowledge creation introduced in the beginning of this chapter [4, 12, 13]. We focus on examining IL in knowledge-creating interaction on a micro level, bringing into examination the dialogical dimension of knowledge creation, analyzing the ways people engage in discussions and build joint understanding with conversative means by listening, questioning, and suggesting their own views. Hence, the focus of this study is, what kinds of information landscapes the participants of the workshop discussions can reach and how does the collaborative process enable them to reach something more. IL is examined as a way of navigating and expanding the information landscape by evaluating, clarifying, and seeking for the most relevant information in the course of actions.

3   Methods and data

The data of this study is gathered in the context of research and development work in a multidisciplinary research project developing solutions for sustainable energy markets in Finland. The project included researchers from five disciplines: Economics, Computer Science Engineering, Meteorology, Information Systems Sciences, and Information Studies. In addition, there were stakeholders committed to collaboration, representing private firms in the energy sector and related societies. The aim of the project was to develop a digital marketplace for clean energy trading. In this development, the concept of the Virtual Power Plant (VPP) needed to be defined. In this study, we concentrate on the analysis of interaction in one workshop, where the community gathered to develop concepts for VPP. In the workshop, there were researchers of each discipline and stakeholders present, in total ca. 30 participants. The duration of the workshop was 7 hours and it had three parts: 1) Presenting key results of the studies and state of art in energy markets, 2) Developing the concept of VPP in small groups of 6-8 participants, and 3) Sharing the developed concepts with the whole group. The results of the workshop day were later written down and shared to all project members for further development.

Our approach is qualitative, and the study is conducted in the light of an ethnographic approach [23]. Data was gathered by participating in the work of the research project from 2015 to 2019, conducting participatory observation, collecting documents, discussing with the participants of the community, and videotaping all the joint events of the community. The close analysis of the multi-modal interaction is focused on the video data from one workshop, from which we have video materials from the gathering of the whole community and from working in four small groups, which were all videotaped separately. Hence, we have two sets of data: 1) main data: video data (10h

in total) from a workshop organized by the research consortium, to analyze the knowledge-creating interaction on a micro-level, and 2) background data: ethnographic data (videos, documents produced in the project, observations) gathered in 2015-2019, to understand the significance of the examined discussions in the long-term development and creation of new knowledge in the community. By combining these data sets we develop means and methods to analyze the significance of face-to-face interaction in knowledge processes. We refer to information as utterances, written texts, conversations, and other materialized and thus observable objects shared in interaction, whereas knowledge is understood as experiences or interpretations of the participants [10].

The data were analyzed on three levels: 1) the content of the discussion to find out what kind of information and knowledge was brought into the workshop discussions - also related with the previous discussions of the participants via the analysis of the background data and 2) the multimodal interaction of the discussions to find out how the used information and knowledge was evaluated in the discussions. After that, 3) the content and modality of the data were analyzed together to find out how the phenomenon of information literacy was intertwined in the interactive process of knowledge creation. The analysis of interaction was inspired by multimodal conversation analysis [24], but the detailed transcriptions (e.g., marking intonations, vowel extensions, and voice tones with their own signs used in conversation analytic tradition) are not used in reporting the findings in this paper, to concentrate on the clarity and readability of the dialogues.

4   Findings

4.1   Information and knowledge brought into the discussions

First of all, it should be highlighted that in the discussion data the participants' focus was on the topic of the workshop and there were no off-topic discussions and information. All participants were committed to the discussion and worked to reach the goals of the workshop. In the analysis, three main categories of information were found: *1) Professional information and knowledge a) from one's own field, b) from the other participant's field, 2) Relational information from the shared information landscape formed by the common history of the participants, 3) Common information and knowledge from a general perspective*. In all the categories, the interactive nature of sharing, using and elaborating information was highlighted and there were different kinds of practices to bring information into the discussion.

The participants of the workshop were all present because of their professional background – they all represented a firm, discipline, or other organization, and they were all aware of this specific context. Hence, in the discussions, they had the information of the others' background and professionality to guide the collaboration. First, the participants used **professional information and knowledge from one's own**

field explicitly as a basis for developing new solutions, which is evident. In the discussions, the professionals could draw on their scientific knowledge base and when developing joint ideas, this professional information was most often the basis of new ideas. Viewed from the interactive point of view, the style of interaction was direct and usually without evaluation from the participant's side: there was no need to question the source of information, as the other is viewed as a professional in that field. However, the professional could show uncertainty, as manifested below:

MET1: So do we know well enough the weather related production and related, can we take advantage of the insecurity, if we think (AB1 interrupts)
AB1: Would our idea be that insecurity related to the production (…), it is not utilized?
MET1: Yeah, it is not utilized, so could we always offer the best forecast, that optime situation and, maybe the first question is that what is a good enough forecast (…), could it function so, that instead of giving that forecast, we could give with some index, some figure, some way, tell what the level of insecurity is related to that forecast at that moment (1.0, looks at AB1 closely, they continue developing idea)

In this example, MET1 starts by sharing his professional knowledge on meteorology and ideates further, keeping the question open and a little uncertain. AB1 has a background in developing technological solutions for energy markets and he uses this knowledge about uncertainties in energy production and renewable energies, which is visible here as an ability to ask relevant questions. In terms of creating new knowledge, it is important that he can also show uncertainty by formulating questions and giving space to the other and his expertise. This gives MET1 a possibility to elaborate his thoughts further aloud, sharing information on the details of forecasting to AB1, so that they can together develop their idea on using uncertainty in developing VPPs. In addition, the participants used **professional information and knowledge from the other's field** to make suggestions and start conversations, asking for evaluation. The style of interaction is more insecure and reflective: the other suggests, asks or otherwise informs, that she is aware of some potentially useful topic, as in the next example:

AB2: So how is this, kind of (is writing down the ideas and stops to ask), this creates like peer-to-peer markets (writes down), but there is no blockchain, there is not?
INSI1: Yeah, yeah, we need that marketplace (shows the paper)
AB2: (Marketplace) (they start developing the idea of the technological solution)

In this example, AB2 uses his prior knowledge on blockchains and shows that he is aware of the concept and possible usefulness, but gives the role of an expert to INSI1, who confirms the suggestion and develops the idea further. Here, the uncertain nature of talking about blockchain is again connected to the fact, that the participants know each other and their strengths: AB2 gives authority to INSI1, who is expert on new technological solutions as a researcher – AB2 can, however, reveal his own uncertainties, but also the fact, that he is aware of this quite complex topic. Hence, they are able to develop their idea further. Additionally, the participants used **relational information and knowledge from the shared information landscape** formed by the common history of the participants. To be able to examine this from interaction data from the workshop, the ethnographic data from the interaction history of the participants

was needed. Based on our analysis, the participants were able to use knowledge shared in previous workshops and other gatherings and refer to that common knowledge by using certain core concepts of the research community, such as flexible energy demand. This is illustrated in the next example:

AB2: Is there any sense in bringing in some electric cars' batteries or such, when they are not in use?
INSI1: Yes, there is.
AB2: Cars are not used 95% of the time, and from that time,
INSI1: Flexible energy demand-
AB2: Flexible energy demand (starts to write down) e-mobil, so flexible energy demand (2.0), so the company doesn't have its own power plants (mm) (nods and the participants continue to develop the idea on virtual power plants)

In this example, INSI1 can, by just referring to the flexible energy demand, bring the whole concept and discussions conducted around the topic of using electric cars' batteries to save surplus energy in previous workshops to this current situation. AB2 doesn't need to ask for further details but decides to write the idea directly down and this forms a basis for their joint ideation. Finally, **common information and knowledge from a general perspective** was used to refer to the phenomena and information that the participants assume are already known by the others, as citizens. This is illustrated in the next example:

AB3: ... some people are ready to pay more for-
ISSI1: (I know, I know) (nods) what do you mean.
AB3: For example, someone buys from e-bookers a flight from a to be for three euros, whereas someone is ready to buy a private jet and with that go from a to be.
ISSI1: It just requires that you can afford that.
AB3: That's right, people are different. (they continue by negotiating the issue)

In this example, AB3 refers to e-bookers as a concept, which is supposed to be common knowledge and gives only minimally further information to support his idea, but ISSI1 seems to understand the idea despite that. This phenomenon was linked with the use of certain trademarks, places, and concepts, related to energy, technology and familiar locations. Having a common knowledge base supported developing joint understanding and finding ways to communicate and draw analogues to more complex concepts.

4.2 Information and knowledge evaluated in the discussions

As we analyzed the discussions to see if the features of information literacy were present in the discussions, we noticed that there were only a few occasions, where the used information was explicitly evaluated, or its origins opened up for evaluation of the others. However, as we examined the interaction and action in the events, there were several actions related to the information use, which were implicitly linked with IL as clarifying and navigating in the information landscapes. Five set of actions were found: *1) Giving some proof of the correctness of the suggested information, 2) Talking*

through the idea, giving more information, 3) Asking for premises and clarifications, 4) Showing uncertainty in the discussions, and 5) Showing thinking, consideration and reflection in action. First of all, **giving some proof of the correctness of the suggested information** was done by referring to the sources of information, by explicitly showing something from a computer or other tools. In the next Example, INSI1 highlights his views by referring to his computer:

INSI1: We need that marketplace, these guys need a marketplace, it is either a blockchain or (starts to look at something from his computer for the first time in this workshop)
AB2: (writes something down in the paper)
INSI1: (shows something to AB2 from his computer) this same can be done with a mobile network (shows his computer and makes eager gestures), we have IPC coming from the software, we have megas in the software, we can do this as a virtual service (continues to ideate, based on the complex technological information)

In this example INSI1 giving some background for the information suggested, by using a computer and showing some details on this mobile solution. Here, the reference to the exact, technological information is done more reliable, and also accessible, by showing the information from the computer, helping AB2 to understand. These kinds of actions were however not very common in our data, as the participants relied much on their status as professionals of their own fields, as illustrated in chapter 4.1. The correctness of the information was elaborated in more subtle ways, such as by referring to an authority or a jointly shared information source. The possibilities to evaluate the premises of given information was in some cases enhanced by doing illustrations of the argumentation and the basis of the information, as in the next example:

MET1: That, well let's say it is a developmental issue for next ten, five years, that we can already better limit the insecurity, I can draw that to that paper, how-
FAS1: You can also write directly-
MET1: Well yeah, I do this kind of a concept to this paper first (takes a post-it and starts drawing, looking at AB1 simultaneously), so the situation is, that we have the time here, and here some figure, like energy or whatever, and we give a forecast, it is something like this (draws further a diagram to the post-it, sometimes looking at AB1 for confirmation), and let's say in two day you can see, that it is here!
AB1: Yeah. (they continue ideation, using the drawing as a tool in explicating thoughts)

In this example, MET1 needs to support his ideation based on more complex information on forecasting by drawing an illustration of his idea. In this way, the information is more understandable and accessible also to the other participant. In this example, the action of giving some proof of the correctness of the information is intertwined with the second action, **talking through the idea and giving more information.** This kind of activity also often caused the talker to change one's own opinion - this was highlighted in our data and the borders between knowledge sharing and creating were ambiguous. To reflect, critically evaluate and develop one's own thoughts by talking aloud could be seen as a valuable part in creating complex knowledge, as seen in the next example:

MET1: So, is there something, like what do we know before about the predictability of the forecast? So, there are some methods, (…), these are like weather models, we can with some disturbance stimulate uncertainties (…) We can run several different, like-
AB1: Yeah.
MET1: scenarios, and they then disperse into a flock. And this, kind of-
AB1: Yeah.
MET1: in some weather conditions the flock is smaller, and we can rely on it, and in some conditions the atmosphere is chaotic, and a small disturbance disperses into different scenarios, so there is a kind of like built-in uncertainty-
AB1: So, this is like, you could compare this with finance markets, where sometimes the uncertainty is higher and no-one knows, where the markets are developing?
MET1: Yeah, yeah (they continue developing the idea of using uncertainty as a basis)

In this example, AB1 shows his understanding by answering "yeah" every now and then, and by finally referring to his previous knowledge on stock markets, and abilities to draw conclusions and combine information gained from the other. In this example, we see how the silent or minimal participation of the other, encouraging the other to ponder the problem can also be an important knowledge-creating element. Here, MET1 can take his time to evaluate, reflect and clarify his own thoughts. **Asking for premises and clarifications** was related to the previous knowledge of the participants. Here, the need to further explain and evaluate the value of the given information came from the other participant and could even have some features of questioning or challenging the other's knowledge. This is illustrated in the next example:

ISSI1: If we start with this my idea (puts a post-it ready on the table)
AB3: Yeah, yeah, let's start with that!
ISSI1: I can almost say, that then it solves the problem, that the investment is small, a risk-free investment, you don't buy a big wind turbine. The user doesn't need a big sum of money-
AB3: Yeah, before you write anything there (shows the paper), I mix up your thoughts a bit, that I have an opinion, that some people are willing to pay a bit more-

In this example, ISSI1 proposes that they would start to develop an idea based on his previously suggested theme, and AB3 immediately agrees with that. However, as ISSI1 gives an evaluation of what problem the idea would solve, AB3 explicitly questions him by telling his own opinion. In addition, he gives his own opinion and emphasizes that by giving some further information and an example, which is understood also by ISSI1. In this discussion, AB3 continues to ask for more premises of ISSI1's views, and they end up having a joint understanding of the best solution. These kinds of interactional situations could be related either to the need to get more information to be able to evaluate its suitability in this context, or to a need to bring forth one's own, challenging point of view. Here, essential was the ways in which the participants were able to discuss and clarify the possible misunderstandings and form a joint understanding in the end. Next, **showing uncertainty** was related not so much about the correctness of the information, but about the usefulness of it in this context, or the possibility to connect two fields or information sources, as in example 3 in Chapter 4. The knowledge-

creating power of showing insecurity is illustrated also in the next discussion of MET1 and AB1, where also MET1 shows the limits of his knowledge and asks for more information from AB1 in a subtle way:

MET1: So how, is this somehow, like it (makes movements with his hands, searching for words), in a big picture, I don't know how it, in this context, does it have any role? (1.0), does it solve anything from the point of view of the user (looks at AB1)
AB1: (looks concentrated and listening, writes down something to his own papers),
MET1: Of course in the long run (taps with a pen on the paper and looks at AB1 closely, AB1 starts to look MET1 into the eyes), it reduces costs (1.0), or? (MET1 continues to elaborate the problem and finally AB1 confirms, that the idea is good)

In this example, MET1 shares his professional knowledge, but also questions his own capacities to evaluate, if the solution and the chosen path is correct and useful. AB1 shows that he has listened to the informative turns of MET1 and understands the problem and is also capable of posing a relevant question to MET1, which suggests a way to a solution. Hence, the knowledge creation process is connected to the capabilities of using existing background knowledge and also knowledge gained in interaction with others. Finally, **showing thinking or consideration** could be seen as a manifestation of IL in interaction. This feature was seen in interaction as taking some time for thinking and considering the shared information, or its usefulness in the context. In our data, this was not common, as the discussions were quite hectic, and the participants were well aware of the limited time they had. However, there were some moments, where the participants stopped to think for the best way forward, as in the next example:

INSI1: The question is, if I put the panels on the roof, can I even sell (looks at INFO1 defiantly) (1.0)
INFO1: You can sell to the electricity company and (…), you pay huge taxes
(5.0, all the participants sit silently thinking about the problem)
INSI1:(scratches his head), so this is like playing against the existing players resisting things, the markets don't support renewing at all.
AB2: There are no markets. (the participants continue to develop a solution to that)

In this example, the participants first are eager to develop their joint idea, but, unlikely for them, end up sitting quietly for a while, thinking and considering a good solution to a tricky question of breaking the monopoly of the big electricity companies. This is evoked by an informative turn of INFO1, who shares her understanding of the current policies in energy pricing and tasks.

5   Discussion and conclusions

In this study, we have examined how knowledge creation situations include manifestations of information literacy, and how information literacy is performed in interaction, when developing solutions to complex problems in researcher-stakeholder collaboration. Our findings illustrate how the decision making on the relevance of

information is intertwined in the interactive process of knowledge creation. Interaction between the participants was crucial in creating new ideas, and the participants were able to bring into the discussions new insights, take the other's ideas into account and combine existing knowledge and information in new ways [cf. 3, 4, 13]. In terms of creating new knowledge, the participants together developed their ideas for VPPs by suggesting, asking for evaluation of their ideas, revealing uncertainties and with many interactive means built joint understanding and found ways to communicate and draw analogues to more complex concepts.

In knowledge creation, the abilities to bring into the discussion new insights is crucial [cf. 17, 21]. Our analysis indicates, that in working context, this information can be based on participants professional knowledge, but also the mutual history and shared previous experiences matter, helping the evaluation of the relevance of the information. In our data, the ideas were based on three kinds of information: professional information and knowledge from one's own field, or from the other participant's field, relational information from the shared information landscape formed by the common history of the participants, and common information and knowledge from a general perspective [4, 10, 17]. It was noteworthy, that with different actions, the participants were able to create novel ideas based on that information by evaluating it and combining it with other information resources. This can be understood as manifesting IL in interaction: giving some proof of the correctness of the suggested information, talking through the idea and giving more information, asking for premises and clarifications, showing uncertainty in the discussions, and showing thinking and consideration [3, 4, 13, 17]. In general, the analysis indicated, that IL can be a shared and interactive phenomenon. Furthermore, the analysis indicated that IL was manifested both in words and in action. Interactive processes, such as explaining, questioning, and arguing, were related both to the content of shared information, and developing new ideas, which highlights the interconnected nature of the phenomena of knowledge creation and IL. Here, the relation to the research on knowledge-creating interaction [13-16] and IL, both in the Framework [17] and in organizations [6, 20] is clear.

The findings indicate that IL can manifest in interactive, embodied ways [7, 21], and is intertwined with creating new knowledge, as evaluating, changing one's views and enlarging one's information landscape is inevitably creating new stances and thus new knowledge [4, 15, 16]. The development of the skilled knowledge workers can be seen in their abilities to quickly adopt new possibilities related to information sources, connections between fields, using knowledge and information gained from others as a starting point of knowledge creation [11, 15]. Such IL abilities displaying openness to new ideas and viewpoints [15], unprejudiced reflection of ideas and skills to critically evaluate gained information [16, 4] foster creation of new knowledge. As our findings indicate, this can be supported by using also material tools (such as whiteboards, papers, computers) and circumstances to share information, be more precise and to give others a more clarified view of the ideas [1]. Here, the concept of information landscapes and focusing on the environment should be further elaborated [18].

In the background of this study has been a strive to find ways to examine how information and knowledge are present in human action and interaction, not just as an

explicit element in the form of documents or information sources, but as an inseparable part of every human action, perceived and experienced in the course of actions. Hence, we develop theoretical, conceptual, and methodological premises of information studies [25, 22, 19, 18]. This can be continued by examining the theoretical premises of understanding humans acting and interacting with information, for example related to a phenomenological approach [25, 26]. Furthermore, by developing methods to examine discussions as part of longer knowledge processes, we create paths to understand how single moments of action can be viewed as parts of a wider system of information practices, processes and infrastructure in future studies, to develop organizational environments and tools, which support IL and knowledge creation as action. This provides also practical implications for developing supporting environments, tools, and organizational practices, which take into account the interactive and embodied nature of working with information [14].

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