ORGANISING INTERDISCIPLINARY PROJECT WORK - PROCESSES OF INTERACTING AND INTERRELATING

Theme: The Social Processes of OL and KM

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Abstract

The difficulties involved in integrating and making productive use of highly specialised knowledge bases within an organisation have been described and discussed intensively (Boland and Tenkasi, 1995 and Dougherty, 1992). This paper sets out to illustrate an interdisciplinary development project, with the purpose of developing a new stacker, which can be considered as a successful example how such integration may be achieved. The processes involved in organising at the interfaces between different disciplines will be explored and discussed from the basis of the empirical case presented. In the concluding discussion the concepts of an interacting and interrelating logic is elaborated upon and suggested as a means by which these processes can be further explored and understood.

Introduction

To set up a project as a kind of temporary solution in order to solve some specific problem calling for the integration of specialised and distributed knowledge bases, is common among organisations today. However, to "access the breath and depth of functional knowledge pertinent to the product and to integrate that knowledge" (Grant, 1996:378), thereby being able to use the knowledge of specialised individuals in a productive way, is not an easy undertaking. To set up an interdisciplinary project team is not a solution per se. As illustrated by Dougherty (1992:182), specialised individuals represent different thought worlds, each thought world having its own fund of knowledge and system of meaning, which means that people within different thoughts worlds not only know different things but also interpret the same thing in different ways. Therefore, project members tend to seek for inputs from their fellow team members that differ from those team members' primary focus and people representing different thought worlds therefore find it difficult to exchange ideas in any useful manner. Postrel (2002:303) described this somewhat poetically when suggesting that people from different thought worlds working together constitute "islands of shared knowledge in a sea of mutual ignorance".

This paper presents a single case study of a development project with the purpose of developing a new stacker and explores the processes involved in co-ordinating at the interfaces between different disciplines. To develop a new stacker calls for the co-ordination of highly specialised individuals. In this case, these individuals were located at a number of different functional departments throughout the organisation and were only working part-time in the project. There was no motivation or time to establish a basis that was shared by all members of the project and that they could use to integrate their knowledge. The project team was free to chose technical solutions, solve problems and organise their work in a way that they considered suitable, while a steering committee comprised of top managers from different parts of the organisation defined the constraints in terms of time and budget.

The project studied can be regarded as a success. Project members were very satisfied with the work that had been undertaken and the product developed was a success, outreaching even the most optimistic sales scenario presented during its development. Project members described the project as the best one they had ever participated in and concluded that good relations between representatives from different departments had been established. The project team had reached a state of 'collective competence', and had been able to overcome

the differences in perspectives held by its members and used them in a positive way. Thereby, they were also able to co-ordinate their different knowledge bases in a heedful manner. I argue that the project studied constitutes an interesting case since it succeeded despite the fact that project members were not placed together and undertook much of project related work individually and despite the difficulties often related to the integration of different knowledge bases. But how was this done? What are the processes involved in such a successful undertaking? How can we understand the way in which project members organised themselves? To state a more overall question that can work as a guiding light throughout this paper; *What are the processes involved in organising at the interfaces between different disciplines in an interdisciplinary project context?*

In order to explore this issue, I will relate to some concepts of importance when trying to understand the organising of individuals with highly specialised and complex knowledge bases that are distributed throughout the organisation. Having considered these theoretical concepts, the reader will be given a short presentation of the methods used, before the empirical results are presented and analysed. In the final section of the paper, the reader will find a concluding discussion, where the concepts presented below are contrasted to the results of the empirical study, resulting in two different logics that focus the dynamism between individual and collective features of project work and their respective importance in the process of organising at the interface between different disciplines.

Organising at the interface of different disciplines

The organisational processes involved in integrating specialised and distributed knowledge bases of members in an interdisciplinary project team have not been given much attention in literature. However, some authors have reflected upon the way in which members of a group co-ordinate their efforts and integrate their knowledge from other bases than shared knowledge and meaning, e.g. Weick and Roberts (1993) suggest that undeveloped groups, i.e. groups where members do not share knowledge and/or meanings, can act with developed mind. Based on a study of the launch and recovery of airplanes on an aircraft carrier involving a number of participants with different knowledge bases acting from different parts of the carrier, they suggest that individuals make a representation of the social system that is involved in the collective task. People make this representation because they know that the outcome of their own actions are dependent upon actions undertaken in other parts of the system and therefore they have to consider those parts of the system if their own actions shall emerge as heedful and the social system as intelligent.

Weick and Roberts (1993:357) suggest that when individuals make a heedful contribution to the social system of which they are part, they "construct their actions (contributions) understanding that the system consists of connected actions by themselves and others (representation) and interrelate their actions within the system (subordination)". This means that the ability to undertake a collective task in a competent way is dependent, not only on contributions given by knowledgeable individuals, but also on heedful interrelating of these diverse contributions. It is a joint situation that has to be envisaged and not only the local situation in which the individual finds himself. But the question still remains; how is this building of a representation of the social system to which one has to relate one's own contribution possible?

In order for people with different knowledge bases, living in different thought worlds (Dougherty, 1992), to envisage a joint situation and act together with 'collective competence', they have to interact in a way that let them make sense of the situation as a whole. However, as pointed out by Weick (1993) and Boland and Tenkasi (1995), the aim of this interaction is not to reach a state of complete consensus in terms of shared meanings, perspectives, interpretations and so forth, but to try to make sense of a joint situation having a social context in mind. Sensemaking may be described as a social process, but it is aimed at finding plausible, rather than accurate, interpretations that may constitute a guide to action, which means that sensemaking can be social even when undertaken individually. If such sensemaking processes shall occur and result in plausible representations of a social context, it is important to act on principles of respectful interaction (Weick, 1993), which is built on trust among participating team members. When trust exists between members of a team each of them "report honestly" so that others can come to "valid beliefs" about the joint situation, letting them act in a heedful way. Boland and Tenkasi (1995) emphasise communication and narratives in this respect since it allows for a kind of illustration of implicit assumptions related to a certain thought world and thereby facilitates the integration of different knowledge bases within the group.

The empirical study

This paper presents a study of a project aimed at the development of a new stacker. The project team responsible for the achievement of this goal can be described as interdisciplinary since it is comprised of thirteen members representing ten different functional departments, each one with expertise in a specific domain of the organisation's activities[1]. With exception of the two design engineer consultants, project members were not placed together, but stayed at their respective department. Moreover, all of them where involved in several projects at a time and had also to take care of line responsibilities. The project was organised around frequently occurring project meetings where project members discussed issues related to project work. At these meetings, all project members were present, even those representing functions whose actual work did not occur until the end of the project. Project management considered this to be important in order for project members to get a feeling for the project "as a whole" and suggested it to be one of the main features contributing to the success of the project. At these meetings different aspects and problems of project work were addressed and discussed and since all project members were present, and most often involved in these discussions, they could be thoroughly dealt with from a number of different perspectives. These project meetings constituted the only arena where all project members met at the same time and most project members were said to have little or no contact between project meetings. Between project meetings, most project related work was undertaken individually.

The study lasted for approximately one year, from the project's entering into the development phase until its completion, focusing primarily on the development phase, to which all the findings presented in this paper can be related. Before attending my first project meeting, I

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[1] Except the project manager (Martin) there were people with the following responsibilities; technical requirements (Miriam), manufacturing (Tomas), manufacturing of tripods and chassis (Bengt), technical support and field testing (Torsten), design (Tage and Anders), electro-design (Hans), quality and standards (Dan), preparation and planning (Ingemar and Albers), order and administration (Johan), and marketing (Inge).

met with the project manager and the head of the development department respectively to get an understanding of the way in which project work was organised at the company and a better feeling for its 'project philosophy'. When undertaking the study, I was present as an observer at project meetings. The discussions at project meetings were tape-recorded and transcribed word by word to facilitate analysis. I attended 12 project meetings in total. During the development phase, I also undertook interviews with all project members involved. The interviews were semi-structured (Merriam, 1994) and were centred on issues related to project members' experiences and interpretations of project work. Each interview, 13 in total, lasted for an average of 70 minutes and all interviews were transcribed word by word. When analysing the transcripts a comparison was made of the descriptions given by project members. The comparison revealed different descriptions of the project context and gave a clearer picture of the dynamics underlying it.

Below, I will discuss these project dynamics, and illustrate empirically, how project members organised their work in a way that made them able to integrate their different knowledge bases. An important aspect when trying to establish this ability is to get an overall understanding of the social context that project members with different roles and knowledge bases constitute since this is a first step towards the establishment of a representation of the project context that can be used when working individually with project related questions. The way in which such a representation is created when project members meet will be illustrated in the empirical presentation of the paper, as will be the way in which project members use their representations when interacting and trying to integrate their different knowledge bases.

Constituting the social context

Somewhat surprisingly, most project members did not consider themselves as being part of a team. The empirical fact that they had been chosen to constitute parts of a project team working with a shared responsibility towards a pre-established target, was seen as the formal state of affairs, but most project members did not emphasise the importance of the team for daily project work to function smoothly.

Johan: "Team…Since…I have the impression that everyone works at his place. You work a little with everybody but most of all you work by yourself…and then together with your little group [at the department] and then you just go down [to the meetings] and give a report of what you have. […] Everybody knows that he is a member of the project but that's it".

It seems that the exceptional case of project work was not when individuals worked individually but when they actually worked together, i.e. when they sat down to discuss project-related issues or tried to solve a problem that influenced several parts of the project. This is also the reason why they describe project work as routine work, not any different from any other work they undertake in that respect. Bengt gives the following account;

"I do never see anything of the other participants, more than those that are close, the assembly guys and the responsible for technical requirements. They are the only ones that I have any contact with, and the manufacturing engineer. The other ones, I don't know anything about what they are up to but I hope that they work with those things that concern them".

Thus, daily work goes on without much contact with other project members but when encountering problems of importance to several parts of the project, co-operation becomes close and people actually sit down together, discussing and trying to solve the problem. As opposed to when contact is established just in order to get information, individuals meet face-to-face when there are such problems to be solved. At these occasions, face-to-face contact is emphasised as important since project members consider it easier to understand when they can "see the expression of a face". Anders gives an illustrating example;

"I had a problem with the hydraulics and electronic things and then I went down to him and we discussed how we would be able to do in order to get a simple drawing of the cables and assemble it. And then I made an outline to him and then he drew the wires and I made it in the CAD and then we got it pretty well together".

When giving accounts about more complex problem-solving, most project participants actually use the expression "going down to" the person that they consider has to be involved in finding a solution. However, when co-ordinating project work from the basis of information, having face-to-face contact is not considered equally important. Moreover, when asked for what kind of contacts project participants have with each other between project meetings, most of them do not mention face-to-face contact except with those people being the most close, which is most often people at their respective department that are not project members.

However, some project members had a 'feeling of belonging to a team', which they meant contributed to a positive and motivating atmosphere in the project.

Me: "So what is it that you have experienced as good in this project?"
Torsten: "What I feel the most is that it is a team that is working. I didn't experience that [in the other project]. There the atmosphere was rather arduous. It was nothing like this...familiarity or that you felt that you belonged to the team (...) But from that project on (...) I felt that you worked together for something. Nice atmosphere. Everybody supported each other and cheered each other and so on. That's what I believe to be the biggest difference, that you work in a team and it's nice to work in a team".

The "nice atmosphere" and the 'feeling of belonging to a team' expressed by the respondent above had a positive influence on project work since it contributed to make project members more motivated. Considered in another aspect though, this 'feeling of belonging to a team' offered a rather clear demarcation of the social system to which project members had to relate their own actions and within which the actions of those others are made relevant for their own contributions. Therefore, knowing the names and roles of other project members is a first step in the process of creating a representation of the social system, also when working individually with project related tasks. Moreover, when encountering problems in project work, project members knew who to consult in order to solve them and who would be affected by their solution. According to some project members, this was the most important aspect of belonging to a project team.

What can be learnt from this part of the empirical presentation is that clear distinctions between situations that call for individual action and situations that have to be 'considered collectively' can be made. The dominating part of project work in this case refers to the first instance and is considered as normal or routine project work and the other instance is considered as more exceptional and mostly referring to situations of more complex problem solving. Therefore, an important part of establishing a project team is to allow for project members to define and relate to a social context of importance for their own doings. Below,

we will see in more detail how project members solve the fact that project work is individual to its character to such an extent, without loosing sight of the collective undertaking that a project constitutes.

Creating a representation

Many respondents give the impression of project meetings as consuming too much time, focusing questions that they consider irrelevant for their own doings and being more in the service of control than communication. In most accounts on project meetings, I find the notions of "report-giving" and some respondents tell that it's all a question about "information-transmitting". Furthermore, I have noticed that decisions are seldom taken, many discussions are brought up again and again and some problems seem never to be solved. Taking a somewhat broader perspective on project meetings as arenas for organising the co-ordination of different knowledge bases, they turn out to be important events, which contribute to the progress of the project in a concrete way. Project members from different departments who do not normally meet get an opportunity to "push each other forward" as my respondents express it. Sometimes more informal meetings are decided upon as a response to an unexpected problem influencing different departments, or other activities are set. The other way in which meetings contribute to the organising is by means of an arena for communication where images of the target and the project context can be communicated, created and recreated.

Me: "What use do you make of these meetings?"
Ingemar: "I get a picture of what is going on".
Me: "Is that something that influences your work?"
Ingemar: "Oh yes it does. Otherwise I may do something that is supposed to be done but maybe it would not be done that way. Then I have to remake part of it".

Getting a feeling of what is going on is an important part of establishing a representation of the social context, of what different project members are up to and how you should relate to it. As a result of their experience of working in this social system, project members know what kind of roles different members play and what kind of perspectives they represent. Project members also learn what other project members know and how they can contribute to project work, as well as they gain an understanding for the problems encountered in other parts of the project. This experience, if used reflectively, results in an ability to communicate more relevant information to the system than would otherwise be the case, but it also facilitates the individual's own making of a plausible representation of the project.

Tage: "There is often somebody who has thought a bit and then you sit down and discuss in the team. Somebody says something and someone else says something else and you think AHA! That has to be done! Things are revealed so to say".

The account makes me think about finding the pieces of a puzzle. Everybody is trying to get their part together but some parts are missing and now they have to find them if the puzzle is going to be ready and if all the parts laid by different project members are going to fit together. This is something that can actually be made as a consequence of the information shared at project meetings, which has helped people to make a better or more up-dated representation of the social system as constituted by the project and its context. Problems are

not actually solved at project meetings, but when project members consider the information that they got at those meetings. This means that as long as the problem is not too complex or influencing several parts of the project, problem-solving is individual to its character but based on a consideration of the collective effort.

Acting from a representation

The target, defined in general terms as developing a new stacker, constituted an important part of each member's representation of the project context, and it can be considered as a basis that was shared among project members and from which they were able act. If one knows in some technical detail what a stacker looks like and how it works, then one is also able to understand which parts of it are affecting each other, i.e. what the interdependencies are. This notion of a stacker can then work as something around which one is able to organise and integrate the work of different team members. To illustrate this argument, I will cite a discussion from a project meeting, taking place in June 2001. Some weeks had passed since the first machines were sent out to field testing sites and Inge, representing the marketing department, has got some indications that the placement of the emergency stop is not suitable.

Tage: "What about the emergency stop that you talked about?"
Mattias: "It tipped, didn't it?"
Miriam: "No".
Inge: "Why we are doing this is because we have got some remarks about it from field testing in Norway and Sweden. They touch the emergency stop when they put down the plate with the foot. Those people with big feet touch it and it falls down. Then there are others who touch it with the knee. When we get to know about this that early then we just have to change it before releasing the stacker to the market. Because it may be that bad that those customers who have got the field testing machines are the ones to get the first machines…and then we will get to know that. That's the way it is".
Miriam: "You said you would take away the stop button".
Inge: "We haven't come that far yet".
Miriam: "Because we talked about moving the emergency stop towards the centre…another thing is to angle the thing that the button is attached to so that it's horizontally placed. Then we change the design of the machine. I had a look at the old machines, what it looked like today and the reason why they don't touch it today is that the plate is…it's on the same level, attached to the same surface but…"
Martin: "…is placed more in the middle. We must take a closer look at that".
Miriam: "Then that would mean…We've made a change on that plate in order to be able to bend it with a radius of ten…and if we do that it will be very clumsy…Then the question is whether we are able to bend with a radius of ten and make the other two bendings with a radius of five?"
Tomas: "A change of radius is no…well…you could have two different radius at a time…"
Martin: "Isn't it just to move the button a bit upwards? Move the hole more upwards?"
Tomas: "Isn't the button for "lower" placed more upwards?"
Martin: "It's placed on the other".
Miriam: "In my opinion…Maybe we should move both of them? It could be a conflict with…"
Inge: "Have a look at that solution then. Because we thought that…We could skip the ignition key and put the emergency stop there instead. But…"
The above transcript from a project meeting gives the impression that project members use as their point of departure an understanding of the stacker that is more complete in some parts than in others. Which parts are complete and which are more blurred differs by role and profession. However, when they get the occasion to discuss around these issues, the

understanding of the stacker, for both parties, will possibly be more complete and gradually an understanding of one another's problems will develop. One is thereby able to relate, not only one's own perception of the stacker to that of others, but also to relate one's own work to that of others, thereby becoming better at dealing with interdependencies. In my discussion with project members this was recurrently brought up as a feature of project work incorporating the co-ordination of different knowledge bases.

However, the stacker was not the only artefact that project members gathered around and used when dealing with interdependencies between their different disciplines. Another example of such an artefact is the Engineering Change Order (ECO). ECO guides the activities at the interface between design engineers, manufacturing engineers and structure designers. When a design engineer had completed a drawing, he distributed it for consideration to manufacturing engineers and participants from the preparation and planning department who were giving comments based on their experiences and perspectives. In this way, the knowledge of a project member was expressed in an artefact that served as a basis for further 'discussion' and that let other project members contribute to project work in a way that was consistent with that of others.

Analysis

The empirical presentation shows that project members acting towards a common target can integrate their knowledge and efforts even though they only share the experience of working in the project and not the sense that is made of it. Therefore this case should be understood as an example of an undeveloped group, acting with developed mind (Weick and Roberts, 1993). The project team does not share common meanings, perspectives, interpretations and so forth, but are still able to integrate their knowledge in a heedful way and act with collective competence. Thus, this ability is not related to the knowledge held by the project team per se, but the way in which the knowledge is integrated when individuals within the group start to act and lay the foundations for a representation of the project context, as illustrated in the empirical presentation. A representation is to be considered as a mental category, which allows for an overall understanding of the project context in terms of the interrelations that exist between one's own work and that of others, and how this work is related to the project's target. The representation is not common to all project members since project members do not share the sense that is made of their shared experience of working in the project. Instead, the representation is coloured by the perspective that each project member contributes to the project as a consequence of his role.

When creating the representation, project members use different sources of information about the project and its progress. Initially, project meetings and an opportunity to communicate stand out as important in order to create a basis from which to build a more elaborate representation and understanding of the project. When organising at the interface between different disciplines, interaction and communication have been brought up as important aspects (see e.g. Weick, 1993 and Boland and Tenkasi, 1995) but this study also suggests that the establishment of a representation makes the integration of different knowledge bases possible even without much interaction and communication. It also suggests that once the individual has created a plausible representation of the project context, s/he is able to modify it from the basis of artefacts. I suggest an artefact is to be considered as a physical object

capable of 'carrying' information about the project and its status. As an example, the reader may consider a drawing representing the design solution chosen that can be considered from different perspectives depending of if you are a design engineer, or a manufacturing engineer interested in finding out about possible manufacturing methods. The artefact can also be considered as a physical object embedding knowledge of different project members. Once again referring to the drawing, it is the result of the design engineers' knowledge about possible design solutions to a given problem, but it can also incorporate the knowledge about available and possible manufacturing solution expressed by the manufacturing engineer. As an object 'carrying around' knowledge, perspectives and so forth, the artefact becomes an important basis for the modification of the project member's representation of the project and its context. The representation may be an individual mental categroy but since it is built from accounts and artefacts given by other project members, it is able to take the collective effort into account, thereby able to integrate the different knowledge bases of project members. Moreover, as shown in the last empirical part – acting from a representation – a rather unsophisticated and non-detailed image is enough to be able to interact and interrelate in a heedful way.

Conclusion – Interacting and interrelating logic

In an attempt to capture the dynamism between the individual and the collectivity and in order to better understand the integration of different knowledge bases in an interdisciplinary project, I suggest that we think of it in terms of a continuing iteration between two different project logics, the interacting and the interrelating logic (see figure 1 below). The interacting logic refers to stages in the project that is characterised by intense interaction between project members, which for example is the case at project meetings or when project members meet more informally in order to discuss project related and more complex problems. At these meetings, information about the project is exchanged and knowledge, perspectives, ideas and so forth are articulated and made explicit, and can thereafter be further elaborated upon collectively and/or individually, thereby constituting the foundation for a representation of the project context as a whole.

Interacting logic	**Interrelating logic**

Collective experience

Contribution

Articulation of knowledge etc.

Representation

Problem-solving
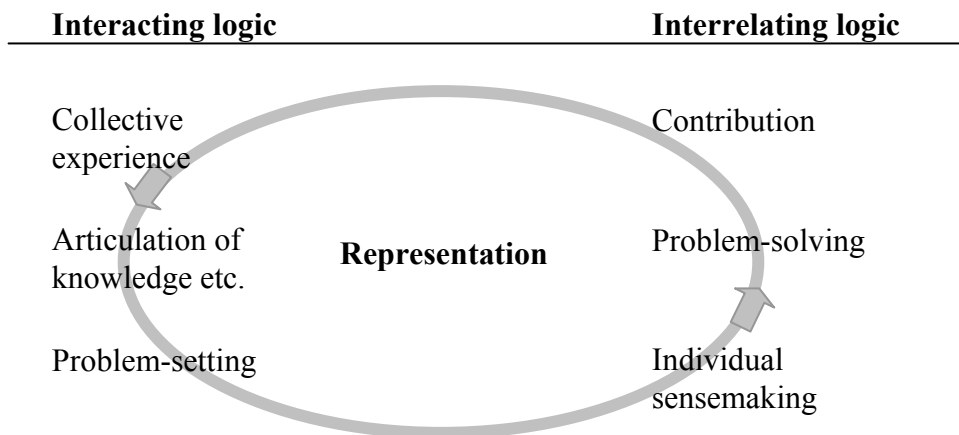
Problem-setting

Individual sensemaking

Figure 1: The processes involved in organising at the interfaces between different disciplines.

The interacting logic is present at instances that my respondents have referred to with words such as information-transmission and report-giving, putting an emphasis on the explicit character of the messages that are transmitted at these occasions. At the collective level, following an interacting logic, project participants most often agree upon what to do. However, the question of how to do things remains and will not be solved until the representation of the project held by each project member has been further refined and elaborated upon. In this way, the representation makes possible distributed problem-solving in an interdisciplinary project team.

The interrelating logic is present in situations when the individual uses the representation established as a consequence of interaction to interrelate to other parts of the project and thereby further refining this representation, e.g. when reflecting upon what has been said or done previously in the project. Different artefacts carrying around information, knowledge, perspectives, ideas and so forth are important parts of this interrelating from the basis of a representation of the project. It is from the basis of a representation that each project member is able to relate to the 'information' carried around by these artefacts and act in a heedful manner as a response to it. Thus, at instances in project work when the interrelating logic is present, project members do not have to rely on verbal communication in order to integrate their work and is therefore not dependent upon an interacting logic in order to make a heedful contribution to the project. Moreover, as long as the project context is not dramatically changed, the individual is able to modify his representation of the project from the basis of what 'information' about the project and its progress that is carried around by these artefacts. The interrelating logic is present at those instances that project members refer to as routine project work, i.e. it can be considered as the dominating logic guiding project work aimed at the integration of different knowledge bases.

When shifting from an interacting logic to an interrelating logic, problems may occur, which influence the situation of the project. This is something that contributes to the continuous iteration between the two different logics. Sometimes, problems encountered do not influence all parts of the project and is not related to the question of what to do, but to the question of how to do. Then, solving the problem may be done by means of finding more information and the individual is still able to act from the basis of his representation. At other instances, the problem is of such proportions that a meeting, following an interacting logic, has to take place, giving the project team the opportunity to collectively make sense of the new situation and what has to be done in order to solve the task. However, there is also a clear indication that the interacting logic is more important in the beginning of the project, while an interrelating logic becomes more and more dominant the closer the termination of the project the project team comes.

Thus, returning to the question posed initially, *what are the processes involved in organising at the interfaces between different disciplines in an interdisciplinary project context?*, I will now try to summarise my answer. The processes involved can be considered in terms of following an interacting or an interrelating logic, depending on what kind of work that characterises the project at the moment. During sessions following an interacting logic, sense of *what* to do is made collectively and the basis for a plausible representation is laid. Phases of an interrelating logic contribute to an ability to make a heedful contribution since project members are now able to continue the sensemaking process individually, further refining their representation, and finding out *how* to do project work in a way that is consistent with the work undertaken by other project members. Thus, the processes involved when

organising at the interfaces between different disciplines can be understood as processes of sensemaking from the basis of a representation of the social system, which has been founded in interaction with other project members and further refined individually, using an interrelating logic.

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