MAKING SENSE OF VERBAL PROBLEM-SOLVING PROCESSES - A STUDY OF A CROSS-FUNCTIONAL SOFTWARE DEVELOPMENT PROJECT

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ABSTRACT

Dealing with uncertainty and ambiguity is at the very heart of project work. Even where projects are well-organized and structured in sequential phases with time-tracking, milestones, activity schedules and process descriptions, deviations and unforeseeable problems turn up, which must be solved quickly, "right here and right now". This makes face-to-face meetings an important aspect of project life and communication constitutes a large part of the ordinary day of the project worker. Moreover, members of cross-functional project groups are often strongly specialized with little overlap between individual knowledge bases. While previous research has generally stressed the importance of face-to-face communication in such settings, detailed accounts of communication processes are still rare. In this paper we outline a framework for identifying what goes on in these kinds of processes.

We illustrate this framework with reference to observations from an ethnography-based comprehensive case study of a large software project, which was carried out by a national authority during 2002-2004. Here, we show how project phases associated with different degrees of progress also display quite different modes of communication. In conclusion, we believe that case study observations focusing on macro level aspects of project organizing may be complemented, enriched and substantiated by a subsequent analysis of conversation modes.

1 INTRODUCTION

Project work may be characterized as goal-directed problem solving (Lindkvist and Söderlund, 2002) and as a team activity (Lundin & Söderholm, 1995). The project goal is typically framed in terms of conducting a task within limits set as to time and cost. Dealing with uncertainty and ambiguity is at the very heart of project work (Christensen and Kreiner, 1998). Even where projects are well-organized and structured in sequential phases with time-tracking, milestones, activity schedules and process descriptions, deviations and unforeseeable problems turn up, which must be solved quickly "right here and right now". This makes meetings face-to-face an important aspect of project life and communication constitutes a large part of the ordinary day of the project worker (Westling, 2002); research indicates that an average day consists of 80% formal and informal talk. In particular, where

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projects involve individuals with different specialties well functioning interaction processes may be difficult to achieve. Whether people are different by profession, experience, departmental belonging, geographic dispersion, or way of thinking (Dougherty, 1992), communication problems and conflicts may easily emerge.

> In thinking about the many barriers to personal communication, particularly those that are due to differences of background, experience, and motivation, it seems to me extraordinary that any two persons can ever understand each other. Such reflections provoke the question of how communication is possible when people do not see and assume the same things and share the same values. (Rogers & Roethlisberger, 1952, p. 50)

Previous project research and studies in new product development have often stressed the importance of frequent and rich face-to-face communication in multifunctional settings to achieve knowledge integration (Grant 1996; Pinto & Pinto, 1990; Daft & Lengel, 1986; Sapsed & Salter, 2004) As argued for example by Wheelwright and Clark (1992 p. 180) "communication that is rich, bilateral, and intense is an important, even essential, element of integrated problem solving". In our view, however, this much-trumpeted finding is not very well specified neither in the project-related literature nor in the product development literature. What exactly is meant by rich and dense dialogue? How do we distinguish between rich and non-rich? Can we observe when members in cross-functional teams engage in a rich face-to-face conversation? Thus, frequent, intense, rich, two-way face-to-face communication seems to be a somewhat crude and zealous recipe, which would benefit from a more detailed specification of its ingredients.

2 COORDINATION AND COMMUNICATION

Project teams are often deliberately put together in order to cover a set of competence areas that are deemed appropriate to accomplish the task at hand (Hoegl & Gemuenden, 2001; Hobday, 2000; Pinto & Pinto, 1990). Hence, its members are often strongly specialized with limited overlap of individual knowledge bases (Lindkvist, 2005). To carry out a project task is thus a matter of bringing about concerted time-limited action (Lundin & Söderholm, 1995) among people who know different things and think differently (Dougherty, 1992; Sydow et al., 2004).

Certainly, projects where interdependences are easy to identify a priori could adhere to a kind of scheduling logic (Lindkvist et al, 1998) and coordinate specialist knowledge by resorting to rules, routines and sequencing. However, while such mechanisms serve to economize on communication costs, they are hardly sufficient to solve problems and coordinate experts in projects where systemic complexities prevail and the creation of new knowledge is called for (Pinto & Pinto, 1990, Lindkvist et al, 1998). In such ambiguous project environments there is a need for group problem solving and coordination characterized by mutual adjustment and face-to-face communication (Grant 1996; Mintzberg, 1983). As expressed by Adler (1995), development efforts characterized by high novelty levels, task complexity and task uncertainty require decentralized interpersonal interaction and frequent and rich communication in order to integrate specialist knowledge. Co-location is then important in enabling the creation of a "common ground", facilitating interpersonal communication, mutual understanding and integration of knowledge (Sapsed & Salter, 2004).

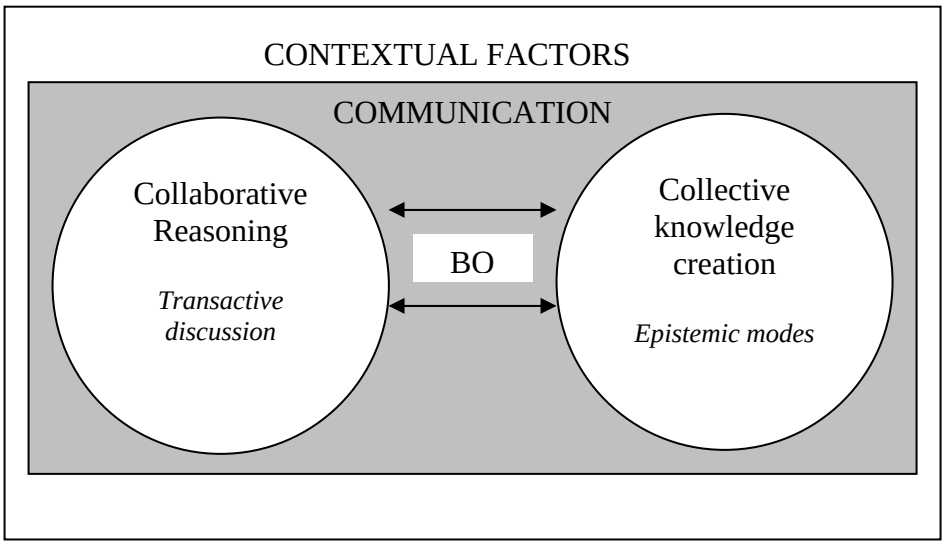
Except for complexity and uncertainty reasons, face-to-face communication is also emphasized for its real time coordination aspect, which is important in high-velocity environments. Real time coordination where progress, problems, interests, and ideas are frequently exchanged, is the essence of mutual adjustment, as argued by Wheelwright and Clark (1992). Moreover, Kellogg et al (2006, p 23) has recognized that there is a lack of research focusing how work is coordinated in "heterarchic organizations", i.e. in diverse high-speed temporary groups with "horizontal relations" and "shifting centers of expertise". Existing coordination mechanisms and boundary spanning methods and tools originate mainly from studies of traditional hierarchical organizations or large manufacturing firms and may not be applicable in high-speed, diverse and more dynamic settings.

In conclusion then, the fact that uncertainty and time pressure put strong demands on the organization and that relationships between individuals and groups should be of a kind that supports face-to-face communication is understandable. However, it appears that we know little about how we may characterize and conceptualise what goes on as people communicate in projects settings, where speed is important, where members have different backgrounds and yet have to accomplish a common task or goal. In the next section we make a first attempts to generate a more microscopic account of how we might think of the general nature of conversations taking place in such settings and how the various conceptions put forward may be operationalized in order to be useful for empirical analysis.

3 PROJECT TALK – OUTLINE OF A FRAMEWORK

Generally, while there is lot of advocacy for the importance of communication in the organization theory literature, our quite extensive search for suggestions on how to study and analyze talk in detail has produced little fruit. Maybe it is still the case, as argued by Weick and Browning (1986), that conceptions of organizational communication follow too strictly structural and other already well-known dimensions of organizations (e.g. up-down, formal-informal, etc.), which in the end adds very little new knowledge and insight to organizational communication. Our literature review instead revealed that turning to educational psychology, discourse analysis and cultural anthropology might be a rewarding detour.

Based on this literature, we propose a model featuring communication in development projects as a two-sided phenomenon, where *collaborative reasoning* is one core aspect and *collective knowledge creation* another. While the first aspect is reflecting the need in a project setting for people to "hold and cherish" (Asch, 1952) a collective goal, the second aspect acknowledges that the individuals and the entire team need to know more as time goes by.



Turning the first circle, *collaborative reasoning*, one could say that for a project team to succeed it is imperative that its members are willing and able to "support" and "use" each other in a way that contributes to goal fulfillment. A social obligation to talk collaboratively is thus inherent in a project communication setting. In our view, the notion of a *transactive discussion*, a term first adopted by Berkowitz and Gibbs (1983), who studied children's reasoning, may be used here as a criterion to assess whether individuals adhere to this built-in social obligation or whether a team as a whole is engaged in such a responsive communication. The notion of a transactive discussion refers to "a type of interaction in which each child uses his or her *conversational turn* to operate on the reasoning of the partner or to clarify his or her own ideas" (Teasley, 1997). A *transact* can thus be either other-directed or self-directed, but to qualify it must somehow display reasoning. Such a view then focuses on the "efforts by each speaker to extend the logic of the prior speaker's argument, refute the assumptions of the argument, or provide a point of commonality between competing positions" (Nucci, 2006). More specifically, a turn is considered transactive if it extends, paraphrases, refines, completes, critiques the partner's reasoning or the speaker's own reasoning. See below.

Type	**Transactive move**
Feedback request	Do you understand or agree with my position?
Paraphrase	I can understand and paraphrase you position or reasoning.
Justification request	Why do you say that?
Juxtaposition	Your position is X, and my position is Y.
Completion	I can complete or continue your unfinished reasoning
Clarification	No, what I am trying to say is the following.
Refinement	I can elaborate or qualify my position to defend against your critique.
Extension	Here is a further thought or elaboration.
Integration	We can combine our positions into a common view.
Critique	Your reasoning misses an important distinction, or involves a questionable assumption.

(Teasley, 1997)

Moving to the next circle in the model, *collective knowledge creation*, we acknowledge that project work involves a problem-solving process among people of different backgrounds. Generally, such a process may involve the generation of shared knowledge (Carlile, 2004) or rather be a matter of knowledge exchange (Kellogg et al, 2006) as it evolves over time and finally results in a material or ideational outcome of team effort. Moreover, as projects typically comprise different competences, we may presuppose that those involved adhere to, more or less, different *epistemologies*. Although they truly wish to talk cooperatively they may find it hard to build on their fellow members' talk in a transactive discussion manner and have difficulties in understanding each other's way of reasoning.

Certainly, there are many other differences between individuals, such as their idiosyncratic way of talking, their different inclinations to use their emotional reasoning that may also have an impact on project communication (Donellon et al., 1986). However, in this version of the paper we limit our efforts to consider how we may look upon talk as epistemological. Below, we resort to a quite open-ended set of descriptors in identifying epistemic aspects of how the individuals of the project group talk and communicate. Following Pontecorvo and Girardet (1993), our (initial) operationalization of epistemic features will acknowledge how conversations involve the use of definitions, categorization efforts, predicating and evaluating, and what people appeal to in warranting a claim. Especially the last item 'appeal to' is a very broad category, picturing whether people tend to appeal to analogies, exemplar cases or instances, conditions, rules, general principles, motives/intentions/ goals, consequences/implications, authority, time, context, etc. See below.

Type	**Epistemic modes**
Definition	A statement about the essential nature of an event or about the meaning of a word, including a shift of meaning.
Categorization	When something is considered as being a member of a class, including a shift of categorization.
Predication/ Evaluation	The action of asserting something about a topic *without* or *with* an evaluative decision.
Appeal to	The action of supporting a claim by appealing to something that the speaker considers relevant to the topic.

(Pontecorvo and Girardet, 1993)

Collaborative reasoning and collective knowledge creation are thus core conceptions in our model, each of which requires careful operationalization to be analytically useful. In addition, the model suggests a complex relationship, indicated by the arrows, between the two constructs in that the diversity of epistemic modes will no doubt influence the collective reasoning, whereas at the same time the collective reasoning, hopefully, will be a way in which such differences may be handled and somehow overcome.

As discussed by Star and Griesemer (1999) and Carlile (2004) the availability of tools, functioning as *boundary objects*, between people with differing backgrounds may be highly useful as a means of bridging epistemological differences. Generally such objects should be both "robust" enough to establish a common point of reference and "plastic" enough to allow for adaptation to a variety of needs and constraints of the different parties employing them. However, both Kellogg et al. (2006) and Sapsed and Salter (2004) argue that the

benefits of constructing boundary objects are limited in uncertain high-speed project contexts. There is not enough time to identify, negotiate, accept and incorporate differences and interdependencies in 'objects' that are likely to become obsolete quite soon as knowledge and lessons learnt develop continuously. Uncertainty and changes will thus make it hard to construct and rely on such coordination mechanisms. Given our focus on communication contexts that are "heterarchic" (Kellogg et al., 2006), we believe that emergent and temporary linguistic objects, e.g. in the form of metaphors, analogies, etc, may be particularly important in project conversations. Hence, although we have not yet elaborated this idea in this paper we have inserted the boundary object (BO) notion in our model.

Finally, there is a third component to the model, *contextual features*, which is represented by the area that surrounds the grey part in the model. As explained above the overall organizational context is coloured by the features characterizing development projects, such as time pressure, focus on task completion and goal accomplishment, day-to-day problem-solving, collective learning, etc. These features as well as the character of project leaders, team composition, roles and relationships will no doubt impact on how people interact and communicate. Moreover, the local context in which the conversations take place may be of great importance. Different types of meetings and communication forums and media could play a significant role for how information is delivered, how problems are solved and whether people have a chance to contribute with their unique knowledge or not. We thus recognize that both general contextual factors and more local circumstances may significantly impact project talk. This then serves to underline that although we may consider the collaborative and creational aspects of talk itself, such talk is also organizationally embedded or "situated".

To summarize, our frame of reference pictures project communication in a simplified descriptive model incorporating collaborative reasoning, knowledge creation and contextual factors. The model is broad in a sense, which implies that it must be developed a bit further to enable quantification of the conversational turns, or if also more non-rational aspects of conversations should be captured. To be true this is a picture that focuses on the rational pursuit of reason within communication. We are well aware that actual processes may be less so, and inhabit much emotionality or even much "garbage can" behavior (Cohen et al., 1972). In addition, the fact that individuals are different and have different communication skills makes studies of talk complicated (Alvesson and Kärreman, 2000). Yet, even if we will eventually find that there is very little rationality or reason in certain practices, we think it is a useful model in providing a specific kind of gestalt, against which deviations may be identified.

4 METHODOLOGY

Basically, this paper is methodological in that our main purpose is to explore how a more detailed account of project talk may complement and enrich 'higher level' accounts project work. This formulation presupposes a kind of two-level understanding, where what goes on at the level of talk is seen as somehow connected to the local and global context within which it is embedded. As a result, we think of talk as both autonomous and situated. The study of 'communication in context', then calls for both ethnography-inspired case study

methodology (Van Maanen, 1988) to cover the contextual or organization level aspects and conversation analysis to cover the internal logic and dynamic of talk itself.

While in a general sense, studying 'communication' in 'context', would imply that these ingredients are seen as inseparable, we believe they could be separated for analytical reasons. This is mirrored in our research design, where we report on a large software development project. On the one hand this study represents a real-time, in-depth case study (Yin, 1994) providing for an organizational level description and assessment of project progress. On the other hand, it includes a large set of communication episodes, collected as the project was moving along until it was finally concluded. As this software project went on, some phases were clearly associated with discontent and failure to deliver on time, while other displayed the opposite pattern of satisfaction and swift progress. This pattern of phases with different outcomes was identified as a result of the organization level ethnography. Taking this pattern as a datum, we could then turn to analyzing whether and how talk going on in these phases mirrored the different degree of success of these phases.

As to the details of our case study, we do believe it generally deserve the near-ethnography designation. One of us spent about a year in the organization, granted an unrestricted access to observe different group and dyad meetings (more than a hundred), to conduct about 50 semi-structured qualitative interviews, and take part in casual discussions with people from various diverse functional subsections of the organization, as well as participate in some computer test activities. We also had unrestricted access to all different kinds of project documents. One of us was allowed to just be around and spend time in their offices to follow and make observations as things happened. Most meeting sessions and some of the informal discussions have been taped.

In accordance with the above reasoning the subsequent empirical section of the paper consists of a description of the general project process, "the project story", which is divided into three chronological phases. The phases were constructed and separated in accordance with project occurrences that dramatically changed the way things developed in the project. Then follows a presentation of the meetings that were characteristic and representative for each of the two last phases[†]. Last in this section we present a few typical conversation sequences from the meetings to illustrate briefly how talk is being pictured in our suggested communication framework. The case project is hence described on three different levels, the overall project context, the meeting context, and the talk. The first two levels are informed by the ethnography-inspired methodology and the third by our conversation analysis.

5 PROJECT STORY

The aim of the case study project was to develop a computer system for the Swedish premium pension system, with the capacity of keeping 5 millions of pension savers accounts and thousands of daily fund transactions. It was developed "in house" by the authority but comprised to a great extent temporary IT-consultants. The project employed around 80 people in the beginning, a number that was reduced in the middle of the process to just about 30. The task was unique and complex requiring specialists from different

[†] The first phase was studied retrospectively by interviews and documents. No meetings from this period were attended.

disciplines such as insurance, finance, public relations, technicians and software programmers and account administrators. The account administrators represented the internal department that ordered the software system. The project ended successfully by the end of 2004 at a cost of approximately 100 MSEK (13.5MUSD).

Phase one. The first phase lasted from the start-up in September 2002 until the restart in mid-2003. During the first year the project experienced problems in the process of writing user requirement specifications. The cross-functional collaboration between end user and their managers on the one hand and IT-developers and their managers on the other hand was characterized by misunderstandings and mutual accusations for poorly written specifications and barely functioning technical solutions, respectively. Changes in existing specifications were made repeatedly, which caused loops in the development process making the progress slow. The overall view of the situation and the way out towards the end goal were unclear. After more than a year it turned out that the requirements demanded a more wide-ranging technology base and a switch to a new technical platform. People explained, when retrospectively reflecting on the history, that before May 2003 nobody had understood the scope of the task or the practical implications of achieving the requirements.

Phase two. The executive group of the project decided to restart the project. All programming was stopped at once in order to get an overview of the situation. The restart consisted of structural changes, such as an external recruitment of a new head project leader, a downscale in the number of project workers, centralization and formalization of the writing of the requirement specifications and development process. After the restart the project consisted of four different units; IT, Test, Operation, and Implementation, each led by a "unit project manager". The head project manager got the executive group of the project to prioritize and choose one of the three steering parameters; time, functionality and cost. They considered time to be most important, to finish the project and make it come to an end. This resulted in large cutbacks in requirements and user functionality. Formal development methodology instructions similar to the waterfall model should now be strictly followed. A salient feature of this period was the establishment and maintenance of sophisticated time schedules and comprehensive plans of activities that specified the work hour by hour. Progress reports, controls and follow-ups were done more or less every day. It became prestigious to deliver on time, to show that the project now progressed in a controlled manner and that it indeed would succeed. One of the main challenges that the head project manager faced was to make people both inside and outside the organization believe in the project again, build legitimacy around the activities and regain trust.

In spite of strict prescriptions and detailed planning problems piled up, especially in the IT-unit. It was that said the plans were set up before the requirement specifications and detailed design sheets were finished, which resulted in too few hours calculated. Every day people complained about bad and unrealistic plans. Project members argued that spending time on the planning sheets was only to please the managers or executives. Moreover, the new development guidelines were not strictly adhered to by all group members and many project members pointed at a lack of technical leadership. The people of the IT-unit were not satisfied with how technical issues, problems and decisions were handled. Besides, other non-functional requirements such as performance, stress capacity, technical excellence for enabling further development, maintenance and technical operation management were not specified in the requirements or in the "methodological handbook". The project also experienced problems in how to deliver the first package, which resulted in

delays and a package with less functionality than agreed. Altogether, it led to frustration and conflicts, internal coordination difficulties and deviations from the time schedule.

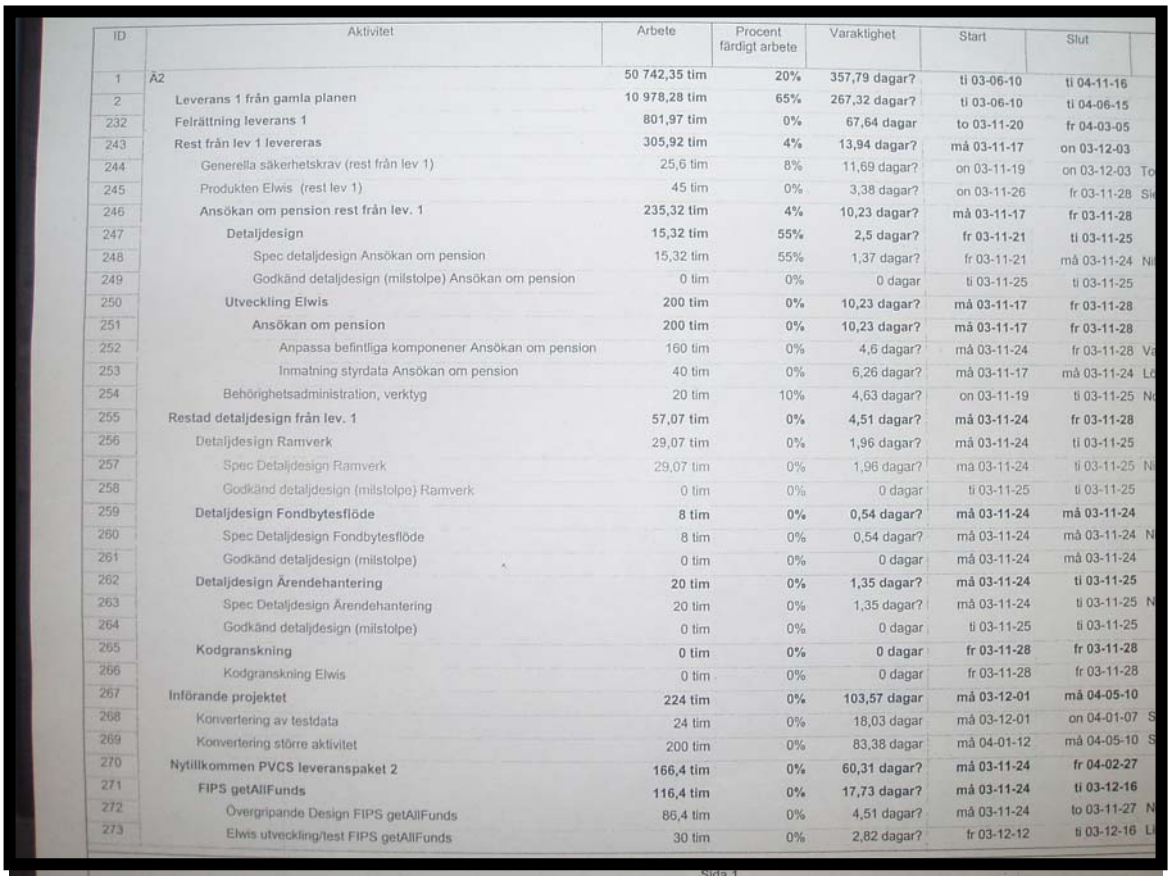
However, the development process continued and the corrections of bugs and errors started in order to deliver patches as soon as possible. Certainly, the individuals as well as the whole project learned as time went by since the project ended successfully, but during this phase the process was slow-moving. More functionality was postponed or cancelled. Some of these parts were already half done but not reported in the plan because they were coded before the detail design was made or even before the restart of the project, which was not allowed according to the methodological handbook and waterfall procedure. This made the situation complicated and the control that the plans first induced was about to vanish. Time went by and deviations from the plans grew stronger. At some point no one knew how to continue and the project drove off the road and reached a dead stop where nothing was produced.

Phase three. Several actions were taken by the head project manager to get the IT part of the project going. A new role structure with some changes in the group constellation with new recruitments was organized. The IT-unit manager was discharged and the position was taken over by the head project manager. It was also explained how to prioritize between the non-functional requirements. As a result, the interaction and communication changed within the IT project group and the development process began progressing in a positive manner with better software quality and fewer faults. People gradually believed in the work again, in the project goal and that they would eventually finish the project task.

By the day of the final deliverance and implementation people knew the system would operate well since all data conversion was completed and the comprehensive tests went well and the most important security issues were finished. In the end, the entire technical product and the functionality of the new applications as well as the interface to other systems seemed to operate properly. End users had gone through an extensive training program and were more than familiar with the application and not very anxious about passing on from the old user interface to the new one. Some time after the project had come to an end people were still satisfied and happily surprised that so few problems and faults had turned up.

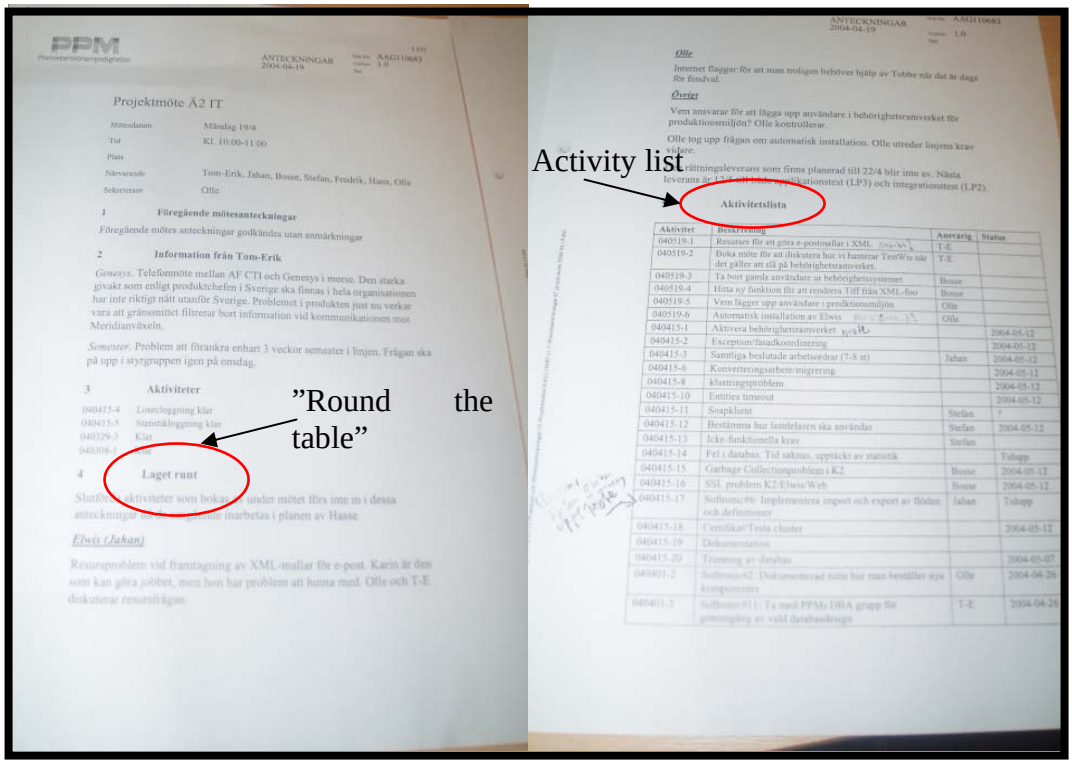
5.1 Meetings

The meetings in phase two: The typical communication of the IT-unit during the less productive phase, number two, took place in meetings that were structured around detailed planning sheets. The time was devoted to check actual status to the plans. As is shown in the picture below the planning of the activities were decomposed, specified and lined up in different rows with total work in hours in the next column, percentage of work finished after that and duration in days in the following one, and start and end dates in the last columns. The numbers of duration and work hours were correct to two decimals. The meeting procedure was that the project manager of the IT- unit (ITPM) went through all the different activities to check if they were completed on time or not. If not, she asked the programming leaders (PL) and group leaders (GL) for a new due date. The questions were short as well as the answers since the objective was just to mark the immediate status of each activity.



ID	Aktivitet	Arbete	Procent färdigt arbete	Varaktighet	Start	Slut
1	Ä2	50 742,35 tim	20%	357,79 dagar?	ti 03-06-10	ti 04-11-16
2	Leverans 1 från gamla planen	10 978,28 tim	65%	267,32 dagar?	ti 03-06-10	ti 04-06-15
232	Felrättning leverans 1	801,97 tim	0%	67,64 dagar	to 03-11-20	fr 04-03-05
243	Rest från lev 1 levereras	305,92 tim	4%	13,94 dagar?	må 03-11-17	on 03-12-03
244	Generella säkerhetskrav (rest från lev 1)	25,6 tim	8%	11,69 dagar?	on 03-11-19	on 03-12-03 To
245	Produkten Elwis (rest lev 1)	45 tim	0%	3,38 dagar?	on 03-11-26	fr 03-11-28 Sl
246	Ansökan om pension rest från lev. 1	235,32 tim	4%	10,23 dagar?	må 03-11-17	fr 03-11-28
247	Detaljdesign	15,32 tim	55%	2,5 dagar?	fr 03-11-21	ti 03-11-25
248	Spec detaljdesign Ansökan om pension	15,32 tim	55%	1,37 dagar?	fr 03-11-21	må 03-11-24 Ni
249	Godkänd detaljdesign (milstolpe) Ansökan om pension	0 tim	0%	0 dagar	ti 03-11-25	ti 03-11-25
250	Utveckling Elwis	200 tim	0%	10,23 dagar?	må 03-11-17	fr 03-11-28
251	Ansökan om pension	200 tim	0%	10,23 dagar?	må 03-11-17	fr 03-11-28
252	Anpassa befintliga komponener Ansökan om pension	160 tim	0%	4,6 dagar?	må 03-11-24	fr 03-11-28 Va
253	Inmatning styrdata Ansökan om pension	40 tim	0%	6,26 dagar?	må 03-11-17	må 03-11-24 Lä
254	Behörighetsadministration, verktyg	20 tim	10%	4,63 dagar?	on 03-11-19	ti 03-11-25 Nä
255	Restad detaljdesign från lev. 1	57,07 tim	0%	4,51 dagar?	må 03-11-24	fr 03-11-28
256	Detaljdesign Ramverk	29,07 tim	0%	1,96 dagar?	må 03-11-24	ti 03-11-25
257	Spec Detaljdesign Ramverk	29,07 tim	0%	1,96 dagar?	må 03-11-24	ti 03-11-25 Ni
258	Godkänd detaljdesign (milstolpe) Ramverk	0 tim	0%	0 dagar	ti 03-11-25	ti 03-11-25
259	Detaljdesign Fondbytesflöde	8 tim	0%	0,54 dagar?	må 03-11-24	må 03-11-24
260	Spec Detaljdesign Fondbytesflöde	8 tim	0%	0,54 dagar?	må 03-11-24	må 03-11-24 N
261	Godkänd detaljdesign (milstolpe)	0 tim	0%	0 dagar	må 03-11-24	må 03-11-24
262	Detaljdesign Ärendehantering	20 tim	0%	1,35 dagar?	må 03-11-24	ti 03-11-25
263	Spec Detaljdesign Ärendehantering	20 tim	0%	1,35 dagar?	må 03-11-24	ti 03-11-25 N
264	Godkänd detaljdesign (milstolpe)	0 tim	0%	0 dagar	ti 03-11-25	ti 03-11-25
265	Kodgranskning	0 tim	0%	0 dagar	fr 03-11-28	fr 03-11-28
266	Kodgranskning Elwis	0 tim	0%	0 dagar	fr 03-11-28	fr 03-11-28
267	Införande projektet	224 tim	0%	103,57 dagar	må 03-12-01	må 04-05-10
268	Konvertering av testdata	24 tim	0%	18,03 dagar	må 03-12-01	on 04-01-07 S
269	Konvertering större aktivitet	200 tim	0%	83,38 dagar	må 04-01-12	må 04-05-10 S
270	Nytillkommen PVCS leveranspaket 2	166,4 tim	0%	60,31 dagar?	må 03-11-24	fr 04-02-27
271	FIPS getAllFunds	116,4 tim	0%	17,73 dagar?	må 03-11-24	ti 03-12-16
272	Övergripande Design FIPS getAllFunds	86,4 tim	0%	4,51 dagar?	må 03-11-24	to 03-11-27 N
273	Elwis utveckling/test FIPS getAllFunds	30 tim	0%	2,82 dagar?	fr 03-12-12	ti 03-12-16 Li

The meetings in phase three: The meetings in phase three had less detailed planning discussions and were more focused on immediate problems and people's different opinions on the definition, causes, content, importance, consequences and alternatives to handle and solve problems wisely. Compared to previous meetings, they were now built on a different communication structure where the participants, the programming leaders (PL) and group leaders (GL) were supposed to hand in a short written status report before the meeting with finished activities, present work, problems and current critical issues. Instead of going through several detailed planning sheets where the manager asked questions following the rows on the sheets, the meeting now started out by the head project manager (HPM) giving some information and then they verbally "went round the table". The word was free and they were, one at the time, given space to discuss current topics. People shot in spontaneously, but some order was maintained by the head project manager and the quality inspector (Q) of the project. The minutes of the meeting were formally summarized in a document of the below kind, which could be compared to the much more detailed meeting sheets from phase two.



5.2 Illustrative examples of conversations

Sequences from two meetings in phase two:

We start with two conversations from weekly meetings in phase two. The first excerpt displays how the communication between the IT-unit manager and the programming leaders normally went on during this period. The meetings were organized around the plans and even though there were many problems during this period of time, these were seldom discussed in the meetings. The manager worked with other daily tasks than the programmers and did not know the details about their on-going activities. In those parts where the conversation involved some sort of explanations or clarifications it seemed more as the manager learned from the programming leaders what had happened in the past and about the logic of the task (e.g. 6-10), rather than a situation where they jointly discussed how the tasks should be dealt with and the project learned as a whole. The *collective* part of the knowledge generation reasoning seems thus less present.

A

1. (ITPM) Yes. If we continue with the plan now. Can I mark pension application for ELWIS, both adjust existing components and the control data input as finished, that is row number 252 and 253?
2. (PL) Yes.
3. (ITPM) And then we have row number 256, detailed design of framework. It shall not be done, you or [co-worker] told me? Shall I mark it as finished or delete it?
4. (GL) Delete.
5. (ITPM) Then we have detailed design of job handling. I know you have sent it to the design group but I do not know…
6. (PL) No, we are currently working on amendments but it will be finished today.
7. (ITPM) It will be finished today.
8. (PL) But then it goes to the design group to..
9. (ITPM) But it has been there once, right?
10. (PL) Yes, and then we got it back….

11. (ITPM) Yeah, you got it back.
12. (ITPM) Then we have data input of job handling. The first priority activities are supposed to start today. It might not be possible?
13. (PL) No, we are busy doing other things.

The following excerpt is from the week when the project was supposed to deliver its first package of functionality. Since the first delivery was critical to the project the project owner (PO) and the head project manager (HPM) attended the weekly IT-unit meeting to check the progress status. Ordinary weeks, this was the meeting of the computer programming leaders (CPL) and the manager of the IT-unit (MIT). The meeting started with the regular activity checking and time schedule report. After some further questions with short answers the meeting was ended. Later on it turned out that the three tasks that remained to do before they could deliver were not clear to anyone. Nobody was assigned to the tasks; nobody knew what the test and quality procedure should comprise, how to do it, what material was needed or when to do it. Everybody knew the tasks had to be done but not how. The developers claimed it did not matter who took care of it while the test group said the opposite; there was a point in dividing the task in a specific way between the test group and the IT-unit group. The situation resulted in a crucial problem, which the head project manager referred to as "malfunctioning culture of deliverance". Thus, the problem came as a shock with confusion, delays and conflicts. The meeting, which was set up to check the status and detect problems in order to get a clear view of the situation, did not thus fulfill its purpose.

B

1. (HPM) *What will happen next? What is to do before Friday?*
2. (CPL) *Examination of codes, test and quality inspection.*
3. (HPM) *Will we deliver on Friday?*
4. (CPL) *As it seems now. We will see.*
5. (HPL) *We have a new checking meeting on Thursday afternoon then.*
6. (CPL) *Yes.*
7. (PO) *But is it reasonable?*
8. (CPL) *As I said, yes, as it seems now.*

In these excerpts the mode of collaborative reasoning was non-transactive since there were no self-oriented or other-oriented statements. That is, the conversational turns could not be described in terms of justification request, refinements, clarifications, paraphrases, extensions, critique, etc. In the same vein as Teasley's (1997) notion of the hypothesis that transactive reasoning constitutes the basis for productive and faster problem-solving, we could imagine that the problems that later turned up could have been detected already in the meeting and hence decided on and solved earlier if the members had engaged in a mutually responsive dialogue. For example, the CPL could have taken on self-oriented reasoning by extensions and clarifications on how these three tasks were organized and thought out. Furthermore, the PO could have acted upon the reply asking for justifications to why and how it seemed realistic to deliver the first package. As far as this conversation reveals, there were no linguistic boundary objects in use, reasonably because the conversation did not involve negotiation, conflicts, arguments or any other epistemic characteristics. Consequently, in this case it seemed as if there was more a need for triggers that could activate the surfacing and identification of the different problems, which in turn could have promoted transactive reasoning. One factor that should enhance the production of transacts,

both self-oriented and other-oriented, suggested in Teasley (1997) is *the attendance* of another person. That person does not have to take part in the problem solving process to make it work. Instead it was the inherent social aspect and supply of a "natural context" that the person offered that mattered. Here the "natural context" seemed negatively affected by the plans around which the conversation was strictly kept, leaving little space for the members to raise questions and act on each others' talk.

Sequence from a meeting in phase three:

The conversation below starts with a question directed towards the programming leader (PL), but the group leader (GL) is as involved in the discussion as the PL. The excerpt is from the type of conversations that typically occurred during the third phase. The conversation is about a technical problem regarding security and the framework for access rights on the one hand and its effects on the test tool for component testing and the test environment on the other hand. The framework for access rights does not work properly with the test tool.

1. (HPM) The framework for access rights?
2. (PL) There are some decisions that we have to make about which environments this should be activated on. It is problematic since the test tool makes different things it should not in order to generate data. Either we have to go through all test cases of the test tool, all of them, or we have to make a decision like "okay, we do not run the framework for the access rights in the development environment or the application test environment, while in the integration environment it could be switched on.
3. (HPM) Yeah. Does it feel all right?
4. (GL) It feels like a risk, I think, if you do not have it switched on.
5. (HPM) Yes there is a risk.
6. (GL) It makes a difference, I think, with application tests. That is, if you click around in K2 using the web then it has to be switched on.
7. (PL) What environment are you talking about?
8. (GL) Regardless of the environment when testing those things. When testing functionality, that is application tests, it has to be switched on, otherwise you do not test.
9. (PL) Yes but then everybody has to go through all the test cases.
10. (GL) They should run the test tool in another environment, do you understand?
11. (PL) No.
12. (HPM) The problem…I see what you mean, we should have run K2 tests and ELWIS tests in two different environments. K2 should have had the framework of access rights switched on, you say. ELWIS tests are dependent on the test tool. We should make a decision what to do.
13. (GL) Do as you want but it depends on how big the consequences are …
14. (PL) I ran the test tool and…
15. (GL) But test data…
16. (PL) Not test data, you do not have the access to do things as….
17. (GL) But what is the problem? That there must be a user with access rights?
18. (PL) Yes
19. (GL) We could not set up a user then?
20. (PL) But what is the point?
21. (GL) Then can at least those with access rights to the test tools use the tests with full framework of access rights switched on.
22. (PL) Either…I do not want it, I want to have it separate in that case. We can have a super user who cannot…
23. (GL) What is the difference between that and having it completely switched off?
24. (PL) Completely switched off in one environment and running in another.
25. (Q) Is it an alternative to create a sneak type of the rights of access?
26. (PL) That is what I want to get away from. A sneak type to the rights of access means giving up the very safety…

First, the communication is more task-oriented starting with an open question on a specific problem issue. Using the model from the conceptual background, we can compare this to previous excerpts and see an example of a transactive discussion and joint problem-solving session. There are examples of several different types of transactive moves. The conversational turns are longer and the participants produce self-directed (e.g. 26) or other-directed (e.g. 12) transacts in almost every line. All the participants take part and show how they meet each other in a transactive course of reasoning by disagreement, judgments, concessions, explanations, clarifications, etc. The discussion is triggered by a statement that requires further elaboration, extension and feedback (e.g. 4). Subsequently, transacts were produced, for instance justification requests, (e.g. 20) feedback request (11) paraphrase and reasoning; (12) etc. where the participants acted upon each other's utterances.

In addition, the conversation may be described in terms of different epistemic modes of individuals, in accordance with Pontecorvo and Girardet's (1993) classifications. Almost every line could fall into one of the four categories and could be summarized, quantified and decontextualized to get an overview of what epistemic modes exist in a certain setting. From this one might understand among other things what linguistic boundary objects can be used to bridge the epistemic differences. This is to be developed in a future paper. However, here follows some examples of the categorization of epistemic modes in relation to Pontecorvo and Girardet's (1993) idea. One example of *definition* is when the group leader makes claims of what functionality test is all about, the meaning of that kind of test (8). This is at the same time a transactive move, a critique, since it contradicted the preceding statement (2) at the beginning of the discussion. In addition, there are utterances that fall into the *categorization* line (e.g. 7, 10, 23). Furthermore, there is also examples of the *evaluation* sort (4, 12) and the *appeal to* is represented by (2) where the time limit of the project is implicitly included since it takes time to go through all test cases and also that faults are being produced which need a formal decision before they can handle it correctly. Also (26) could be viewed as an *appeal to* an established norm on safety issues.

Adhering to the model, one tentative example of a linguistic boundary object might be the choice of the word "sneak type". It involved both the security issue and the possibility to test the functionality properly. The proposal from the quality inspector is a try to combine the different interests and integrate the two different perspectives of the group leader and the programming leader. However, in this case the boundary object did not "solve" the problem but captured both perspectives and permitted a step forward in the knowledge generation process through the rejection of it. Furthermore, the Q and HPM (12) may function as a kind of a social context by their attendance or in-group mediation boundary objects as they conclude, ask questions, explain problems in a different way etc.

Generally, the IT meetings in phase three had more collective reasoning in the conversations where the planning logic was set aside and the role of argument, contradiction and negotiation was more dominant. The excerpt shows also that the meetings in phase three, in spite of less specified task and overall planning documents, involved a more general understanding and collective knowledge creation by a stronger mutual commitment to each other's problems. It seemed that if somebody was asked to *freely* ventilate his or her current problems it also awakened and got the other person interested. That is, it tends to put that person's emotions and "knowing" into motion as well. This shows how another type of communication form may have a positive impact on the production of transacts and collective knowledge generation. Organizing the meeting in this

way with round the table discussions might enhance the chances for unique knowledge and insights to be presented. Furthermore, when participants anticipate conflicting views and discussions they prepare and perhaps act upon their own reasoning before the meeting and create self-directed transacts in advance. That is, a self- or other-oriented transactive conversation may start before the meeting and continue afterwards. One tentative hypothesis is that the first type of reasoning seemed to hinder collective learning whereas the other form of reasoning seemed to foster learning and knowledge generation.

6 CONCLUSIONS

Many projects fail to reach their goals, and IT-projects, in particular, have long had a reputation for cost overdrafts and for being notoriously late. In such cases where projects do not run smoothly, people often point at malfunctioning communication as a major source of trouble. Yet, in the literature, "good" communication has been put forward as an important ingredient in many project management recipes and as discussed earlier, face-to-face communication has long been suggested as an appropriate way of dealing with complex integration problems. One reason why this ingredient has brought limited relief, we contend, is that the suggestions put forward have been far too general.

Hence, we try in this paper to enter a new line of research, which will enable a discussion of communication issues in a much more fine-grained manner. Our aim has thus been to outline a frame of reference providing a more detailed account of project communication processes. Incorporating collaborative talk and collective knowledge creation as two main aspects of communication, we believe is fitting in the context of collaborative and goal-directed project work.

As a result this paper is mainly methodological, advocating a new line of project research. However, we also somewhat explore its usefulness by applying this framework to a set of illustrations taken from a case study of a large software project. We here show how a traditional case study description may be complemented, enriched and substantiated by a subsequent analysis of conversation modes. Moreover, we suggest that there is a need to situate this micro-level conversation analysis within its proper macro-level context.

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