Balancing Innovation and Control

The Role of Face-to-face Meetings in Complex Product Development Projects

Gunnar Westling

AKADEMISK AVHANDLING

Som för avläggande av ekonomie doktorsexamen vid
Handelshögskolan i Stockholm framläggs för offentlig granskning
Fredagen den 20 december 2002 klockan 14.15
i sal 550, Handelshögskolan, Sveavägen 65

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Dissertation for the Degree of Doctor of Philosophy, Ph.D
Stockholm School of Economics 2002

ISBN 91-7258-605-2

Key words:
Meetings
Face-to-face meetings
Complex product development
Projects
Innovation
Ambiguity

Printed by:
Elanders Gotab, Stockholm 2002

Distributed by:
EFI, The Economic Research Institute
Stockholm School of Economics
P.O. Box 6501, SE-113 83 STOCKHOLM, Sweden
www.hhs.se/efi

To Ingela

Preface

This report is a result of a research project carried out at the Fenix research program and the Center for People and Organization (PMO) at the Economic Research Institute, Stockholm School of Economics.

This volume is submitted as a doctor's thesis at the Stockholm School of Economics.

The present volume would not have been possible without the financial support from the National Institute for Working Life (ALI) and the cooperation of Ericsson.

The Economic Research Institute and the Fenix Research Program at IMIT (Institute for Management of Innovation and Technology) wishes to warmly thank all involved for their generosity and openness.

Bo Sellstedt
Director of the Economic Research Institute at the Stockholm School of Economics

Bengt Stymne
Professor of Organizational Theory
Center for People and Organization (PMO), Stockholm School of Economics and the Fenix Research Program, IMIT

Acknowledgements

Many have taken part in the work that led to the completion of this thesis. I would therefore like to express my gratitude towards all of you that have helped and supported me during this endeavor.

Horst Hart, Bengt Stymne and Udo Zander have formed members of the thesis committee. Thank you Horst, Bengt and Udo for guiding me along the slippery road of writing this thesis and for the valuable comments and suggestions that you provided.

Apart from myself, Horst spent the most time reading through various versions of the manuscript and offered countless suggestions through which my reasoning has been improved. Horst also encouraged me to always continue the writing process, ensuring that it never ceased. He also offered valuable insight into the functioning of the informal hallway conversations via the clinical experiments he performed in our own organization. Bengt has been the strategist of the group and often phrased the seemingly obvious questions that increased or altered the focus of the text. As a cautious act on Bengt's behalf, one was always placed in his big leather chair before such questions were raised in order to give the "victim" a comforting sense of stability. Udo provided sharp suggestions on how to improve the structure of the thesis, hands on methods as to how this could be achieved, and more than once expressed a specific type of enthusiasm that strengthened my own confidence about my project.

During my doctoral training, I have been affiliated with two different research centers: the Fenix research program and the Center for People and Organization (PMO). Thank you all for being such great colleagues and your support during various parts of the research process. It provided a great opportunity to have one foot in each research center. The more practical and hands-on oriented Fenix helped me to get the work done. PMO, on the other hand, provided the more theoretically intriguing questions regarding the study of organizations. So, thank you Mats, Björn, Andreas, Lotta, Ylva, Robert, Staffan, Peter (B H), Jesper, Johan, Ulrika, Jan, Martin, Anita, Svante, Pernilla, Pär, Andrew, Annika, Anna, Sophie, Cassandra, Peter (M), Peter (H), Markus, Frida, Flemming, Sven, Niclas, Hans, Sophia, Ragnar, Håkan, and Fredrik for your support and valuable feedback in- and outside the seminar room.

A special thought goes to Marianne Döös (National institute for working life) and Darren Hughes. Marianne did a tremendous effort as an opponent at the

final seminar held on a draft version of the thesis. During the final months, Darren contributed considerable time and effort to transform my 'Swenglish" into something that now appears more "English-like".

I am also very thankful for the financial support from Fenix and the National institute for working life ("ALI") that made my research project possible. In addition, I would like to thank my new colleagues at IFL (Swedish Institute for Management) for their patience and support during the months when the "finishing touches" of the thesis were completed (which was considerably more work than I thought it would be).

During my research process, I have learned that an academic project retains much in common with the product development projects I studied. Thus, similar to a product development project, unexpected learning occurred along the way that I had not expected at the outset. Similarly, some matters that I expected to take place never eventuated. This understanding led to a respect on a deeper level for the people involved in the practice of developing complex products. I would like to thank all the people involved in the two Ericsson projects studied in this thesis for their openness and generosity in providing their time and insight (for example Mats, Lars, Christer, Monica, Thomas, Ulf and many more).

One person (beside myself) is probably happier than anyone else that this writing process had come to an end – my wife Ingela. During the last two years or so, this thesis has been omnipresent for us all. Therefore, my warmest thanks are devoted to you, Ingela, for your help, support and your patience with all the evenings that I spent in front of the computer and my often distracted demeanor.

A big hug is devoted to our two-year old daughter Julia for just being a sparkling wonder and for directing my focus to other matters than the thesis, for example, life. The work with the thesis has also led to interesting ways that Julia makes use of certain terms. For example, when using (inspired by her father) the expression 'I'm on my way' (in Julia-Swedish "jag pommer") it does not always mean that one actually is one the move!

Gunnar Westling

Stockholm, November 2002

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1. Introduction

In any organization, formal and informal face-to-face meetings make up a profound part in the daily life of its members. Meetings are played out continuously, some formal, such as a management board meeting, an information meeting, or a project meeting. The formal meetings people "attend to", "participate in", or "are in charge of" depending on a person's position within them. Other meetings are less formal, such as a desk-side discussion, a chat in the hallway, or a private conversation between two colleagues. The latter often just appear, seemingly by chance.

This study examines meetings, as a way of observing the organizing process of complex product development projects that need to cope with the contradicting demands of innovation and control. More specifically, formal and informal face-to-face meetings will be examined that took place in two projects that were both developing telecommunication systems. What do different types of meetings represent in this specific context? What are their uses and functions? How do different types of meetings interplay around a task? How do these two projects differ from each other in terms of their use of meetings?

In this study face-to-face meetings are defined as those occasions when people physically gather together and engage in taking turns at talking (Goffman 1963: 9, 22, 24). Formal as well as informal meetings are included in the scope of this definition. In the forthcoming text, the term meeting will be used to refer to those occasions that fall within this definition.

Complex product development can be conceptualized as a social process in which a new or improved product is developed through a number of interdependent activities performed by participants with specialized skills (Karlson 1994:173). Besides developing new or improved products, such projects may also be essential for change and renewal of their organizations (Brown and Eisenhardt 1995:343). To say that an activity is complex means that many elements that retain extensive variations simultaneously has to be considered (Scott 1992:230). In the development of telecommunication

systems, one form of complexity is related to large number of interfaces to other technical systems that need to be considered.

1.1. Complex product development - a problem ridden activity

Complex product development can be viewed as a continuously emerging activity with a preponderance of non-routine events. This implies that it encounters many exceptions and that the work process is difficult to analyze prior to commencement (Perrow, 1967:77-79). In contrast to more routine oriented work, in which steps and procedures to transform inputs into outputs are known in advance, the procedures for task accomplishments in non-routine work is determined progressively as new information influences the thinking about the task (Pasmore and Gurley 1991:370).

Confusion naturally arises during an activity that is always under-defined and in the "process of being planned" (Pava 1983a: 48). Thus, a need for eradicating 'what the hell is going on around here' is often present in these projects. Consequently, time-pressured product development has been described as an ongoing process of crisis resolution (Sheremata 2000:393).

Due to their inherent non-routine characteristics, problems are a common ingredient of most product development projects. In this regard, problems can be described as junctures in the conversion of inputs into outputs at which the process can go seriously wrong (Pava 1983a: 19). Such problems often relate to matters that are perceived to be equivocal, ambiguous or uncertain (Purser et al., 1992:4).

1.1.1 The character of problems

Well-known examples of problems that impede an expected output are errors in the earlier phases that cause problems at a later date, often referred to as 'transmitted variances'. Other examples are events outside the system that cause disruptions on the inside, known as 'boundary variances'.

Fundamental dimensions describing the character of problems are the distinctions between problems that appear *analyzable* or *systemic* (Levinthal and March 1993) and *simple* and *complex* (see Thompson 1967; Eisenhardt and Tabrizi 1995). Those problems that were difficult to foresee can be referred to as systemic problems, as it is difficult or impossible *a priori* to identify their existence. Thus, these problems need to be solved *ad hoc*. In contrast, analyzable problems refer to problems that can be detected and dealt with relatively easily in advance.

The problems that appear may also retain different characteristics, referring to the distinction between simple and complex problems. Levinthal & March (1993) refer to 'simple' situations as error detection, whereby a low degree of knowledge generation is required in order to manage them. For such problems, the chief task is to surface errors in the system via an active signaling process. Hereby, detected errors can be connected to an already existing solution. In contrast, complex problems call for error diagnostics involving more fundamental problem solving and deep and specialized knowledge generation. Thus, error detection becomes the main task in activities related to knowledge exploitation, while error diagnostics is closer to innovation activities where exploration of new possibilities are prominent (Söderlund 2000).

1.2. A balancing act between innovation and *control*

As argued here, an organization engaging in complex product development needs to manage a balancing act between two contradicting demands: innovation and control.

1.2.1 Product development as innovation

To deal with problems in a product development project does not only corresponds to the solving of them (i.e. the selection of the solution from available means that best suits the established ends). For ambiguous or confusing situations, it also involves the process that identifies the appropriate decision, the ends to be achieved, and the means that may be chosen, that is, the identification, framing and defining of problems that converts them into solvable problems. In this process of problem setting, the problems are actively *named* (as 'things') and framed in a context to which they will be attended (Schön 1983:40).

In this sense, a product development effort is one of innovation; problem setting changes the cognition about the appropriateness or exigency of taking action. Such innovative activities involve interpretation and learning about matters that adds new meaning to it (Daft and Weick 1984). More specifically, activities are "deemed innovative if they differ significantly from current or recent activities" (Greve and Taylor 2000:55). Therefore, what is changed are the evaluation of information, the appropriateness of actions, and the foci of attention (Greve and Taylor 2000:57-58).

When people are confident of their interpretive schemata (i.e. structures that encode past experiences and guide future actions), activities are focused towards a passive confirmation that their existing schemata work well. Well-established routines (for interpreting information, evaluating outcomes, and

judging the likelihood of outcomes) are used to handle typical events. When non-routine problems arise, the behavior changes from passive scanning to active probing of the situation at hand resulting in new strategies and discrediting old ones. In this way, innovations create an opportunity for choice and widen the normal sets of choices. The rate of innovation should therefore increase if an organization faces many non-routine events (Greve and Taylor 2000:58).

1.2.2 Product development as control

While innovative activities that enable identification, framing and defining of problems are of great importance, product development is also a collective effort of putting innovative ideas into good currency. Similarly, ideas that have been shown to work well should be adopted as official routines implemented at a wider range, which may reduce the effort needed when the same problem appears in the organization at a later date (i.e. economy of scale). To do so well, control is required. Among organizations, such control is generally achieved through formalization of behavior, that is, bureaucratic structures (Mintzberg 1979:84). As Weber (1922/1968:980-981) stated, management of an activity according to the bureaucratic arrangement is then "ordered by rules [...] or administrative regulations [...] distributed in a fixed way as official duties [with] super- and subordination in a definitely regulated manner".

1.2.3 Product development as a tension system between innovation and control

Newness in the way of perceiving or interpreting a situation may not be adopted with ease in an organization. In this regard, Peters & Waterman (1982) provided a dramatic example of a product that innovation that required 223 reviews and approvals among 17 standing committees in order to take the development from concept to market reality.

> "The irony, or the tragedy, is that each of the 223 linkages taken by itself make perfectly good sense. Well-meaning, rational people designed each link for a reason that made sense at the time [...] The trouble is that the total picture as it inexorably emerged [...] captures action like a fly in a spider's web and drains the life out of it" (Peters and Waterman 1982:19-19).

This is due to that an established practice has little ambiguity in execution and a known history of returns, while an innovation has highly uncertain future rewards. Managers' interpretations may also interfere with the adoption of innovation. For example, an innovation may be interpreted as a threat to the current strategy as they suggest to decision makers that existing organizational procedures are inadequate. Thus, a product development effort can be viewed

as a tension system, where the dominant tension is between innovation and control (Weick 1995:72-73).

In Brown and Eisenhardt's (1997:1) study of firms developing computer applications, it was found that the more successful firms (in terms of meeting stipulated dead-lines) were able to blend firm structure around responsibilities and priorities with extensive design freedom within their current projects.

Thus, the organizing process of a product development project can be viewed as a balancing act between *individual action and creativity* and *collaboration and control* by which ideas, knowledge and information retrieved by their parts can be pooled (see e.g. Van de Ven 1986: 590-91; Sheremata 2000:393).

Formal and informal - one representation of the struggle between innovation and control

At the individual level, people struggle with a balance act between doing things on behalf of an organization, or engaging in behaviors falling outside the formally expected. Göran Ahnre (1994:28) refers to the embodiment of both acting on the behalf of the organizations *and* on the on the behalf of the 'natural person' as the 'organizational centaur'. Thus, when organizations execute a task, it is always enacted through the action of its individual members. Similarly, individuals do not act on their own account, but on behalf of the organization. Thus, an organization "is made up of persons, but not whole persons; each one enters into it with a [...] part of himself" (Cooley, 1914:319; cited in Ahnre 1994: 29). In other words, people often do things on the behalf of an organization, but not wholeheartedly (Ahnre 1994:30), and may therefore need to express a 'role distance' (Goffman 1972:102) to what they do, for example to step out of the formal role and communicate as a 'private person'.

Also at the organizational level, formal and informal (or unofficial) behavior is a common representation of the struggle between actions that diverge from the established and agreed (i.e. innovation) and those that aim at predetermining behavior (i.e. control). For example, Burns & Stalker (1961:121) stated that action requirement could not be expected to automatically arise from a formal hierarchical and bureaucratic structure in situations where high levels of adaptation and innovation are needed to cope with a changing environment. Instead, 'out-of-role' and informal action is often needed to deal with ambiguous and equivocal problems (Dalton 1959:215; Purser, Pasmore et al. 1992:2, 5; Weick 1995:73). Thus, in such situations, less formal means of organizing are important so as to enable higher levels of flexibility, mechanisms that allow for swift adaptations, and for permitting creative interpretations.

Tight and loose couplings

Also tight and loose couplings between entities of an organization reflect the problem of coping with the contradicting needs for innovation with control.

Thompson's argument regarding loose couplings in organization (inspired by Parson's 1960 article) was that an organizational system could be viewed to simultaneously emphasize a closed rationality *and* cope with uncertainties by separating their locations. Thompson (1967) proposes three organizational levels with different characteristics and duties in the organization: a 'technical core', an administrative level, and institutional level with 'boundary spanning units'. The classical argument regarding loose couplings is that organizations try to buffer or protect their technical core (Thompson 1967) from the hostile and changing environment by its boundary spanning units. The administrative level, on the other hand, works as a system that mediates between the other two.

Such a loose coupling between activities and locations can therefore be defined as one where one element has both some distinctiveness *and* some responsiveness to another element (Orton & Weick 1990:205). Phrased differently, a loose coupling means that the elements to some extent were coupled, but also showed some evidence of separateness and retained a separate identity by having their attachment "circumscribed, infrequent, weak in their mutual effects, and/or slow to respond" (Weick 1976:219). With a tight coupling, on the other hand, there is high responsiveness without distinctiveness.

Lindkvist et al. (1998) proposed tight couplings in a product development effort where it is difficult to foresee which problems will arise. Tight couplings of a system will facilitate detection of error signals. However, such tight coupling activities do not facilitate a qualified and creative interpretation of problems (e.g. innovation). Instead, when more complex problems need to be solved, loose couplings that retain autonomy in the system generally favor more distinctive, deep and creative interpretations. Commonly, such looseness is referred to as 'organizational slack'.

Thus, control enabled through tight couplings in a system seems relatively good for system-wide error detection, but they are relatively poor for creative and innovative error diagnostics. Loose couplings in a system, on the other hand, make error diagnostics easier but may have difficulty in localizing and detecting errors, thereby making a general awareness of problems difficult. The appropriate balance between tight and loose couplings should therefore depend upon the frequency of errors and the difficulty of diagnosis (Levinthal and March 1993).

1.3. Viewing complex product development activities through the lens of meetings

For a study aiming to gain an understanding of an organization that in many ways is "in the process of being planned" (Pava 1983a: 48), it is of importance to include situations that catch people in the planning process. Critically, that includes activities that as yet have not been formalized or which break with the formally prescribed procedures. However, it has been problematic to show empirical examples of how formal and informal (or bureaucratic and organic) elements operate side by side in organizations (Nord and Tucker 1987:347). This is perhaps because the organic and informal elements, by definition, are difficult to grasp.

One way to examine the organizing process of a system with an inbuilt tension between innovation and control is to make a detailed observation of the day-to-day activities of an actor within it. Below (see Exhibit 1-1), the result from shadowing Carl Svensson during a normal day at work is presented. Carl was responsible for a technical sub system developed within one of two projects included in this study. Within the organization, Carl was both known and appreciated for his skill at solving technical problems.

1.3.1 A day at work in a technical expert's life

06.00	As always, awoke to radio at six A.M. Showered, ate breakfast and got my kids ready for school.
07.45	Left the house at quarter to eight and drove to work. As a preparation for my nine o'clock meeting, I called a colleague and asked him to participate. Unfortunately, he said no.
08.10	Arrived at work at about ten past eight, walked directly to my room, docked the laptop, and began to read my incoming mail. Several people sitting in the hallway came by and asked a few questions during my mail reading. One of these 'drop-bys' developed into a spontaneous hallway meeting, where most of the people in the nearby office rooms participated.
09.00	At nine, the system forum meeting started. We tried to deal with the issues that were unclear in the project, those that could not naturally be related to any specific sub-system. Basically, technical oriented stuff: work out requirements and reasonable technical approaches. We actually managed to make an agreement. The meeting was run through out without a break, and ended at about 11.30, a half an hour earlier than planned.
11.30	On my way back to my office, I turned on my mobile phone. The phone made a signal almost instantly. A former colleague of mine greeted me from the other side of the line. We engaged in a discussion on how to products could be adapted to new demands.
11.50	When I came back to my office, my boss knocked on the door. He closed the door behind him and began to discuss a number of tricky problems we have with some products.

12.00	After about ten minutes, we went to grab some lunch together. At the canteen, we tried to avoid the product talk due to its confidential nature.
12.50	Back from lunch, I received a message that the meeting I was about to attend was cancelled. This was a relief as it provided me with some time to write on a report. However, I did not spend much time on the report. Instead, I put some time on grazing down the pail of mails that was waiting for my response. As usual, a number of people stopped by for brief conversations.
15.00	At three, a meeting took place about coordination between different units involved in the project. I had made the call for the meeting and also acted as chairman. Six people from the Stockholm office participated and five people from the USA by conference phone. The meeting went fairly well. We managed to arrive at a suggestion on how we could coordinate our activities better, and it will hopefully give us some room for maneuver in the future. The meeting was supposed to end at five, but continued for another half an hour.
17.40	I left the office at twenty to six. Because of the delay in the last meeting, I missed the first parts of the annual parents' day at my son's school.
19.00	At the school, I was reminded about the meeting with the orienteering club at seven. I went there. The meeting took a couple of hours.
21.00	At about nine, I arrived at my home. Sat down to plan our vacation with my wife. Later, I checked if I had got any new mail. There was plenty.
23.00	Went to bed.

Exhibit 1-1. Carl Svensson's Thursday

When examining Carl's day, it reveals that the bulk of it, approximately 85 %, was spent in formal and informal face-to-face meetings. Carl's expert status of course made him a desirable participant. Although the pattern present in Carl's day at work should not be taken too far, the example does contain a message about the organizing of product development activities: it seems to take a lot of formal and informal face-to-face meetings to develop a complex product such a telecommunication system.

In this sense, meetings are an interesting unit of analysis, as they cover both the formal and informal activities of people involved in a product development effort. Thus, formal and informal face-to-face meetings make up a promising unit of analysis from which the organizing of complex product development can be observed and studied

1.3.2 Meetings – praised and criticized in the literature

Carl's example bears similarities to Perlow's (1999) findings regarding software engineers, in which meetings served as important means for getting the work done. In her study, engineers were unable to successfully complete their deliverables merely by sitting alone in front of a computer and writing code. Instead, writing code required formal and informal meetings with other engineers and managers. For example, when confronted with barriers, engineers turned to other engineers for help. Similarly, engineers needed to

work jointly to integrate their separate pieces of code, to check the status of particular problems, and (with or without their manager) to create a plan as to how to proceed. Managers also frequently checked up on the engineers, both to provide resources and guidance on how to deal with problems and to check how the work was progressing (Perlow 1999: 64).

Meetings have also been accused as; "ineffective, unproductive, inept, chaotic, incompetent, ridiculous, boring, tedious, silly, and so forth"(Schwartzman 1989:53), where the participants often suffer a confusing experience (Bjerlöf 1999:12). People involved in research and development activities are perhaps even more critical towards meetings than others. "These days, everyone hates meetings. Engineers and scientists may hate them more than most people" (Pasmore 1997: 420). Sometimes, the respondents in the two examined projects also made similar comments.

Somewhat ironic definitions of meetings can also be found: "A meeting is a group of people that keep minutes and waste hours (Furnham, 1993: 55 cited in Alvehus 1999:8). Peter Drucker even suggests that organizations would be better off without meetings. They should be considered as a concession to organizational imperfection.

> The ideal is the organization that can operate without meetings – in the same sense in which the ideal of the machine designer is to have only one moving part in his contraption. In every human organization there is far too much need for cooperation, coordination, and human relations to have to provide for additional meetings. And the human dynamics of meetings are so complex as to make them very poor tool for getting any work done (Drucker 1974:548).

The view of meetings as a waste of time and a poor tool have led to various suggestions on how to improve the functioning of them. Many of these suggestions are intended to tighten the leash on how meetings are conducted by introducing more structure (e.g. more preparations before meetings, having a more structured agenda, following a straight series of steps). Secondly they may also place more emphasis on group dynamics such as; recognizing the importance of involving all members, using a meeting facilitator, developing trust, resolving conflicts, etc.. A third category of improvements is comprised of different ways to reduce the number of meetings in an organization in order to decrease the 'waste of time'.

However, in two studies whereby people's face-to-face interactions were examined more closely, they both showed results contrary to the common discourse regarding meetings. In one of these studies, it was found that most interactions (76 % of them) occurring inside and outside product development teams were viewed to be at least of an acceptable value for the respondent (Carlsson and Lundqvist 1995:53). In the other study, Perlow (1999) found

that 96 percent of the interactions that involve software engineers could be judged as helpful (to one self or the other part looking for help).

The above discussion points to that the discourse about meetings and their usefulness are inconclusive, both in the scientific as well as the popular literature. However, is seems as the negative aspects of meetings foremost are directed towards formal meetings, although it is not always clearly stated. Conversely positive comments regarding meetings appear to address informal meetings. As discussed earlier, formalization of behavior is one common way in which control is achieved in organizations. Negative comments made about the formal meetings could therefore reflect that control rarely is anything that most individuals appreciate, although it may be of great importance at the organizational level. The resistance to control applies specifically to specialized, highly educated knowledge workers such as those examined in this thesis.

Rather than making the premature judgment that formal meetings are ineffective, a more fruitful approach therefore is to examine the character and use of both formal and informal meetings and how they interplay with each other around tasks present in product development projects.

1.4. Purpose, expected contributions and specifications

Formally, the main purpose of this study is to *explore and explain the role of face-to-face meetings in a product development organization with regards to the balancing act between innovation and control.*

Theoretically, this study departs from a socio-technical framework for analyzing knowledge work that is characterized by many non-routine events (see e.g. Pava 1983a). Apart form Calvin Pava's work (1983a; 1983b; 1986), which is the most influential work within this line of thought, other important contributions within this approach have been made by; Pasmore & Gurley (1991), Purser, Pasmore et al. (1992), Stebbins & Shani (1995), Boland & Tenkasi (1995) and Lundqvist (1996).

Empirically, the socio-technical line of thought is closely related to the present study: the target is meetings and problems in research and development contexts (see e.g. Pava 1983a; Pasmore and Gurley 1991, Purser, Pasmore et al. 1992, Lundqvist 1996). Therefore, the results and concepts from the socio-technical tradition will be used as the frame of reference to which the results from the study can be compared and discussed. Similar to the socio-technical framework, the present study frames the analysis of meetings as problem management activity in which three elements are focused: the important and difficult problems that occurred in the projects, the people involved in the

management of the problems, and the meetings they used to discuss those problems (Pava 1983a: 97-98 and 101-102).

With a point of departure from the socio-technical line of thought, this study will identify and examine how different types of formal and informal face-to-face meetings were used in relation to the problems that occurred within two projects. The study will also examine how different types of meeting interplay when attempting to resolve problems. Furthermore, different sub-groups or occupation's use of meetings will be examined as to how they are used within and across sub-groups. Finally, the system of meetings that many meetings together form will be examined and explanations sought as to why the structure of such systems may differ when the two projects are compared.

Thus, to arrive at position where the main research question can be answered, this study also has a descriptive purpose regarding the study of face-to-face meetings of *describing the prevalence and role of face-to-face meetings in two complex product development projects and how the organizations differ in this regard.*

Although the socio-technical school encompasses the most attractive breakthrough in conceptualizing the role of meetings in non-routine work, the research has so far contributed with limited empirical descriptions of the actual use of meetings in organizations. Typically, the number of meetings referred to in these articles is few and summarized when described (see e.g. Purser, Pasmore et al. 1992; Stebbins and Shani 1995). Also the terms used are vague and lack clear definitions.

From an empirical and theoretical point of view, it therefore seems clear that the field provides possibilities for conceptual refinement and further empirical observations of meetings, with a broader and more detailed scope than previous studies. The lack of research on how different types of meeting interplay during task accomplishments points to the importance of making such empirical observations. Also the differences in the use meeting across and within organizations require further empirical inquiry. For example, different sub-groups within an organization may make use of meetings in very different ways.

Thus, the intention of this study is primarily to make an empirical and analytical contribution to the body of research on meetings that so far has been growing within the socio-technical school. Further descriptions and explanations of the use of meetings from research and development activities will primarily achieve this contribution. However, other theoretical disciplines (e.g. the micro-sociology that Erving Goffman represents) will be used for refining and enhancing the framework of how meetings can be studied and understood in a product development context.

Beyond that, my hope is also that meetings, which play such a profound part in the daily life of the members of any organization, may also gain more interest as an important unit of analysis in organizational research. This has not always been the case, as Schwarzman (1989:4) noted when she discovered that the word meeting usually did not appear in the subject index of books of organizational behavior.

1.4.1 Specifications to the study of face-to-face meetings

Below, specification of the study will be made regarding the aspects of meetings that will be studied.

Formal and informal face-to-face meetings that are project related

The thesis focuses on a phenomenon that is specified as *formal and informal face-to-face meetings that are project related.* As previously stated, the definition of face-to-face meetings is here broadened to also include those of a more informal or unofficial nature although the term meeting traditionally has been used for gatherings of a more formal nature.

Face-to-face meetings are one of various other possible forms for social interaction. Social interaction could include virtually the whole of human activity, such as radio and television broadcast (Goffman 1981), public meetings and theatrical performances as well as conversations, theft, buying and selling, as well as driving a car in a city (Burns 1992:17). This means that a number of forms of interaction will be excluded in this study.

Examples of forms of interaction that will be excluded are where the presence of others may be incidental and/or irrelevant to another individual's activity (such as passing by another in the hallway but not engaging in conversation) or when engaged parties are not physically present[1]. This means that this study focuses on face-to-face meetings and not mediated forms for interaction. The only exception is when mediated forms for interactions intermeshes with the face-to-face meetings studied here. This was, for example, the case in one of the meetings that Carl Svensson participated in (see the example in the beginning) where five people participated by conference phone and six were physically present.

The study will also be limited to meetings that are project related. By project related, it is meant those face-to-face meetings that had a relation to the

[1] In the latest 20 years, a transformation has taking place in the work place. In addition to more traditional forms of interaction, such as a letter, telephone call, memo or meetings of various types, the means and opportunities available has risen dramatically. Non-immediate means of interaction such as e-mail, voice-mail, fax, internet and intranet have increased the possibility to interact across time and space. Also the forms of immediate interaction across space have developed through for example video- and phone conference.

activities that went on in the two examined projects. This means that meetings, for example, in the local union will not be covered here, as well as meetings held outside the work context. However, this does not mean that the face-to-face meetings had to be initiated or organized by the project. For example, many meetings taking place in the line organization discuss matters with great relevance to the project, and will therefore be included here.

Distinguishing levels of analysis when studying meetings

As indicated in the purpose specification, meetings can be studied on many different levels. Here, three levels will be shortly discussed and described: studies on what goes on *within* meetings, different *types* of meetings and how they *interplay*, and the *system* that many meetings together make up.

Studies examining what goes on *within* meeting usually engage in a detailed rendering of certain aspects that occur when people are gathered to meetings. Such studied may, for example, engage in a linguistic analysis of the speech discourse that evolves in a meeting (see e.g. Stubbs 1983:1), the intentions and learning that speech acts in a meetings represents (Bjerlöf 1999), or the social psychology of the groups dynamics evolving in specific meetings (Schein 1988).

Above the individual meeting level, different types of meetings and their interplay can be studied. A third level can be found at the *system level*, that is, overall meeting body that the members of an organization utilize.

A specification of this study is that the prime focus is set on the types of meetings and how they interplay, and the system of meetings that many meeting together comprise in an organization. One important rationale for the study *of many meetings* is to gain an understanding of the overall patterns present in the overall meeting body (i.e. the meeting system) of an organization. A study of many meetings also makes it possible to examine how different types of meetings interplay (for example formal and informal meetings) within a product development effort.

Another rationale behind this focus is that a meeting is not, to say the least, an individual activity. Therefore, the meetings run by an individual involuntarily impact upon other members of the organization. However, to what degree a manager's behavior affects those whom they manage has not been explored in the studies regarding what individual managers do (Perlow 1999:58). These studies (e.g. Carlson 1951; Mintzberg 1973) do little to enlighten the notion of the overall patterns that meeting activities in an organization together make up. However, several studies have found that managers are, for the most part, initiators, not recipients, of interactions (Dubin & Spray 1964 and Thomason 1967 both cited in Perlow 1999:58). Thus, is it so that managers to a large degree disrupt their subordinate's work by many and lengthy meetings?

1.5. Frame of reference

The following explores theories regarding meetings that underscore the analysis of the empirical data. As such, it specifies the thesis's theoretical frame of reference.

As posited earlier, the socio-technical analysis of non-routine work (e.g. Pava, 1983a) comprises the principal framework from which this study derives from. This also means that this study applies a system perspective for the study of meetings in product development projects. Beside the works by Pava and colleagues within the socio-technical school, the work provided by Goffman (1959; 1972; 1959; 1963; and 1967) also supports the major theoretical building blocks of this study.

In association with the study's specifications, a number of levels were distinguished which can be used to study meetings. The target was set at the levels where different types of meetings and their interplay could be studied, and the study of meeting systems that many meetings together comprise. In reference to how different types of meeting interplay during the sequences of a task, useful theories within the socio-technical literature seems to be lacking. Therefore, this study's frame of reference will also include the micro-sociological reasoning by Goffman on this specific issue.

First, the implications of the system perspective will be briefly addressed. Thereafter, the general framework for the study of meetings provided by the socio-technical reasoning will be presented. Their concept of deliberations focuses on three elements: problems present in the projects, the meetings in which they were dealt with, and the actors that were involved (Pava 1983a: 97-98 and 101-102).

Third, different types of meetings will be discussed. One common typology of meetings is the distinction between formal and informal meetings (see e.g. Purser, Pasmore et al. 1992:15). While such a distinction delineates some of the rules and norms employed in meetings, this study will, based on the reasoning provided by the early works of Goffman, go beyond the dichotomous distinction between formal and informal meetings. Instead, a continuum is identified on which meetings can be categorized according to the amount of discipline expected from the participating individuals.

1.5.1 The system perspective

The system perspective presupposes that it is possible to gain an overall view of the organization and the problems it is exposed to. The perspective emphasizes the organization's interplay with the environment, the construction of the organization, and how different parts and levels of the

organization are related to each other, in terms of the main factors influencing the situation.

According to Rhenman (1969), the study of hierarchies of systems has proven to be of particular importance when trying to understand organizations. Thus, an individual, a work group, a department or a project, an organization, and a market are examples of such levels in a hierarchy of systems. Each superior level can be viewed as the subordinate level's environment or suprastructure. Equally, meetings can also be sorted and examined in a similar way, such as the team meeting, the project meeting, and the management board meetings, can all be said to represent different levels in a hierarchy of systems.

1.5.2 The socio-technical approach to non-routine work

The socio-technical approach originated from field research undertaken at the Tavistock Institute in England in the 1950s. The starting point of the socio-technical school is a famous example of the importance of the informal means for communication and how the introduction of further bureaucratic structures can destroy it. Trist and Bamforth's coal mine study (Trist 1981, originally published in 1951) showed that the introduction of a new advanced technical system separated the workers and destroyed the informal communication that previously took place between the coal mine workers. The result was that the most important means for coordination was eliminated, which in turn lead to a considerable decrease in productivity and alienation amongst the workers. Thus, perhaps well intended by the managers, structural changes may well destroy the important informal network that had been nurtured over a period of time. Trist and Bamforth's conclusion was that both the formal technical system and the informal social system should be considered when work is reorganized.

The studies on coal mining, metal and weaving industries proffered insights into the importance of the relationships between interdependent workers. These insights were later conceptualized into a socio-technical theory that held three parts. Firstly a technical system that explored the nature of the material being worked upon, unit operations, and the nature of interdependence between tasks. Secondly a social system that involved the psychological and social conditions that affect the patterns of interaction through which people operate the technical system. And finally the work relationship structures that bring the two systems together (Pava 1983b: 128; Pasmore 1995:2-3).

Departing from an observation of a scarcity of methods to improve performance of non-routine office work, in contrast to the rich heritage of work design methods developed in and for the factory, Calvin Pava began to develop the socio-technical theory in order to make applicable to non-routine work as well (Pava, 1983a: 126). However, for this to be successful, the

prevailing methods drawn from studies on industrial factory work had to be altered by new concepts and methods in order to suit the partially undefined texture of non-routine activities (Pasmore and Gurley 1991:369).

This new line of thought, which developed during the mid 1980s, focused on communicative and reflective practices around which important topics were dealt with in knowledge and non-routine work. Thus, attention was drawn to social and interpreting processes, where meetings of various sorts played an important role as a way of 'catching people in the planning process' and to research and development activities as a typical example of non-routine knowledge work.

The concept of deliberations

According to Pasmore and Gurley (1991: 370), the possibility of making valuable and intelligent decisions regarding problems is dependent on making the right trade-offs between different objectives. Also it is important to retain and utilize the knowledge available for the appropriate situation during those moments when a matter is *deliberated.* Such a deliberation can be described as times when people think and communicate about a topic of importance (Pasmore 1995:6). More specifically, Pava defined deliberations as:

> Deliberations are reflective and communicative behaviors concerning a particular topic. They are patterns of exchange and communication in which people engage with themselves or others to reduce the equivocality of a problematic issue. (Pava 1983a: 58)

However, deliberations are not decisions, but more a continuous context and subtext of decisions in that it encompasses the informal human interaction and the continuous ebb and flow of information related to a particular topic over time (Purser, Pasmore et al. 1992: 4-5). Hence, deliberations can be viewed as a type of socio-cognitive artifact of intensive, non-routine technology (Purser, Pasmore et al. 1992: 2).

The idea behind this theory is then that better ideas will be produced as a result, or an outcome of the right configuration between topics, forums, and people (i.e. optimize social and technical design in order to cope with the demands that are put upon the organization). High performance in non-routine office work is with these concepts a matter of building effective discretionary coalitions around key topics of deliberations.

Meetings

The deliberation concerning a problem can be seen to occur in various *meetings*[2].

> The second important aspect concerns the *forum* [i.e. the meeting in my terms] in which topics are deliberated. Virtually any equivocal topic in non-routine work is pondered in more than one forum, and it is useful to identify the degree of orderliness found among deliberations (Pava 1983a: 59).

Meetings can be "structured, semi-structured or unstructured" (Pava 1983a: 128; Stebbins & Shani, 1995), "formal or informal" (Purser et al, 1992:15) and may be viewed as consisting of the location, ground rules and norms for exchanging information (Purser et al 1992: 6).

Furthermore, Stebbins & Shani (1995:24-25) suggest that; openness in sharing information versus competition among participants, spirit of inquiry versus advocacy, individual member contribution, missing information, group process methods utilized, knowledge of the task and the technical transformation process, and time constraints may all be valuable variables when analyzing meetings.

The actors involved

A number of different groups of people participate in the process of developing a new product. Examples are senior managers, project managers, coordinators with different expertise, engineers, people at the core and periphery of the project, or those viewed to be internal or external (for example customers and subcontractors) in relation to the host organization.

To deal with problems that occur in non-routine activities, the views of multiple perspectives that transcend formal organizational boundaries are often needed (Purser et al, 1992:5). Thus, an analysis of the *participants* involved in the problem solving is essential. According to Pava (1983a), a coalition of participants addressing a problem should be driven by both parsimony (excluding extraneous people) and necessity (including required people by short circuiting the chain of command and competence).

Stebbins & Shani (1995:24-25) go further and specify variables that may be analyzed regarding the participants of deliberations: people's connection to formal hierarchy and membership issues (managers and other formally

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[2] Although Pava argues that deliberation forums are not equal to meetings, later empirical research on deliberation forums have developed into the study of occasions for face-to-face meetings and how they can be improved. Stebbins and Shani (1995) for example, put forward formal meetings (such as structured project, administrative and management meetings) and informal desk-side discussions as examples of deliberation forums. Similar interpretations of deliberation forums have also been made by Pasmore (1995), Purser et al (1992) and Lundqvist (1996).

designated players, informal players, customers, etc), forum size (number of people participating), and those excluded.

Findings within the socio-technical school

Generally speaking, the socio-technical position regarding non-routine work stresses the importance of people engaged in extensive communication. To increase the utilization of knowledge and information available, meetings should enable a symmetric distribution of say between participants in a secure environment that provides an open inquiry.

According to Pava (1983a), Purser et al.'s (1992), and Lundqvist (1996) these types of meetings reduce knowledge barriers, efficiently utilize available knowledge and thus create the potential for mutual learning across functions and intelligent trade-offs between different objectives. In the end, improved efficiency and a high performance of the product development team should result.

Arguments about the importance of symmetry have also been put forward by other researchers such as Allen (1977) and Wilhemson (1998). Allen (1977:200) stresses the importance of symmetry in technical discussions to increase the amount of information and knowledge available regarding an issue. Wilhelmson (1998:266) concludes her analysis of prospects for learning in conversations with a statement saying that it takes a conversation that in its nature is symmetric to create mutual learning. Wilhelmson describes symmetric conversation as one that is open to inquiry and where mutual reflection is allowed in the group.

However, as stated above, this only applies to 'ideal' situations where the necessary conditions are in place. In Purser et al.'s (1992) article primarily small, informal meetings were shown to have these characteristics. Lundqvist (1996:19-20) in his outline of an ideal (rather than empirically observed) model, asserts that these conditions could be present if centralized control is performed ensuring that enough reflection and questioning of action-outcome relationships occurs across functions and that these interactions converge into one idea. Thus, while Purser et al. (1992) and Lundqvist to some extent point in different directions[3], they both emphasize the importance of symmetric interaction structures as a precondition for effective learning and creative interpretations to take place.

Meetings that are less 'ideal' in their appearance seem by and large to be equivalent to asymmetric, formal meetings with many participants (see Purser, Pasmore et al. 1992; Stebbins and Shani 1995). These types of meeting were

[3] Purser et al. (1992) stress the importance of informal meetings, and Lundqvist (1996) the necessity of formalizing otherwise informal meetings

by Purser et al. (Purser, Pasmore et al. 1992) found to hinder knowledge sharing and learning because of their low interactivity and unequal distribution of 'say' amongst participating members. The unequal distribution of 'say' and the large size of forums also created a tense group dynamic.

Similarly, Stebbins & Shani (1992) found in their comparative analysis of a chemical R&D division and a medical school affiliated hospital that the large hierarchical and functional based forums held monthly often were appreciated by the participants for information sharing. However, they were problematic in the sense that people did not feel a sense of participation or that the knowledge present was not utilized. Also Argyris (1990:99-100) has observed that formal meetings may often obstruct people from being open to change or learning from a situation due to routines of face saving that are employed in such situations.

Based on the discussion above, it therefore seems as symmetric and informal meetings in general have a greater capacity for housing ambiguity and multiple perspectives, which should foster innovation as a result. Formal meetings, on the other hand, seem to limit and counteract initiatives of creativity and instead aim at controlling and predetermining behavior.

Variations in the use of meetings within and between organizations

Regarding differences in the use of meetings between organizations, it is difficult to imagine any organization of some size in which the members do not meet face-to-face. Therefore, differences in use of meetings between organizations (or different settings within one organization) is not a dichotomous question of whether they exist or not, but of how many, and of what types.

The use of meetings (e.g. the number of meetings held) in an organization could be expected to follow the complexity and interdependence of the work structure and the need for collaboration and coordination it creates (Karlson 1994: 154-155). Likewise, the members' need for sense making may have an impact on the use of meetings (Schwartzman 1989:10).

Within the socio-technical discourse on non-routine work, Pava (1983a: 59) have asserted that the more important the problem, the more frequent use of meetings. Pava also stated that the more politically sensitive the problem, the more people tend to deliberate on it in less formal meetings, because of the tensions it would give rise to in more formal circumstances. Also issues of time may impact upon how people use meetings. Both Stebbins & Shani (1995) and Purser et al. (1992) have asserted that time pressure will make people communicate less, due to less slack available in the organization (i.e. increased control).

However, also the members' need for sense making may impact the need for meetings within an organization. Schwartzman, for example, has stated that "the more sense-making a setting requires, the more meetings it needs"(Schwartzman 1989:10), meaning that much confusion usually proliferates the occurrence of meetings. This issue should of course not be treated as separate from the issue of complexity and interdependence of the work structure. Instead, one may expect that such complexity may also create a greater confusion, and subsequently more meetings.

However, all sub-groups of an organization may not make use of meetings in a similar way. Thus, different occupational sub-groups may have different needs and habits regarding their use of meetings. Mintzberg (1973), for example, stated that managers' meeting patterns were fundamentally different from those he or she managed:

> "Unlike other workers, the manager does not leave the telephone or meeting to get back to work. Rather, these contacts *are* his work"

1.5.3 A micro-sociological perspective for identifying meeting types

Erving Goffman's early works (see 1959; 1972; 1959; 1963; and 1967) make up an important part of the theoretical framework used in distinguishing types of meetings. Goffman's early works were by large related to identifying and describing 'the ceremonial observance' out of which social order is constructed. His principal object was to study the small change of social interaction that could be said to constitute the physiology of the social institutions and organizations that make up what we see as 'society'.

To identify different types of meetings implies that the 'surface structure' (Burns 1992:25) of meetings is the principal concern. More specifically, to study the surface structure means that the background or the context to face-to-face encounters is focused rather than the specific speech acts that evolve within a single meeting.

In many ways, the typification of meetings means that the code of conduct becomes a sphere of taken-for-granted routines (Berger and Luckmann 1966: 75-76). For example, pre-fixes used in relation to the word meeting (such as board meeting, lunch meetings, stand up meeting, informal preparation meeting, and so forth) describe what type of meeting a person is referring to. Such pre-fixes therefore help people to adjust and prepare their behavior according to the specific meeting they are about to attend.

As stated previously, this study presents considerations regarding the typology of meetings employed by the socio-technical discourse on non-routine work. Therefore, this study will make use of a more theoretically advanced and

exhaustive formation, proposed by Erving Goffman, from which different types of meetings can be identified.

A continuum on which formalization of meetings varies

In opposition to the dichotomous distinction between formal and informal meetings, Goffman (1963) illustrates how meetings can be identified along a continuum that vary on the amount of discipline that is expected from a participating individual.

Goffman (1963:15-20) boiled down his dimensions of face-to-face interaction to one, as being more important than others. In daily speech, he writes, the terms 'formality' and 'informality' are usually used to refer to this central axis of situational regulation.

> "At one extreme, situations in which the regulation barely constrained the participants to display their respects for the gathering, and, at the other extreme, situations in which much of this particular kind of situational respect was required (Goffman 1963:198)

Based upon Goffman's reasoning above, it seems as though meetings can be arranged along a continuum or axis, whereby the formalization of meetings varies. This arrangement would describe how a meeting relates to what has been planned and officially agreed upon and how disciplined the individual involved is obliged to show respect to the meeting and the ceremony employed there. As argued by Goffman (1963), the expectations on an individual to maintain and embody a certain standard may vary depending on the specific 'region' that he or she is engaged in.

Social order and the practice of behaving predictable

The type of disciplinary or situational respect that an individual shows toward an interactional situation can be referred to as 'social order'. Social order is here used in the sense that people have an obligation to display what can be called 'civility' or 'good manners' – socially accepted or 'proper' behavior – in the presence of others.

The orderliness that characterizes most experiences of the behavior of people in company with others, is, as Goffman (1963: 247) notes, maintained through the observance of rules. These rules do not apply to the ends sought by participant individuals, but rather are more like traffic rules. They are concerned with *how* you go, not so much with *where* you are going.

Social order is in actions related to the practice of behaving predictable, or refraining from causing offence to other people. Thus, the rules regulating social order are something that in meetings must be "taken into consideration, whether as something to follow or to carefully circumvent" as Goffman (1963:42) wrote.

The social order that regulates this orderliness can be seen as codes where some are elevated into systems of substantive rules, and become law. Others, equally binding when it comes to face-to-face interaction, govern the ceremonial behavior towards others that is encoded etiquette. The ultimate penalty for breaking the rules is harsh, as Goffman asserts:

> Just as we fill our jails with those who transgress the legal order, so we partly fill our asylums with those who act unsuitable – the first kind of institution being used to protect our lives and the property, the second to protect our gatherings and occasions" (Goffman 1963:248)

There are, of course, plenty of times when social order breaks down. Goffman notes that there usually is a readiness on the part of most people to see social order restored whenever it has been disrupted.

Different regions to which the social order vary

Goffman discusses different regions where interactions take place that have separate social regulations of what is proper and acceptable behavior. Goffman defines a region as "any place that is bound, to some degree, by barriers of perception"(Goffman 1959:109). He means that the degrees to which regions are bound vary. Thus, one can never from one spot observe everything that a group of people is involved with. Depending on which region one is observing, different actions will appear.

Goffman speaks of a 'front region' which refers to a setting where an individual puts in *much effort* in order to give the appearance that his or her activity in the region maintains and embodies a certain standard. These standards fall into two broad groupings. One of these groupings relates to the way that the performer treats the audience while engaged in talk with them or in gestural interchanges. These standards are often referred to as matters of politeness. The other group of standards refers to the way in which the performer comports himself while in visual or aural range of the audience but not necessarily engaged in talk with them (the 'decorum'). An example of a 'decorum' could be the bystanders that hear or see parts of a hallway conversation that other people are engaged in.

In contrast to the front region, there is also a 'back region' or 'backstage'- where otherwise in front stage suppressed facts make an appearance. A back region or backstage is defined as a place, relative to a given performance, where the impressions fostered by the performance is knowingly contradicted as a matter of course. Here grades of 'ceremonial equipment' can be hidden. Here, the team can run through its performance, checking for offending expressions when no audience is present to be affronted to them; here poor members of the team can be schooled or dropped from the performance.

Here, the performer can relax, he can drop his front, forgo speaking his lines, and step out of character.

Thus, what is viewed as acceptable behavior differs between these regions. By having the front and back regions adjacent, a performer out in the front can receive backstage assistance while the performance is in progress and can interrupt his performance momentarily for brief periods of relaxation. An example of how people arrange the meetings in sequences of front and backstage is the important coffee break in the middle of a formal meeting, where people can relax and prepare their acts before the formal front stage meeting continuous.

1.6. Definition of central concepts

Below, definitions of the most central terms have been summarized in one section. Note that several of them already have appeared in part within this chapter.

1.6.1 Innovation

While the term innovation is used in many circumstances to describe radical breakthroughs or changes, this study employs a more modest definition: Innovation occurs if changes take place in the cognition about the appropriateness or exigency of taking action. This involves interpretation and learning about matters that ads new meaning to it (Daft and Weick 1984). More specifically, activities are "deemed innovative if they differ significantly from current or recent activities" (Greve and Taylor 2000:55). What then are changed are the evaluation of information, the appropriateness of actions, and the foci of attention (Greve and Taylor 2000:57-58).

1.6.2 Control

Control is here defined as activities that to create predetermined behavior in organizations. As such, control serves to create certainty. Among organizations, such control is generally achieved through the formalization of behavior, that is, bureaucratic structures (Mintzberg 1979:84). As Weber (1922/1968:980-981) stated, management of an activity according to the bureaucratic arrangement is then "ordered by rules [...] or administrative regulations [...] distributed in a fixed way as official duties [with] super- and subordination in a definitely regulated manner".

1.6.3 Face-to-face meetings

Face to face meetings are defined here as those occasions where people gather closely together with a physical face-to-face presence (Goffman 1963:9) and engage in taking turns at talking (Goffman 1963:22, 24). Formal as well as informal meetings are included in this scope of the definition. Furthermore, face-to-face meetings form a series of occasions, often with the same participants. These "instances that form part of a series of like occasions, the series being seen as a unit, and developing as such in terms of daily, weekly, or annual cycle, often with the same participants"(Goffman 1963:19). Thus, one may therefore differentiate between unique face-to-face encounters and meetings with a more regular occurrence.

Furthermore, a meeting shares characteristics with some meetings and not with others. Thus, one may speak about different *types* or classes of meetings according to how they vary on certain dimensions.

By a *system of meetings*, it is referred to as an aggregation of all the individual types of meetings that occur in an organization or a project. Such systems of meetings are likely to assume different structures when two or more organizations are compared.

1.6.4 The formal - informal distinction

The necessity to cope with a fluid reality and misfits between people and fixed and limited formal roles means that informal and unprescribed behaviors are common in any organization. Such elasticy towards the formal organization is, among other ways, enabled through informal and unofficial meetings.

The formal - informal distinction has long been used to describe modes of behavior in organizations. More specifically, this distinction is used to describe whether modes of behavior fit into what has been formally agreed upon, i.e. 'correct' or 'how things should be done'. Regarding this issue, Dalton (1959) stated:

> "From at least the time of Augustus Caesar, these dissimilarities [between expected and unexpected behavior in organizations] were recognized and incorporated in the terms *de jure* (by right) and *de facto* (in fact), which are roughly the equivalent to legal or official and actual but unofficial. In industry and business today, one repeatedly hears the same general meaning phrased as "administration versus politics", "theory versus practice", "red tape versus working relations", "fancy versus fact", etc (Dalton 1959:219).

Following Dalton's (1959) discussion of formal and informal activities, formal meetings are hereby defined as those congruent to "that which is planned and agreed upon" (Dalton 1959:219) while informal meetings as those falling outside of this definition.

1.6.5 Non routine work

According to Perrow's (1967:77-79) typology of technologies, defined by the two dimensions variety and analyzability, a non-routine technology is one with a high degree of variance and low analyzability. This means that large components of this type are under-defined. Thus, in contrast to more routine oriented work, in which steps and procedures that transform inputs into outputs are known in advance; the procedures for task accomplishments often had to be developed *while* the work was being performed in the two projects.

1.6.6 Complexity and interdependence

Generally speaking, the level of complexity describes the number and heterogeneity of involved elements that has to be considered simultaneously during a task (Scott 1992:230). The complexity of the organization increases as a function of increasing diversity, uncertainty and interdependence of work flows (Galbraith 1973). Most commonly, complexity is dealt with through specialization of knowledge among involved actors and the integration of work they perform (Nittmar 2000:9, 24-25).

Interdependence refers to the extent to which the work processes are interrelated so that changes in the state of one work process affect the state of the other. In terms of the interdependence of the work structure, Thompson (1967:54-55) identified three different levels: (1) pooled interdependence, in which work performed is interrelated only in that each element or process contributes to the overall goal; (2) sequential interdependence, which exists when some activities must be performed before others; and (3) reciprocal interdependence, which is present to the degree that elements or activities relate to each other as both inputs and outputs.

Thompson argues that; pooled interdependence is inherent in all organizations, that both pooled and sequential occur in more complicated types, and that all three exist in very complicated organizations and require the use of mutual adjustment or coordination by feedback, in which the interrelated parties must communicate their requirements and respond to the needs of others.

1.6.7 Uncertainty and ambiguity

Situations and problems may differ in that they can appear as uncertain or ambiguous. Uncertainty can be described as the shock occasioned by an inability to extrapolate current actions and then foresee their consequences. Uncertainty can therefore be defined as the absence of information. Ambiguity, on the other hand, is one of confusion (Weick 1995: 98-99). As such, uncertainty can be managed by increasing the amount of information

available whereas ambiguous situations call for sense making (Daft and Lengel 1986).

High levels of uncertainty in organizations can be reduced by asking questions to which information is acquired (Daft and Lengel 1986: 556). Uncertainty may therefore be viewed as the absence of answers to explicit questions and an "individual's inability to predict something accurately" (Milliken 1990:136).

An ambiguous problem can be defined as those where available 'cognitive maps' function ineffectively. The 'map' can be seen as an interconnected set of understandings, formed by frequently implicit views of what one's interests and concerns are, what is important, and what demands action and what does not (McCaskey 1982:17). Ambiguous events are therefore puzzling, confusing and do not fit with what is known.

> "Ambiguous situations are [those] that cannot be coded precisely into mutually exhaustive and exclusive categories" (March 1994:178)

1.6.8 Loose coupling

The idea behind loose couplings in organizations is to explain how an organizational system can simultaneously emphasize a closed rationality *and* cope with external uncertainties by separating the locations to which they are handled. Thus, different parts of the organization may operate according to different types of logic. Some elements respond to external demands while others to a lesser extent (for example an assembly line compared to a marketing department). A loose coupling between activities and locations can be defined as one where one element has both some distinctiveness *and* some responsiveness to another element (Orton & Weick, 1990:205). Phrased differently, a loose coupling between elements means that they, to some extent, were coupled but they also showed some evidence of separateness and retained a separate identity by having their attachment "circumscribed, infrequent, weak in their mutual effects, and/or slow to respond" (Weick 1976:219).

1.6.9 Project

Most product development activities are referred to as being organized in projects. This was also the case for the two settings studied in this thesis. Traditionally, there are three qualities of a project: it is goal oriented, limited in time and unique (Engwall 1995:263). However, when empirically examined, this definition does not stand well. Thus, as both Engwall (1995) and Blomberg (1998) have asserted, projects generally have a history as well as long-term ramifications for the future. Rather, the term project is used to define an activity in relation to other activities – 'non-projects' (Blomberg

1998: 80). In the product development literature (see e.g. Clark and Wheelwright 1993:ch 8) projects are usually defined in relation to the activities performed in line functions. Thus, what is defined as a project may vary from organization to organization, and from time to time depending on the meaning associated with the term.

In the two settings studied in this thesis, the term main project refers to a larger unit to which a number of projects with specific tasks are affiliated. In addition, most projects were organized into a number of sub-projects.

1.7. The division of the thesis

This chapter presented the rationales that explain why a study of face-to-face meetings in complex product development projects is of importance and the specifications of the study. Furthermore, the theoretical framework has been presented and definitions made of central concepts. *Chapter two* will describe and discuss the research design and the methods employed in the collection and analysis of empirical data. The empirical and analytical parts of the thesis follows a structure which clarifies step-by-step the role of face-to-face meetings (see Exhibit 1-2 below).

First, in *chapter three,* the two projects are described and compared according to dimensions derived from the present literature on research and development activities. Thereafter, *chapter four* identifies and defines six central problems that frequently occurred in the two product development projects (System expert bottleneck problems, Technical problems, Interface problems, Coordination problems, Tracking problems, and Boundary problems). These six problems will later comprise a foundation for the analysis of meetings as a problem management activity.

Chapter five describes (qualitatively and quantitatively) the 224 meetings covered in this study according to various dimensions. In *chapter sex*, the relationships between meetings and occurring problems are examined which results in a sorting of meetings according to their content. More specifically, the chapter distinguishes three clusters of meetings according to the meeting-problem relation, which represents sub-systems within the projects that focuses on different issues within the development process (Operating sub-system, Administrating sub-system, and Allocating sub-system).

In *chapter seven,* a sorting of meetings is made according to their organization. Four types of meetings (announcement meetings, work meetings, hallway meetings, and private meetings) are identified according to the degree of discipline expected from participating individuals and the corresponding degree of formality employed.

Chapter eight examines the different actors' use of meetings in terms of interacting within and across sub-groups. This chapter illustrates that the projects can be seen as being divided into two different communities, one engineering and one managerial, where coordinators played a key role in integrating the two with one another.

Chapter nine becomes a pivotal chapter that describes the uses of and interplay between meetings when actors in projects attempt to deal with problems. By combining the two dimensions of meeting content and meeting organization developed in chapter six and seven, a taxonomy of meetings for complex product development is established that includes twelve different classes. Basically, this taxonomy illustrates the different components of the meeting systems within the two projects examined in this thesis.

In *chapter 10*, the two rather different systems of meetings of the two projects are described and compared. Information on project characteristics from *chapter three* is used to ascertain why the two projects differed from one another with regards to their respective system of meetings.

Chapter 11 suggests an alternative view of meetings. Principally it addresses meetings as social texts in an organization, as a complement to the analysis of meetings as a problem management activity. In this chapter, the use of meetings as a means for reading and seeing the social system, the statuses of actors, and expectations from others are explored. This chapter also differs from the other empirical/analytical chapters in that it contains a theoretical part of its own, based on the reasoning provided by Schwartzman (1989). Theoretically, Schwartzman's framework provides an interesting integration of different areas of research, such as anthropology, sociology and organizational theory, and offers valuable definitions and concepts to the study of meetings.

Finally, *chapter 12* summarizes the findings, discusses the contribution of the study, outlines a theory of meetings in complex product development, and suggests routes for future research.

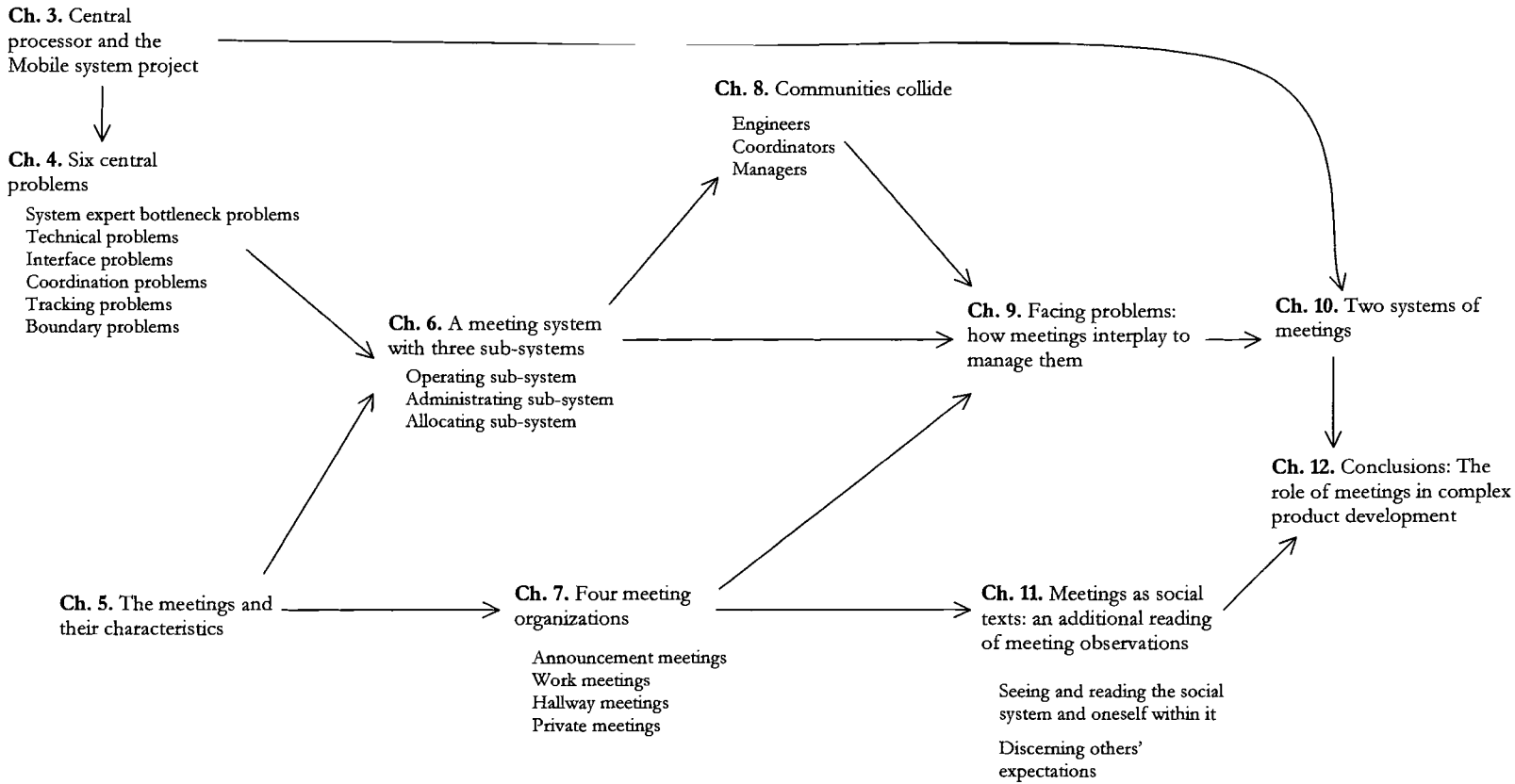

Exhibit 1-2. The division of the thesis

2. The research design

This chapter presents the research design that connects the purpose of the study to the collection, treatment, and analysis of the empirical data. The chapter entails six parts: the abductive research process employed, the overall research design, the data obtained and the methods used for generating them, how data has been recorded and prepared, the classification and analysis of data, and a discussion regarding the quality of the research design.

2.1. An abductive process

Statements and formulations about the prevalence and role of meetings in the studied settings have emerged through an interactive process between obtaining empirical data, analysis and theorizing. In practice, this also means that the analysis has continued from the point in time when the collection of data began and then throughout the whole process of writing this report.

To conceptualize this process, it has much in common with what Alvesson & Skjöldberg (1994:42-44) refer to as "abduction". Abduction can be described as the process where cases are interpreted through hypothetical patterns (i.e. a theoretical or practical pre-understanding) that could potentially explain the case. The interpretation is further examined by including more and more observations or cases. Thus, abduction includes both elements of deductive and inductive reasoning, but is not limited to the two. During an abductive process, the empirical field becomes further expanded as well as the theoretical claims refined and adjusted (Alvesson & Skjöldberg 1994:42).

To provide information on how issues have emerged to become important in my study, the example of problems in complex product development can be used. Problems were initially not focused upon at the initiation of the study. However, as problems were frequently discussed in most meetings as well as in the unstructured interviews, they were chosen to form the major sounding board from which the uses of meetings could be analyzed. Thus, gradually (and sometimes suddenly), my attention has been narrowed and directed deeper on elements that appeared as relevant and essential.

2.2. A multiple and embedded case study design

This study has an exploratory and an explanatory focus regarding the role of face-to-face meetings in complex product development. Regarding the exploratory part, a case study design would seem to be appropriate (Yin 1989:18). However, the explanatory part (e.g. why certain types of meetings are used) it points to an approach in which operational links can be traced. This indicates that more than one organizational setting should be available for empirical inquiry through which an understanding can be created regarding important differences between cases and the explanations as to why such difference exist.

The research design of the present study be specified as a multiple embedded case study as it involves more than one unit of analysis, and explores the possibilities of comparison between different empirical settings (Yin 1989:46).

2.2.1 Units of analysis

To have more than more than one unit of analysis in a case study could be advantageous for gaining insights to a phenomenon in operational detail, as well as a more holistic - global level. Yin (1989: 49-50) calls this an embedded case study. This study has employed such an approach. In addition to meetings, which are the primary unit of analysis, additional units of analysis are the projects (in which the meetings took place), and the different sub-groups within the projects that made use of the meetings.

2.2.2 Exploring the possibilities of comparison

To have more than one organizational setting available for empirical inquiry creates a potential for comparison. Foremost, comparative analysis could be used as an epistemological function that creates an understanding regarding important differences between cases and the explanations as to why such difference exist.

Traditionally, comparisons have often been used in experiments (field or 'laboratory'), where either the units or the treatments are subject to variation (Cook 1983:74). In such experiments, the impact of different treatments (for example different tasks, demands or other constraints) can be examined by keeping the units examined constant (or at least similar). On the other hand, if the different units vary on certain dimensions, then the impact of the variations among the units could be examined by exposing them to the same treatment.

Although this study was by no means designed as an experiment, the analysis may benefit from viewing the study as such (Yin 1989:53). Thus, if viewed as a

naturally occurring field experiment, the outcomes studied are the prevalence and uses of meetings in different projects that may vary on certain dimensions. However, compared to the laboratory situation outlined earlier, this natural experiment displays more complexity in variations, resulting in more difficulties in distinguishing the causes for particular outcomes.

2.2.3 Choice of cases

When exploring the possibility of comparison regarding the prevalence and use of meetings, data was collected from two different product development projects. On the basis of relative differences, access and geographical proximity, two complex product development projects within the Swedish telecom firm Ericsson were chosen as the empricial settings to be studied. These two projects are in this study labeled with the pseudonyms – the *Mobile system projects* and the *Central Processor project.* The chosen settings seem well suited for a comparative analysis regarding the use of meetings under varying contingencies, as the two projects show distinctive differences in their characteristics when compared (as will be described in chapter three).

In terms of access, colleagues of mine had previously conducted studies in collaboration with persons working in the two settings. These studies generated findings of interest for the involved practisioners (see e.g. Adler 1999) and presented opportunities for further studies.

2.2.4 Treatment of the two empirical settings

The two projects and their host organizations have been studied; not to write a correct historical account of them, but to find out about the presence and role of meetings. The projects and their host organization have therefore been labeled with pseudonyms, and not their true names.

As well, the names of those cited in this study have been excluded. Instead they appear as 'a project manager', 'an engineer' or other appropriate labels. Other than these alterations I have not tried to erase anything of the characteristics of the two settings.

2.3. Collection of empirical data

Multiple sources of information have been used to collect data about the three units of analysis (meetings, projects, and sub-groups within projects). The multi method approach heralds empirical material imbued with rich information on all units of analysis. It also open up possibilities for crosschecking data collected through different means (i.e. triangulation).

Regarding the prevalence of meetings in the two projects, a method was needed that enabled a broad scope to collect information on many individual type of meetings, and which could be easily replicated between cases (Yin 1989:52-54). Thus, focused interviews were used to obtain information on the characteristics and uses of meetings ensuring similar data could be collected from both projects. Focused interviews can be described as a middle form between the structured (or schedule-structured) interview and the unstructured (or non-directive) interview (Frankfort-Nachmias and Nachmias 1992:224-225). This implies that the interviewer follows a certain set of questions (rather similar to the structured interview), but where answers are not limited to pre-established categories (Fontana and Frey 2000:653).

To better understand the complex phenomenon of meetings, the focused interviews were combined with other methods that could generate further types of data on meetings as well it created a possibility to cross-examine the reports made in the focused interviews. Therefore, documents were collected containing information about participants of meetings, issues raised, and formal expressions of events. Direct observations of various types of meetings took place to better understand the organization of formal and informal meetings and issues not easily described in interviews. Unstructured interviews were also used to collect information about stories, experiences, and other types of information regarding meetings.

Regarding the other two units of analysis, the projects and the sub-groups within them, unstructured interviews, informal observations, and documents were used to generate data. More specifically, data were generated on structural and historical accounts of the projects and their host organizations, problems that occurred, the everyday life in the projects, and how different sub-groups viewed their own and other's work.

Finally, workshops were used for looping back early findings to the respondents and to generate ideas or new data that could explain confusing issues that puzzling me.

Although different methods have been employed in the collection of data, interviews were used most frequently. In practice, most interviews contained both focused elements, in which a fixed set of questions were asked about meetings, and nonstructured elements, where almost all types of issues could be raised (either by myself or the respondent).

In total, 80 people were interviewed, most of them more than once. The respondents were interviewed during one longer interview session (lasting from 40 minutes to more than two hours). In addition, follow up interviews (from a short phone call lasting a few minutes to longer sessions) were enacted several times, in a few cases up to 10 times with the same person. Also e-mail correspondence was occasionally used to verify certain facts that had been

brought up in a previous interview. Many follow up interviews were conducted by telephone.

Unit of analysis	Type of data generated	Method of collecting data	Extent (respondents and quantity)
Meetings	The characteristics and uses of meetings to which the respondent attends	Focused interviews	64 respondent (equally distributed across projects) interviewed twice
	Participants of meetings, issues raised, formal expressions of events	Collection of agendas, announcements, minutes of meetings, and documents dispersed at meetings	Text documentation from 40 meetings
	The organization of formal and informal meetings	Direct observations of formal and informal meetings	15 formal meetings observed (five with video-camera)
	Non-verbalized and non-discussible actions and behaviors		Presence in hallways, the canteen, around coffee machines, etc
	Stories, experiences, and other types of information about meetings not covered in the structured interviews	Unstructured interviews/conversations	80 respondents interviewed (many interviewed more than once)
Projects	Structural and environmental properties of the projects. History of the organizations, Structure and features of the product under development	Unstructured interviews/conversations	See above
		Collection of documents and archival records (project specifications, PMs, etc.)	65 different documents
	Problems occurring in the development effort	Unstructured interviews/conversations	See above
	Develop an appreciation for the everyday life in the projects	Intensive researcher presence	3+3+1 months
Sub-groups of actors	The respondent's view of the development effort, their own role, other sub-groups, and the organization of the day-to-day activities	Unstructured interviews/conversations	See above
All units of analysis	Loop back and discuss empirical findings with the respondents, raise questions not previously asked.	Workshops	10 workshops have been organized. Approx. 100 participants.

Exhibit 2-1. Types of data and the methods used to generate them

Most interviews were conducted with one individual at a time. However, several times small groups of two to three persons were interviewed at the same time (dictated by time constraints).

Beside myself, Sanne Olilla, Helen Bryhske, Horst Hart, Maria Olsson, and Lars Marmgren have been involved in the collecting data. Assistance was received with some of the focused interviews on meetings and with observations on some of the workshops that were arranged to discuss results of the research project with the respondents.

2.3.1 Timing of data collection

Empirical data has been collected throughout the entire course of the projects (see also Exhibit 2-2 below). Most data has therefore been collected when activities took place in real time. Early 1996, and winter and spring of 1997 formed the initial extensive period of data collection in which the first rounds of the focused interviews was carried out. Also many unstructured interviews were made in order to gain an introductory appreciation of the two projects.

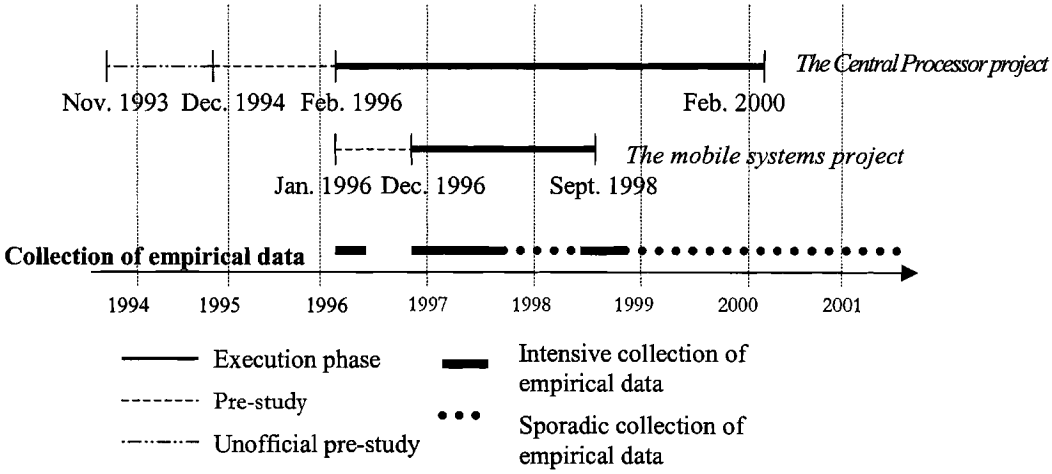

Exhibit 2-2. Data collection in relation to the duration of the two projects

Later, another intensive period of data collection took place during summer and early fall of 1998 prior to the Mobile system project's completion date (which was in September 1998). Furthermore, follow up interviews were conducted on themes previously discussed and progression during the last year. In addition, new questions were posed regarding matters that were not previously raised.

In addition, throughout 1999, 2000, and 2001, I have occasionally contacted people in and around the two projects in order to clarify certain matters that puzzled me whilst analyzing the empirical material.

2.3.2 Focused interviews regarding meetings

During a longer and otherwise more unstructured interview, the respondent was asked questions about the meetings he or she participated. In total, 64 respondents were subject to the focused interviews concerning meetings that resulted in 311 reports on different types of meetings.

Questions and topics of the focused interview

The focused part of the interviews started with a question where I asked which meetings the respondent participated in (according to the definition of meetings this study employs). Presented with a list of meetings, I asked the respondent to describe each one of the meetings in response to a particular set of questions (see Exhibit 2-3 below).

Having run through the set of questions, the respondent usually mentioned a few more that he or she had been reminded about when describing the others. Then, these meetings were included and the same sets of questions were repeated.

Background information on the respondent (if not available already)
Geographical location; Line organization affiliations (department/section); Project and sub project affiliation; Formal role and tasks performed by the respondent in relation to the project and the line organization
Name/ label of meeting
What is the meeting called?
Location
Where does the meeting take place? Always same place?
Time and regularity of meeting
When does the meeting take place? How often? What kind of regularity is employed?
The participants
Who is participating? (Name, organizational (project and line org.) affiliation, and formal role (e.g. hierarchical position) of participants
Is it always the same people participating?
Organization of meeting
What is your role in the meeting? Do you view yourself to be in charge or a subordinate in the meeting?
How is the meeting organized?
What degree of structure and regulation of talking is employed?
How is the airtime distributed among the participants? Who regulates the airtime?
Focus and activities of the meeting
What is the main focus of the meeting?
What is achieved at the meeting?
Why is the meeting held? What would happen if the meeting was closed down?
Is the meeting helpful to you? If so, in what way?
What are the requirements for action on issues discussed? (Immediate attention/ long-range)

Exhibit 2-3. Set of questions used in the structured interviews

At the end of the structured interview, the respondents were asked to assess the meetings on a five point scale to express to what degree the meetings were helpful in dealing with problems that the respondent had at hand (see specification in Exhibit 2-4 below). This approach was very similar to the approach used by Carlsson & Lundqvist (1995:53) when detecting the experienced value of communication in a product development team.

Scale	Definition
5	Received significant help
4	
3	Received some help
2	
1	Did not receive any help

Exhibit 2-4. Scale used for judgments as to what degree meetings were helpful to the respondent

The respondents of the focused interviews

As stated previously, an approximately equal distribution of respondents across the two projects and across sub-groups within the projects was a significant factor in securing an accurate comparison.

In total, interviews were made with 64 respondents equally distributed across the two projects, (i.e. 32 respondents from each project). If divided by sub group categories, 15 managers, 7 coordinators, and 10 engineers in each main project were subjected to the structured interview. To collect information relating to new questions that had appeared as a consequence of my own learning over time, and to deal with the limitations of the focused interview, all respondents were interviewed on two, or more, occasions.

The sub group 'managers' includes the main project manager, the deputy main project manager, and the managers in charge of the project. The sub-groups 'coordinators' contain people with a coordinator role at the main project level (such as testing or configuration management) and on project level (such as a technical coordinator in a design project). Finally, the group 'engineers' comprise design engineers, people working with testing activities (but not in a coordinator position), and team leaders for various engineering teams (if they do not perform a coordinator role as well, and are therefore categorized as 'coordinators').

An approximation of the actual distribution of people according to these categories would say that approximately 5 % of all people working in a project could be regarded as 'managers', approximately 10 % as coordinators, an the remaining 85 %, as engineers. This signifies that the distribution of

respondents across sub groups does not represent the actual distribution of people in the two projects. More specifically, managers are over-represented by approximately nine times compared to their actual representation in the projects. Coordinators are over-represented by two times and engineers under-represented at 0.4 times their actual representation.

Sub-group category	Included people	Mobile system project	Central Processor project	Total	
				N	Per cent
Engineers	Design engineers, testing personnel, and team leaders	10	10	20	31 %
Coordinators	Main project- and project coordinators	7	7	14	22 %
Managers	Main and deputy main project managers, project managers	15	15	30	47 %
Total		32	32	64	100 %

Exhibit 2-5. Distribution of respondents in the focused interviews on meetings

Reports on meetings collected

In total, the 64 respondents made 311 reports on meetings they participated in. Approximately the same numbers of reports were collected from both projects; 159 reports from respondents in the Mobile system project, and 152 from respondents in the Central Processor project. On average, each respondent has made 4,9 reports on meetings. However, managers have on average made more reports (5,4) than coordinators (4,8) and engineers (4,1). This difference is stronger in the Central Processor project, where managers on average made 5,5 reports and engineers only 3,6.

	Mobile system project	Central Processor project	Total
Engineer	41 (4,6)	40 (3,6)	81 (4,1)
Coordinator	33 (4,7)	29 (4,8)	62 (4,8)
Manager	85 (5,3)	83 (5,5)	168 (5,4)
Total	159 (5,0)	152 (4,8)	311 (4,9)

Exhibit 2-6. Number of observations for each sub-group

Note: Numbers within parenthesis indicates the average number of reports per person in each sub group category

If the geographical location of the respondents is compared, most respondents are located at the main location of the project. Merely 20 % of the respondents from the Central Processor project were located outside the main office, while approximately 40 % of the respondents in the Mobile system project were located elsewhere than the main location. Thus, most respondents to the study had a central location. Furthermore, comparisons

across locations will not be made, due to the small number of respondents that have a non-central location.

2.3.3 Unstructured interviews

Unstructured interviews were used for obtaining data about issues not covered in the focused interviews, for example about the project itself, how the respondent viewed the development effort, and the organization of the day-to-day activities. These interviews retained the character of a conversation between a researcher and a practitioner, where almost anything could be brought up ("How does a project come eventuate?"; "Who become project managers and why?"; Who is really in charge?", "What do you discuss with your colleagues immediately prior to entering a formal meeting?"; "How should one act in meetings in order to avoid attention being drawn to issues that do not work very well in the project?"; "What kind of problems are you experiencing right now?" "What does not work in the project?" "Describe problems that have been solved or remained unsolved").

The same respondents as in the focused interviews were also subject to the unstructured interviews. In addition, another 20 respondents that performed various roles in the organization were added (from head of the R&D organizations to project administrators).

2.3.4 Direct observations of formal meetings

Observations were performed that allowed a first hand appreciation of how meetings were organized. At this point, issues raised in the interviews could be studied 'live'. As such, observations have been important in that they complemented the information acquired in interviews. Observations of meetings were also important for gaining information about other matters, such as the study of faces and inflections, that otherwise would be hard to verbally reiterate in an interview situation, or matters that appeared as non-discussible (due to their sensitive nature) in interviews. In total, 15 formal meetings have been observed.

Observers may assume various roles of engagement from the passive presence of the hidden or disguised voyeur to the active participant who becomes a full member of the setting that is under study (Adler and Adler 1994:380).

Using observations to study meetings mean that the researcher's presence may influence what and how events are played out. In order that these influences be kept to a minimum, an unobtrusive mode of direct observation was employed. Usually, I tried to place myself at the rear of the room in order to be less 'in the way' for the other participants of the meeting. However, it was known by all present that I was conducting observations. Usually, the

chairman of the meeting made a comment in the beginning regarding my presence and its purpose. Occasionally, jokes were made when this matter was announced. For example, more than once I was labeled a time study man.

According to Gold's (1958 cited in Adler and Adler 1994:379) outline of different roles that a researcher may take while observing (ranging from the complete participant, via the participant-as-observer, the observer-as-participant, to the complete observer) I took on a role in the observations that was closest to the observer-as-participant. Therefore, my presence as a researcher was at all times indisputable. Subsequently, I never strived to (nor was is intended) to be treated as an ordinary member of the organization.

2.3.5 Informal observations and researcher presence

I have also spent a considerable amount of time in the two organizations, during which less formal observation were conducted. This was readily achieved, especially since a personal access card was made available for each organization. Thus, besides observing formal meetings, I have had the possibility to observe a large number of informal meetings whilst being present in the two organizations, for example before and after formal meetings, in the hallway, around the coffee machine, at lunch, etc.

During the most intensive periods, I visited the organizations several times a week. In total, three such periods took place while projects were still in operation (February to April, 1996; December 1996 to May 1997; and August to September 1998). These periods also presented the opportunity to develop an appreciation of the everyday life in the projects. Consequently it became possible to collect data in an ethnographic manner (see e.g. Alvesson and Sköldberg 1994:109-111).

2.3.6 Documents

Document and meetings possess a close connection, as various types of texts are both prepared prior to meetings (e.g. slide shows) and distributed during or at the completion of the meetings (such as minutes from meeting). I collected the documents in meeting in which I was present. In other words, many of the documents could be understood in the context of their use (Hodder 1994:394). Alternatively, I also requested documents from meetings that I did not attend.

Other documents were collected during interviews and provided examples of issues raised there. Typical examples are project plans, project reports, error-reports, organizational charts, and risk analyses. In total, approximately 65 different documents were collected.

2.3.7 Workshops

Workshops were used to discuss empirical findings with the respondents and to conduct observations, but also served as an opportunity to raise previously unasked questions. In total, 10 workshops were held with participants from the two projects. As the requests for workshops were more frequent in the Central Processor project, consequently, seven out of the ten workshops took place there.

That which constituted a workshop varied, yet all retained some semblance of a looping back to findings to the projects. Initially, these workshops were rather informal. However, a number of more formal and ambitious workshops were organized with many participants. Thus, the form and the content of these workshops varied, from being part of a regular meeting in the organization, to occasionally those that were organized by the research team.

From a methodological perspective, workshops are somewhat 'fuzzy' as it is difficult to decide how to evaluate the collected data. A workshop can be viewed both as a structured group interview (Fontana and Frey 1994:364-365) and a direct observation.

If viewed as an occasion for observation, the participants were most often situated in their natural setting, but discussed matters that were influenced by the researchers. Thus, information obtained in the workshops could not be treated as naturally occurring data. If viewed as a structured group interview, workshops are still problematic, again from a methodological point of view, as the information provided by the respondents may differ from the information given in interviews (because the respondents had to consider the presence of their colleagues). I have chosen to view these occasions as group interviews and to treat the information as such in the forthcoming analysis.

2.4. Recording and preparing the empirical data

In the focused interviews, data was recorded through written notes taken during the interview. Immediately after the interview, the notes were reviewed and complemented with additional information that I had not been able to record while interviewing. The unstructured interviews were recorded using a video camera or a tape recorder. As many of the interviews included both nonstructured and focused elements, it meant that most of the focused interviews were recorded by two means (written notes and video camera/tape recorder). In those cases follow up interviews were made by phone, a tape recorder was always used.

In terms of the direct observations, five out of the total 15 (or 33 %) observations of formal meetings were recorded by video camera. The other

ten observations were recorded by making notes during and after the meeting. Systematic notes regarding the patterns present in meetings in terms of distribution of talk and talk-order was made via a quantitative observational schema developed by Schein (1988).

When visiting the two projects, I ensured always to carry a notebook in which events (such as informal meetings taking place around the coffee machine) could then be recorded. This notebook was also used for recording reflections, thoughts and feelings I experienced during these visits.

2.4.1 Data management and software used

Information from interviews, documents, and observations were entered into the qualitative structuring and analysis software program Envivo, in which the data was sorted according to themes. In terms of different types of meetings, this involved the identification and sorting of information into categories that each correspond to an individual type of meeting.

When stable types of meetings had been established (in total 224 individual types of meetings) quantifiable information about the meetings was entered into a statistical program (SPSS). The specific structure of the empirical data, that is the individual types of meetings that vary on certain quantitative and qualitative dimensions, has of course favored the possibility of having data available in qualitative and quantitative software tools. Data of a less relative character, for example data on how often a meeting take place, could easily be quantified. Other examples of such quantifiable information are the number of participants in meetings, whether they were formal or informal, how useful the meetings were according to the respondent, time intervals between meetings, etc.

Through the qualitative and quantitative note and sorting systems, it was possible to monitor each individual type of meeting and the different characteristics each entailed. The fast availability to the empirical data that computer-based note systems enable was advantageous in terms of making classifications and other formulations. As the classifications and other formulations were subject to change due to my own learning, the schematic note systems have been kept 'alive' throughout the research process and have been gradually developing, as further information was entered.

2.4.2 The need for weighting data while making comparisons

Respondents to the focused interviews have made reports on individual types of meeting based on an aggregated experience from participating in a series of occasions where the participants of the individual type of meeting were gathered.

A significant problem occurs when this type of data is compared across empirical settings, where the nature and magnitude of data differs. The frequency of occurrence that an individual type of meeting has during a given period of time is a paramount example where the magnitude of data may differ across organizational settings. It therefore has to be included in an analysis comparing the prevalence of meetings across organizations. To give an analogous example, the comparison of incidents of crime from one year to another often include the number of offences, disregarding that some result in death and others were merely an inconvenience. Therefore, comparisons can be misleading if there are significant changes amongst the type of offences committed. Sellin and Wolfgang (1964 cited in Frankfort-Nachmias and Nachmias 1992:339-340) dealt with this problem by introducing an index that described different crimes via a scale that measured their magnitude.

A similar problem is present when comparing the prevalence of meetings across organizational settings. This type of comparison may also be misleading, if one organization (termed A) engages in various different types of meetings, but for each type of meeting, there is a long interval between meetings, while the other (termed B) contains fewer types of meeting but with shorter intervals. A simple count of the individual types of meetings would illustrate that there are more meetings taking place in organization A. Therefore, the number of individual types of meetings should be weighed by the frequency of their occurrence. This is especially relevant when comparisons are made across organizational settings or between different sub-groups use of meetings. The latter need only apply to chapter ten where comparisons were made across projects and sub-groups of people.

2.5. Analysis: Classifying and comparing data

While analyzing the empirical material, I have tried to connect particular observed circumstances (e.g. meetings) to others (e.g. problems), from which systematic patterns were developed on successive higher levels in abstraction. Significant vehicles that were used to achieve a better understanding of the phenomena under study have been to make classifications and to compare projects and sub-groups with each other. Furthermore, classifications were useful in comprehending the diversity of meetings.

First, the strategy of analyzing data in two ways – pooled from all settings *and* kept separated by project and sub-groups – will be discussed. Thereafter, the task of making classifications and taxonomies will be given attention.

2.5.1 A mixed strategy of pooled and cross-case analysis

A combined strategy has been used to analyze the data (see Exhibit 2-7 below). To ensure maximum variety when working out classifications and definitions of meetings and problems, data has been pooled from all settings (Yin 1989:59; Huberman and Miles 1994:436-437). Upon this base, qualitative and quantitative descriptions were made of meetings and their characteristics (see chapter five and seven) and the six defined problems (see chapter four). Furthermore, the interplay between meetings and their uses in relation to the problems, were also examined with data pooled from all settings (see chapter six, eight, and nine).

When the data was sorted, defined and classified, a comparative analysis was undertaken in order to determine and explain the significant differences between the two cases. This type of comparison enabled a concentration of particular characteristics that in turn illustrated more saliently their uniqueness. Thus, on this level, data has been kept separated by projects and subgroups (see chapter ten)

In reality, these two types of analysis were made more or less in parallel, which enriched the understanding both for potential methods of classifying and ordering the material, and as a way to discern the necessary dimension to be used for a comparative study across cases.

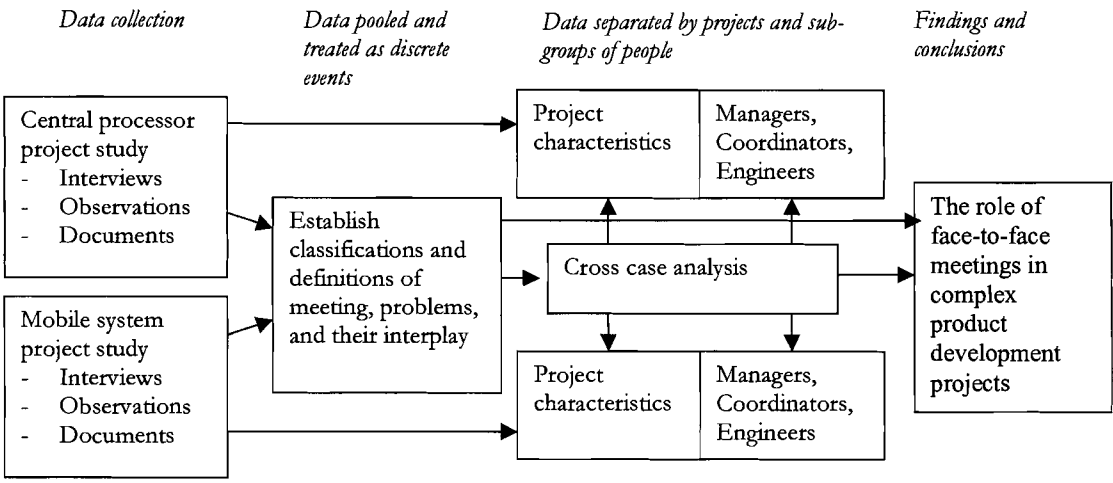

Exhibit 2-7. The mixed strategy used to analyze data

2.5.2 Sorting and classifying empirical observations

While all meetings share some similar characteristics (e.g. they all are face-to-face encounters), they also display distinctive differences. This type of

variation presents the challenge of making classifications based on empirically observed phenomena. To make classification is very much a process of learning about the empirical data on the researcher's behalf, whereby possible generalizations and ways of structuring the empirical material are pursued.

Through the use of classifications, a researcher generally attempts to unite objects into homogenous classes that, according to certain dimensions, appear similar. Thus, while the objects within one class are similar or alike, the different classes within the classification system should be clearly dividable from each other according to the same dimension (Sjöstrand 1973:42). The classification process also means that a researcher is obliged to recognize particular aspects or characteristics (and reject others) and then arrive at several simplifications, implying that perfect fit cannot be achieved between the classification and a set of data (McKinney 1966:39). As such, the process of making classifications can be viewed as a pragmatic research methodology, whereby the developed classification are subject to further evaluation in terms of their usefulness for the researcher, for example the accuracy of their predictions (McKinney 1966:202).

Identification and categorization

In one way or the other, classification also involved identification and categorization[1] of objects (Sjöstrand 1973:47-48). While identification and categorization may seem to forego the classification of data (i.e. first objects are identified, and then categorized into a number of sub groups of which classes are created and defined), this may not always be the case. Identification of an object is usually achieved according to a theoretical or common sense pre-understanding carried by the classifier[2].

Taxonomies and typologies

One may distinguish between two types of classifications: taxonomies and typologies. While taxonomies are derived from analysis of empirical data (for example, structure, process, groups, etc.) giving rise to the identification of 'natural clusters' classified in the taxonomy (thus, they are not *a priori* conceptions), typologies involve the construction of (at least partly) *a priori* conceptual distinction. Thus, in relation to the empirical data, taxonomy arises from a more inductive process and the typologies from a more deductively oriented reasoning. Taxonomies may also be distinguished from classification in general. Taxonomies should usually involve more than one dimension, thus

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[1] One may also distinguish categories from classification, by saying that classifications are a more advanced than categories, as they also involve definitions of the classes.

[2] Without a pre-understanding, identification will not be possible. Instead, confusion will result on the researcher's behalf. Identification must therefore always have an ingredient of deductive reasoning.

multiple classifications are used in combination (Sjöstrand 1973:46-47; Söderlund 2000:58-61).

The use of classifications and taxonomies in the study

In this study, both classifications and taxonomies have been developed. Examples of classifications are the six problems (see chapter four) and the four types of meetings classified according to the degree of formality employed in a meeting (see chapter seven). In chapter nine, these two classifications are combined into taxonomy and display the major characteristics and uses of meetings in the studied product development projects.

The classification of meetings has largely formed a part-whole problem, where the parts (e.g. individual cases of meetings) and the whole (the classification system) interplay. Thus, the classification of meetings has arisen through a study of the individual types, which in turn could only be classified, in conjunction with an understanding of the classification system.

A specific problem of classifying social conducts such as meetings is that actors may have different perceptions of them, for example due to different prior experiences of them or that the relations to the phenomenon differs. It may therefore be argued that what is an occasion of play for one individual could be an occasion of work for another, as in the case of the guest and the servant at a party. However, too much relativity does not seem justified. Therefore, I have taken a stand similar to Goffman (1963) on this issue:

> However different participants may feel about a past social occasion, they can presumably agree as to which occasion they are talking about. Further, he who must work during and at an occasion defined for play still knows that his job locates him in a play occasion, not in a serious one (Goffman 1963:20)

2.6. A discussion regarding the quality of the research design

Meetings do not run around with their measures stamped on them like the capacity of a freight car. It has taken a certain amount of investigation to discover what their measures are[3]. Thus, a discussion of the quality of this study's measurement instruments are of importance, not so do much for making replications possible, but to allow the reader to form an opinion about the reliability and credibility of the methodological design, and the validity and accuracy of the findings.

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[3] In part, this sentence is borrowed from Norbert Weiner (1920:181) quoted in Research Methods: Issues and Insight Franklin, B. J. and H. W. Osborne, Eds. (1971). *Research Methods: Issues and Insights*. Belmont, CA, Wadsworth..

The discussion below will focus on the steps taken to minimize errors and biases in the collection and analysis of data, the extent the findings can be regarded as valid in relation to the studied phenomena, and this study's claims on generalizations.

2.6.1 Reliability

Regarding the reliability of the methods employed in the collection empirical data, I have tried to organize the data (from interview questions used in the focused interviews to the organization of data stored in SPSS and Envivo) in such a manner that colleagues of mine could understand and make use of it. Moreover, the reliability was also tested, as several colleagues were initially involved in the collection of data. Thus, the systematic approach in the use of databases and protocols and a certain degree of transparency had to be employed from the outset.

I have also attempted to present my research process and methods as explicit as possible by providing information on the overall research design as well as the detailed operations of the interviews. Thus, when assessing the study's reliability, this chapter has demonstrated how the collection and analysis of data was conducted.

However, it appears improbable that another researcher would arrive at the very same results. In this regard, I take a similar stance as Morgan (1983:383), who posits that the object under study gains its 'objectivity' only by being observed, and the objectivity is to a large degree is "a property that stems from the observer". Thus, the researcher does not generate knowledge of an object world, but of his or her interaction with that world. Therefore, another researcher could possibly arrive at different conclusions.

2.6.2 Validity

Both interviews and observations cause their own respective problems when considering the issue of validity. Generally speaking, information collected through interviews raise questions about the possibility of making inferences regarding events where first hand information is lacking (Yin 1989:43).

Observations, on the other hand, always retain the potential of causing observer effects. Moreover, observation methods have been criticized for lacking validity in that they may be susceptible to researcher's bias and subjective interpretation of situations (Adler and Adler 1994: 382).

For both interviews and observations, it is important to determine whether the respondents and subjects recite and act in manner that are representative of him or her.

Several steps were taken to deal with these questions and in turn improve the finding's (interval) validity. As pointed out above, almost any method, if used in isolation, can be criticized for poor validity and rigor (Adler and Adler 1994: 381-382). Using interviews in combination with information obtained through observations and documents allows that data collected through different means to be crosschecked and triangulated (Fontana and Frey 1994:373). Data collection in which different methods have been combined should therefore yield empirical data that produces a better rigor, consistency and validity, than methods used in isolation (Adler and Adler 1994:382). Furthermore, by combining focused and nondirected elements in the interviews, the nondirected elements enable further scope for the respondent in which reflections about the respondents' own views on matters were both asked for and encouraged.

An extended presence in both empirical settings made it possible to 'sneak in' without disrupting the organizations, thereby partly avoiding observer effect. The extended presence also meant that I observed and talked with people on repeated occasions. Thus, peculiar, unlikely or unrepresentative statements and behavior could be detected. Most commonly, however, it is my impression that people were simply too occupied with other matters that they did not bother to adjust their behavior because of my presence.

The large number people interviewed also made it possible to cross check pertinent facts. Approximately 100 persons from the two organizations participated in workshops where early findings were discussed. Furthermore, during the writing of this thesis, contact was taken with several key-informants in both empirical settings that involved further questioning and testing of preliminary explanations. .

2.6.3 Generalization of findings

In studies using samples that cannot be readily generalized to a larger universe, such as case studies and experiments, statistical generalizations are not possible to achieve. Instead, case studies are compelled to rely upon analytical generalization (Yin 1989:43). This indicates that a study strives for generalized results towards some broader theory, essentially regarding a specific phenomenon or settings.

The present study's ambition is to provide results on the role and prevalence of face-to-face meetings, how they are used in the organizing of complex tasks, and how different contingencies may have an impact in the uses and prevalence of meetings.

As for the comprehensive conclusions made about the role and prevalence of meetings (such as the major types of meetings identified here, the major uses

of meetings, and the interplay between different types of meetings) the results probably offer a general application to larger organizations engaging in complex knowledge work.

Regarding the contingencies on which the prevalence of meetings may vary, generalizations should be made more carefully. Such findings probably only have relevance for organizations engaging in temporary and complex knowledge work with similarities to the two projects studied here.

The more specific findings, such as the individual types of meeting identified and their specific content, they are probably only valid for the two studied projects. However, this should not limit the reader from drawing comparisons with his or her own experiences or other studies (so called case-to-case transfer) (Firestone 1993 cited in Wilhelmson 1998:74).

3. The Central processor project and the Mobile system project

In this chapter, the two Ericsson projects and their host organizations will be presented. The purpose of the chapter is twofold. First, this chapter serves to acquaint the reader with the cases and the specific practices of product development employed there. Secondly, the chapter will describe in what ways the two projects differed from each other. This information will later be used in chapter ten, as an explanation to why the structures of a meeting system differed between the projects.

The chapter contains six parts. Firstly, a very brief presentation regarding the telecommunication company Ericsson is outlined. Thereafter, a summarized account will be given of the two projects and their respective tasks. Thirdly, a description is made of the two telecommunication systems, their basic architectural layout, and organization of the two projects. The fourth and fifth parts contain a description of the how the projects' evolved over time, both in regards to the critical ambiguities they experienced, and how the projects related to their historical and organizational context. Finally, the outcomes of the two projects are described in relation to their original objectives.

3.1. Ericsson and the two projects

The telecommunication company Ericsson describes themselves as "largest supplier of mobile systems in the world (...) covering everything from systems and applications to services and core technology for mobile handsets"(www.ericsson.com/about/compfacts/, Oct 6th, 2002)

The company's history traces back to 1876, when Lars Magnus Ericsson opened a repair shop for telegraph equipment. Today (fall 2002), Ericsson employs approximately 75,000 people, which is close to 25.000 less than late 1990s and early 2000s when the company peaked in terms of employees and revenues. Thus, similar to other competitors, the company has recently undergone turbulent times that include downsizing of personnel, fewer incoming orders and prioritization of R&D efforts.

The company operates in more than 140 countries (fall 2002) with major localities in Australia, Brazil, China, Germany, Italy, Japan, Mexico, Netherlands, Spain, UK, and the USA. Their headquarters are based in Stockholm, Sweden. During the latest decade, the US and China has altered each other as the largest single market for Ericsson, where both fixed and mobile networks' growth rates have increased most rapidly in China.

The company has a tradition of making heavy investments in R&D. Their R&D budget has varied between 15 and 20 percent of sales during recent times (1995-2000) and more than 20,000 Ericsson employees have been active in research and development during the same period.

The Central processor project and the Mobile system project represent important core areas for Ericsson: the Ericsson system AXE used for switching in any of the company's wire line or mobile networks, and the systems used for mobile networks.

If a person uses their phone almost anywhere, it's likely that AXE is involved. In fact, AXE is the most widely used switching system in the world with a total of 250 million users in more than 135 countries at current (www.ericsson.com/multiservicenetworks, 2002, Oct 6th). Ericsson's mobile systems are also well spread and serve at currently 40 % of all mobile calls being made.

3.1.1 Changes in the telecommunication market during the 1990s

Capacity demands from telecommunication systems increased radically during the 1990s due to a number of changes in the behavior of both operators and their subscribers.

The deregulation and subsequent dismantling of monopolies within the traditional telecommunication sector and the rapid development of digital mobile systems gave rise to new demands from both existing governmental clients as well as new private operators (Adler 1999).

The number of subscribers using mobile phones grew at an exponential rate. Similarly the demands for more services for both stationary and mobile systems increased, as it enabled possibilities for transmitting richer information (e.g. pictures). Increased competition amongst established operators resulted in lower costs for customers that in turn resulted in an increase in the number and length of calls made. Together, these changes signify a common demand: A demand for higher capacity in terms of speed, bandwidth and quantity of transmission, which basically translates to the need for an increase in the capacity of the telecommunication systems.

3.1.2 The launch of the two projects

The launch of both projects should be considered in the light of these changes that took place in the telecommunication market during the mid 1990s. The aim of the Central processor project was to develop a central processor (an *APZ processor*) for the AXE system that could dramatically increase the capacity of the system in terms of speed, bandwidth, and quantity of transmission. The objective was initially set to develop a central processor four times faster than its precursor before the end of 1998.

The purpose of the Mobile system project was to develop the fifth system issue of a mobile system application within one of the three standards used for digital mobile communication. This implied development of new functionality as well as system improvements to all customers using the Ericsson mobile system with this specific standard. Deliveries were initially set to be implemented in mid 1998.

3.2. A summarized account of the two projects and their host organizations

To summarize, the projects showed some very distinct and important differences while retaining some similarities. Depicted within a framework for different types of innovations (as offered by Abernathy and Clark 1985; Henderson and Clark 1990:11-12), the Central processor project may best be viewed as one oriented towards an 'architectural innovation'. This implies that it challenged existing technical competence and in turn related to its history and organizational context much like a 'battering ram' in order to introduce new ways of thinking. The Central processor project was therefore not only used for developing a new system, but also to implement change and renewal within the host organization. The Mobile system project, on the other hand, furthered the applicability of those efforts pursued by the previous projects within the product family.

The Central processor project's performed a hardware dominated task on a system with numerous and indistinct interfaces. In contrast, the Mobile system project was more of a software design effort of a relatively horizontal and well-defined system. To a large extent, these technical differences were mirrored in how the development efforts were organized in terms of included activities and project flow.

More specifically, the task of developing an APZ processor demanded a scheme where the sub tasks (i.e. the development of sub systems) needed to relate to each other as both inputs and outputs implying a reciprocal interdependence (Thompson 1967:54-55). As such, the interrelated parties

needed to communicate their requirements and respond to the needs of each other.

Whereas in the Mobile System project, the project flow may best be described as one that was dominated by pooled interdependencies, that is, the work performed was interrelated only in that each sub system contributed to the overall goal (Thompson 1967:54-55). However, sequential interdependencies also existed, due to the fact that some activities were required to be performed before others. This indicates that the activities could be coordinated through standardization – the development of rules or routines and via plans or schedules, which specify timing and order in the work process.

The two projects were also hit by different qualities of ambiguity. The Central Processor project experienced significant levels of confusion regarding *how* to perform the design of a product with extensive front-end technology. Whereas the Mobile system project had sustained difficulties with defining the scope of the development effort, that is, *what* to do.

	Central processor project	**Mobile system project**
Duration	**About 4 years**	**About 2 years**
Type of innovation	**Architectural innovation**	**Incremental innovation**
Project's relation to history and organizational context	**A battering ram**	**A continuation**
Task ambiguity	**High**	**High**
Major ambiguities during the journey	Unclear definitions of the technical work process (How to do it?)	Unclear definition of the scope (What to do?)
Task complexity	**Higher**	**Lower**
System architecture and project flow	Partially undefined, interdependent and vertical	Well-defined, independent and horizontal
Hardware/software focus of development task	Hardware intensive (approx. ¾ HW and ¼ SW)	Software intensive (approx. ¼ HW and ¾ SW)
(Experienced) time pressure	**Higher**	**Lower**
Tensions and unrest within the social system	**Higher**	**Lower**

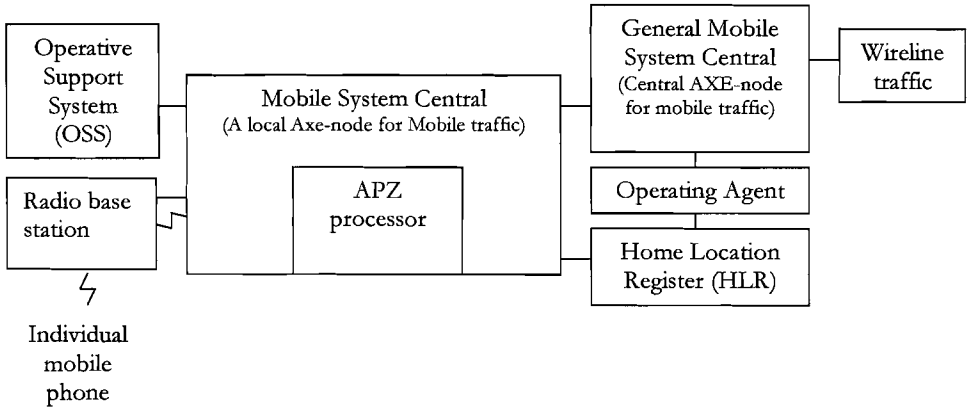
Exhibit 3-1. The two projects and their relative characteristics

3.2.1 The two technical systems developed

The technical systems developed by both projects can on an overall level be explained by using the example of a person making a mobile phone call.

The person using the mobile phone is connected to the system through a *radio base station*, which in turn is connected, either through a radio link or cable, to a *Mobile System Central* (MSC). A mobile system central can be described as a local (AXE) node for wireless traffic. Although this may vary considerably, approximately 80 radio base stations can be connected to each mobile system central.

The MSC is connected to a database, a *Home Location Register* (HLR), through which calls and services used by the subscriber are registered for the *operating agent* that then makes it possible to record the call charges and services used. The HLR also makes it possible to locate the subscriber's phone in order to transmit calls when, for example, a person makes a call to a friend traveling in



Australia.

Exhibit 3-2. The principle features of a mobile system

The *APZ processor* (the central processor) constitutes the heart of the system such as a Mobile System Central. To a large extent, it is the APZ processor that determines the AXE system's total capacity in terms of speed, number of parallel calls, and services provided that can be transmitted through the system. Connected to the Mobile System Central is also an *Operative Support System* (OSS), used for operations and maintenance of the mobile system central. The mobile system central is in turn connected to a *General Mobile System Central*, making it possible to transmit wireless traffic to wire-line traffic through the *operating agent.*

The product developed by the Central processor projects was an APZ processor for use in various communication systems, such as mobile traffic, ISDN, or public networks.

The systems delivered from the Mobile system projects included a mobile system central (MSC) application including all its sub components (including an APZ processor but not the one developed by the Central Processor project), operative support systems (OSS), a Home Location Registrations (HLR) system, and radio base stations. The Mobile system project developed and delivered upgrades of existing mobile systems as well as the addition of new functions.

The development of an APZ processor is predominately a task of developing hardware (e.g. circuits), making up about 75 % of the design work. A mobile system, on the other hand, is much more a software-intensive task, where software development constitutes about 75 % of the total task. Generally, software design tends to be more flexible, where it for example, is possible to make a 'work-around' in the program in order to absorb various faults and errors. However development of hardware elements, such as circuits often requires a time-consuming hardware redesign when errors arise.

3.2.2 Time and duration of the projects

The Mobile system project operated between 1996 and 1998 and continued for one year and nine months (or, including the pre-study, two years and eight month). On the other hand, the Central processor project began in earnest in 1996 and continued until early 2000. Thus, it totaled four years (or, including the pre-study, five years and three months). In addition, an unofficial pre-study of the Central processor concept began in November 1993.

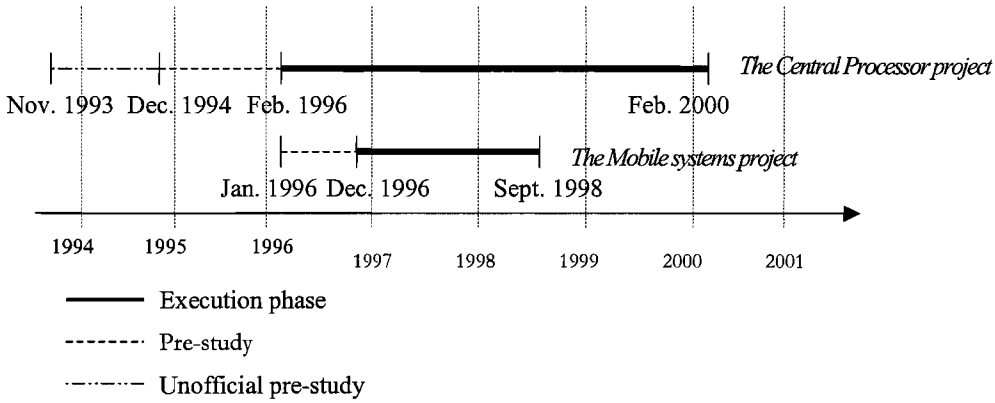


Exhibit 3-3. Duration of the two projects

This means that the projects took place in an era that can be described as a boom period for the telecommunications industry. For example, during the execution of the Central processor project (from February 1996 to February 2000), the stock prices of Ericsson B increased by more than 12 times. However, just a few months after the Central processor project had finished its assignment, the golden IT era was over.

3.2.3 The organizations hosting the projects and the project members

The two projects were driven from two different organizations within Ericsson both of similar size (approximately 2000 employees in each). The organization hosting the Central Processor project was an independent R&D unit within Ericsson, which was responsible for developing telecommunication platforms. The Mobile system project, on the other hand, was run from a business unit responsible for all business operations (development, marketing, etc) for one of the digital standards for mobile systems.

Both projects employed a matrix structure with multiple command structures, where vertical and lateral channels of information and authority operated simultaneously. In effect, functional departments operated as home bases for all employees; and the projects combined and coordinated the services of the functional specialists in terms of particular projects or areas.

The responsibilities between projects and line functions in the two studied organizations followed a rather common division of focus. The line functions were responsible for issues related to *'who'* (that is human resources devoted to a specific activity), *'how'* (methodology being used) and the project for issues related to *'what'* (activities that should be performed) and finally *'when'* (when these issues should be done). Furthermore, the members of both projects were employed in a specific line function, such as testing, software design, the project office, and so forth. However, it should be stated that the *practiced* division of responsibility was not always as straightforward as outlined above.

Both projects were organized as 'main projects' implying that further projects of varying sizes were organized and coordinated under the one umbrella – *a main project.* The Mobile system project included seven projects and the Central processor project, nine. As an entity, the main project management teams comprised the following: the main and the deputy main project manager, those project managers responsible for the included project (seven in Mobile

system project and nine in Central processor project) and a number of persons with coordinating functions [1].

In each main project, approximately 300 people were engaged, spread over the different stages of the project flow. Most were located at the host organization's main location, in both cases just outside Stockholm. However, Ericsson's global presence was also represented in the two projects. Both projects had seven different locations, across three countries and two continents. In addition, the Central processor project utilized, to a great extent, external consultative resources.

The majority of the participants had a master's degree in electrical engineering, computer science, physics or mathematics. Many of them retained extensive experience working with large and technically complex projects. However, the people in the Central processor project were generally older and more experienced. For example, the members of the main project management team had on average been working within Ericsson for more than 13 years and had more than 20 years of working experience. The equivalent personnel in the Mobile system project had spent five out of their 12 years in the industry working at Ericsson.

Approximately, 85 % of the project members in both projects were male. Similarly, the majority was of Swedish origin, although many nationalities were working within the projects both at the main site and overseas. Commonly, English was used - always in documents, and frequently in meetings, for example to accommodate non-Swedish speaking participants.

3.3. Two different project flows mirroring the product architecture

To organize product development activities that cut across functions into projects is probably the most common form for ensuring a careful integration of the product. However, the specific situation of the individual project, such as the architecture of the product and the location of the main difficulties of the task also have implications as to how the specific project chooses to organize its task (Sheremata 2000:393).

As has been mentioned previously in this chapter, the development tasks differed between the two projects. The Central processor project was to a large degree a technology-driven project engaging in a complicated hardware

[1] In the Mobile system project, five coordinators were included in the main project with a system responsibility (for acceptance, hardware, technical, test and quality issues, and a project controller). The Central Processor project had five different coordinators included in the main project (system-, quality-, and configuration management, project administration, information and promotion and a project controller).

dominated effort. The Mobile system project's main focus was on the improvement of a previous system and consisted of less complicated software development. The two project organizations and the interplay between the subparts within them were, to large degree, blue prints for the architectural layout of the technical system developed. One may therefore say that the characters of the two telecom systems were inherited into the formal organization and conversion process of the projects.

3.3.1 The complex, interdependent and vertical system architecture of the Central Processor

The system architecture of the APZ processor is significantly more complex and difficult to define in terms of clear-cut interfaces, relative a mobile system. The system architecture forms a vertical structure with many external and internal interdependencies.

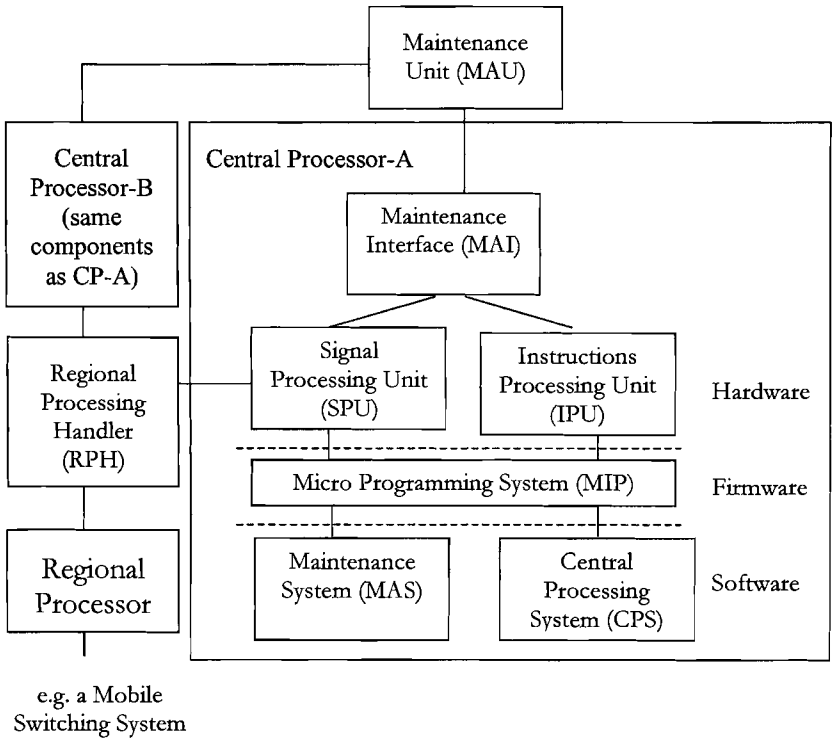


Exhibit 3-4. The complex, interdependent and vertical system architecture of an APZ processor

The APZ system is connected to the Mobile System Central via a Regional Processor Handler (RPH) and a Regional Processor buss (RP-buss) to the

Regional Processor of the communication system (for example a mobile switching system as described above). The APZ processor's potential for use in many different types of communication systems, for example for public network, ISDN or a mobile system, denotes one of the major complexities involved when developing an APZ processor. In the Central Processor projects, 29 different external dependencies for various communication systems needed to be considered during the development effort (in comparison to five in the mobile system).

An APZ processor system is composed of two processors with exactly the same design, a central processor A and B (CP-A and CP-B), and a maintenance unit (MAU). Using two processors, and having one of them working merely a few nano seconds behind the other can then reduce the risk of break down by automatically switching between the two processors. Under normal circumstances, when both of the processors are working, the processor 'in charge' alternates regularly between the two. The maintenance unit regulates the power supply and the temperature via a fan system (processors working at a high speed create a lot of heat) and other vital maintenance tasks of the APZ processor system.

A central processor (CP-A and CP-B) consists of seven major sub parts or systems and has both soft and hardware ingredients. The hardware components consist of the Maintenance Interface (MAI), the Instruction Processor Unit (IPU) and the Signal Processor Unit (SPU), which all are various types of circuit cards. SPU and the IPU transmit the signals and relay instructions on how to deal with the incoming- and outgoing signals. The Maintenance Interface (MAI) transmits instructions so that the pace of entire processor system is synchronized. MAI is also the interface for the Maintenance Unit's power supply and temperature.

IPU and SPU circuits are the hard ware core of the processor and are comprised by a number of Application Specific Integrated Circuits (ASIC). ASICs were used because mass-produced standard circuit cards did not comply. This is predominately caused by unique and different types of interfaces within a system. Generally speaking, it is a complicated process to develop ASICs, involving extensive simulation and the use of prototypes before the final hardware circuits can be ordered.

In order to connect the software with the hardware, a micro program is needed to ensure that software instructions are transferred into the required hardware movements. The interface between hardware and software – the microprogramming system (MIP) – is also called firmware.

A Central Processing System (CPS) and Maintenance System (MAS) compose the software system. In these systems, the intended behavior of the processor is programmed in accordance with the required situation. In addition to these

parts, there is also (as mentioned earlier) a Regional Processing Handler connected to the Signal Processing Unit (SPU).

Exhibit 3-4 outlines the APZ system and its connections. As both processors (CP-A and CP-B) are identical, only the subparts of CP-A are shown. The main interfaces between the systems sub parts are: from Maintenance Interface (MAI) to Signal Processing Unit (SPU) and Instructions Processing Unit (IPU), from SPU to Regional Processing Handler (RPH) and Micro Programming System (MIP), from IPU to MIP, and from MIP to Maintenance System (MAS) and Central Processing System (CPS). RPH constitutes the major interface into other communication systems.

The project flow of the Central Processor project

Included within the Central Processor project were six design projects that equaled the sub systems of the APZ processor. Portrayed from hardware to software, three projects were focused on the development of hardware and circuits: the RPH (Regional Processing Handling system) project, the SPU (Signal Processing Unit system) project, and the IPU (Instruction Processing Unit system) project.

The MIP project was concerned with the integration and translation at the interface between soft- and hardware. The CPG (Central Processing Generator system) was responsible for integrating the sub systems into a whole system, performing simulations, and developing the maintenance equipment. A software (SW) project developed the software that governs the central processor and the maintenance system.

In addition to these six design projects, there were also three other projects concerned with issues not related to the direct design of the product. A small project labeled APZ project was responsible for handling quality control and producing the documentation for the product. A test project was responsible for the testing and verification of the system. Finally, an industrialization project was concerned with the production aspects of the final product and to support the introduction of the APZ processor into a commercially available product, e.g. first office applications.

The projects responsible for developing hardware and circuits (RPH, SPU, and IPU) and the CPG project were the four largest in the organization in terms of man-hours.

As a consequence of the system architecture, the project flow of the Central Processor project is complex, with less than clear-cut interfaces and many interdependencies between the different projects. Thus, the software engineers were required to coordinate their work with those responsible for developing circuits, and the micro-programmers in conjunction with both the hardware as

well as software engineers. The interdependent system architecture of the APZ processor meant that every step taken in the development process required many vertical iterations of information across the sub systems (see Exhibit 3-5 below).

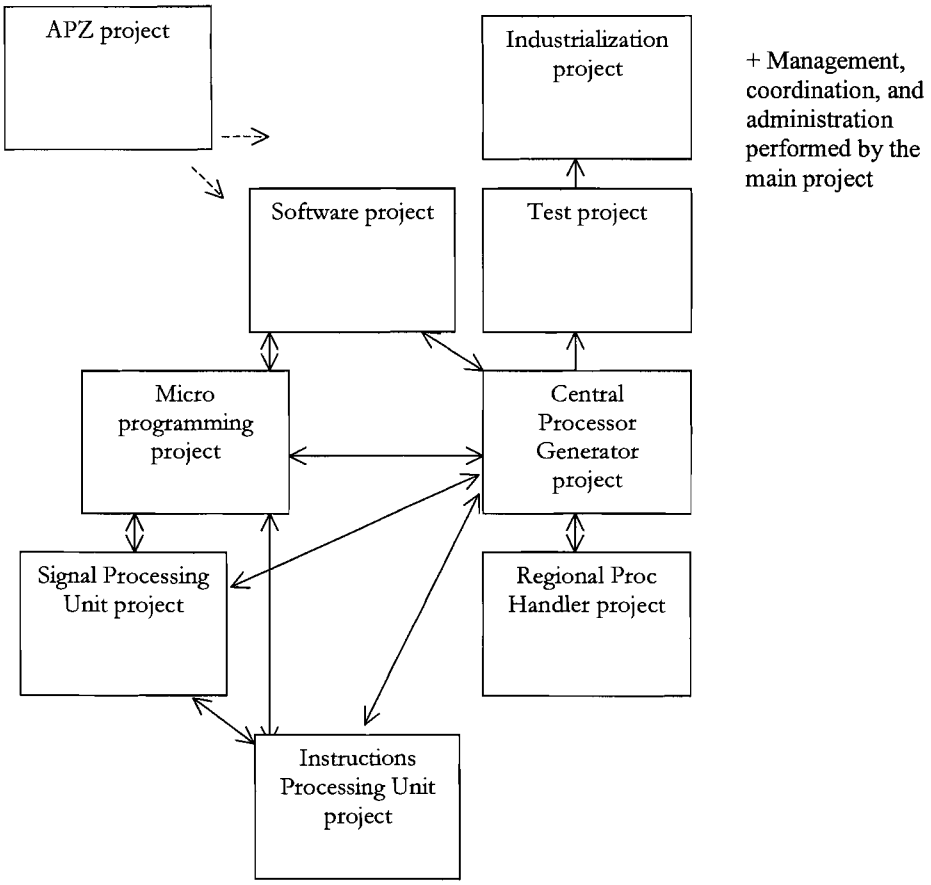


Exhibit 3-5. The reciprocal and sequential interdependencies present in the Central Processor project.

In other words, the Central processor project comprised a work process dominated by reciprocal dependencies.

> Here we have a vertical structure with dependencies from all sub-parts lower down in the system to other parts all the way up. Such a system cannot be sliced into independent sub-parts like a loaf of bread and then connected again, as you can do with a mobile system (Senior manager of the organization hosting the Central Processor project).

To give an example of these reciprocal interdependencies, a technical coordinator involved in the microprogramming project explained how the interdependencies appeared from his perspective.

> Teams within the IPU and SPU projects deliver their work to us. In turn, we are very dependent on them (the IPU and SPU projects) as the hardware they are developing is going to be steered by the micro-program we are developing. The CPG project integrates our work into a system. We deliver work to them. For us, the CPG project only exists when the IPU and the SPU are not doing what they should. In addition we have the software project. Perhaps their software guys are more dependent on us, than we are of them? Well, there are many other dependencies beyond these mentioned.

3.3.2 The well-defined, independent, and horizontal configuration of sub systems in the Mobile system

The major technical sub systems of the mobile system delivered by the Mobile system project is Mobile Switching Sub system (MSS), a Mobile Radio Subsystem (MRS), a Mobile Base station Subsystem (MBS) making up the Mobile System Central (MSC) and a Operative Support Subsystem (OSS).

The layout of the system architecture is one with rather independent sub systems that become integrated into the whole mobile system through well-defined and horizontal interfaces. Thus, one may characterize the system architecture as well defined, independent and horizontal.

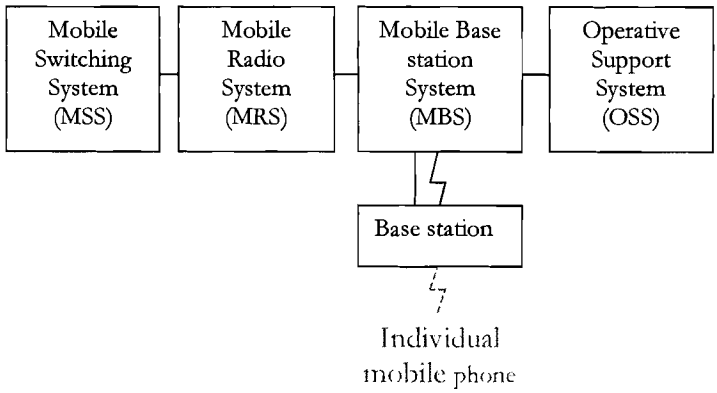


Exhibit 3-6. The horizontal system architecture of sub systems developed by the Mobile system project

The project flow of the Mobile system project

The Mobile system project comprises four major sub systems: switching, radio, base-station, and support. These sub systems were developed in four

separate design projects responsible for one sub system each[2]. These projects were also labeled in accordance with each sub system.

However, in addition to the design projects, the Mobile system project also consisted of three other projects: The *system coordination* project was responsible for coordinating the compatibility and interface demands between the sub systems. A *verification and integration* project was responsible for testing and integrating the entire system (thus, the design projects delivered their output for verification and integration). At the end of the product flow, a *First Office Application* project was located in the customer's country and responsible for implementation, installation and rollout at the customers' site. After installation, the local Ericsson Company assumed responsibility for maintenance and customer contacts.

The Mobile base station project was undoubtedly the largest project of all, making use of about 50 % of the main project's human and financial resources. The second largest project was the Switching project. The other projects were relatively smaller.

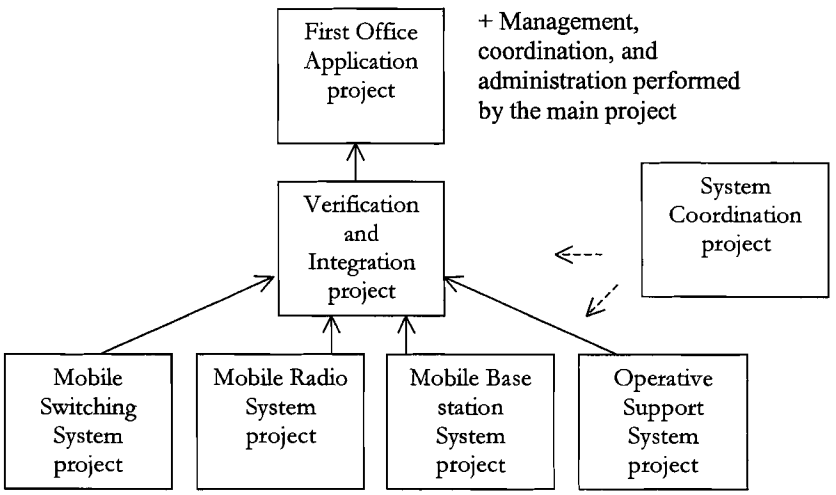


Exhibit 3-7. The pooled and sequential interdependencies present in the Mobile system project

Because of the horizontal and well-defined interfaces present in the system architecture of the mobile system, the design of the sub systems could be established independently. Integration of activities during the design work could therefore be minimized. The character of the project organization, the

[2] However, for some time, also a small Hardware Modernization project (HWM) and a large Packet Data project (PD) were included in the Mobile system project, as well as another base station development project. These initiatives were later cancelled due to lacking customer interest as will be described later.

relations between its sub parts and how the development work unfolded over time also mirrored the horizontal architecture of the mobile system. Thus, the Mobile system project was composed, primarily, as a system with pooled and sequential dependencies. The deputy manager of the Mobile system project also viewed the main project in such a way when visualizing the project as a train, where matters such as scheduling and independence become the most important issues.

> The main project can be viewed metaphorically as a large train with people of different competencies and roles that can take a ride on together towards a common goal. People will get on an off depending on their duties and available time. (Deputy main project manager, Mobile system project)

3.4. History and context of the projects: A continuing affair versus a battering ram

The version of the product that Mobile System project developed constituted the fifth product generation. The first product generation of this specific standard developed was delivered in 1994. Thus, another three versions have been developed in between.

The Central Processor project's roots can be traced back to the mid 1970s. In 1977, Ericsson delivered the first APZ processor. From this perspective (not considering various 'cousin-versions' of the product) the product developed by the Central Processor project was the ninth product generation of the APZ processor. When viewing the two projects in this perspective, it is clear that both of them inherited considerable resources in terms of reusable software- and hardware elements as well as knowledge and experience from prior project generations.

Although both projects retain strong historical roots, they related quite differently to their organizational contexts and history. In many respects the Mobile system project appear as a *continuing affair*, refining and improving concepts and methods inherited from the previous project generation. Consequently, the main project manager stated that the principal reason for their choice of organizational method of the project was because they "inherited an well-optimized organization from earlier project generations".

On the other hand, the Central Processor project related to their organizational and historical context more as a 'battering ram' in that the project introduced new ways of thinking regarding product development. The project was therefore not only used for developing a product, but also for establishing the organization's future direction.

3.4.1 The Mobile system project – a continuing affair

The R&D organization hosting the Mobile system project began to take form during the spring of 1992 when Ericsson, secured their inaugural and prestigious contract for the delivery of mobile systems to an important market that Ericsson had not previously been involved in.

Strict and challenging deadlines from the initial customer instigated the need for innovative methods for the organization of development activities. This lead to several chaotic years between 1992 and 1994 when the organization hosting the Mobile system project began to crystallize. A critical solution that was used to deal with the time pressure was to organize the project flow more concurrently. Here, different development phases of the project were 'squeezed' together, which should (at least in theory) result in shorter time to delivery in the end (see e.g. Iansiti 1995 for a discussion of similar approaches). 'Planned overlapping' therefore became a key word, in time could be saved by avoiding situations where people are waiting for one step in the design process to be completed before another is started, as was prevalent in the more traditional 'cascade' or 'waterfall' models. This approach of organizing the development effort more concurrently also implied that one tried to wait as long as possible to freeze the design requirements. By doing so, adjustments could be made to customer demands until the very last stage in the development process.

The first project in the organization managed to cope with the tough deadlines, and as a result created a practice of keeping deadlines. For forthcoming projects, maintaining deadlines became the number one priority, sometimes expressed in the following way:

> In our organization, we treat time goals as a constant, and not as a variable (Line manager, Mobile system project)

The management of the organization also attempted to reproduce these norms into people that were recruited into the organization. In the introductory guide given to new recruits, one can read about the philosophy and spirit in the organization:

> "[The organization] has a tradition of keeping time plans and efficiency in the organization. Much of this is due to the co-operative spirit, individual initiatives and the focus on results rather than the means" (From Project management – introduction at A-company, p. 1)

However, since the completion of the first product development project a gradual change began to take effect. At the start up of the Mobile system project, some managers convened to discuss the issues.

> We work very hard to make people motivated. But, despite all kick-off activities, T-shirts, etc., I have a feeling that we are going down. When will we pass the limit? We

> will probably first know when the system breaks down at the customer's site. (Main project manager of a previous project generation to the Mobile system project)
>
> Our culture has become unclear and diverse in some way. The respect for targets has decreased. There are also more managerial levels than before (Senior manager, Mobile system project)

As it seems, the organization hosting the Mobile system project had left behind some of the entrepreneurial spirit of the pioneering phase (when the organization was more or less equal to the product development project) and had now entered a phase of continuous improvement and bureaucratization. Also the layers of the hierarchy began to expand between the product development project and the head of the business unit.

3.4.2 The Central Processor project - A project as a battering-ram

The Central Processor project constituted the first APZ processor project started in its host organization, formed in 1995. But it was also the latest part of a chain of many APZ processors developed within Ericsson during a period of more than 25 years.

The performance of development projects of the AXE system during the late 1980s and the early 1990s was perceived as rather disappointing by the senior managers of Ericsson. Criticisms were directed at an inability to deliver products on time and exceeding projected budgets.

In addition to these disappointments, a large and expensive bandwidth project (AXE-N) was halted due to poor results despite the use of considerable financial and human resources. These failures gave rise to the R&D organization that became the host of the Central Processor project. As a further result a union formed between people that had previously been working within the development of the AXE platform and those people from the bandwidth initiative.

The chosen path to increase the possibility for success in the newly formed organization was to gather 'best practices' from other R&D settings within Ericsson, recruit carriers (i.e. people) known to work according to these practices, and hoped that these practices would be emulated in the new environment. The first step was to appoint the position of the managing director with the person that formerly was the head of the organization that later came to host the Mobile system project.

Rather naturally then, perceived desirable practices became synonymous with how the first projects operated in the business unit hosting the Mobile system project. A number of managers 'with good track records' were also recruited to the new R&D organization from this unit and they then appointed some of

the most important positions within the organization. Amongst these positions was the main project manager for the Central Processor project.

In terms of managing product development, the new managers' alternatives were very similar to the ones used in the unit hosting the Mobile system project. In other words, an increased focus on concurrent engineering, emphasis on early integration of the product, and visualization of ideas regarding the finished product through 'machine anatomy pictures'. Also centralization and an increased focus on the projects reduced the formal bureaucracy of the line organization. One senior manager in the organization describes the situation at the time as follows:

> Our organization became an answer to the lack of customer focus that previously existed. Our new managing direction took part in and changed many things. Basically, he made a project organization of it all, and directed and wanted to control everything (senior manager in the organization hosting the Central processor project)

In the process of introducing new methods for managing product development projects the Central Processor project got much attention. In this sense, the Central Processor project was afforded the role of *a battering ram* into the whole organization for introducing new ways of thinking about how to develop products.

Also a much more stringent time schedule was introduced for the Central Processor project. Shortly after his appointment, the new head of the R&D organization reduced the project's allotted time by five months. The new schedule impacted heavily upon those in the project:

> (Q: Describe the journey with the project the last two years). It has actually been very tough, very hard. It has been really stressed and much has always been focused on time - on how to be able to get things done in time. Time has been overriding everything else (Team leader, Central processor project)

> It is really a tough time plan. I have not ever experienced anything like it (Technical coordinator, Central Processor project)

The change did not come easy. Instead, the managers' new initiatives were interpreted as a devaluation of previous experience of developing the AXE processor, and gave rise to considerable tension and clashes within the project.

> There were many of us who said: "We have been developing the APZ processor for twenty years. We know our work. People from other parishes should not come here and tell us how to do our job". It's possible that these methods may have worked elsewhere, but our work is a specific case (Team leader, Central processor project)

Significant frustration arose among both the new managers and the engineers that stemmed from proud traditions of AXE development. Many of the most experienced engineers simply did not accept the new managers' way of thinking. Thus, the managers discovered with difficulty that diffusion of organizational practices is a slow process.

> The learning here should be that the system knowledge it took the APZ house many years to build can not be easily transformed into a new organization in merely a few months (excerpt from 'kick-out' report, Central Processor project)

3.5. Processes with high levels of ambiguity

A well spread understanding of how the life cycle of product development projects is that it gradually unfolds and perpetuates a linear and sequential process. It starts with an idea that is subsequently transformed into drafts, layouts, drawings, and prototypes, until the objectives are eventually realized and manifested, e.g. a new product is created. From this perspective, a product development project appears as a 'cool', smooth and well-controlled process.

The realities for both the Central Processor and Mobile system projects were far removed from such textbook ideal of how product development should evolve over time. Rather, these two projects seemed closer to the continuous processes of crisis resolution with their members experiencing severe anxiety and distress. The day-to-day reality of the two projects was often characterized by constant fire fighting to cope with the tough time demands from customers and senior managers and the various problems that arose.

> We have experienced many different moods in the project. Right now, it feels like someone has emptied a load of gravel onto us. Again. (Assistant main project manager, Central Processor project)

However, there were also positive periods of affirmation when the situation appeared promising. Thus, the projects often swayed between hope and the deepest despair.

> Now, they are on track. They are on the move. Even from a distance, one can both hear and see that the project managers are beginning to find their way. They even walk differently compared with just a few days ago. (Director of the project office in the organization hosting the Mobile system project commenting on the appearance of the main project manager and the deputy main project manager)

Although anxiety and distress were often present in both projects, the sort of ambiguity they met differed. While the Central Processor project was hit by a shock occasioned by difficulties of *how* to perform the development task, the Mobile system project experienced confusion in terms of *what* to do, chiefly because of unclear customer demands.

3.5.1 Ambiguity of 'how' in the Central processor project

The Central Processor project's 'what issue' was quite clear ("develop a central processor for times faster!"), but the path and the technical solutions to get there much were much more ambiguous. This indicates that the question of 'how to do it' became much more confusing. During the initial period of the

project many unknowns were present in terms of how to develop the central processor, and these issues remained in the project for quite some time. For a considerable period, the Central Processor project endured disorder and confusion. The first two years presented various problems and setbacks. Some project members and stakeholders outside the project began to question whether the project would realize its planned outcome. The external stakeholders had either lost their hope or had very low expectations. The following comment made by the project manager during an observed project management meeting in early 1997 illustrates the situation:

> The system manager visited one of the business units the other day (an Ericsson unit making use of the products developed at the R&D organization). They had not realized that we would develop a new product. They thought that is was not going to be anything, at least not before 2010.

The extended period that had elapsed since the last APZ processor was developed demanded a rather extensive technology leap to be taken predominately regarding the integrated circuits

> It is an extensive architectural change we are now approaching, involving a radically new approach. It is probably the largest step that has been taken when it comes to APZ processors. (Hardware engineer, Central Processor project)

Considering the said technology leap, the technical design work showed to be difficult to plan and evaluate in advance. The work became much more complicated than expected.

> It is more complex that we thought it would be. Perhaps we have not grasped all hardware problems yet, even if we should have gained a good picture by now. (Project manager, Central Processor project)

The multitude of technical unforeseen circumstances meant that it became problematic to arrive at guiding answers of *how* to perform the development tasks. In this regard, the Central processor project constituted a more genuine R&D endeavor, in comparison to the Mobile system project, with many unknowns about the product that required continuous reassessment and evaluation.

> "In this project, we have really been exposed to the general problem of development work: the fact that it has not been done before, makes it impossible to know for sure how do it and how long time it will take (Hardware engineer, Central Processor project).

3.5.2 Ambiguity of 'what' in the Mobile system project

In the Mobile system project, the members of the Mobile system project experienced significant difficulties establishing a stable scope for the project. At the end of the pre-study, the project management team summarized their impressions of their forthcoming task as follows:

"The only thing we can say for sure about phase 7 is that there will be changes in the scope all the time (excerpt from Pre-study report)

Generally, they were accurate with their forecast. At its inception, the project still lacked a signed agreement with a customer. Therefore, a number of changes in the scope took place while the projects were operating in order to present a system that would appeal to customers using the previous versions of the product. These changes in the scope also meant that the project had great difficulties in creating the stability needed for the practical design work.

When the pre-study of the Mobile system project was initiated in early 1996, the project only included one delivery. Scheduled for mid 1998 the delivery primarily aimed at improvements of the mobile system in use at the customers' sites, including new radio bases. Shortly thereafter, however, changes in regulatory requirements meant that another delivery needed to be added to the scope of the project. As new hardware had been developed for the AXE system, a hard ware modernization delivery was also included in the project during the fall of 1996. Simultaneously, another delivery was established that contained the new functionality of Internet applications, which was then added to scope of the project. Apart from a radio base delivery included from the start, a second radio base delivery was inherited from the previous project generation. To summarize, during a time span of one year from January 1996 to February 1997, the scope of the Mobile system project changed five times. Each change meant an addition of another delivery. At the beginning of 1997, the project retained six deliveries in total.

Because of low customer interest for Internet applications, this delivery was later cancelled. For similar reasons, one of the radio base deliveries also stopped. Thus, during 1997 and 1998 delivery after delivery was dropped, resulting in only two remaining. This meant that changes in the scope of the Mobile system project to place up to a point in time when about 2/3 of budgeted time had been consumed.

3.6. The project results - Two partly successful projects

Both projects sustained difficulties in meeting their targets, but could still be regarded as partially successful efforts.

3.6.1 The Central Processor project - A financial success despite continuous delays and excessive over spending

The Central Processor project was not able to meet any of its originally targeted functional, financial or time objectives. At the end of the pre-study, the Central Processor project first deadline was 45 months for completion. The end result showed 58 months, nearly 30 % more time than expected.

In terms of financial resources, the final figure was nearly four times the first approved budget (the project's estimated cost when official pre-study started in Dec. 1994). Similarly, the functional goal that demanded a processor four times faster than its predecessor was not met, due to fact that the final product delivered only 80 % of the targeted speed.

The continuous time delays became an issue that necessitated frequent discussion, both inside and outside the project. The targeted time goals began to slip away already at the very start up of the project. As a reaction to this tendency, management began to supplement more personnel to the project (both hired and consultants). However, this approach created another issue. As Fred Brooks (1975) has noted regarding the mythical man month, adding personnel to a project running behind its initial deadline may delay it even further. The Central Processor project is testimony to Brook's theory as many of most experienced personnel became occupied with the task of introducing the new personnel to the project rather than engaging in the operative work of developing a new system.

Although the stipulated functional, financial and time goals were not met, the Central Processor project could still be viewed as successful. More importantly, the units within Ericsson making use of the APZ processor warmly welcomed the product. The product also provided an excellent business case for Ericsson despite the substantial investments. Calculations made on payback time on the investment show that the costs invested into the project were gained within half a year. In addition, new methods of developing complex products were also generated during the project.

3.6.2 The Mobile system projects – high quality output but symbolically important delays

The Mobile system project suffered from an unstable project scope over an extended period. In fact, rather dramatic changes in the scope took place up to a time when less than 1/3 of the available time was left. Despite these difficulties, the project was able to deliver a high quality mobile system (almost) in time.

> The Mobile system project must be regarded as successful. The in-service-performance figures seen today are the best ever [in the organization], even compared with all other Ericsson mobile systems. (Excerpt from final report, Mobile system project)

The project also managed to keep its spending within the approved budget. Thus, in relation to the functional and financial goals, the Mobile system project met its targets.

However, due to the unstable scope, the timetable did suffer somewhat. In fact, the Mobile system project did not meet its time plan for either of their two deliveries. One partial delivery was made one week later than stipulated, although the complete rollout of the system was made according plan. The other delivery was delayed by one day compared to the contracted date.

Although the delays may seem minor and almost negligible in comparison to the Central Processor project, they were symbolically important. It was the first time ever that delays occurred in the organization! The main project manager and his deputy were amazed that the delays occurred, and reflected on what the delays could mean for forthcoming projects.

> (Were the delays a disaster?) The consequences were positive, the quality increased. But, what does it mean, do we change the culture in the organization now?

4. Six central problems for complex product development

The process of developing a new product generates a number of technical and organizational problems to which a number of real time corrections and coordination must take place, possibilities investigated, alternatives chosen, and solutions provided. Furthermore, the actual progress has to be checked and controlled in order that it follows the route of the project (Clark and Wheelwright 1993:301 and 367-68).

As stated in chapter one, problems are in this thesis defined as junctures in the product development process in which it can go seriously wrong (Pava 1983a: 19). Such problems can be seen as obstacles to the creation of an expected outcome that occurs during a product development effort.

In the socio-technical literature, basically any issue perceived as ambiguous, uncertain or equivocal would form a suitable subject for further deliberations in which the 'fuzziness' of the problematic issue can be reduced (Pava, 1983: 58 and 126; Pasmore and Gurley 1991:369-370). Classic issues that may impede an expected output are errors in the earlier phases that cause problems at a later date - 'transmitted variances' - and events outside the system that cause disruptions on the inside - 'boundary variances'. In more detail, Pava (1983:97) identified a number of issues that should be addressed in software engineering team to make a contribution. Among them were: how and which stipulations of the system features that should be made, outline of the system, and keeping pace with hardware changes. Lundqvist (1996:22) also provides some examples that may need to be addressed in a product development process: which material to be used, the specification of the product, trade-offs between the degree of manufacturability and serviceability of a component. Also problems related to the environment "elicit identification of recent market and competitor trends" and the project context "appraise and match dispersed development resources" may constitute problems that need to be deliberated (Pava 1983a: 133).

However, although related in many ways with the issues brought up above, this study argues that six problems were more important than others in the two projects (se also Exhibit 4-1 below): (1) the system expert bottleneck problem; (2) the technical problem; (3) the interface problem; (4) coordination problem; (5) tracking problem; and (6) boundary problem.

Complex of problems	Definition
The system expert bottleneck problem	Shortage of carriers of system knowledge creates bottlenecks in the organization of complex tasks
The technical problem	Difficulties of detecting, signaling and solving technical problems that occur during work on the design object
The interface problem	Problems of fit and function that occur at the interface between two or more sub parts
The coordination problem	Difficulties of collaboration due to poor mutual understanding across sub-groups
The tracking problem	Difficulties in finding guiding answers regarding the progress of the project and its sub-parts
The boundary problems	Instability of the project's scope and resources

Exhibit 4-1. Identified and defined complexes of problems

Beside these six problems, many other problems certainly existed that differed from the characteristics of the problems outlined above. Such problems may have to do with personal conflicts, software tools for project management, recruiting the right people, etc. which I have come across in the interviews with people in the two projects. In comparison to the six problems focused here, however, they seem to be of relatively lesser importance in terms of obstacles for the complex product development process.

4.1. The abductive process of understanding and defining problems

The experiences and perceptions of the people working in the projects have been of foremost importance when identifying the problems. Thus, I have employed a 'project outlook' on these issues. If problems had been identified and described from another angle, for example the perspective of the senior manager, from production, the subcontractor, or the customer, other problems would probably have arisen retaining different characteristics.

An abductive method, discussed in chapter two, was used to collect and analyze the empirical data regarding the problems. In the first round of nondirected interviews (in total 20 persons), different types of problems became a major theme. Therefore, I attempted to understand and define the

different types of problems present in the projects that were tabled for discussion.

Firstly, when sorting the material, the information from the interviews and collected documentation was entered into a qualitative structuring and analysis software program (ENVIVO). Via an inductive and iterative process, the material was thereafter categorized while further analysis was undertaken. The results of the first analysis comprised approximately 40 different categories, whereby each category represented a specific problem.

In order to reduce the number of categories, an initial clustering of the 40 categories was made according to their relevant similarities. The results displayed four different complexes of problems. A preliminary empirical definition of each problem was also suggested. A preliminary cross-case analysis was also made to verify that each problem retained an empirical relevance towards both projects.

At this stage, when a somewhat clear assessment of each problem had been achieved, a more thorough examination of the relevant literature was conducted. According to these studies, it was evident that some of the problem's characteristics could be further separated into more distinct classes while others could be merged. Similarly the definitions of these complexes of problems were developed further.

With a number of rather well defined problems at hand, I decided to return to approximately half of the respondents previously interviewed to conduct more detailed interviews. In these follow up interviews, I noted in what manner the respondents reacted to my list of problems and asked further questions about those problems. Due to my own increased understanding of the problems and thus an increased capacity for phrasing knowledgeable questions, richer and more detailed descriptions of the problems were collected. During these interviews/conversations, I became more aware that the two of the previously defined problems were two sides of the same coin. Thus, they could be merged and assessed as one problem.

From the final interviews, the collected data was also entered into the Envivo software, and then coded into to the characteristics for each problem. Literature was consulted once again in order to increase my understanding of specific issues that were either raised in the follow up interviews or which I began to reflect upon as a consequence of these interviews. A number of categories representing sub problems were also omitted and treated as a residual issue, as they did not fit into any of the now rather distinct characterization of problems. A number of adjustments and refinements of characterizations and definitions were subsequently achieved during the writing process.

4.2. *The system expert bottleneck*

System expert bottleneck problems are defined as the problems associated with the shortage of carriers with a specific type of comprehensive technical knowledge, here referred to as *system knowledge*, which is most urgently needed in a complex product development effort.

While the technical problems may be complex, a fundamental problem in its own right is to have the appropriate knowledge available when dealing with particular issues. Thus, similar to the findings of Iansiti (1995; 1997), I suggest that the utilization of system knowledge be of great importance to the development process.

In his study of flexible and concurrent approaches to complex product development, Iansiti (1995: 49 and 53-54) found that the design of the said process requires an emphasis on discovering and capturing knowledge about the interaction between new uncertain technical possibilities and the system, prior to committing to a particular concept. Thus, it is of critical importance to have system knowledge and the carriers of it available in situations when it is called upon. Otherwise, many critical problems that arise during the course of a product development project will run the risk of remaining unsolved.

4.2.1 Nature of system knowledge

It is possible to distinguish between the product as a system and the product as a set of components. This in turn underscores the idea that a successful product development requires two types of knowledge: component and system (or architectural) knowledge.

Henderson and Clark (1990: 11) define component knowledge as the fundamental knowledge underlying the individual components of a product (maintenance functions, circuits, radio base technology, cables, cases, etc.). Furthermore, it is the knowledge about each of the core design concepts and the way in which they are implemented into particular components. System knowledge, on the other hand, is knowledge regarding the ways that components are integrated and linked together towards a coherent whole (for example a mobile system or a central processor system).

Thus, system knowledge can be described as a comprehensive technical knowledge about the technical system and its internal and external relations. It is directed considerably towards understanding how technical matters are linked. However, the broader picture that system knowledge represents is not generated in the expense of deep technical knowledge. On the contrary, those with this type of general understanding about the system usually carry deep practical knowledge within more than one component knowledge domain of the system being produced, for example testing, hardware, signal trafficking or

software coding procedures. This pattern indicates that a deep technical understanding should be seen as a prerequisite for the development of system knowledge. In turn, system knowledge is system specific (Göranzon 1988: 16), as it deals with problem solving skills and an understanding acquired from deep involvement in a specific practice.

The knowledge is acquired predominately from being active for many years in the practice of developing central processors or mobile systems. Thus, mastering the practice is developed by having been exposed to numerous and varying problematic situations of error-location (Dreyfus and Dreyfus 1986; Göranzon 1988; Levinthal and March 1993)

> "This is a type of knowledge that one has developed during the years while working here. I think it is special and unique with regards to understanding how things are linked. One has to be able to understand the whole system. And it is not a small system we are developing. And for sure, it is nothing that can be learned during one day! It is something you develop step by step by being involved for a long period time. (Technical coordinator on sub project level, Mobile system project)

4.2.2 Carriers of system knowledge

It takes a long time to acquire system knowledge and it is difficult to transfer from one person to another. When asking about whom is carrying system knowledge, the same names consistently arose. Thus, the experts carrying system knowledge are clearly evident[1].

> "The things that occurs regarding the important technical matters can always be derived from the action of about 10 persons. They are the same 10 people in all of our projects" (Line manager, Central processor project)

From these numbers, it seems that less than 5 % of those people engaged in the two products development projects can be labeled as 'system experts'. The inflow of system experts is very low. Besides the difficulties of acquiring system knowledge, the time consuming commitment and the low official status that comes with role of being a system expert may also hinder an increase of available system experts.

4.2.3 The bottleneck

The need for system knowledge existed at many levels and during different activities within the two projects. In general, it can be said that system knowledge was urgently needed to manage any situation that, from a technical

[1] The system experts are engaged in a number of roles in the projects. Common official roles are the technical coordinator on main or sub project level, and product or sub product responsible in the line organization. Supplementary to the official roles, the system experts are also engaged in a number of important, but unofficial roles. Some examples are troubleshooters, informal project leaders, pivot, uncertainty reducer, mouthpiece for the system-related issues, and a bridge between the engineering community and the managers.

point of view was perceived as difficult, problematic, or 'extraordinary' and thus of a more complex nature[2]. Apart from these situations, people with system knowledge were also used for making formal and informal remarks about what is 'good and bad' design work through reviews of the design work of others.

Despite numerous actions undertaken on behalf of the two organizations to mitigate the effects of the system expert bottleneck problem, they rarely proved to be successful.

> "We have great troubles with increasing the numbers [of system experts]"(Project manager, Central processor project)

The constant need for system experts to participate in many activities throughout the projects make them one of the most critical resources in achieving project success, which is well expressed by the manager below:

> "Despite the large number of people involved in our product development projects, the progress made in these projects can be derived from the actions taken by a very limited number of people" (Project office manager at an R&D unit within Ericsson)

The pressure on individuals carrying system knowledge was therefore extreme. Their attention is demanded at all times. As their help is needed at many places simultaneously, it results in fragmentation of their work. The scarcity of those people with system knowledge also creates a vulnerable dependence on a small number of people, both for an ongoing project and the R&D organization as a whole.

> "We are totally dependent on these people. If someone is home sick for a couple of days, our progress drops immediately. (Main project manager, Central processor project)

The expertise bottleneck developed into problems of planning, caused delays in the start up of projects, resulted in reduced guidance for the less experienced, and limited the possibilities for up-scaling and parallel activities.

> "We had problems with system experts becoming bottlenecks in our projects. They were needed all over the place at all times – at inspections, trouble analyses, in management meetings, etc. (Sub project quality coordinator, Mobile system project)

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[2] An example of such a situation is when to use the flexibility of system software to overcome possible problems with the relatively inflexible hardware design or when a decision is to be made about changes in the product configuration – a matter that has impact on several sub parts and the external (technical) interfaces of the system. Those people with system knowledge become important because of their ability to foresee problems and the possibilities for different alternatives. This is a competence that no one else has, apart from the system experts. Another example of how system knowledge is used in practice has to do with mysterious or inexplicable situations. An example is where an application does not work as expected. In these situations, a deeper analysis and error detection process involving system knowledge is necessary.

In other situations, the people carrying system knowledge were foremost involved in the operating parts that retained high levels of unpredictability. In practice, this usually corresponds to the first critical steps of designing a new block that constitutes the frame from which the forthcoming work is done.

In both projects, the system experts became a major bottleneck for a large number of activities. Indeed this was a critical problem, which had a wider impact. It is not simply finding ways to solve a technical problem. The whole project and its ability of creating an expected output could be jeopardized if the competence of solving the most critical problems is lacking or arrives at late stages of a project.

Lack of system knowledge often lead to the use of costly and traumatic crisis operations (see e.g. Engwall and Svensson 2000) and can probably explain some of the many the project failures that can be found among product development endeavors.

4.3. The technical problem

Technical problems are defined as the difficulties of detecting, signaling and solving problems that occur during the direct work on the design object. Technical problems commonly cause rework and delays in the projects. Things do not work according to expectations and a new route for the design work needs to be tested. This makes the design process closer to one of 'muddling through' (Lindblom 1959) with numerous changes and adaptations during the process, rather than a well-planned, smooth and linear process where the product gradually evolves.

> "We worked really hard, and we were really under stress. Despite that, it showed after a while that we had to redo most of our work. We had to rewrite and start all over again (hardware designer, Central Processor project).

4.3.1 A small number of problems cause much trouble

Often, a limited number of technical problems can consume a disproportionate amount of time in the process of solving them. These types of time-consuming technical problems were commonly labeled as 'stinkers'.

> "We know from earlier projects that a few occurring problems can consume a disproportionate amount of time put on rework. This means that we ought to try to identify potential stinker products and decide what to do to avoid that they become stinkers!" (Excerpt from Quality plans document for Central Processor project)

Hardware problems (such as circuits) were more commonly regarded as stinkers rather than software problems because of the many elements and costs involved in replacing them[3].

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[3] Hardware redesigns are troublesome because they are costly and take longer time to solve due the more complicated procedures of producing them. As a prerequisite for the micro- and software programs, changes in the hardware may also cause changes elsewhere. Therefore, it is preferable to make a "work-around" in the software, and adjust to the circuit that is produced, instead of changing the actual hardware.

"Generally speaking, one may say that a small error in the hardware may cause several weeks to solve, while a problem within the software can be solved in an hour. (Software line manager, Central Processor project)

An extensive effort was made to detect 'potential stinkers' in both projects, in order to avoid as many surprises as possible. However, many technical problems were not foreseeable. They had to be solved *ad hoc*. Thus, despite the comprehensive planning of a forthcoming project, one may assume unexpected circumstances to arise, especially if the project make use of or develops front-end technology.

The technical problems, however, need not always be of an extremely complex technical character. They may also deal with rather basic technology such as cables and connectors. These types of problems are easily underestimated.

Within Central processor project we saw the 'classical' issues such as cables, connectors, PCB, EMC, heat...The main problem is that these things are supposed to work from a project point of view. Project managers tend to underestimate the variety of possible problems and also the fact that problems found often take very long to correct" (Presentation made at an ending ceremony of the Central Processor project)

These different sort of technical problems draw attention to a fundamental dimension present within the context of product development: the distinction between situations or tasks that appear analyzable or systemic (Thompson 1967; Eisenhardt and Tabrizi 1995) and complex or simple (Levinthal and March 1993). According to this distinction, 'stinkers' generally are those problems that are complex, and more so, those that have a system appearance.

4.3.2 The late detection of complex technical problems

Technical problems detected and signaled in the late phases of a project are of course troublesome when the potential for change is greatly reduced (Engwall 1995:52-53). The entire project may therefore be jeopardized by these severe technical problems when limited time is available for correction and rework. However, there are a number of reasons why (especially the complex) technical problems tend to appear late in the project's timeframe, despite attempts for early detection.

First of all, developing a new product involves a learning process that takes trial and error and subsequent reflection to find suitable directions for the work (Purser, Pasmore et al. 1992). Prior to the start of the project, all knowledge regarding technical solutions is not available, as the product has never been built before. Many 'unknowns' exist at this stage, which are gradually explored over the project's life. Thus, knowledge about the constrains and the possible ways of designing the product are compiled as the

people involved in the project acquaint themselves with the product's conception by solving various problems that appear. From a knowledge perspective, viewing a product development effort as a learning process makes much sense. However, from a planning point of view, this becomes more problematic.

As an example of this issue, one project manager in the Central Processor project expressed, midway through the project, an increasing anxiety that the most difficult technical problems were probably yet to come. Similarly, the technical design work appeared to be more complex than what he thought it would be. To a large extent, he was right.

> Perhaps we do not know about all problems, i.e. the really heavy ones. Perhaps we are working with only surface issues and the deep heavy problems are yet to be discovered. It is a lot more complex than I thought it would be (Software engineer, Central Processor project)

Furthermore technical problems appear late in the design process due to the fact that most parts of the technical system have to be in place before the problems can be detected. Despite simulation equipment and other tools, the most certain tests can only be made when everything is in place.

Also the human mind's ability for perception and making 'gestalts' out of the information on errors may cause the risk that potential problems are not initially taken seriously when they sporadically occur. Humans react to elaborate patterns of stimuli, usually with little awareness of their individual parts. Many of the technical problems may at first be of an ambiguous nature and hence open to various interpretations. In these cases, in contrast to the more visible and stable technical problems, it is easy to interpret ambiguous or sporadic information of errors from lab reports as a 'no problem'.

> "We always have a list of errors. The very visible and well-defined problems are always easier to act upon than those, which one may only suspect to exist, as they appear in a more sporadic manner. I suppose it has to do with the human nature - you tend not to see the sporadic errors, or make the conclusion that in the next round, they will be gone (Main project manager, Central Processor project)

4.4. The interface problem

The *interface problem* appears as multiple resources, functions and disciplines are needed to transform an innovative idea into a concrete reality – so much so that individuals involved loose sight of the whole effort. Product development projects are not an individual led, but a collective achievement involving many people and functions. As a consequence, the problem of putting the parts into a whole and vice versa is created. The interface problem is a significant problem for many organizations, but perhaps most visible for innovation and product development activities (Van de Ven 1986: 598):

Basically, this problem starts when an idea is expressed from one person to another. Then, it proliferates into multiple ideas as people have diverse frames of reference that filter their perceptions. These differing perceptions are amplified by different functional or professional references. As such, a product development effort becomes a highly complex and interdependent activity.

> The less people you have to cooperate with, the easier it becomes. It is impossible to know what everyone in the project is up to (Senior line manager at the hosting unit of the Central processor project)

The traditional (and perhaps prevailing) approach of handling this complexity and interdependence within organizational design has been by a division of labor. Labor is divided among specialists who are best qualified to perform unique tasks and then to integrate the specialized parts to recreate the whole. However, the whole often turns out to be less than or a meaningless sum of the parts because the parts do not add to, but subtract from each other. The basic principle of contradictory part-whole relationships is that "impeccable micro-logic often creates macro nonsense" (Van de Ven 1986: 598).

Although the interface problem may be multifaceted, I will focus on the problems that become visible in the process of assembling a product's sub parts. The interface problems often appear in the shape of concrete difficulties where two or more sub parts are assembled and their functions integrated.

Two common types of interface problems are problems of function and problems of fit (Thomke and Fujimoto 2000:129). In terms of the problem of function, developers are concerned with the actual performance of a product. Thus, when the sub parts are held apart, their internal functions may function appropriately. However when assembled, the whole system does not work due to problems in the interface between the two, as exemplified below.

> (Q: Which are the problems that are hardest to eliminate?) "One example is the difficulty in sending in- and outgoing signals through all sub-systems. It all becomes very complex as several projects and many people are involved. (Quality manager and designer, MS project)

Concerning problems of fit, different parts and/or subsystems occupy the same coordinates within a three-dimensional geometric space. In other words, they do not fit because the parts interfere with each other. These types of problems are very common during the geometric integration of a complex product. Problems of fit may not always be of a very complex technical nature. The witnesses to very trivial part-whole problems are many. In one of the project's generations prior to the Mobile system project, an internal demonstration of the mobile system showed that the case of one sub component was too wide. Consequently the component could not fit into the rack in which the system was supposed to be delivered. The same

demonstration also exposed a number of other errors, from missing parts to mechanical errors. For many of the engineers participating at the demonstrations, it was the first time that they saw a complete system put together (Söderlund, 1998:54).

Both types of interface problems (fit and function) deal with the difficulties of understanding the entire technical system before it has been assembled. Due to the fragile concept of 'the whole' early on in the project, informal priorities on sub levels determine the action and focus of the development efforts.

> To be able to develop this central processor unit, certain hardware needs to be in place. However, this may differ with the opinions of those in the hardware projects regarding which parts are the most important to be developed first. There, the internal parts may seem more important rather than the common parts. This happened to us. When we finally realized that we had this problem, it was too late to make them (the hardware project) change the direction of their work (Project manager, Central processor project)

4.5. The coordination problem

A coordination problem is defined as the difficulties of achieving collaboration and aligned action among many people due to poor mutual understanding across sub groups.

The product development projects studied in this thesis comprise a large number of hierarchical layers and a plentitude of functional boundaries that separated the people engaged in the projects. In addition to the functional and hierarchical separation, both projects were also geographically dispersed across many different locations and countries. This separation calls for activities that integrate the efforts of the people involved. Therefore, overcoming language, knowledge and culture differences in order to create possibilities for mutual understanding across sub groups becomes the fundamental key on which coordination within a product development project can take place.

Most commonly, the problem of creating mutual understanding across sub groups has been framed as a horizontal problem that is created at the border between specialist, for example between design and manufacturing engineers. I will also emphasize that this is also a problem that exists at the border between different hierarchical levels.

Geographical distance in combination with a large number of project members deems collaboration across activities, sub projects and people difficult (Lundqvist 1996:34-35). Managers from both projects witnessed the difficulties:

> "Communication problems increase with the amount of projects and coordinators as we had in the Mobile system project. Issues of coordination and communication are

the causes of most of our problems and they are also the hardest ones to handle" (Main Project manager, Mobile system project)

4.5.1 Horizontal and vertical coordination

The need for coordination can be formally defined as a need that originates from the division of labor into separate specialized tasks *and* the interdependence between these specialized tasks (Karlson 1994: 154-155).

Coordination between participants can be performed horizontally or vertically. Certainly, two engineers working together can make sure that their activities are coordinated, and if not, make the necessary adjustments themselves. Alternatively, the issue can be channeled through a functional or project manager who, through the use of formal or informal authority, prescribes action that coordinates the two specialists (Karlson 1994: 152). However, such hierarchical differentiation also adds a vertical dimension to the problems of coordination - that between different hierarchical sub-groups.

4.5.2 Separate skills, cultures and languages develop

Separation of people does not end with matters such as spatial and time separation and division of tasks (Lillrank 1995:974). If the skills possessed and deployed by one sub group are not readily understood by another, then cooperation and communication problems arise which creates problems in terms of coordination. A necessary condition for coordination is therefore that differences in skills should be overcome to some degree (Karlson 1994:161).

Within functional and hierarchical sub groups, separate cultures and languages develop (Schein 1996; Karlson 1994:157-160). Schein (1996) proposes that product development activities may be hindered by a lack of understanding between 'occupational communities' or cultures within an organization. The implication here is that understanding the work performed by another functional or hierarchical sub group often is a fundamental difficulty.

> (Q: Which of these relations are the least and most problematic?) Within our own sub-project, it is rather uncomplicated because we all speak the same language (literally speaking). But as soon as one moves outside our own project, things become more difficult, because people tend to view things differently. (Team leader, Central Processor project)

Even if extensive communication takes place, people's different views of issues may confuse the coordination of the project.

> "Within the different function, we use different languages. To make an example, a classic issue as Basic Test - how many different opinions are there about what it should include. This also goes for other terms such as integration, verification, function test, system test, and so forth. It almost seems as though it has been made to cause confusion. . (Project manager, Central processor project)

As a consequence, misunderstandings and conflicts develop, and people begin to work in directions that diverge from each other. The actions taken within hierarchical and functional sub groups may then stand in a dysfunctional relationship to each other, subtracting rather than adding to the efforts contributed by one another. Thus, mutual blame rather than mutual understanding becomes the theme for interactions across sub groups, creating a situation where people interact with each other in a competitive or hostile manner rather than in a cooperative one (Simon, 1976/1945: 73) [4].

Therefore, in order to overcome language, knowledge and culture differences, mutual understanding across functional and hierarchical sub groups becomes the fundamental issue on which coordination within a product development project can take place. This leads to the direction of taking the concept of culture and task specific skills more seriously when discussing coordination across functional and hierarchical boundaries.

4.6. The tracking problem

Organizing complex product development activities is largely founded on perceptions of the connections between time and action in the past, present and the future. Interpreting these connections, managers and engineers alike then try to formulate a notion of the project's current state. Complex product development projects appear as an extraordinary elusive activity and there is a constant shortage of information that can be viewed as 'certain'. Thus, the *tracking problem* is hereby defined as the difficulties associated with finding guiding answers as to how the project and its sub parts are progressing.

4.6.1 "Are we on the right track?"

Product development projects usually devote extensive time to information exchange in terms of how things are running, such as follow up and progress reporting, which aims at creating more 'certainty' about on the project's progress. Actors involved in the product development projects constantly ask: "are we on the right track?", "what has been accomplished so far?" and "what is our view of the expected end result?". By keeping track of the performance of various tasks, formal demands and requirements from internal or external customers and end-users, answers are sought regarding the whereabouts of the project and its progress. Answers to these questions serve an important guiding role for decisions regarding forthcoming action for the projects.

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[4] In a cooperative pattern, both participants prefer the same set of consequences. Hence, if each anticipates the other correctly, they will both act so as to secure these consequences. In contrast, a competitive pattern means that the optimum outcome for the first participant is not the optimum for the second. Hence the realization by the first participant of the consequence he prefers will frustrate the other participant (Simon, 1976/1945: 73)

As an example of the importance attached to these activities, the project management team at the Central Processor project expressed that a guiding measure of progress was one of most the critical factors that may reduce the risk of project failure:

> "[The risk of project failure can be decreased by] focusing on issues of central importance to progress and quality measured at regular intervals. Visible honest progress measured towards exit criteria related to the over all picture creates constructive discussions that solves problems early" (Excerpt from Result of Central Processor project's risk analysis).

The formal and informal activities used to establish the project's status and progress is here labeled as 'project tracking'. The interpretation of whether the project is progressing does not take place in isolation of other matters. Instead, it is very much dependent on 'what ought to have been done', usually defined in an overall project plan. The difference between 'what ought to have been achieved' at a certain point in time (prescribed in a plan) and the interpretation of 'what actually has been achieved' constitutes the image of the current progress situation. Built on an understanding of the planned end result and the current state of progress, time plans and directions for further work are identified. This implies that the characteristics of the plan and how people interpret it are of central importance.

> The idea was to keep the big plan under control, but it was often too difficult to keep it that way. This lead to a divided perception about what actually was going on in the project (Sub project manager, Central processor project)

4.6.2 The 'volatile' perception of performance

To understand the project's status may at first appear rather simple, but when 10 projects and hundreds of project members are involved, no single individual can readily appreciate the complex interdependence of each person's role and the activities being played out. This is the very reason why different forms of project tracking are needed. In combination with an ill-defined perception of the end result and a constantly moving target, project tracking then becomes extremely difficult.

> "It is difficult for management to gain are reliable image of this matter. Enormous amount of time is devoted to getting hold of this image (Main project manager, Central Processor project)

The difficulties are compounded by unknown factors such as whether functionalities of the product will work as planned. Furthermore, people may deliberately conceal information regarding the development of a sub function, and communication may fail to be effective, especially over hierarchical and functional boundaries. The plan to which the progress reporting relates may appear as unrealistic, imprecise, too rationalistic, or lack legitimacy among the

engineers, which in turn erodes the significance of making progress reports. For example, contingent on the plan being used, the whereabouts of the sub parts in a project may vary dramatically. Finally, variances in how plans, important features of the product and the 'actual' achievements are interpreted adds to the divided and unclear 'task reality' for the actors involved.

Project tracking is most difficult during the early stages of the project. This is to a large extent caused by the absence of a concrete product or prototype, which as yet has not been created. Thus, conflicts often took place in the beginning regarding abstract definitions, yet a visit to the lab settled the disputes during the later phases.

> When the integration of the product began, it was no longer possible to go on talking as we did before. Then, hands-on results from the lab showed how the parts of the product worked. People could no longer talk about "how well everything is running" in their sub project, rather we talked about what to do with the time schedule, how to deal with matters that did not work, and so on. (Sub project manager)

More than once, it was evident that the understanding of the current progress situation could change dramatically in just a few days. During the interviews on a particular Monday, the project was on track according to their time schedule. By Thursday of the same week, when the next round of interviews was undertaken, the project was three months behind schedule. This dramatic change in the understanding of the project's progress was due to that additional information regarding unsolved technical problems suddenly surfaced and came to the project managers' attention. This illustrates the rapid changes that new information may impact the interpretation of the current state of the project, making appearance of the project very 'volatile'.

4.7. The boundary problem

A project retains a number of boundaries to its organizational context and environment. The character of these boundaries largely defines the project in terms of focus, expectations and resources. In comparison to more stable activities in the line organization, a project's boundaries may vary considerably as experience is gained and the project's role changes over time, as (among others) both Engwall (1995:166) and Blomberg (1998:32) have noted. This instability in terms of the project's scope and resources has impact on the possibilities to plan ahead and pursue a direction for ongoing activities.

In contrast to ideas expressing that these 'boundary issues' are set and fixed at the initiation, it will here be emphasized that this is a process that is ongoing throughout the entire life of a project. As an example, large number of mid-course corrections and changes of the scope took place in both projects (previously described in chapter three).

> Schedule updates - continuing story? It is a fact that the Central processor project changed its schedules a number of times. This included delivery dates. One time I was asked how it could be possible to show a straight time-line with all the delays we reported (Excerpt from a final-presentation of central processor project)

This implies that many of the project boundaries were not fixed, but constantly up for negotiation between significant actors both outside and inside the project with somewhat conflicting interests. Project activities therefore become 'politicized' whereby political skills and organizational influence are of great importance. Hence, the project's boundaries become the subject of a tug-of-war between actors within the development organization.

> The project scope is for sure a politically important issue for me. As a project manager, I want things to be settled and stable. Changes are in this respect a disturbance. (Main project manager, Central processor project)

Although there are a large number of issues that can be viewed as important project boundaries, the most important boundaries were the overall content and scope of the project in terms of expected *functionality*, the overall *time* schedule (where the final delivery date is the most important), and the *staffing* and organizational assignments of engineers to particular project activities (which often equals to the costs of the project). Commonly, both in textbooks and among practitioners, these three issues relate to each other as 'communicating vessels'. Thus, a project should therefore not be able to score 'high' on all three dimensions.

An incompetent participant in the tug-of-war may severely impede the project's possibilities for success. Insufficient 'boundary management' may cause that project's members to become less dedicated, or simply too few for the task. If the project fails to maintain a fairly stable scope, the project runs the risk becoming disorganized and disorderly. Similarly, instability in terms of scope and resources hinder planning. On the other hand, too rigid conduct from a project manager side regarding demands for change in the scope may cause problems of adapting to market needs.

This problem is to a large extent a process of finding the adequate balance between the project members' need for stability (in order to produce work and plan ahead) and needs for adaptation to the needs of the project's external stakeholders.

4.7.1 The project boundary – a tug-of-war

The process of defining and redefining the project's boundaries can be viewed metaphorically as a tug-of-war, whereby a number of actors employ both formal and informal mechanisms to pull or guide the project towards a particular direction. During this process, the participants end up winners or losers.

In contrast to a traditional tug-of-war, there are more than two ends to the rope for a 'project boundary tug-of-war'. At the center, the ropes connect and constitute the boundary situation for the project. In some cases, it may even be rather unclear who is on which side. For example, a number of people carry dual roles and simultaneously act as a sub project manager role and a resource owner (line manager). Alliances between actors are formed and changed, depending on the issue being discussed.

> Sometimes they (the line managers) acted as a prolonged arm, but also counter parts depending on the issue being discussed (Deputy main project manager, Mobile system project)

At best, a rational balance of interests is created to ensure a high quality product that is delivered to the customer on time. At worst, it becomes a very time consuming, messy and conflict-ridden process for all the participants.

As described in chapter three, the two projects operated in a matrix organization. This implies that a large number of actors were involved in the process of defining the overall scope for a project and the staffing and organizational assignments of engineers to particular project activities.

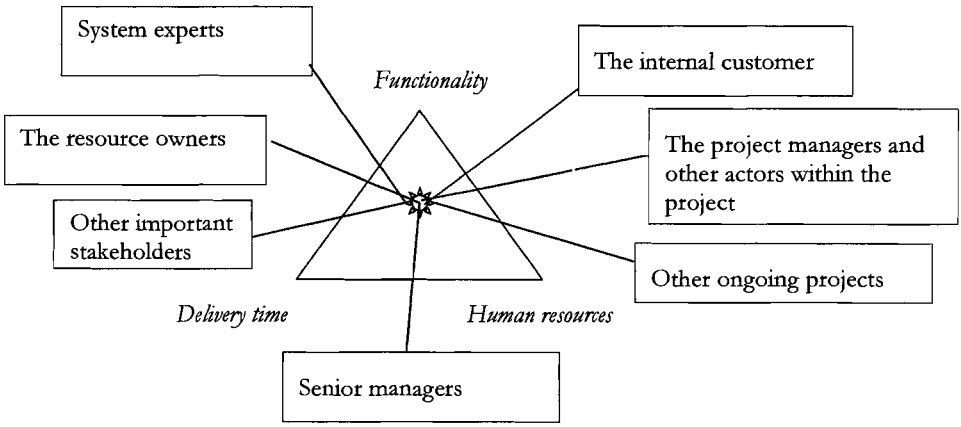


Exhibit 4-2. The project boundary tug-of-war

Six actors with somewhat conflicting interests seem most important. These include the project managers for the main project and project levels, the involved R&D organizations' department and section heads, the internal customers represented by managers from marketing units, other projects operating in parallel within the R&D organizations, system experts, and the senior managers acting as sponsors. In addition to these six actors, the end customer is of course an important player (to say the least). However, the actors identified here are those that are present *within* the system that constitutes an R&D organization. It was predominately between these six

actors where conflicts arose and negotiations about the scope and the resources took place.

4.8. A final note to the chapter

With a point of departure from these six complexes of problems, the 'task reality' and how time and action may be connected appears as very 'fuzzy' and unclear to the actors involved in the two projects. The metaphor of making a voyage of discovery over the ocean with a bad map fits well the descriptions of the endeavors facing a complex product development project. It equates to a number of skilled but sometimes confused specialists, many and sometimes unclear hierarchical levels, combined with an imprecise and changing image about the final destination of its journey. Just as the failure of a crew's navigation may increase the risk of grounding, a product development project's inadequate estimations about their progress may result in a disastrous decision regarding its direction. Furthermore, inadequate steering and coordination may result in groups or individual working through tasks that is not possible to combine later in the project flow, causing hundreds of working hours to be worthless.

As applies to most issues in organizations, it is difficult to separate one element from another. Instead, most elements are interwoven into a complicated web with many interdependencies. This is also the case with the six problems presented here. The problems overlap each other to some degree, and some characteristics of each problem may from a specific perspective be viewed as a symptom of the others.

However, a number of relations between the problems can be outlined. With few technical experts available for the project, more technical and interface problems are likely to occur. With an inadequate management of the project boundary problem, fewer technical experts are likely to be available. Similarly, poor coordination of activities will probably result in an increased number of technical and interface problems and will in turn make it more difficult to arrive at accurate estimations of the project's progress.

5. The meetings and their characteristics

This chapter serves two descriptive purposes. First, the chapter will provide information on which meetings this study covers, and which meetings that have been left out. Thereby, the reader will be acquainted with the meetings before further analysis take part. Secondly, the meetings will be sorted and described according to a number of basic dimensions. One of these dimensions is the time interval between meetings. This dimension is identified as a key factor when comparing the prevalence of meetings across different settings.

To give a summarized account of the meetings most frequently occurring in the two examined projects, the typical meeting was an informal one in which project-related issues calling for immediate attention were discussed. Most often, two or three persons participated and the meeting was ended in less than 20 minutes.

This chapter is divided into eight parts. These introductory notes precede a first illustration of the meetings included. Thereafter, six parts will follow that each display one meeting character: The perceived utility of participating in meetings, the distribution of formal and informal meetings, the meetings' relation to the project, the locations of meetings, the number of participants, and finally the time intervals between meetings. Finally, the concluding section of the chapter will outline the implications for the forthcoming chapters.

Descriptive statistics (frequency tables, mean values, and cross tabulations) will be accompanied by qualitative data from interviews illustrating their significance.

5.1. Meetings included in the study

In this section, a rough overview will be provided of the meetings this study covers. In total, information has been collected from 224 unique individual types of meeting related to the two projects: 99 from the Central processor

project and 125 from the Mobile system project. An individual type of meeting refers to a face-to-face meeting that, even if they take place on several occasions, are *perceived as one unit.* Together, 64 respondents compiled 311 reports on 224 individual types of meetings, implying that multiple reports were made on several. Each individual type of meeting and their labels can be found in appendix 1.

Groups of meetings included in the study	Number of individual types of meetings included in the group	Number of reports made on the specific group of meetings
1. Senior management meetings and Strategic steering committees	5	5
2. Product councils and other formal meetings regarding system design	12	13
3. Meetings regarding improvement activities	3	4
4. Project steering and follow up meetings	11	19
5. Centralized intensive project-line coordination meetings	3	7
6. Main project management meetings	4	30
7. Change Control Board	3	9
8. Project management meetings	14	16
9. Meetings where the entire projects gather	16	21
10. Formal training & knowledge transfer seminars	5	5
11. Formal meetings with customers regarding contracts	1	1
12. Formal demonstrations of product for customers	4	4
13. Participation in other project's steering committees	2	2
14. Subcontractor management meetings	1	2
15. Section- and department meetings	6	7
16. Section meetings at the project office	1	3
17. Technology oriented section meetings	2	2
18. Reference and advisory group meetings	5	6
19. Local project-line coordination and resource planning meetings	3	4
20. Pubs and other planned social activities	3	6
21. Team meetings	9	12
22. System Emergency Board	2	15
23. Coordination meetings regarding activities at the main project level	13	15
24. Formal technical discussions	18	23
25. Coordination and information exchange with customers	4	4
26. Informal discussions with colleagues and project members	11	12
27. Informal coordination of design work through spont. interaction	16	17
28. Management by walking around	2	2
29. Technical surveillance by walking around	3	3
30. Ad hoc coordination meetings between projects	6	6
31. Informal coaching and correction of technical work	5	5
32. Unofficial management group meetings	2	2
33. Informal learning dialogues	4	4
34. Lobbying/unofficial meetings between project and line managers	8	8
35. Project internal lobbying	12	12
36. Cross-talk in team room	3	3
37. Informal customer contacts	2	2
Total	224	311

Exhibit 5-1. Meetings included in the study, sorted into 37 groups

Exhibit 5-1 (above) and the text below describe the meetings briefly. The descriptions are not in depth at this point. Instead, they are described in further detail in chapter nine. The meetings have been sorted into 37 groups. The sorting was made according to their relation to problems that occurred in the projects and the similarity they share in terms of formality and (these two sorting dimensions will be discussed extensively in chapter six and seven).

5.1.1 Short presentations of included meetings

1. *Senior management meetings* and *strategic steering committees* represent meetings where the most senior managers participated. Meetings found within this group were, for example, the top management boards of the organizations hosting the two projects, committees steering strategic market and product choices, and management boards and committees with a strategic focus such as coordination of products across Ericsson.

2. Numerous *product council* meetings took place within the two organizations hosting the projects. These product councils were organized into a hierarchy that matched the structure of the system being developed. The product councils performed a general responsibility for keeping a specific part of the system robust (for example the switching system of a mobile system) in terms of backward compatibility for older systems and documentation of the product. The product councils also organized formal reviews within their domain at regular intervals for the writing of code, hardware and technical documents.

3. A number of meetings are included in which *improvement* for current work practices were discussed. Examples include project methods, verification or testing. Examples of specific meetings are, among others, a Quality Assurance Board (QA-board) in the Mobile system projects that initiated improvement methods and formulated an operations manual.

4. Follow up and progress control of the two projects formally took place within the *project steering group meetings*, located at main- and project levels. In meetings, such as the Operating Steering Group (the OSG), senior managers tried to monitor the project's progression in terms of design activities, and they then arrived at general decisions, such as prioritization for major tasks. Beside the steering committees, a number of other follow up meetings existed as well, such as budget follow up meetings.

5. On several occasions, most stakeholders gathered at the same *meeting to make coordinated plans* and to ensure that line function and project managers were committed to same line of action. Many participants, often 20-30 people, were involved at these meetings. The Mobile system project employed a meeting format called the 'Dalarö-process'. Its name is derived

from the conference site where the first meeting of this type was held in a previous project. Similarly, 'Almåsa meetings' performed a similar role in the Central processor project (named in a similar fashion to the Dalarö-meetings). Later, the Almåsa format of the Central processor project was reduced to shorter meetings, 'CP Friday meetings', held every week.

6. The *main project management team meetings* retained very similar formats. In both projects, the participants were (beside the main project manager and his deputy manager) responsible for each of the included projects and coordinators at a main project level, in total more than 15 persons. A wealth of information was processed here, as the progress of each project was reported and evaluated. Beyond that, the discussions could vary from strategy and technology forecasting to working out personal conflicts between individuals.

7. *Change Control Board meetings* (CCB) were used in both projects to control the influence and implementation of new requirements received after the project's inception. Usually, the main project manager, system management, and market and product management were represented at the CCB.

8. Below the main project level were the *project's management team meetings*. Typically, the participants in the project management team meetings were the project manager, the team leaders, a number of specialists such as technical coordinators, a person responsible for the technical sub system, and sometimes a project administrator. Most project management meetings retained a fixed agenda in terms of transferring issues priory raised at the main project management meeting.

9. Occasionally, managers tried to *gather all members of a project*. Large stand up meetings, seminars, and general information meetings were all examples of this type of meeting. Most often, these meetings were arranged when information of critical importance was to be announced.

10. *Formal training and education seminars* were sometimes arranged. Examples of these types of meetings were seminars and training sessions of a technical focus. These were arranged when new tools or methods were introduced or served to transfer know-how from development to the production site, or vice versa. Seminars with a managerial focus were also arranged with an ambition to transfer knowledge and ideas from one project generation to another.

11. In the Mobile system project, rather many *formal negotiations* took place *with the customer* especially regarding the detailed scope of the contract. A large number of participants were included, for example market and product

management, and installation experts from both Ericsson and the customer.

12. Both projects arranged *meetings to demonstrate the product* to the customer at different phases of the development process. For the Central processor project, an occasion labeled the 'N-sund show' was used to gain attention for the system within Ericsson. A rather similar activity was the road show arranged by the manager responsible for hardware modernization of the mobile switch center in the Mobile system project. Beside these meetings, the Mobile system project performed a number of demonstrations for the customer as part of a contractual agreement. The product demonstrations provided an opportunity to 'sense and smell' the customer.

13. In a similar fashion as the project steering committees, members of the Mobile system and Central processor project also acted as internal customers for other projects and acted as *members of their steering committees.*

14. A number of *meetings* were also held *with sub contractors.* In the Central processor project, for example, one tried to more tightly integrate the activities of the sub contractor to the activities of the project. The managers of the sub contractors viewed this initiative with contempt. Therefore, the meetings proceeded to develop into conflicts and distrust amongst the participants was prevalent. They became time and effort consuming meetings, where coordination between the two parties was sought, but not successfully realized.

15, 16, 17. During *section and department meetings*, those operating within line functions assembled. Here, information was disseminated regarding ongoing projects, new tools and methods for the design work, and future development of the product, and bonding between the unit personnel. Departments intensively involved in the operative technical design work also included discussions of an in-depth technical focus. At the section meetings at the project office the issues relating to the coordination and management of a project was of course focused, as the majority of the members were appointed project management roles.

18. During project reference and advisory group meetings, specialist and line managers gathered to receive information about the progress of the project and then advise the project managers as to a course of action, without formally forcing these solutions upon the project.

19. In addition to the project steering and follow up meetings on a main project level, there were also a number of *formal meetings where line and project managers meet* on a local level. Here, the participants monitored progression and resolved conflicts between the line and the project organization (usually regarding human resources).

20. *Pubs and other social activities* were regularly arranged, both at a main project-, project-, or team level. Often, the pubs were combined with a theme, such as discussing a specific issue (for example organizational culture) or to perform a satirical interpretation of the project target. Although the pubs often retained a level of informality, they were often well organized and possessed an explicit purpose, that being the managers' aim of promoting contact and to encourage a specific thought process and dialogue.

21. During the frequently occurring *team meetings* within the design teams, team members helped each other with technical problems and made plans for the forthcoming work. During these meetings, it was also common that the members performed informal reviews of each other's work.

22. The *System Emergency Board* (SEB) meeting was held everyday in the Central processor project and focused on the day-to-day integration of the technical work. Here, people from different sub projects came together to monitor the technical work's progress and to jointly design solutions for problems. All involved in the project were welcome to participate. However, it was mandatory for each sub project to send a representative (usually the technical coordinator) to the meeting.

23. A number of meetings took place within the project that focused on the concerns for the entire main project that was required to be *coordinated across the projects*. Examples of such issues were meetings discussing quality work, the introduction of new hard ware, planning of testing procedures, production, and internal and external deliveries. One person with a special responsibility for the issue often coordinated these meetings, such as a test coordinator.

24. The development of a system requires *extensive discussion and coordination of the advanced technical issues* related to its different parts. Examples of such meetings were the system forums in the Mobile system project. In these meetings, a senior specialist and the project manager responsible for a sub system invited a number of people from other sub systems that the sub system predominately interfaced with.

25. During the execution of the projects, many *meetings* were held *in conjunction with the customer* in order to *coordinate activities*, make mid-course alterations and to *exchange information*. This also included cooperative solving of technical problems.

26. The *informal discussions with colleagues and project members* are a group of meetings that were rather fuzzy in their character. Due to an indistinct focus, it was difficult to establish who organized them and who was participating in them. However, these meetings primarily included colleagues from the same section- or department and/or project members.

Typical meetings of this sort were spontaneous encounters that took place around the coffee machine, outside conference rooms after formal meetings, in the canteen, or hallway. These meetings spread information and gossip amongst people and sectors of the organization. The content of these conversations was of a broad nature, and could include almost anything, such as the latest political scandal, sport results, and plans for the weekend or technical forecasts. Foremost, however, these meetings included discussions regarding the project's progress and the technical problems that arose.

27. On the day-to-day level, people engaged in *close informal contact within and between groups of engineers*, assisted one another to solve problems or coordinate the technical work more or less spontaneously.

28. Through *walk-around* in the hallway, project managers attempted to understand the design team member's mood and their progress. Managers acted upon problems, often spontaneously, that their subordinates reported.

29. Another group of the 'walk around' meetings was *the technical surveillance* performed by senior experts. Many of the senior experts spent several hours a day in the hallway, and made use of it as a coordination point to monitor progress and to supply expertise.

30. Through *informal ad hoc contacts across projects*, information was exchanged and actions coordinated at the interfaces of sub systems.

31. In addition to the formal technical inspection performed by the product councils, the teams themselves also organized *informal reviews* where colleagues from other teams reassessed their work. These informal reviews were undertaken on numerous occasions as a crosscheck between the formal reviews in order to maintain the quality of the work.

32. Several *unofficial management group meetings* are also included. One example was the result of reorganization, where a design department moved from one business unit to another. During the reorganization, a new management group was assigned with a combination of people from both the new and the 'old' business unit. Those that previously were assigned to the management board prior to the reorganization continued to gather informally and thus formed an unofficial or shadow management board.

33. Occasionally, project managers contacted more experienced managers (who previously had acted as project managers) for advice on how to deal with difficult issues. As an example of such *informal learning dialogues*, the manager in charge of project office (at the host organization of the Mobile system project) informally helped the project managers involved in the

Mobile system project. When someone was in need of advice, they simply knocked on the door and engaged in spontaneous dialogue regarding the troubling matter.

34. Preparations were commonly made in *informal lobbying between line function managers, senior managers and project managers*, prior to formal meetings in order to secure support for alternate decisions. The same channels were also used by project managers to confront line managers with critique that would have caused embarrassment, if put forward at the formal project steering committee meetings.

35. *Project internal lobbying* were informal meetings between two or three project managers or coordinators within the projects (in contrast to the lobbying activities presented above). Here, difficult decisions were discussed and negotiated before they were formally announced, ideas lobbied for, and agendas coordinated and synchronized.

36. Through the *cross talk that appeared in team rooms* (where several engineers of a team shared an office space) help was often gained 'by mistake". Thus, an issue discussed between two colleagues could often help a third who overheard the discussion.

37. Beside the formal meetings with the customer, *informal contacts* also took place, both regarding the contract and later to coordinate and integrate activities, exchange information about operating methods, and in order to deal with technical problems.

5.2. Perceived utility of meetings

In the structured interviews, the respondents were asked, on a five point scale, to express to what degree the meetings they participated in were helpful in dealing with problems that the respondent had at hand The results suggest that most meetings were helpful in that respect.

In fact, 286 out of the total 311 reports made (or 92 %) described the meetings as helpful (rated as 3, 4 or 5). On the five-point scale used (see Exhibit 5-2) 37 % of all reports recorded the highest grade, indicating that the respondents received significant help while participating in the meeting. The average grade was 3.94 and the standard deviation ranked at 1.026. The respondents therefore appear rather satisfied with the meetings, at least when assessed individually.

Scale	Definition	Frequency	Percent
5	Received significant help	116	37.3
4		89	28.6
3	Received some help	77	24.8
2		19	6.1
1	Did not receive any help	6	1.9
Sub Total		307	98.7
Missing		4	1.3
Total		311	100.0

Exhibit 5-2. The distribution of responses for meetings sorted according to their helpfulness.

5.3. Formal and informal meetings

When examining the included meetings, 2/3 (or 150 out of the 224 individual types of meetings) was of a formal type according to the definition suggested in chapter one: those congruent to "that which is planned and agreed upon" (Dalton 1959:219) while informal meetings as those falling outside of this definition.

However, this should not be interpreted as a pretext that formal meetings were more common in the projects, if assessed from the respondents' perspective. What it does say, however, is that this study's coverage has a center of gravity towards formal meetings.

	Frequency	Percent
Formal meetings	150	67.0
Informal meetings	74	33.0
Total	224	100.0

Exhibit 5-3. Distribution of formal and informal meetings

Many of the meetings included can be described as formal *project* meetings (about 40 % of the meetings included from both projects). These meetings display a high level of variation and cover most activities performed within the projects (everything from general management to educational seminars, social activities, and technical discussions of interfaces between sub systems).

The formal meetings that took place outside the project sphere, such as section meetings or product councils, are also well represented (20 individual types of meetings or 16 % from the Mobile system project, and 9 individual

types of meetings or about 10 % from the Central processor project). This may also be said about the meetings run jointly by the project and the line organization to deal with issues at their interfaces. 22 or 10 % of the meetings included were formal meetings of that sort and were represented by 12 meetings from the Mobile system project and 10 from the Central processor project.

Also formal meetings with customers and subcontractors can be found among the included meetings. In total, 12 types of meetings are included, 7 from the Mobile system project and 5 from the Central processor project.

1/3 or 74 out of the 224 individual types of meetings (36 from the Mobile system project and 38 from the Central processor project) are informal meetings. The informal meetings include a great variety related both to the project, the line organization, and the interface between them and contacts with the customer. When examining the list of meetings presented in appendix 1, many of the informal meetings have vivid labels. These meetings were typically those with a clear presence in the respondents work. However, there are also informal face-to-face meetings that were subtler in their appearance, such as peering through the door to someone else's office for an informal chat. Those informal meetings were typically labeled as 'spontaneous interaction'.

5.4. Most meetings have a history and future beyond the project

The meetings included in this study can directly or indirectly be related to the activities of the two projects. However, this does not mean the majority of meetings only existed during the course of the two projects. On the contrary, I would posit that many of the meetings existed before the project's inception and continued beyond their completion. Many meetings therefore reveal a more stable presence than the project organization, and sometimes even in comparison to the line organization.

Firstly, formal meetings were organized with reference to the departmental structure, the product structure (for example product councils), the project structure, the product flow, and the managers of the organization. Thus, only a small part of the formal meetings taking place in an organization can be directly related to the actions taken within a specific project, although many meetings are used by or related to the project.

During the project's inception, a meeting's participants may change, but the meeting itself remains from project generation to project generation. The product council for the APZ system, for example, can be traced back to early 1970, when the first AXE system was created (see Vedin 1992). Despite

numerous reorganizations, this type of meeting still exists today. Other examples are the main projects management meetings, which were organized in a similar manner project after project. The organization of the meeting is simply inherited from the previous project generation. A similar argument can be made about meetings such as the test forum and the 'Dalarö-meetings' that were used in the Mobile system project environment for an extensive period. These meeting continue to exist in all projects, although most of its original members have departed.

> The test coordination is an old forum that has worked well in all projects. (Excerpt from the final report of a project that developed a previous version of the mobile system)

The stable presence of meetings sometimes becomes problematic in that meeting habits were inherited, but those that introduced them have left the organization. The Dalarö-meetings, for example, were introduced four projects prior to the Mobile system project.

> Some meetings, such as the Dalarö-process, were continued only as 'empty shells'. It has never been prescribed, however all believe and expect that we should continue to run the meetings. There is no one to answer about the content of it. (Technical coordinator, Mobile system project)

That a meeting continues to be used despite changes of participants points to the strong existence of a meeting routine. However, the stability of the meetings does not end with the formal meetings. It also seems valid for many of the informal meetings. Some of the informal meetings mirror the existence of very stable informal networks that significantly transcend the existence of a project, perhaps through out the entire working life of some participants. One of the technical coordinators described one of the networks that evolved and continued, project after project, when problems arose or when technically complex matters were dealt with.

> Martin, the key-persons in the design projects, and myself participated in these informal meetings. All the heavy guys. It is always the same people that meet when difficult issues arise in the technical system. (Technical coordinator, Mobile system project)

5.5. *Meeting places*

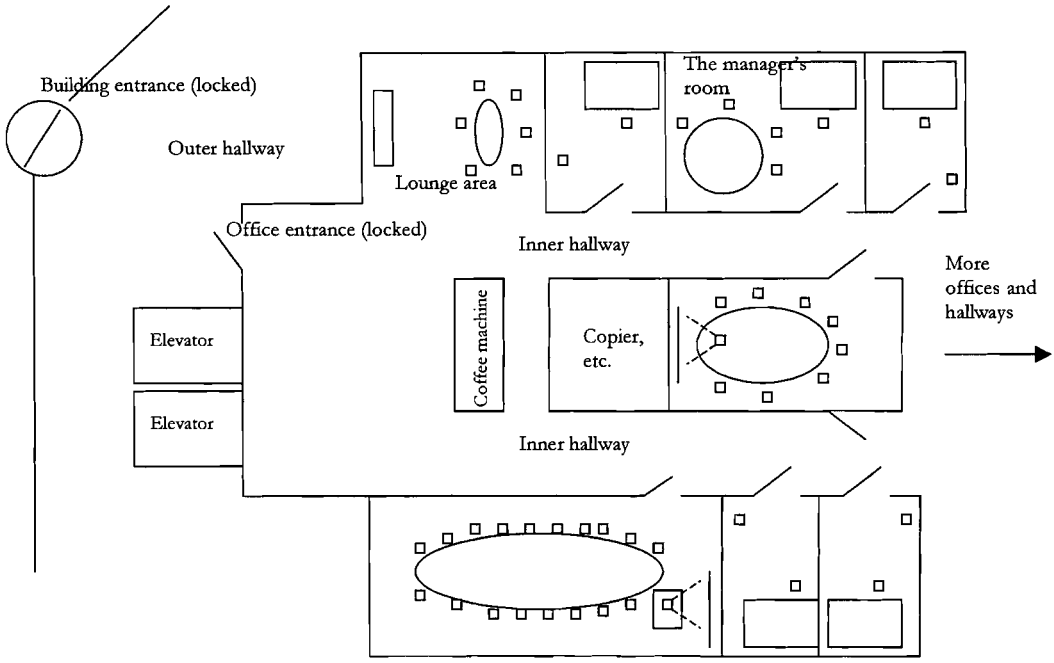


Exhibit 5-4. The physical layout of a typical office.

The location of a meeting makes up important scenery to it. Some meetings were even named after the location where they were first was held, for example 'the Almåsa meeting' in the Central Processor project or the 'Dalarö meeting' in the Mobile system project. The location may also have a symbolic importance for many meetings, in that that they express order, creativity, or equality (cf. knights around the round table). Furthermore, the room where the Central processor project had its main project management meetings was decorated with plans and results from other meetings, indicating what the focus of the meeting ought to be.

Exhibit 5-4 describes how (parts of) the typical physical layout of a department presents for both of the two R&D organizations. Many of the meetings included in the study can be easily located within the physical layout of the office.

In order to access the department's location, it was necessary to enter through a number of locked doors. First, it was required that the main entrance to the office complex be accessed, then, an entrance to a specific part or building, and finally through the department's entrance door. An individual access card facilitated entrance to the door, or through accompanying a person with such

a card. The last entrance separates an outer hallway located outside the office premises of the department, and an inner hallway on the inside of the department. In the outer hallway, an elevator or stairs provides access to other parts of the building, for example to have lunch with a colleague or to walk to the conference room of another department. Here, many informal conversations took place rather co-incidentally while people moved around in the building.

The inner hallway provides an area for informal conversations with other department members or visitors. The copier, the coffee machine and the lounge area comprise the central axis for such interaction. Also some formal meetings utilized the lounge area, for example stand up meetings, where an entire project or department assembled. By and large, the incidental interactions taking place in hallways were extremely dependent on how people were physically located.

The lounge area was usually located adjacent to the conference rooms, where formal meetings were conducted. The close proximity of these locations, provided the opportunity for informal pre- and post meetings to take place as people assembled for a formal meeting or when they left the area. Often, there was one larger and several smaller conference rooms within the one premise. The larger conference rooms were typically used for meetings with many participants, for example sections meetings, project steering groups meetings, main project management meetings, and so forth. While the smaller rooms could typically host team meetings or committee meetings between experts.

The private offices were also used as a location for meetings. Usually, the department manager and sometimes also the main project manager, have larger rooms than others, where a small meeting table, four or five chairs or a sofa, and a whiteboard were fitted to the room. Here, a large number of informal meetings took place between the manager and others, but also some formal meeting with fewer participants, for example when conference rooms were occupied. In other private offices, large numbers of informal conversations took place with the door shut to the hallway especially when they were of a more private or unofficial nature, and open for less delicate subjects.

5.6. Number of participants in meetings

The number of participants in meetings varied from two to more than a hundred. However, most meetings had less than 12 participants. Participation in a meeting could also vary from occasion to occasion.

24 % of the meetings had only two or three participants, among them many of the informal meetings. In terms of who attends them, the respondents

typically labeled the other participants by their names, and expressed a personal relation to them.

"Hans and Per"; "One or a couple of teammates"; "Mats and I, usually".

The participants were between 4-12 persons for 44 % of the cases. Typical examples of these 'middle sized' meetings were sub project management meetings or team meetings. More than 12 persons participated in about 14 % of the meetings. Among these fairly large meetings, main project management meetings and coordination meetings are included. 8 % of the meetings had more than 20 persons and were typically the ones where entire projects assembled, for example stand-up meetings.

When I asked about the participants in the latter three groups of meetings, the respondents most often referred to other participants according to their functional roles or their group affiliation, thus a less personal and more distant expression compared to how participants of smaller (informal) meetings were referred to.

"Project managers within the project and specialist"; "Everyone at the section"

In about 10 % of the meetings, participation varied sporadically. Meetings included in this group were those with an open invitation to the entire project, for example the system emergency board in the Central Processor project, informal meetings at the lunch table or canteen, and some loosely structured section- and department meetings.

	Frequency	Percent
2 - 3 persons	54	24.1
4 - 12 persons	99	44.2
12 - 20 persons	31	13.8
More than 20 persons	18	8.0
Unfixed	22	9.8
Total	224	100.0

Exhibit 5-5. Distribution according to number of participants in meetings

5.7. Time intervals between meeting occasions

An issue of fundamental importance when examining meetings in organizations is the time intervals between their occurrences. This issue was discussed in chapter one, with references to the work of Goffman (1963).

When examining the meetings, it seems clear that most meetings are not one-shot affairs with a single occurrence. Instead, more or less all individual types of meetings included here formed part of series of like occasions, where the

series was seen as part of a unit, and also developed as such, in terms of a daily, weekly, or annual cycle, often with the same participants. Paraphrasing Goffman (1963:19), this means that these face-to-face encounters can be described as *regular* meetings.

The regular occurrence of the meetings included in this study means that they can be sorted according to the time intervals between their occurrences. As a first step of examining their time intervals, all meetings were given a value that corresponded to the number of occasions a particular type of meeting was conducted during one year. A year is here defined as 260 workdays (when weekends and other work free days have been excluded). The meetings that were held once a year got a value of 1, and those taking place several times a day 780 (that is three times a day over a period of one year). All other meetings were given a value that varied between 780 and 1 that corresponded to the frequency of each meeting.

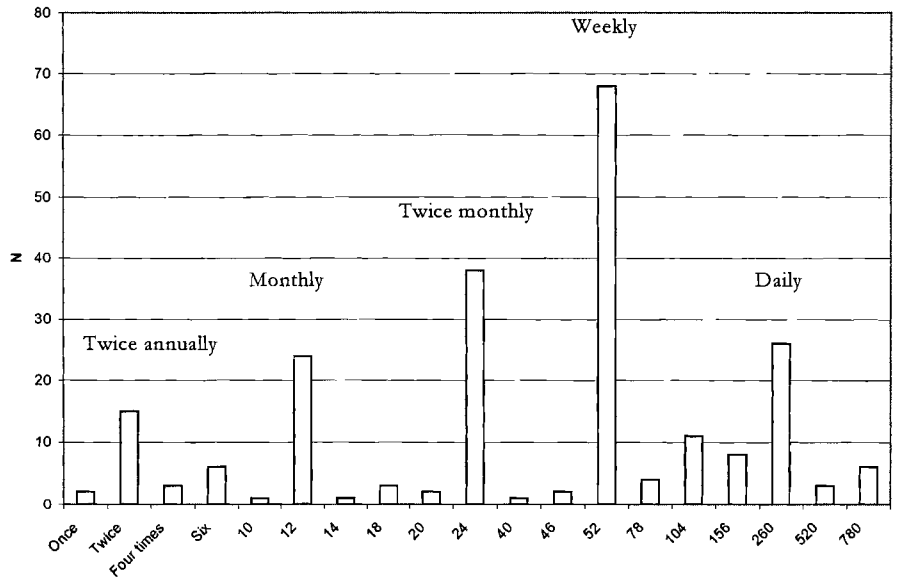


Exhibit 5-6. The distribution of meetings according their occurrence measured over one-year

The distribution of meetings according to the intervals between occasions reveals that some interval cycles were more common than others. The most common time interval were *weekly*, comprising approximately 30 % of all the included meetings, *twice monthly* (16 %), *daily* (12%), *monthly* (11%), and *twice annually* (7%). Thus, the meetings in two projects can be sorted according to these five groups.

Based upon this observation, it seems that most meetings were paced according to the basic building blocks of the calendar: day, week, month and year. Qualitative information about the meetings also supports this finding. Many formal meetings made use of a fixed interval regardless of the present activities in the project.

> The main project management meetings always take place on Thursdays at 12.30 (Coordinator, Central processor project)

However, this pattern also applies to many of the informal meetings. They too occurred with a more or less fixed interval between the meeting occasions. Even those meetings that were explicitly viewed to take place when an important event occurred (i.e. they are viewed to be event-based) they still seemed to assume certain regularity.

> "We always decide the time for the next meeting depending on its necessity (*But how often do they take place?)* Basically, we meet every second week (Team leader, Mobile system project)

5.7.1 Covariance between time intervals and other meeting characteristics

Here, the covariance between time intervals and other characteristics will be displayed. What seems clear is that the proportion of informal meetings increases with shorter intervals. Thus, of the meetings that took place everyday, the majority was informal (see Exhibit 5-7 in the endnotes to the chapter).

The meetings with shorter intervals also dealt with issues that required more immediate attention (as perceived by the respondent), were shorter sessions, and had fewer participants (see Exhibit 5-8, Exhibit 5-9, and Exhibit 5-10 in the endnotes to the chapter). At least the latter two are characteristics that have close connections to informal meetings.

The duration of meetings also varied from less than a minute (a quick chat in the hallway) up to several days (for example management seminars). Generally, the shorter the interval between meetings, the shorter the meeting. Of those daily meetings, nearly half (or 47 %) were short 'meeting flashes' and finished before 20 minutes had elapsed. 15 % of the weekly meetings were similarly long. Nearly all of the other meetings constituted longer sessions.

Similarly, meetings with shorter intervals retained fewer participants. The meetings with only two or three participants steadily increased from 11,5 % of the meetings that took place twice a year to 51 % of meetings held everyday.

These results imply that most daily meetings involved quick interactions that did not follow formally agreed procedures involved few participants, in which issues that needed to be dealt with instantly were discussed.

Those meetings with longer time intervals consequently retained adverse characteristics: most often formal meetings, longer sessions, more participants, and dealt with issues that required less immediate attention.

5.8. Concluding remarks and implications for the forthcoming chapters

In this chapter, the meetings included in the study were presented and described according to a number of dimensions. Several findings of this chapter should be highlighted. First, the two projects did not rely on a few meetings in their work. Instead, a great variation and multitude of meetings was found in both. In total, 99 individual types of meetings were included from the Central processor project and 125 from the Mobile system project. This seems to suggest that a great variety of meetings were needed to cope with the complex tasks present in the projects.

Reports from the two projects also show that meetings were more appreciated by their participants than could have been expected. This result breaks with the negative view often expressed about formal meetings in the socio-technical literature (see e.g. Stebbins and Shani 1995; Pasmore 1997) as well as the popular or semi-academic discourse (see e.g. Drucker 1974).

Finally, meetings' frequency of occurrence came to forefront as an important dimensions when studying meetings, and especially so when comparing the use of meetings across organizations.

This chapter has also shown that meetings often show a more stable appearance than the projects to which they affiliated. Meetings often persist to take place, project after project, even when the original participants had been replaced. In other words, meetings often become institutionalized routines and constituent parts of organizations running temporary knowledge work. These elements generate interaction, relations, and thus commitment between people (Weick 2001:16-17). They also bind action towards managing certain tasks, in or against the formal purposes of the larger organization.

Metaphorically speaking and viewed from the perspective of these constituent parts, the projects appear as 'objects' that pass by on an assembly line. Around the assembly line, the meetings are placed to deal with issues that the projects generate. This view on the projects and the activities performed implies that the 'uniqueness' of a project often is very limited and foremost serves the role of packaging activities under a common label.

5.8.1 This study's coverage on meetings

Regarding the coverage this study has on the different types of meetings, it seems plausible that the study covers most of the formal meetings that took place in and around the two projects. For the informal meetings, however, the method used (i.e. interviews) for collecting information may imply that the respondents have reported on those that they were consciously aware of. Thus questions can be asked, from a methodological point of view, how far in the very subtle region of informal meetings that this study has reached. This also means that only very clear differences should be taken into consideration when statements are made about different settings and their use of meetings.

A number of meetings were also deliberately excluded by design of the study. Thus, meetings that did not have a strong relation to the projects are not a part of this study's coverage. Examples of such meetings could be formal and informal meetings within the human resource department, the marketing departments, and so forth. Other meetings that are not included may relate to the workers union within the organizations, or social activities taking place outside the project framework.

Endnotes to the chapter

	Formal		Informal		Total
	N	%	*N*	%	*N*
Twice annually	24	92.3%	2	7.7%	26
Monthly	21	80.8%	5	19.2%	26
Twice monthly	36	83.7%	7	16.3%	43
Weekly	59	68.6%	27	31.4%	86
Daily	10	23.3%	33	76.7%	43
Total	150	67.0%	74	33.0%	224

Exhibit 5-7. The distribution of meetings according to formality and time intervals.

	Issues that requires an immediate attention		Long term/ varying	Total
	N	%	*N*	*N*
Twice annually	4	14.3%	24	28
Monthly	10	34.5%	19	29
Twice monthly	34	45.9%	40	74
Weekly	54	45.0%	66	120
Daily	36	60.0%	24	60
Total	138	44.4%	173	311

Exhibit 5-8. Distribution of meetings according to perceived demand for attention and time intervals.

Note: Perceptions on the requirements for attention varied for respondents when they reported on the same meeting. Therefore, the cross tabulation in Exhibit 5-8 is based on the 311 responses and not the 224 individual types of meetings.

	Less than 20 minutes		Exceeding 20 minutes		Total
	N	%	*N*	%	*N*
Twice annually	1	3.8%	25	96.2%	26
Monthly	0	0 %	26	100.0%	26
Twice monthly	4	9.3%	39	90.7%	43
Weekly	13	15.1%	73	84.9%	86
Daily	20	46.5%	23	53.5%	43
Total	38	17.0%	186	83.0%	224

Exhibit 5-9. Distribution of meetings according to duration and intervals between meetings.

	2 - 3 participants		<2-3 participants)	Total
	N	%	*N*	*N*
Twice annually	3	11.5%	23	26
Monthly	6	23.1%	20	26
Twice monthly	6	14.0%	37	43
Weekly	17	19.8%	69	86
Daily	22	51.2%	21	43
Total	54	24.1%	170	224

Exhibit 5-10. Distribution of meetings according to the number of participants and time intervals

6. A meeting system with three sub-systems

In this chapter, a classification is explored regarding the *content* of the meetings. That is, the issues that were addressed while meetings were taking place. Classifying meetings according to their content is possible by examining the relationships between the meetings and the six problems identified in chapter four. The outcome of this analysis is a one-dimensional axis on which meetings can be located based on their relationship to the problems. The axis provides an illustration of the span of activities that are included in a product development project. Three clusters of meetings are identified on the axis, pointing to the presence of sub-systems inherent in the projects with a division of labor when it comes to the management of occurring problems. This differentiation in focus has previously been posited by several researchers (Parson 1960; Thompson 1967; Mintzberg 1979; Orton and Weick 1990) around the idea of loose couplings between entities of an organization (see also discussion in chapter one).

This chapter, together with chapter seven, serves the purpose of developing a two-dimensional matrix in which the use of meetings will be analyzed (which will take part in chapter nine). The focus of this chapter will be at structural level where the characteristics of system of many meetings are examined.

6.1. Relationships between meetings and problems

As defined here, a relationship between a meeting and a problem exists if initiatives were taken during a meeting to deal with specific problems. Therefore, as discussed in chapter one, the management of occurring problems does not only involve the solving of them, meaning that specific means were chosen to achieve a specific end. It also involves the identification, framing and defining of the problems, as well as other ways in which problems are dealt with, for example shuffling them around the organization. Thus, to 'deal' with or manage a problem is here used in broad terms.

The examination of relationships between meetings and problems is achieved by using an explicit *qualifying criterion* that builds upon the definition given above. With this *qualifying criterion* in mind (displayed in Exhibit 6-1), it has been examined whether initiatives were taken in the meetings to deal with or approach a specific problem.

Information from interviews, documents, and observations has been used as sources for identifying relationships between meetings and problems. This means that there *may* exist other relationships than the ones presented here, but support has not been established from the available empirical material.

Problem	**Qualifying criteria** *A relationship exists between a meeting and a problem if initiatives during the meeting were taken to…*
System knowledge bottleneck problems	…making it possible for others to make use of the expert's system knowledge
Technical problems	…identify technical errors and connect them to possible solutions
Interface problems	…integrate the technical components into a coherent whole
Coordination problem	…ensure collaboration and mutual understanding across sub groups
Tracking problems	…create an understanding about which tasks have been completed and those that have not
Boundary problems	… negotiate and define the scope and resources devoted to the project

Exhibit 6-1. Qualifying criteria for establishing relationships between meetings and problems

6.1.1 The procedure of identifying relationships

This section presents the identified relationships between the meetings and the six problems. First, three examples will be given on how these relationships have been identified. These three examples are also representative meetings of one and each of the three clusters that later will be identified.

Tracking and coordination at the main project management meetings

From the perspective of the overall project plan, the progress of all projects was reported and commented upon during the main project management meetings.

> Here, we tried to inform each other about how things were running in various parts of the project. The idea was stay in control of the 'grand plan' of the project (Project manager, Central Processor project).

Many stressed that the role of the main project management meeting was to synchronize and coordinate the personnel and to develop a project unit.

> The main purpose with the meeting was the synchronization, to have the same foundation so to speak, for example the values and how people think about the project. This meeting in many ways became the foundation for the whole project and made sure that everybody knows what is going on- (Main project manager 2, Mobile system project)

Thus, although the issues raised during these meetings could vary from strategy and technology forecasting to working out personal conflicts between individual, the main project management meetings in both projects were identified as predominately to deal with the *coordination* and *tracking* problems.

Informal coaching and correction of technical work

In order to ensure the quality of work being performed in between formal technical reviews, the design teams often performed informal reviews of their own work.

> It is a very simple process behind the informal reviews. You just go and knock on the door of a colleague and ask for help. This is an everyday activity. We review the work and help each other with the coding procedures. (Software engineer, Central Processor project)

That person who best understood the overall technical system organized these informal inspections, sometimes a system expert and most often the most experienced member of team. Therefore, these people performed a role similar to a tutor, explaining why problems occurred and how they could be handled. Thus, besides informal quality controls, informal inspections also helped to make system knowledge available to those less experienced.

> Through our informal reviews, we create a common perspective of the design work, people learn about other functions, knowledge is spread throughout the team, and new people imbibe the coding culture. (Team leader, Central Processor project)

> We did this very informally with the team once a week. It was very important for us. We review the work, detect errors early, and it helped us to structure our work for the software design. By doing so, the risk that someone is working in the wrong direction for a longer period of time is minimized. In a way, this is the very essence of the design work. (Team leader, Mobile system project)

Thus, the meetings falling under the label 'informal coaching and correction of technical work' were identified to deal with the *technical* problems, the *interface* problems (as it made sure that people worked towards the same direction) and the *system expert bottleneck* problems.

Project steering and follow up meetings

For both projects, the project steering groups performed follow up and progress control. Here, senior managers attempted to monitor the project's progress and arrived at formal decisions such as the prioritization of major tasks.

> Follow up on progress and decisions regarding changes are made in the operating steering group for the main project. This meeting is important for deciding the course of the project, but it could also relate to how resources are dispersed to a certain task. It is a formal meeting when you need a decision or just 'Everything looks fine - proceed' (Main project manager, Mobile system project)

From the perspective of a senior line manager participating in the Operating Steering Group, the project steering group was paramount to assess impact upon the project.

> *(Q: How do you steer the project's course?)* You place an order with the project and include the adequate requirements and resources for the task. The process then goes to the project steering group where follow up and steering takes place. (Senior manager, Central processor project)

Thus, the based on these findings, a relation exist between meetings included in the group 'project steering and follow up meetings' and the *boundary* and *tracking* problems.

6.1.2 Identified relationships between meetings and problems

In the same way as described in the three examples above, all other meetings have been examined as to their relationship to the problems. Exhibit 6-3 illustrates the identified relationships between the 37 groups of meetings and the six problems. Exhibit 6-3 also indicates that most meetings retained relationships with more than one problem. In fact on average, each meeting retained a relationship to 2.6 problems (as the summary of Exhibit 6-2 indicates).

Problem	**N**	%
Coordination problem	147	65.6
Tracking problems	138	61.6
Interface problems	112	50.0
Technical problems	86	38.4
System expert bottleneck problems	72	32.1
Boundary problems	42	18.8
Total	597	266.5

Exhibit 6-2. Number of meetings with a relation to the specific problem

Note: Exhibit 6-2 illustrates a considerable overlap, as the sums constitute more than 224 meetings or 100 %. This means that many meetings dealt with more than one problem.

Exhibit 6-2 indicates that coordination- (66%), tracking- (62%), and interface problems (50 %) were the problems that the meetings most commonly dealt with. The boundary problem (19 %) was the least common problem raised during the meetings.

Groups of meetings	Problem					
	Bound	Track	Coord	Syst	Tech	Inter-face
Senior management meetings and Strategic steering committees	●	●				
Product councils and other formal meetings regarding system design				●	●	●
Meetings regarding improvement activities			●	●		
Project steering and follow up meetings	●	●				
Centralized intensive project-line coordination meetings	●	●	●			●
Main project management meetings		●	●			
Change Control Board	●	●				
Project management meetings		●	●			●
Entire projects gather for meetings		●	●			
Formal training & knowledge transfer seminars			●	●		
Formal meetings with customers regarding contracts	●	●	●			●
Formal demonstrations of product for customers	●	●	●			
Participation in other project's steering committees	●	●	●			
Subcontractor management meetings			●			
Section- and department meetings		●	●			
Section meetings at the project office			●			
Technology oriented section meetings		●	●	●	●	●
Reference and advisory group meetings		●		●		
Local project-line coordination and resource planning meetings	●	●				
Pubs and other planned social activities			●			
Team meetings				●	●	
System Emergency Board		●	●	●	●	●
Coordination meetings regarding activities at the main project level		●	●			●
Formal technical discussions			●	●	●	●
Coordination and information exchange with customers		●	●		●	●
Informal discussions with colleagues and project members		●	●			●
Informal coordination of design work through spontaneous interaction			●	●	●	●
Management by walking around		●	●			
Technical surveillance by walking around		●	●	●	●	●
Ad hoc coordination meetings between projects		●	●			●
Informal coaching and correction of technical work				●	●	●
Unofficial management group meetings	●					
Informal learning dialogues			●			
Lobbying/unofficial meetings between project and line managers	●	●				
Project internal lobbying		●	●			
Cross-talk in team room				●	●	
Informal customer contacts		●	●		●	●

Exhibit 6-3. The relationships between groups of meetings and the six problems

6.2. A one dimensional axis expressing the focus of meetings

The relationships between meetings and problems indicate that particular groups of meetings dealt with particular problems but not others. Thus, based on this finding, the meetings can be sorted according to their relationship to the problems.

The sorting according to problem focus has been established by testing the strength of the relationship between particular problems and particular meetings. The issue examined is then the following: out of those individual types of meetings that dealt with problem A, how many of them did also have a relationship to problems B, C, D, E and F (respectively)?

For example, of the 42 individual types of meetings that dealt with the boundary problem, 36 of them also dealt with the tracking problem. Therefore a rather strong relationship existed between boundary and tracking problems in that they often were dealt with at the same meetings.

A weak or non-existing relationship was present between the boundary problem and system expert bottleneck, technical, and interface problems, suggesting that boundary problems and the other three problems were rarely dealt with at the same meetings. Exhibit 6-4 displays all overlaps between problems dealt with at the meetings.

	Boundary (42)	**Tracking** (138)	**Coordination** (147)	**System expert** (72)	**Technical** (86)	**Interface** (112)	**Sum**
Boundary	-	36	7	0	0	3	46
Tracking	36	-	93	6	23	63	221
Coordination	7	93	-	46	49	89	284
System expert	0	6	46	-	69	55	176
Technical	0	23	49	69	-	72	213
Interface	3	63	89	55	72	-	282
Sum	46	221	284	176	213	282	1222

Exhibit 6-4. Overlaps between problems dealt with at meetings

Note: Within parenthesis, the number of individual types of meetings that had a relation to a specific problem is displayed. For example, out of the 42 meetings that had a relation to the boundary problem, 36 of them also had a relation to the tracking problem (and so forth).

In order to examine the strength of the relationships between problems, based on how meetings relate to them, involves the first stages of detecting chi-square values, in which the row and column variables are compared to the

values within the cells of the matrix[1]. The result of the calculations display the variations and distance of the relationship between the problems, based on how meetings related to them (see Exhibit 6-5 below).

	Boundary	Tracking	Coordination	System expert	Technical	Interface
Boundary						
Tracking	3					
Coordination		1				
System Expert						
Technical				1		
Interface			2		2	

Exhibit 6-5. Distance between problems, based on how meetings relate to them

This type of data provides the opportunity to develop a one-dimensional axis. The meetings can be placed along this axis, which reveals their focus of attention with regards to the six problems. Exhibit 6-6 displays this one-dimensional axis, and spans the boundary problems at one end of the scale to the system expert bottleneck problems at the other. The technical and interface problems are closely related to the system expert bottleneck problems. Between these, tracking and coordination problems are located. Exhibit 6-6 illustrates this axis that contains eight units or sequences. If the mid point is given the value 0, the axis ranges from -4 to +4.

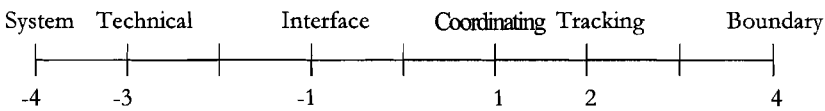


Exhibit 6-6. A one-dimensional axis illustrating the span of focus amongst the meetings

Each meeting can be placed along this axis depending on its relationship to the problems. For example, the meetings included in the group 'informal coaching and correction of technical work' (that has been used as an example

[1] More specifically, identifying the strength of relationships involves a calculation of the difference between the observed overlap (O) and the expected overlap (E). The distance (D) between problems can be calculated as follows.

D = O – E

Where E = n (r) * n (c)/N

r = row

c = column

N= the sum of all cells

previously in this chapter) would be given the value -2.7 based on the average between -4 (system knowledge) -3 (technical problem) and -1 (interface problem). Similarly, all other meetings have been given a value expressing their (average) focus point on this axis, resulting in the distribution displayed in Exhibit 6-7.

Value	-3.5	-2.7	-1.8	-1.5	-1	-0.7	-0.3	0.7	1	1.5	2	2.3	3	4	Tot.
N	14	12	37	3	6	11	6	37	14	40	5	4	29	6	224
%	6	5	17	1	3	5	3	17	6	18	2	2	13	3	100

Exhibit 6-7. The distribution of meetings according to their problem focus

6.3. Three clusters of meetings reflect a division of labor within the projects

Three clusters of meetings can be identified in Exhibit 6-6 according to their similarities in terms of the relationships to problems and are illustrated by the axis. These clusters of meetings represent a division of labor when it comes to focus on problems, that is, three sub-systems within the projects. This points to an image of complex product development projects as presented in Exhibit 6-8. This type of representation stresses the issue of loose couplings within the systems (see e.g. Parson 1960; Thompson 1967).

The operating sub-system

On the left side of the axis, one cluster is formed for the meetings that managed the system expert bottleneck problems, technical problems, and interface problems. This cluster of meetings related to the management of problems at the technical component and system level of the design object and fulfilled the function of learning about and managing the technical system under development. Therefore, the meetings located on the left side of the axis can be labeled the '*operating* sub-system'

Administrative sub-system

In the middle, a second cluster is formed for meetings that dealt with tracking and coordinating problems. These meetings related to the problem management at the project organizational level, and performed the function of learning about and managing the relationships between the members of the project and the action they undertook. These meetings can therefore be labeled the '*administrative sub-system*'

Allocating sub-system

At the right end of the axis, a third cluster is formed for the meetings that dealt with problems at the project context level and related to learning about and managing the different interests of the project. These meetings can therefore be labeled the *'allocating sub-system'*.

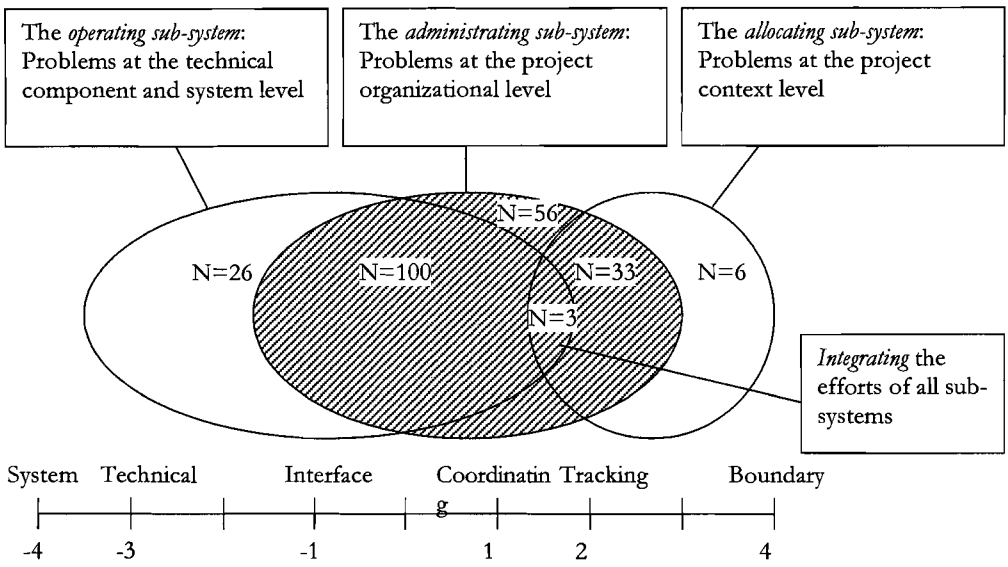


Exhibit 6-8. The product development system

6.3.1 The relationship between the sub-systems

Exhibit 6-8 suggests that the meetings within the administrating sub-system were more tightly coupled with the two other sub-systems when considering their overlap with the other two sub-systems. On the other hand, the allocating sub-system and the operating sub-system appear to be independent of each other. However, as shown in Exhibit 6-8, several meetings also existed at the intersection between all three subsystems, indicating that these meetings function as integrating engines of the projects.

More specifically, 26 (or nearly 12 %) of the meetings included in the study can be regarded as 'pure' operating sub-systems meetings, as they only dealt with the problems focused there (the system expert bottleneck problems, technical problem, and the interface problems). 100 meetings (or 45 %) of the meetings constituted a large overlap between the operating and the administrating sub-system. 56 meetings (or 25 %) were 'pure' administrating

sub-systems meetings. 33 meetings (or 15 %) were located at the overlap between the administrating and allocating sub-system, and 6 meetings (or nearly 3 %) were 'pure' allocating sub-system meetings, as they only dealt with the boundary problem. Finally, 3 meetings (or slightly more than one percent) formulated an overlap between all three sub-systems.

6.3.2 Relations to the design object and the external environment

The three sub-systems and their meetings varied in terms of their proximity to the design objects under development and the external environment (e.g. customers).

The *operating sub-system* pertains directly to the design object due to the fact that it is here that the actual design work is construed (such as coding, etc.). However, the other two sub-systems retained only an indirect relationship to the object (i.e. through other people).

The allocating sub-system is the least affiliated system situated two steps from the actual design work. On the other hand, sub contractors and customers participated more frequently in meetings held at the *allocating sub-system* (approximately 17 %) in comparison to the administrating (approximately 7 %) and operating sub-system (approximately 5 %).

6.4. Final notes to the chapter

In this chapter, the relationship between meetings and problems was explored. The results showed that this relationship varied. More specifically, three clusters could be identified within the two product development projects, saying that the management of problems has separated locations, i.e. a loosely coupled system.

While the allocating and the administrating sub-system seemed to retain distant relationships to the design object, the operating sub-system was buffered from direct interaction with the environment (i.e. fewer meetings with customers and sub contractors).

In other words, Thompson's (1967) observation that organizations, through their managers and boundary spanning units often try buffer or protect their technical cores (the equivalent to the operating sub-system) from a hostile and changing environment also relates to the situations of the two projects examined in this study.

As will be further discussed in chapter eight and nine, the loose coupling of the product development organization, as illustrated by Exhibit 6-8 has implications for how people understand their work and communicate across sub-systems, and give rise to constrains for managing occurring problems.

7. Four meeting organizations

In the previous chapter (chapter six), the classification of meetings related to differences in the issues raised there. In this chapter another sorting will take place according to how the meetings were *organized* (e.g. regional character, engaged parties and their roles, and control, visibility and transparence of the meeting).

As discussed in chapter one, several researchers have found an acute difference between formal and informal meetings, in product development and elsewhere, in terms of their uses and their organization. In chapter five, a meeting distribution according to the formal-informal distinction was presented. However, a dichotomous distinction between formal and informal meetings appears too indistinct for the purposes of this thesis. To exemplify the problem, team meetings and project steering group meetings would appear in the same group of meetings (i.e. formal meetings), although they differ sharply from each other in most other regards. This chapter will therefore go beyond the dichotomous distinction and identify and describe four general types of meetings along a continuum expressing the degree of formality employed and the amount of discipline expected from the individuals participating.

The four types of meetings, together with the result from chapter six, make up the framework on which the forthcoming analysis of the uses of meetings and differences between settings will address. The chapter contains six parts, where the first part describes the layout of a classification system of meetings and how the meetings included in the study are distributed according to that system. Part 2 through to 5 describes the characteristics of the four meeting types. Finally, the aspect of control with regards to the different types of meetings is discussed. Data included in this chapter was collected via interviews and observations.

7.1. *The classification system and identified meeting types*

Based upon Dalton's and Goffman's reasoning (see chapter one), meetings can be sorted along a continuum or axis expressing the degree of formality. Such a sorting describes how different types of meetings relate to what has been planned and officially agreed upon and secondly how disciplined the individual is obliged to be, in terms of paying respect to the meeting and the ceremony employed there. Along this formal-informal continuum, four types of meetings have been identified. Each type of meeting in this classification system can be viewed to represent an archetype or ideal type with its own logic and characteristics.

	Regional character	Type	Engaged parties and their roles	Engaged activities	Control, visibility and transparence
Formal meetings	Formal Front region; Much situational respect expected	*Announcement meetings*	15-100 persons engaged as in asymmetric relations of speakers and audience	Performing a well-prepared manuscript	Control performed by the superior actor and from outside the meeting. Visible, official and quotable;
		Work meetings	A formal workgroup or a discussion meeting with 5-15 participants engaged in formal roles	Performing standard operating procedures	Control by authority and routines. Less visible, but still official.
Informal meetings		*Hallway meetings*	Spontaneous and incidental gatherings of 2-5 persons (+ potential by-standers)	Dealing with matters on the spot and satisfying social needs.	Control performed by initiator. Semi-public.
	Back region; Less situational respect expected. Informal	*Private (one-on-one) meetings*	(Symmetric) one-on-one private conversation	Acting outside the manuscript. Preparing and negotiating the formal manuscript.	Control performed by actors involved. Invisible, unofficial and therefore non-quotable.

Exhibit 7-1. The four types of meetings and their organizations placed along the formal-informal continuum

At the upper end of the continuum (see Exhibit 7-1), meetings can be found in which much situational respect and discipline was expected. These meetings received a large amount of attention in the organizations (everyone knew about them), gathered many participants, and information put forward there was possible to quote in most other circumstances, at least within the organization. Thus, these meetings can be viewed to be oriented towards the front region of the organizations. Due to these characteristics, this meeting type has been labeled *announcement meetings.*

Meetings of this type were heavily enjoined and codified in advance by an agenda relating to the meeting's sequence of acts and the range of activities permitted. Issues that were not tabled prior to the meeting were not welcome and a high degree of predetermination emphasized. Basically, participants

followed formally agreed schedules and acted within the borders of their formally assigned roles. Framed differently, action in these meetings was performed within the framework of a preplanned and formally agreed manuscript. Relations at the meetings were strongly asymmetric, appearing with a division of attendants into speakers and audience.

At the other end of the continuum, there were meetings that involved few participants, most often only two persons. In these meetings, it was emphasized that non-participants should refrain from visual or aural contact. Basically, these one-on-one conversations were off-the-record events. One may therefore say that these meetings took place in the back region (or the 'backstage') of the organization. These meetings most often took place in a symmetric manner between individuals that enjoyed close trusting relationships, often between people of an equal hierarchical level. This meeting type is therefore labeled *private meetings*. Here, participants were less committed to a formal ceremony that prescribed modes of behavior and communicative registers. Instead, people acted outside the formal manuscript (formally agreed routes and roles) in order to deal with inconsistencies and with their formal roles, often with the purpose of influencing the manuscript for future performances at formal meetings.

In between these two types, which each represent the outer ends of the continuum, two other types of meetings can be identified; One relating to the formal side – *work meetings*, and one to the informal – *hallway meetings*.

The formal *work meetings* gathered a group of people working together on a daily basis within the matrix organization, for example a design team within the project, a section within the line organization, or groups of specialists. In comparison to the announcement meetings, fewer people were involved and the meetings were conducted in a more relaxed manner. Many of the work meetings were characterized by bureaucratic and standardized methods, as they often employed a standard meeting procedure.

Conversely, the informal *hallway meetings* were meetings that took place spontaneously, typically during the middle of a task. Thus, they often occurred in response to an situation that demanded immediate attention. Beside that, these meetings were also initiated because of the social needs among the participants and involved extensive discussion of non-work related issues.

7.1.1 Distribution of meetings according to the classification system

Exhibit 7-2 illustrates the distribution of meetings included in the study according to the classification system presented above. Announcement meetings are the most represented type, comprising about 38 % of all

meetings included in the study. Private meetings are the least represented at approximately 14 %. Whereas, work meetings represent nearly 20 % and hallway meetings 19 %. That the number of meetings increase with formalization does not display more formal meetings actually took place in the organizations. Rather, it says that this study covers more information on such meetings.

	Type	Groups of meetings included	N	%
Formal	**Announcement meetings**	Senior management meetings and Strategic steering committees; Product councils and other formal meetings regarding system design; Meetings regarding improvement activities; Project steering and follow up meetings; Centralized intensive project-line coordination meetings; Main project management meetings; Change Control Board; Project management meetings; Entire projects gathered for meetings; Formal training & knowledge transfer seminars; Formal meetings with customers regarding contracts; Formal demonstrations of products for customers; Participation in other projects' steering committees; Subcontractor management meetings	84	37.5
	Work meetings	Section- and department meetings; Section meetings at the project office; Section meetings at technology oriented sections; Reference and advisory group meetings; Local project-line coordination and resource planning meetings; Pubs and other planned social activities; Team meetings; System Emergency Board; Coordination meetings regarding activities at the main project level; Formal technical discussions; Coordination and information exchange with customers	66	29.5
Informal	**Hallway meetings**	Informal discussions with colleagues and project members; Informal coordination of design work through spontaneous interaction; Management by walking around; Technical surveillance by walking around; Ad hoc coordination meetings between projects; Informal coaching and correction of technical work	43	19.2
	Private meetings	Unofficial management group meetings; Informal learning dialogues; Lobbying/unofficial meetings between project and line managers; Project internal lobbying; Cross-talk in team rooms; Informal customer contacts	31	13.8
	Total		224	100.0

Exhibit 7-2. Distribution of meetings according to their degree of formalization

7.2. The announcement meeting

7.2.1 The example of the main project management meeting

It is nine o'clock in the morning. About 15 persons are gathered in the 'war room', where the main project management meeting in the Mobile system project is about to begin. I am sitting in the rear corner of the room and observe the meeting with a video camera on a tripod situated behind me.

The meeting starts with the deputy main project manager going through the agenda of the meeting (displayed on a slide) and asks for other issues to be included. No one answers the

question. The deputy main project manager states "I interpret that as a no". The manager thereafter asks for notes to be taken. The technical coordinator volunteers.

10 minutes is used for reading of the protocol from the previous meeting. The main issue is whether action points from the last meeting have been dealt with, and if not, whether they should remain as action points for the next meeting. During this discussion, predominately two participants (beside the deputy main project manager) are vocal: the project managers for the two largest design projects included in the main project.

After listing the action points from the previous meeting, the deputy main project manager informs the group about progress and events at a customer's site that was discussed at a meeting early that same morning. Thereafter, the main project manager informs the group that a tollgate decision has been made by the project steering group. The announcement is met by applause.

A presentation regarding testing procedures is the next issue on the agenda. A person specially invited to the meeting conducts a 30-minute presentation. Few comments are offered. Most questions seem to be phrased in cordial deference to the invited person.

Thereafter, a coordinator from the main project team lists the activities for implementation. Through a post-it note session, suggestions for future activities are arranged. Similar to the other parts of the meeting, participants remain subdued. People sit on their chairs and try to look as if they were listening. Perhaps they do, but I am not sure.

After the coordinator 's presentation, a coffee break is ordered.

7.2.2 Engaged parties, their roles and the region character of announcement meetings

Announcement meetings involved many people and retained a visible hierarchical division: a few spoke to an audience of many

> There was a bunch of people just sitting and observing the meetings (Senior manager, Central Processor project)
>
> This meeting was definitely not a meeting where people had an equal say. A number of people came to the meeting rather uninformed and got thrashed by the main project manager dictating the terms (Line manager, Central Processor project)

In announcement meetings, the speakers and audience alike were committed to formal modes of behavior and communication. Participants often experienced a feeling that they had to 'shape up' and comply with a normative higher standard.

> It was not possible to get out of this meeting. One only had to grin and bear it. It was definitely run by the manager who was in charge alone. (Project Manager, Mobile system project)
>
> ... one has to shape up a little bit and be careful of what one is saying. You can't just go on babbling about anything (Main project manager, Central Processor project)

The situational respect in relation to these meetings also demanded that organizational members should participate, which was more or less a necessity

for making it possible to assemble large numbers of people from the organizations.

> It was not possible to shirk away from these meetings. It was a large gathering. All the line managers participated, all their best technical coordinators in various areas, all the project managers, and many others. (Project manager, Central Processor project)

7.2.3 The formal role and the person behind

Especially in announcement meetings, but also in work meetings, actors assumed their formal and official company roles. This engagement in the formal roles worked as a mask in order to suppress parts of 'the person' and the thoughts and feeling they retained. This role-play seemed to be most evident during announcement meetings that involved participants from more than one organization, for example between customers and the project members.

During these types of meetings, it was common that the participants suppressed a number of facts. However, the other participants were often aware of them. This type of behavior was not only common in customer meetings, but also in many other formal meetings, for example in main project management meetings, where people attempted to cover up mistakes and deliberately reported information that deviated from actual progress.

A clear example of this role-play, involving both 'face shaping' and suppression of facts, were the events that took place in a formal customer meeting (an announcement meetings).

> It was hush-hush about these meetings, because we did not want to worry the customer with all the problems we were aware of. We only let them know about the problems they could be affected by. However, they suspected and understood that we had a bunch of other problems that we did not inform them about. This was a type of balancing act we were involved in. (Project manager, Central Processor project)

Occasionally, the customer revealed that they were aware of the project members' secrecy. Consequently, a disturbance was created in the face-saving game.

> Sometimes, the customer showed that they knew what went on here in Stockholm. That occurred occasionally. And when it did, we lost faces. That is a deliberate act by the customer. That is what they wanted to achieve. Of course they were also aware of how product development operates in practice. (Coordinator, Central Processor project)

After this discovery, the secrets were made available for discussion via a switch of roles. The mask of the 'official company role' was set aside, and the participant became 'a person' displaying personal thoughts and feelings. This

made it possible to discuss personal interpretations 'off the record'. In Goffman's (1972:102) terms, this is an example of a situation when a person needs to retain distance between their formal roles and subsequently communicates as a 'private person'.

However, a participant should make it clear to the audience as to which role they act upon in such a situation, otherwise misinterpretations may occur. Thus, while speaking as a 'person' in this type of meeting did not have any jurisdictional consequences, statements made from the 'official project or company role' were treated as binding. Thus, personal comments were not matters *de jure* (by right) and could therefore not be quoted as official statements in the manner that matters expressed from a formal and official role.

> When faces has been lost, the role-play is temporarily set aside. Then it was needed to state that it was my personal view on this matter. It is never wrong to say so, as long as you are clear as to whether it is the company's opinion or your own. You have to be clear about that. (Coordinator, Central Processor project)

The disturbance manifested in this meeting revealed that announcement meetings were regulated by a specific kind of social order. This etiquette regulates how and what a participant can say and do and that all participants have a clear understanding of the regulated behavior. A person who does not follow or understand the social order and etiquette of how to deal with matters told 'off the record' may induce severe problems, for example sanctions from his or her co-workers.

7.3. The work meeting

7.3.1 The example of the team meeting

One of the hardware design teams responsible for ASIC development in the Central processor project gathered for their weekly team meeting. The six members of the team sat themselves down in the small conference room located on the opposite side of their offices.

People go into the room, leave their stuff on the table, turn around again and go out to grab a cup of coffee or to collect something they had forgotten. This process of coming and going takes at least six or seven minutes before everybody has sat down for the meeting. People sit in relaxed positions in their chairs. One person has placed his legs on another chair. He is almost lying down. The team leader, placed on the longish side of the table, makes the signal that the meeting should start:

Team-leader: "Ok, how should we use our time today? We have at least four things to discuss today (switches on the projector and points to a visual slide). I think that we should devote most of the time to the results from the technical review made last week. I also

know that Jan has prepared some statistics on how the system is running and that he would like to show us these results.

Engineer at the short side of the table: Should we not use all time today for the technical review? I think we have a lot to work through there.

Another engineer sitting beside: I think so too. That is probably the most important issue right now.

Jan (with the statistics): I can present my data next week. That's fine with me.

Team leader: Ok, we will start with the results from the technical review, and see how long it takes. Then, if we have time left, we can talk about the other issues. Is that OK? People around the table are nodding their heads.

7.3.2 Engaged parties, their roles and the region character of work meetings

In *work meetings*, the division between speakers and audience is less prominent as a larger proportion of them usually took part in the conversations. The lower number of participants involved, usually between 5-15 persons, meant that more 'airtime' was available for each participating individual.

Work meetings typically involved a process where a number of people sat down to deal with matters in manner less asymmetric than announcement meetings. However, the meetings were still formal, illustrated by an agreed and planned format. Much of the common formal scenery such as the visual slides, a chairman, an oval table, and so forth, was also present. Work meetings interactions followed the formal format, in that people took regular turns talking, criticisms were not raised unless carefully embedded into another message, protocols were followed, etc.

> We made use of very clear machinery during these meetings. Most often, our team leader began to say something, thereafter the rest of us. (Engineer, Mobile system project)

In comparison to the Announcement meetings, these meetings were much less visible in the organizations, and were more closely embedded into the everyday routines of various work groups.

7.4. The hallway meeting

7.4.1 The example of a pre meeting to the project steering group meeting

We are about to attend a project steering committee meeting. Due to a delay in the meeting scheduled before us in the same conference room, a group of people has gathered in the hallway outside the entrance. Thus, the

conversations held here in the hallway can be viewed as a pre-meeting in relation to the forthcoming project steering committee meeting

> One of the persons in the hallway looks through the window and points at his watch in order to call their attention to that we are all waiting for them to leave the room. While we are waiting, the following conversation takes place:
>
> *The senior manager (and chairman of the upcoming meeting):* "But wait now, you are both project manager, section manager, and assistant department manager. Which hat are you wearing today? What kind of directives do you want?"
>
> (People gathered in the hallway begin to laugh)
>
> *The project manager* (etc.) replies: "I play John today [the department manager]. He is away."
>
> *The senior manager:* "Ok, then I know."

A few more comments are exchanged in the hallway about other matters. A few minutes later, they enter and the project steering group meeting begins

As the example showed above, the senior manager spontaneously asked some questions he was reminded about when he saw the other manager (the project manager) which perhaps sorted out a few questions he had about the organization of the forthcoming project steering group meeting.

7.4.2 Engaged parties, their roles and the region character of hallway meetings

In hallway meetings, the parties had to keep in mind that potential by-standers could observe, hear, or interrupt the conversations. Thus, they took place in a semi-public setting, involving communication with the individuals engaged in the conversation, but also audible for those in close proximity (i.e. the 'decorum' as Goffman refers to it. See chapter one, page 22)

> Sometimes we had to lower our voices. It is easy to babble on too much considering that the wrong people could hear what was said. (Project Manager, Central Processor project)

The informal hallway meetings did not follow a visible structure in the same way as the formal meetings did. However, it does not mean hallway meetings were free from a meeting etiquette – far from it. It merely means that it was not materialized into meeting scenery and equipment in the same extent as the formal meetings. Similarly, a sense of the formal hierarchy was reduced. However, the relations still remained stratified, as some retain the authority to give approvals and others do not. This is exemplified by the example below.

> One of our teammates got an idea how to solve a technical problem. After a short discussion in the hallway with the technical coordinator, we agreed to make use of the idea. When the heavy engineers give their approval, then the green light is on. We solved this problem really fast. (Team leader, Central Processor project)

7.5. *The private meeting*

7.5.1 The example of an unofficial meeting between a senior manager and an experienced engineer

A group of experienced engineers had been working unofficially on alternative version of the APZ processor for nine months. This is despite the fact that the APZ processor running at the time was planned as the final version of the product. The idea was to provide an alternative to a giant platform project run by Ericsson during the early 1990s. Signals that the giant platform project would fail became progressively stronger due to a lack of progress. Therefore, the timing seemed appropriate to present their alternative to a senior manager within Ericsson. One of the most experienced engineers made contact with the senior manager and requested an appointment. Shortly thereafter, he attended the private office of the senior manager.

> We sat down and talked about previous projects that we had both been involved in many years ago and had a few good laughs. After a while, he became serious and asked: "What is it that you really want?
>
> I told him about what we were up to, the design features of the system, and why another version of the APZ processor would be a god thing to develop.
>
> The senior manager replied: "Go, but keep me informed"

7.5.2 Engaged parties, their roles and the region character of private meetings

To a large extent, private meetings were one-on-one sessions where engaged parties enjoyed mutual trust. In these meetings, neither observers, nor an audience were present. Seclusion was also desired and a critical point of the meetings. Thus, the participant's actions were not restrained to accommodate audience expectations, as by-standers were not privy to the meeting.

> To escape the audience is really important in these circumstances. (Senior manager, Central Processor project)

Much of what was done in private meetings could be seen as *informal rehearsals* and preparations necessary before performances were made at the formal meetings. This means that the manuscript for forthcoming formal meetings to a large degree was prepared here. Also 'schooling' took place during the private meetings, for example to coerce those in the project team to pay more attention to particular matters. These could include; increase attention towards the need of the end customer or alter a person's behavior at forthcoming formal meetings. By doing so, the 'schooled' person was given the chance of improving his/her behavior without the embarrassment of loosing face that would have occurred if the matter were brought up at a formal meeting.

I made contact with the individuals in the project one by one. I made it clear for them that they had to understand the importance of what was going on. (Project manager, Mobile system project

7.5.3 Role distance in private meetings

Although role distance and resistance to being controlled occasionally was expressed in formal meetings, these types of behavior were most prevalent in the private meetings. Thus, private conversation provided a zone for the project members where such expressions were not only common, but also a typical ingredient. For example, 'bad mouthing' a formal meeting in a subsequent private meeting may therefore be seen as a way of upholding an individual balance to the formal control performed by the organization in formal meetings.

7.6. Control and quotability of meetings

Common for both types of formal meetings is that the participants were exceedingly more subject to control than the participants of informal meetings. First, formal meetings were subject to control from superiors in their existing hierarchy. A person with authority, such as a manager or a senior engineer, could command people to be present at particular meetings.

Secondly, formal meetings were subjected to external control. Bureaucratic routines, such as the use of an official agenda or formal protocol, exposed these meetings to external control. To exemplify this, if formal procedures are employed when setting the agenda, it will allow others to influence its content, before or during the event. In addition, the protocol can be read afterwards. The formal meeting's bureaucratic principles may therefore ensure participation and distribution of control regarding its content, for example by showing that different sub groups within the projects were treated justly and given equal opportunities to communicate with management. A 20-minute meeting held two times a week in a design project included in the Central Processor project is an example of the symbolic significance the arrangements of a formal meeting retain in order to ensure equality. The meeting was deliberately convened so that the location of the meeting changed from time to time in order to show that the members at both locations (one central and one peripheral) were of equal importance to the project.

In these meetings, I was always very careful to make sure that S-köping got the same treatment as the people in Stockholm. I was also careful to switch location myself, in that I was physically present at each location on alternate occasions. (Project manager, Central Processor project)

7.6.1 Quotability of formal meetings

As stated above, the protocol is an important part of the scenery for many formal meetings. Keeping a formal record of the meetings also provides the opportunity to reproduce accurate quotes and events.

> It feels very secure to have the steering group meetings on a regular basis, partly because it resulted in a formal record of all the decisions (Main project manager, Central Processor project)

Basically, a person could be held accountable for those things said at a formal meeting. In other words, there was (most often) some transparency between what actually had been discussed at the meeting, and what could be divulged from the transcript.

The protocols were occasionally used as a 'door opener' giving the carrier of it legitimacy to demand service from others, but perhaps not always in the sense meant by the person making the official statement. Thus, protocols and formal records could be used as a tool that makes it possible to direct the course of events.

> The function with this meeting was that, if we had a problem, we had it on paper that we had the support from the senior managers to pursue a particular course of action. This type of documented information could be useful in many ways. (Project manager, Central Processor project)

7.6.2 Control and quotability of informal meetings

The informal meetings were not subject to the same degree of hierarchical or external control as the formal meetings. Rather, they were controlled 'from within' by the participating individuals. The initiator of hallway and private meetings decides to engage in informal conversation with another person in order to deliver a message, exchange information, mutually deal with a problem, or to get help from that person. If the informal meeting is not a mutually activity of the involved actors, the person confronted still retains some control, in that they can refuse to participate.

> Through hallway discussions, I get help with the coding. I get the possibility to find out about things, *when I want it myself* (Software engineer, Central Processor project

The informal meetings, and especially the private meetings, were non-quotable events. Only those people participating were aware of the meeting's content.

> It can be difficult to track decisions. If one has not been a part of the discussion, it is impossible to track how decisions were actually made. Protocols and motives were not recorded. (Main project manager, Central Processor project)

The dissemination of information from private meetings is a sensitive process. Basically any information from private meetings made public without the agreed mutual consent of the participants can create distrust and conflict.

7.6.3 The sensitive appearance of informal meetings

Informal meetings are less 'manageable' than formal meetings. A manager can therefore not order or regulate their existence. However, they may still be affected by and sensitive to managerial action, as two examples will illustrate below.

During the early phases of the Central Processor project, many people noted a dearth of informal hallway contacts. This, in turn, made things run slow. The Central Processor project began in a newly established organization that assembled personnel from many different R&D organizations within Ericsson.

> Collaboration does not happen automatically here. We ought to have something similar to the well in old societies where all gathered. We need a well, but we do not have one at present. (Coordinator, Central Processor project)

However, after approximately two years, personal contacts began to establish spanning the different functions present within the projects. The engineer cited below, describes development as a process where a number of 'real faces and names' have increased.

> Earlier, there were many barriers. These barriers have now begun to be torn down. I can put faces and names to people (Engineer, Central Processor project)

However, when the informal networks have been established, they can easily be deconstructed and are thus especially sensitive to structural change programs that involve the relocation of personnel.

An event similar the to coal mine study (see chapter one, page 15) took place when parts of the R&D organization hosting the Mobile system project was reorganized to another business unit while, at the same time, the project was operating. The R&D department responsible for radio base development (approximately 50 personnel) in the Mobile system project was halved and distributed into two other business units. Furthermore, the personnel were divided into three separate departments within one of the business units. Consequently the Mobile system project retained half of the personnel working on radio-base development and the other half was assigned other duties.

These changes were very traumatic for those people involved, and especially so since the department was previously known for their strong team spirit and pride in their ability to deliver products on time. After the changes, the motivation dissipated.

> One can say that we do not try to overwork ourselves here. Motivation drops. (Team leader, Mobile system project)

However, perhaps even more detrimental to the organization than the problem of decreased motivation was removal of the informal cross-

functional network. Those people working on radio-base development no longer enjoyed daily contact with their colleagues within the radio base project, or the Mobile system project, due to the relocation of personnel between line organizations.

> The worst thing is that we were dispersed amongst the organization. We were not located together anymore. (Team leader, Mobile system project)

Similar to the inception of the Central processor project - before the informal hallway contacts were in place, the personnel at the radio base development noted the slow progress and that the informal means for coordination and integration had ceased to function.

> Earlier, we had coffee meetings where information was spread. We sat down for about 15 minutes in the morning and another 15 minutes in the afternoon where the solution to a problem often was received. Now, it is very difficult to get hold of people. (Sub project manager, Mobile system project)

More specifically, problems of integration between activities such as test, design and system management began to form.

> It has been a really difficult experience to split the organization, as much was built on the informal structure. All the connections in the organization we enjoyed disappeared as a result of the reorganization. Everything is standing still right now. I have no idea of who is doing what anymore. Written information cannot deal with this type of work. There has to be an informal context too. (Engineer, Mobile system project)
>
> After the reorganization, we lacked forums where problems could be dealt with across units, for example across testing, design, and system like we could do before when we were co-located. (Team leader, MS project)

7.7. Final notes to the chapter

This chapter has identified four basic types of meetings to which the included meetings could be sorted. These four types – announcement meetings, work meetings, hallway meetings, and private meetings – represent different meeting organizations that vary in the degree of control employed in them, and visibility in the organization. The chapter also showed that different types of meetings are difficult to understand by studying them as separated entities. Instead, the interplay between different types of meetings around tasks generates better understanding of how meetings operate within organizations.

8. Communities collide

Considering the complex task of developing a telecommunication system and the many interdependencies between the personnel involved in such an effort (see description in chapter four), collaboration across sub-groups is often necessary if progress is to be achieved (Pava 1983a: 101-102). However for a number of reasons, collaboration is often difficult to achieve in practice.

Within functional and hierarchical sub groups separate skills, cultures and languages develop. Therefore, as both Schein (1996) and Karlson (1994:157-160) have noted, more and faster information processing across hierarchical and functional boundaries may not alone be the answer for reaching effective coordination. Framed differently, information cannot be viewed to have a universal meaning to all people. Crossing each hierarchical or functional boundary means that the process of translating the meaning of messages is at work. This also means that problems often arise at the boundary between occupational communities and lead to a dysfunctional state. Sub-groups may, for example, 'seek optimization for its own narrow sub-unit agenda' (Pava 1983b: 130) and discredit each other by accusing each party of not being able to understand and analyze the situation correctly, for example a technical or organizational problem that needs to be solved. Regarding such difficulties across functions, Pava identifies potential problems:

> Research and development will want the most exotic design possible; manufacturing will insist on a design that is easily produced; and marketing may require total compatibility with earlier products, perhaps at the cost of higher functionality of lower production costs(Pava 1983b: 131-132)

Especially, power and status differences generally decrease the flow of information (Hage, Aiken et al. 1971). The threat of sanctions may discourage the communication of problems, which in turn reduces the likelihood that they will then be solved (Sheremata 2000:397). The obsession with rank and hierarchy may also result in major failures because managers do not pay attentions to warning signals from subordinates due to a lack of mutual

respect. In order words, the hierarchy may get in the way of solving the problems.

In chapter six, the two projects were identified as meeting systems that consisted of three sub-systems. These sub-systems' focus differed in regards to the problems. Although many meetings formed an overlap between sub-systems, the system as a whole appeared as loosely coupled. In this chapter, a further inquiry will analyze this separation at the point when converting customer demands into actual features of the product under development.

The purpose of this chapter is to examine how engineers, coordinators and managers valued each other's contributions to the product development process, and how they made use of meetings to interact within and across sub-groups. The intention is to provide a deeper account of the actors, how they interplayed, and how they interpreted their situations while engaged in the projects

The chapter draws on data from interviews and quantitative findings of the meetings reported by different sub-groups and information meetings collected through observations. One implication from the chapter is that meetings were often used to separate and nurture differences rather than integrate, which restricted the possibilities of dealing with complex problems.

As will be argued here, the projects can be seen as divided between two different communities (Lave and Wenger 1991): one engineering- and one managerial with different 'habitats' in the meeting system. In many ways, the coordinators took on a liaison role between the managers and the engineers in that they facilitated conflict resolution and anticipation of problems (see also Galbraith 1973).

8.1. Contribution to the product development effort

Different actors of course retain different tasks and duties within a product development project. However, beyond that, the testimonies given by engineers, coordinators and managers showed striking differences as to how they viewed and interpreted their contributions to the projects. When a project manager described their role, the description was abstract and general. By using words such as "it is *my* role to...", the project managers defined their role as a solitary one, rather than a part of a collective effort.

> I view my role as one where I direct, plan, and follow up the progress in my project and to prioritize and ensure we have enough resources. (Project manager, Mobile system project)
>
> My role, as I have interpreted it, is to lead my project's operations through defining targets, making plans, and to note what is going on and act upon them. Another duty

is to ensure that targets are supplied with adequate resources (Project manager, Central Processor project)

In contrast to the project managers, engineers distinctively described their role as one that was part of a collective. Often, their statements included very concrete descriptions of tasks. Thus, the engineers were more closely aligned to the design object, while the managers focused on external demands and people and resource management.

> The task of our team is to develop a circuit, so called ASIC. We make the outline of different functionalities and 'bake' the very chip together. (Engineer, Central Processor project)

> We are going to plan and carry out a part of our sub-project's functions. Examples are function tests, verifications of base stations, and to write design specifications. Mainly technical issues (Engineer, Mobile system project)

Somewhere in between the managers' and engineers' lie the coordinators' interpretations of their role.

> My duty is to make it possible for others to work in the project. I do this by supplying support, and acting as a sounding board. In more concrete terms, this involves giving answers to questions, planning reviews and work meetings and acting as a facilitator in those work meetings (Coordinator, Mobile system project)

8.2. Meetings within and across sub-groups

As it was shown above, engineers, coordinators, and project managers perceive their roles and contributions to the projects differently. Although this may seem rather natural considering the division of labor and specialization that is necessary for organizing such a complex task, it is more problematic in that the interaction between managers and engineers most often took place via formal meetings. This finding indicates that 'off-the-record' conversations between them were rare.

8.2.1 Meetings within sub-groups

The *engineers* reported the highest numbers of meetings within its sub group - 56 % were meetings with other engineers. Typical contexts or situations where engineers met each other were 'informal coordination of design work' (13 %); 'team meetings' (10 %), 'Informal discussions with colleagues and project members' (6%), and 'talk and cross talk in team rooms' (4 %). Approximately 80 % of the meetings engineers reported were located within the operating sub-system.

Approximately 33 % of the meetings that *coordinators* reported were meetings with other coordinators. The most common type of meeting that assembled coordinators were 'Informal coordination of design work' meetings

comprising 12 % of the meetings they participated in, and 'technical discussions' (similarly 12 %). Many of the coordinators' reported meetings were located at the intersection between the operating and administrating arena (55 %).

The project management meetings were of course a context for interaction between project *managers*, and comprised approximately 9 % of the managers' reported meetings. 'Informal lobbying' provided a common arena for interaction amongst project managers (10%). The project managers also exhibit the lowest proportion of meetings that included people from only one hierarchical layer, approximately 25 %. This statistic could be attributed to their extensive contact with senior managers and their participation in formal meetings across various hierarchies. A majority of the reported meetings (55 %) for project managers were purely administrating sub-system meetings. However, they also reported many allocating sub-system meetings and meetings at the intersection between the administrating and operating sub-system.

In addition, the senior managers had several exclusive forums, for example strategic steering groups and the senior management board.

8.2.2 Meetings across sub-groups

The engineers and coordinators interacted through both formal and informal means, indicating that their exchange exceeded the borders of their formal roles. The relationship between the coordinators and the managers was similar to the former. Senior managers and project managers also seemed to have rather close relations as they engaged in both formal and informal meetings.

The project managers and the engineers, on the other hand, engaged in very few informal meetings with one another. What further complicates the relationship between the engineers and project managers is that they rarely met on common ground where they could stand on equal footing with one another.

> When managers and engineers met, the average engineer usually became low-voiced and said little (Main project manager, Central Processor project)

Also there were few meetings between the senior managers and coordinators, and virtually no meetings could be detected between the engineers and the senior managers.

Exhibit 8-1 displays a grid (adopted from Schwartzman 1989:65) that illustrates the differences in the character and quality of the relations between the sub groups.

This presentation of the meetings reveals that the projects consisted of two different communities of practice (Lave and Wenger 1991); one engineering and one managerial with different 'habitats' within the meeting system.

	Engineer	Coordinator	Project manager	Senior manager
Engineer	Informal coordination of design work; Talk in team rooms, Informal discussions with colleagues at the section			No contacts
Coordinator	Informal coordination of design work; Technical surveillance by walking around; System Emergency Board, Technical discussions	Informal coordination of design work		Centralized intensive project-line coordination meetings
Project manager	Entire projects gather for meetings; Management by walking around	Project internal lobbying; Main project management meetings	Project internal lobbying, Main project management meetings	Lobbying/unofficial meetings: Project steering and follow up meetings; Change Control Board; Centralized intensive project-line coordination meetings

Exhibit 8-1. Meetings most commonly used for interaction within and across sub group

8.2.3 Members and guests within the sub-systems

Exhibit 8-2 exhibits the position of and the network between the four sub groups, which are drawn upon the image of the projects developed in chapter six. This representation of the sub-groups categorizes members and guests within the three sub-systems. A full member signifies that a sub-group of actors had complete access to all the meetings within a sub-system. A guest actor has only partial access to the sub-system, and was limited in possibility to interact informally.

Full members within the operating sub-system were engineers and coordinators. Project managers were guests. Within the administrating sub-system, coordinators and project members were full members, and engineers were guests. Finally, within the allocating sub-system, senior managers and project managers were full members, and the others only invited occasionally.

The relationships between the sub groups suggest that the coordinators (often upholding the role of the system experts) took on a key position in the networks as they received considerable unofficial information from both managers and engineers. They therefore played an important liaison role of

bridging the gap between the managerial and engineering communities. This epitomizes the coordinator's work: endeavoring to bridge the gap between different sub groups.

> I engage in a lot of running around in the hallway to discuss with others how they view different issues. I try to get different parts of the project in contact with each other, so that that can solve their problems jointly. (Coordinator, Mobile system project).

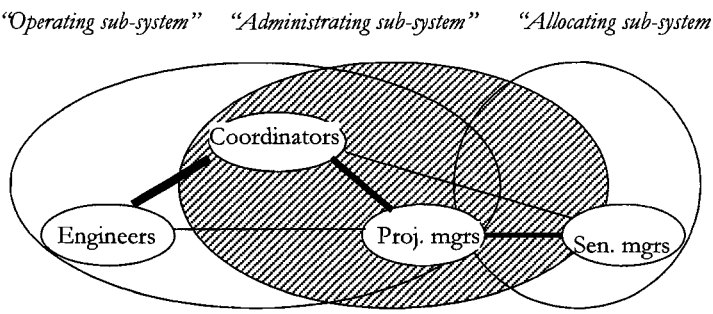


Exhibit 8-2. The sub-groups' position within the system and the relationships between them.

Note: The thicker the line, the stronger the relation.

8.3. Tales about the system: storytelling as positioning and justifying individual beliefs

The absence of informal meetings between managers and engineers created constraints for collaboration because it limited the possibilities of mutual learning (that is, to learn from each other perspectives). Evidences are the stories or tales commonly told within both projects. Stories about other sub-groups comprised a common theme for many meetings and therefore describe the composition of a product development system, its actors, and how the system worked. A common theme of the stories was to describe attributes of sub groups of people working within the project, such as hardware and software engineers, or managers and engineers. These stories expressed views of how certain sub groups 'are', and how they 'usually' behaved within the project.

> The software people are more system oriented than the hardware people are. The hardware people are concentrated on their piece, their circuit, while the software guys can see the big picture (Software line manager within the organization hosting the Central Processor project)

Describing the attributes of sub groups of people primarily seemed to simplify and reduce the complexity of the system. Thus, stories told about the system and its actors worked to justify and anchor their perceived impressions of

others. Furthermore, stories also worked to position oneself in terms of the larger system of people ("I work between the hardware and the software guys"). Stories provided methods of orientation and how sub groups should be treated in different situations. Equally they helped them to navigate within a complex web of people by viewing it as a much more simplified system.

8.3.1 Stories about managers and engineers

Stories were foremost told to express how one sub-group viewed another. As it has been shown previously, engineers and managers predominately engaged in formal interaction with one another. This meant that 'off-the-record' conversations were rare, and that the sub-groups mainly observed each other when acting within a formal role (i.e. when participating in formal meetings). However, both sides were aware that the other was engaged in activities covert to one self. Due to the absence of concrete experiences of these covert activities, this situation fostered speculation about one another.

> This comes down to, if one generalize a bit, an image of the project manager as one who only runs run around with time plans, moves arrows around on the whiteboard, and does not contribute to the solving of the technical problems experienced by the engineers. Similarly, the project managers suspect that the engineers are always up to something else when they are out of focus, for example giving the finishing touches to a chrome strip instead on making deliveries. (Main project manager, Central Processor project).

Both among engineers and managers a number of stories were spread that expressed prejudice about the other. Common themes of the stories that managers expressed about engineers were descriptions of engineers as technology freaks without any sense for real business, which in turn caused problems of 'over-engineering' (too much intricacy with too many features) and time delays. Thus, to a large extent the impressions of the engineers were built around the assumption that the engineers were obsessed in building the most intricate and perfect machine or process.

> It is the engineering disease. Everything should be perfect (Project manager, Mobile system project)

Managers also often stated that engineers placed too large an emphasis on the object design and did not appropriately consider the delivery time. When I asked one project manager why she responded loudly, "You apparently don't know how engineers are constructed!" On another occasion when I was observing a management meeting within the unit hosting the Central processor project, a senior manager expressed:

> "It seems as though the engineering culture is totally unaware of time".

Similarly, the engineers made assumptions about the managers. The project managers were often described as 'administrative people' intent on scaling the

managerial ladder and with little or no understanding of the 'real' tasks necessary for a product development project.

> The projects only become massive paperwork if heavy engineers are not involved. Too many project managers are over administrative. One project manager, for example, said with his hands in his pockets "Well, it is you guys who are going to do the work". That's a clear memory (Engineer. Central processor project)

> The success - advancement factor has an impact. To be a project manager for many teams and subprojects is good for the advancement possibilities. (Engineer, Mobile system project)

> This project, as well as the previous, has been led by so-called project managers. The experience shown so far is that they do not have a good understanding about how the land lies. (Micro programming engineer. Central processor project)

Thus, it was often the case that both engineers and managers discredited each other as they blamed the other group of not being able to understand and analyze the situation correctly, such as a technical or organizational problem that needed to be solved.

Undermining one another uses the logic that if two groups provide different solutions, then one group must be incorrect. This conflict led each sub group to devalue the concerns of the other rather than seeking integrating solutions that both may benefit from. Instead of integration, each group attempted to construct methods to manage the shortcomings or failures of the other group.

> More and more of our development projects consist of things purchased into the organization. The gadgets are purchased by engineers who become really excited when they get them. But they (the engineers) do not give a damn about guarantees, terms of delivery, and configuration management. Therefore, we hired a purchase coordinator. (Line manager, Mobile system project)

> We must start activities that decrease the 'over engineering' that takes place in the organization (Statement from a workshop within Mobile system project)

8.4. Final notes to the chapter

Regarding the participants of meetings, the socio-technical literature on non-routine work has stressed the importance of having the adequate combination of people gathered when problems arise. As Pava (1983a) have asserted, this is not always the case. He noted that functional and hierarchical boundaries often limit the possibilities of having ideal combinations of people to deliberate around a common topic. For a product development project, this is a dilemma, as collaboration across sub groups are often needed to solve problems effectively.

This chapter described how engineers, coordinators, project managers, and senior managers interacted with one another during meetings and how they valued the other sub-groups' contribution to the product development effort.

The chapter suggests that interaction across several sub-groups was limited, which in turn further nurtured the separation between them and added to the difficulties of dealing with complex organizational and technical problems. To some degree, however, coordinators served the role of liaising middlemen that helped to integrate the managerial and engineering communities' efforts.

Thus, a pattern of limited interaction across functional and hierarchical boundaries was also present in this study. More specifically, the projects were divided into two communities of practice (Lave and Wenger 1991), one engineering community and one managerial. This meant that definitions of what is good or 'best practice' on how to solve a problem often differed sharply between these two communities. The existence of the two communities was mirrored in that they foremost relied on formal meetings for interaction across communities, indicating that mutual learning across hierarchies continuously failed.

9. Facing problems: How meetings come into play

The purpose of this chapter is to describe how meetings were used within a system of meetings to deal with occurring problems. Based on these observations regarding this matter, I will make an attempt to expose several basic uses and functions of the meetings.

The inquiry into the uses and functions of meetings will combine the two sorting systems (meeting *content* and meeting *organization* as developed in chapter six and seven) into a taxonomy of meetings that expresses 12 different uses of meetings as displayed in Exhibit 9-1. In addition, the meetings that in chapter six were identified to be located at the intersection of all three sub-systems will be described and examined separately.

The chapter addresses the data collected from interviews and observations and will be divided into five parts. The first part summarizes the use and interplay of meetings according to the matrix shown above. Thereafter, the qualitative data from interviews and observations will be presented one sub-system at a time. The last section describes the meetings located at the intersection of all three sub-systems.

9.1. Summary of the uses and functions of a system of meetings

As stated in chapter six, each sub-system can be seen as an arena within the projects where people learned about and managed a specific issue. When comparing the uses of different types of meetings, all three sub-systems display numerous similarities. In other words, each of the four meeting types comprised a procedure for the project members to learn and manage the problems present within a sub-system. However, there was also a visible difference between the sub-systems: while the hallway meetings were numerous within the operating and administrating sub-system, no data

indicates their existence within the allocating sub-system. Exhibit 9-1 summarizes the uses of the meetings.

Focus of the sub-system	***Operating sub-system*** *Problems at the technical component and system level*	***Administrating sub-system*** *Problems at the project organizational level*	***Allocating sub-system*** *Problems at the project context level*	***Overall use of the meeting type***
Announcement meetings	Prescribing standard operating procedures, ensuring the long-range perspective	Top-down verdicts, mapping and tracking.	Mobilize and enforce commitment	**Prescribing, pressuring**
Work meetings	Surfacing and signaling errors, connecting to existing solutions	Synchronization of activities and 'Soft coordination'	Local adjustments of resources	**Surfacing, Synchroniz-ing**
Hallway meetings	Fast guidance of problems, Story telling containing technical expertise	Vibe-sensing, and story-telling enabling organizational orientation	No data!	**Guiding**
Private meetings	Interpreting ambiguous technical issues	Lobbying and informal rehearsal	Backstage settlements. Preliminary action regarding product design	**Interpreting, preparing innovating**
Overall use of meetings with the sub-system	**Learning about and managing the technical system under development**	**Learning about and managing actor-action relationships**	**Learning about and managing the different interests regarding the project**	

Exhibit 9-1. The functions and uses of the system of meetings

9.1.1 Prescribing and pressuring in announcement meetings

In announcement meetings, information was officially disclosed and the actions of others *prescribed* (for example expressed through standard operating procedures). People were also more or less *coerced* to comply with certain demands. To further increase the impact of such statements, it was important to select the appropriate participants for the occasion.

Surfacing and synchronizing during work meetings

During these meetings problems *surfaced*, and thus *'entered'* into a formal existence. In a formal sense this means that the problems did not exist before they were surfaced here or in any other formal meeting. When they did, they were solved via methods that the project members already retained.

Beside the function of surfacing problems, work meetings connected people to one other (making them aware of each other), and activities *synchronized* within and across work groups and sub systems. Also local adjustments to the 'grand plan' were undertaken. Due to their regular occurrence, the bureaucratic procedure of these meetings also added stability to the development process and enabled (at least some part of) the work process to be traceable and transparent, especially as formal protocols were commonly used.

9.1.2 Guiding and sensing in the hallway

The hallway meetings often dealt with matters and action that needed an instantaneous response. It also provided the participants with *guidance* and information. The usually short interval between the moment of request for assistance and its supply has been stressed by many as an important and valuable factor for the successful functioning of the hallway meetings. Thus, the more tasks to be solved during a given period of time, the greater the need for hallway meetings.

During hallway meetings, people exchanged gossip and *sensed* how things were running serving as an appreciation of how the project was progressing. Stories were commonly told in these meetings. These stories often expressed technical and organizational expertise that provided guidance and orientation. In turn this achieved a reduction of the work's complexity.

9.1.3 Preparation, interpretation and innovation in private meetings

During private meetings, people were able to talk more openly and freely with someone whom they trusted. Therefore it became possible to request advice on issues that would otherwise cause that person asking for help to appear incompetent in a formal work meeting. The greater the ambiguity of issues, the more the important were the private meetings. This especially applies to situations that lacked a lucid and 'accepted' procedure, or when problems could not be managed according to a predetermined plan. According to Weick (1995:101), these two types of interruptions – unexpected events and expected events that did not occur, that foremost trigger sense making activities in order to detect their meaning and importance.

Thus, the private meetings can generally be identified as retaining the functions of *interpreting* and making sense of novel problems through defining and framing them.

During these meetings people also made preparations prior to more public performances that required synchronized action and nurtured *innovative* technical or organizational ideas (for example launching an unofficial study of an alternative technical solutions).

9.1.4 Meetings located at the intersection of all three sub-systems

In addition, a number of meetings existed at the intersection between all three sub-systems. These meetings worked as integrating mechanisms across sub-systems within the organization. These meetings served the function of formulating and maintaining a broad working agreement regarding the project and the necessary steps for assembling the product.

9.2. The operating sub-system: Learning about and managing the technical system under development

This part illustrates how the meetings were used to deal with the technical, interface, and system expert bottleneck problems. As described in chapter four, the system expert bottleneck is foremost a problem of availing system knowledge to problem solving situations. The two other problems draw attention to how organizations manage different types of complexity involved in technical errors that occurred at the component or system level.

9.2.1 A reflective conversation with the object

In interaction with the design object, problems of various kinds occur, either within components or when the functions of those components were integrated. To deal with such problematic issues, engineers must construct a manageable problem from the situation at hand, for example by using metaphors or larger situations that impinge upon how they are dealt with (Schön 1983:170). In many ways, the meetings within the operating sub-system can be seen as occasions in which a "reflective conversation with the material of a situation" (Schön 1983:172) took place whereby engineers learned about and managed the technical system under development.

The problem of putting a car together is a metaphor used by some engineers in meetings when assessing the process of developing the technical system. In Schön's (1983:182) terms, this means that the problem is framed - 'seeing-as' - involving the use of an example that the group or an individual have previous experience of and that bear perceived similarities with the situation at hand.

Participants also assisted one another more directly in meetings, for example through transferring 'ready-to-use' solutions to problems such as the program code developed in a previous project.

Formal and informal meetings were also important occasions to avail others of the experience and expertise of those people with system knowledge. In relation to the interface problem, some meetings provided the 'big picture' from a technical point of view, and thereby avoided further problems during the integration of the sub-parts.

9.2.2 Technical announcement meetings

In announcement meetings within the operating sub-system, people's actions were prescribed in various ways. The formal reviews acted to control the design teams and ensured their work complied with longer-range perspectives of the product's tenure. System knowledge was encoded into standard operating procedures for manual production and formal education.

Formal reviews: to perform control and ensure the long-range perspective

Product councils are line organization forums attached to each system and its sub system, both at the technical- and application level. The product councils were required to maintain the structure of the product "robust, cost-efficient, future-proof and easy to maintain" and to incorporate a long time perspective of the product.

The product councils performed their tasks by formally reviewing the design work. Thus, at certain intervals during the fabrication of code and technical documents, senior specialists performed formal technical reviews of the design team's work. Its purpose was to detect faults and recommend further corrections. In the earlier phases of the projects, reviews were made of proposed design specifications. At later stages, the code or the actual hardware was examined. The meetings were usually very formal and employed a regulated procedure in terms of how and when the work should be performed.

> These meetings were held in an orderly fashion (Team leader, Central Processor project)

Senior specialists chaired these activities. Thus, system knowledge was put into action while the senior specialists assisted the engineers by providing the expertise to plan the different steps in the design process and how technical problems could be avoided or solved.

Externalizing expert knowledge and prescribing standard operating procedures

Both projects tried to limit the problems associated with the system expert bottleneck by externalizing the expert's knowledge. By doing so, they attempted to make available the knowledge via knowledge transfer seminars, manuals and handbooks of various descriptions.

Some of the improvement meetings operated by the line organization were used to develop standard operating procedures. These meetings occasionally followed educational seminars, for example workshops held at the production site regarding technical components in the Central Processor project, or when new tools or methods for design were introduced, such as incremental design in the Mobile system project.

9.2.3 Technical work meeting

The *technical work meetings* ensured that technical and interface errors surfaced, and thus highlighted their existence in the organization. When errors were detected, connections to both external and internal solutions could then be identified and those in need of assistance were proffered solutions to their particular problems.

Technical issues that deviated from the plan often required immediate response and communication across functional boundaries. Examples of meetings where people came together to discuss technical concerns with others were the system emergency board, some section meetings, forums organized around specific technical issues, and various types of formal design team meetings. In addition, work meetings also include those meetings in which a deeper analysis of technical problems with an especially complex nature was addressed.

The participation of experts in these meetings provided assistance on how to interpret and conceptualize a problem (i.e. problem setting). The work meetings could therefore be viewed as a 'live' helpdesk that remained open during specific periods of time.

Exposing the technical situation in the system emergency board

The daily System emergency board meeting in the Central Processor project is one example of a meeting that addressed the daily integration of the operative design work. The System emergency board meeting reported the current technical errors and problems from across the entire main project.

> "The system emergency board foremost ensured that a solution could be found for a particular problem. This type of meeting was very important for our project. It was

here the integration of the product was made and the most central problems were surfaced" (Team leader, Central processor project)

The meeting played a central role for the Central Processor project. Most importantly, the meeting provided its participants with an understanding of the overall technical situation.

> "For me the meeting was good because I got an overview of the problems the other project or sub projects had. I also got an overview of the technical situation of the entire project. (Technical coordinator at a sub project level, Central Processor project)

> The System emergency board was very important for our project. It was there the actual integration of the product took place - it helped us to keep track of all loose ends, and how they could be tied together. When the project had begun to roll, it was clearly the System emergency board that was governing how the product was integrated. (Project manager, Central processor project)

The System emergency board meetings were very successful in enabling fast error detection and allocating solutions for problems. Many participants praised the meeting's strong focus and format. The System emergency board meeting retained very short intervals and all participants were welcome to participate. The meeting operated during a limited timeslot, normally everyday between 12.30 and 13.00.

> "The SEB meetings were really good because it only took about 15-30 minutes and only the important matters were discussed. (Technical coordinator on sub project level, Central Processor project)

Technical section meetings

Line function meetings played an important role in the Central processor project for transferring technical solutions to and from projects operating in parallel. People involved in several projects participated in meetings held at the section.

> In parallel with the Central processor project, we had other project going on with similar task. The same functions goes in there as well. Therefore, it was important to have all members of the section assembled to discuss common problems: "How did you solve the problem in that project?", "Oh, are you guys working on the same issue!", and so forth. We synchronized our work across projects. (Project manager, Central Processor project)

In depth analysis

A deeper and a more comprehensive analysis of the technical problems was needed to solve the problems when technical solutions were not readily available. These analyses were conducted at meetings where the most knowledgeable experts gathered, for example the Central Processor Hardware (CPHW) meeting in the Central Processor project and the system forums in the Mobile system project.

> The meeting was organized to solve a problem. Mike made the call "We have this kind of problem, and there will be a CPHW meeting tomorrow. In this meeting, we reflected upon issues such as whether we should conduct a work-around in the software or if we had to make corrections of the hardware, or whether it was possible to continue despite the problem. Basically, to deal with the difficult problems (Project manager, Central Processor project)

The meetings were very serious, as the outcome often impacted on the entire main project.

> In the CPHW, it was very much back to accountability and they were conducted in an extremely serious manner. At this meeting, difficult and important decisions were prepared which forced us to act in a serious manner (Coordinator, Central Processor project)

Similar to the CPHW meetings in the Central Processor project, *stinker analysis and route cause analysis* meetings were performed in the Mobile system project. The stinker analysis took place twice in one of the design projects included in the Mobile system project. First, it took place at an early stage in order to establish the most potential stinkers (the most complex technical and interface problems) at a time when the architecture of the system was proposed. Then, another stinker analysis was performed just before the design of the different blocks started. Thus, the stinker analysis aimed at a proactive management of the problems in order to avoid difficult technical errors that may arise at a later date. In addition to the stinker analysis, another forum labeled *Route-cause analysis* was used when a more difficult or complex problem arose during the ongoing work (sometimes detected through the error report from the customer). A special task force performed the route cause analysis depending on what type of error had been detected.

The *system forum* was another type of work meeting. This type of meeting was used on several levels of the Mobile system project. The system forum for radio base issues is one example of such a meeting. In this system forum, a well-established network of the most knowledgeable engineers in the R&D organizations gathered every second week.

> We tried to deal with the issues that were unclear, those that could not naturally be related to any specific sub-system. Basically, technical oriented stuff. To work out requirements and reasonable technical approaches (Technical coordinator, Mobile system project)

Team meetings

The frequently occurring design team meetings were also typical work meetings that focused on helping one another with technical problems (i.e. both the technical and the expert bottleneck problems were addressed). Beside the tasks performed at the meetings, such as reviewing code or monitoring the design work, many stressed the function of disseminating knowledge.

> We are very dependent on the team meetings as a means for making it possible for people in the team to share knowledge and experiences with each other. (Team leader, Mobile system project)

Participation in the team meetings by experts was of great importance, as they performed the role of a facilitator by questioning the other members so that their efforts remained focused.

> Mike began to ask us appropriate questions to ensure that we remained focused. Thereby, we were able to begin our work on developing well functioning simulation equipment. (Team leader, Central Processor project)

9.2.4 Hallway tech-talk and on the spot expert guidance

In the *hallway meetings* (hallway tech-talk), people received instant advice for their problems through the help of experts or team members located nearby. Also a great deal of 'storytelling' took place that facilitated an exchange of experience regarding technical problems.

Hallway 'tech-talk' took place spontaneously amongst the engineers and the coordinators in the hallways or around the coffee machine. Among other matters, technical problems were discussed and solved, and system knowledge tendered through exposing the expert to those in need of help. Although time consuming for the individual expert, it was effective for those people in need of help as they usually received this help 'on the spot'.

> "Spontaneous discussions in the hallways are very important when it comes to finding the right knowledge for a specific problem. I spontaneously confronted people in the hallways, most commonly other team leaders or experts, in order to get advice for technical problems. (Team leader, Mobile system project)

The hallways were used as a connection point for both the system experts to perform informal surveillance of the technical design work and those people looking for expert help.

> I walked around for at least one or two hours a day and see what is going on. If I notice anything special, I pull a meeting together instantly. For me, this is my most important source of information. I stand in close contact with all key-persons in the project. (System manager, Central processor project)

The hallway meetings were also important when issues could not be handled via the formal organization.

> The hallway discussions are important when new issues arise. Especially for novel problems that are detected at the border between established sub-projects or when new requirements are introduced. (Coordinator, Mobile system project)

The need for increased speed was an important reason for people to circumvent the constrains of the formal meetings, and instead make use of informal channels in the hallways:

> Spontaneous contacts in the hallway – they are what design work is built upon. If they would disappear, the time it would take to solve our problems would be prolonged. (Engineer, Mobile system project)

Stories exchanged in the hallway

When experiences were exchanged in the hallways regarding the product's problems, they were often expressed through stories of various forms. Firstly, the stories served a key informational function, preserving and circulating essential news regarding particular problems, such as test results from the lab. Story telling also retained an educational function: not only do engineers learn about the particular faults of products they have developed, but they also helped to develop diagnostic and trouble shooting skills. Stories told within the operating sub-system often identified the experience of the interaction with the technical object; technical problems that occurred, and how help could be gained. Thus, the story telling also helps to make expert knowledge available to others. Stories commonly contain metaphors and analogies.

As such, the stories provide perspectives of the technical system (seeing it as a car or a body) and how it functions (in Schön's (1983) terms 'seeing as'). Stories also helped to explain what to do with the technical design object when problems arise. On one occasion at the Central Processor project, I took a coffee break and observed one engineer reciting a story about how he managed to deal with an error he experienced in the previous project.

> When I was working on the previous processor, I experienced a peculiar problem that I could not solve. Luckily, there was another person who had detailed knowledge about the issue. I went into his verilog-code and could interpret what happed at the cycle level. When one is experiencing these kind of unexplainable situations, there is often another person who understands the situation, because he was involved in the detailed design on the previous processor.

The importance of co-location

The interactions taking place in hallways were dependent on the physical location of private offices. An example emphasizing the importance of co-location as a requisite for making use of the potential of the hallway meetings was provided by one of the hardware design projects in the Central Processor project conducted abroad. The participants of the design project both lacked prior experience for AXE development as well as the informal means to interact with the system experts, who were all located at the central site of the project. This meant that they were out of reach of the informal wellspring of knowledge that the hallways at the main site of the project constituted. In order to deal with the problem, all the personnel of the design project were moved to the Stockholm site for a month. The working visit had an enormous impact, illustrating the significance of informal hallway meetings and how expert knowledge is made available to the less experienced.

(Q: What impact did the visit to Stockholm have?) The stay in Stockholm was really good from the project point of view. We received all the support we needed. We had the technical gurus sitting next to us. Then we received better information. We began to make much more progress than earlier. (Q: How has things changed after the Stockholm visit?) Better, now we know what to do. Or, at least we have an idea of what to do (Technical coordinator, Central processor project)

9.2.5 Private tech-talk

During the *private meetings* within the operating sub-system, a number of preliminary unofficial steps were taken and others discussed. These one-on-one conversations often dealt with the interpretation of ambiguous technical matters, for example how to define the interfaces between sub systems.

Private meetings within the operating sub-system ('backstage tech-talk') seemed to be especially important at the beginning of both projects when design stability was low and the technical tasks contained high degrees of ambiguity. Under these conditions, many of the more knowledgeable engineers remained in continuous, but unofficial, contact with each other across project boundaries.

A colleague and I employed a form of 'molding activity' in order to set the fundamental base for the system design. This was the major task we had during the first year of the project – we ran around, made use of our colleague's network of experts, and prepared people so that they knew what to do. (System manager, Mobile system project)

Because the issues discussed in these private meetings were often not officially sanctioned, and/or perceived to be too difficult and broad, people were hesitant in raising them during formal meetings. The private meetings often dealt with how the system and its interfaces should be understood.

My contacts in the design projects were very important, especially at the beginning when the first prototypes began to emerge. These conversations were vital in ensuring that we had similar views. It was like linking together. (Sub project manager, Central processor project)

During the Mobile system project's initial period a system manager coined these conversations as 'wollying'. Through an ongoing 'wollying', they discussed their vision of the product. As a result, the participants of these discussions engendered a common perception.

The wollying was extremely important during the earlier phases of the project. It's about getting the product into our heads, so that we know what to do when we begin the actual development. Then, everything becomes self-evident. During the wollying process, only those things survive that everybody agrees upon. Everything else fades away because it lacks engagement (System manager, Mobile system project)

Thus, the backstage tech-talk that took place in the early phases of the project dealt very much with creating a common knowledge and to indoctrinate the

planned product. To a large extent, these interactions were a collective sense making events of the clarification of ambiguities via mutual agreements.

> This is most important when we are constructing the architectural layout of the system. Then, ambiguities are prevalent. Most often, we come together very informally several times a day to talk about these things. Importantly, we simply get the design work done. (Technical coordinator, Central Processor project)
>
> It takes many discussions to indoctrinate the design specification. (System manager, Mobile system project)

In addition, ideas on alternatives to the official technology were also discussed in a setting that was shielded form management's attention.

> There are always some people sitting in their chamber pursuing another direction. Most often, it leads nowhere. But sometimes, it leads to ideas that can be used in the next product generation. (Technical coordinator, Central Processor project)

As the examples show, a number of preliminary unofficial actions were taken during the backstage tech-talk. These one-on-one conversations dealt with the interpretation of ambiguous technical matters, for example the definition of interfaces between sub systems. As such, these dialogues generated meaning for otherwise 'fuzzy' situations and made it possible to navigate a chaotic technical situation that retained various demands and possibilities.

9.3. The administrating sub-system: Learning about and managing actor-action relationships

The coordination and tracking problem share similarities in that they both are associated with the difficulties in understanding the relationships between the actors and their actions. Thus, the meetings within the administrative sub-system were largely characterized by conversations examining and influencing the actor-action relationship.

Meetings within the administrative sub-system provided the possibility of understanding their colleague's perspectives regarding the designated tasks. During the meetings, the sub-groups' sequences of acts were also synchronized. Meetings opened up the possibilities for the exchange of information and the progress of sub-groups. The stories expressed here aid orientation in complex system that a project constitutes.

9.3.1 Announcement meetings: Top-down verdicts, mapping and tracking.

Announcement meetings within the administrating sub-system focused extensively upon the formal reports of progress. Furthermore, activities were *prescribed* and *mapped*. Typical announcement meetings within the administrating sub-system were project management meetings, project stand

up meetings, customer feedback sessions, and knowledge transfer meetings arranged to bridge knowledge from one project to another.

9.3.2 Top-down 'mapping' and formal progress reporting

The evaluation of the project's progress is one duty commonly repeated by the project managers. To a large extent, this responsibility was performed in the main project management meetings and project management meetings.

Through progress reports, managers received information vertically from their subordinates regarding progress, problems that occurred, and forecasts up to the point in time when the next meeting was held. Project tracking performed this way was problematic. Typically, progress reporting took place with leading questions from the chairman that in turn was answered defensively by others. As a result, reports were only received regarding matters directly asked for and negatively perceived issues were often withheld.

The main project management meeting

The main project management team meetings for both projects were surprisingly similar, both in terms of organization and the opinions that the participants expressed about them. In these meetings, the management team of the main project consisted of many participants, often up to 20. The many people involved made the meetings troublesome.

At these meetings a lot was at stake. This caused many to reflect on what they said or did and in turn become overly cautious. Thus, the main project management meetings developed into occasions where it was an important attribute to be able to participate in a manner that decreased the risk of being criticized. Often at these meetings, positional posturing inhibited progress reporting. The situation became one where people performed the ceremony of progress reporting rather than the intended purpose of exchanging vital information. The rationality behind this behavior must be that the act of bucking the social order incurred severe punitive sanctions and was therefore a more unacceptable social crime than deliberately withholding vital information.

> Who will put his hand up and say that things are not running as they should? There exists a resistance towards doing that and it often becomes a kind of game. No one wants to become the one who delays the process. Therefore, progress reports tend to have a considerable positive bias to them before someone else put their cards on the table. But if someone else reports delays, then many others may report their delays using the first reports as a kind of protection. Of these reasons, people are not always very accurate with their reports. (Main project manager, Central processor project)

People from both projects witness problems and unease within the main project management team meetings.

(Q: You refer to the main project management board meeting as "kind of lousy". Why is it so?) The loyalty to ones own project is so strong, and the group is very heterogeneous (Hardware project manager, Central Processor project)

These progress reports were actually quite a big yawn. This was caused by the limited interest we had in the result that other people had generated in their projects. (Project manager, Mobile system project)

Yeah, you sat there for four hours and became very tired of it all. It was a pure progress and information meeting. A long information meeting. We took turns around the table and reported for four hours, I must say it was very long-winded. (Project manager, Central Processor project)

(Q: How do the main project management board meetings help you to get your work done?) Well, I do not have a good answer on that. I have tried to find out why these meetings were held, their purpose, but I have not been able to find an explanation for it. (Project manager, Central Processor project)

The very procedure of how to run a meeting became the subject of intense discussions. The format of the meeting was also changed several times during both projects.

The format [of the meetings] has been changed so many times. For a period, problem solving was emphasized, and then it was only progress reporting without any discussions. It has gone back and forth. Now, I think it is back to problem solving again. (Project manager, Central Processor project)

However, these changes in procedure did not improve progress. The meetings continued to suffer from defensive tactics and extensive quarreling regarding what has and has not been accomplished.

Project management meetings

Similar to the main project management team meetings, but one stratum lower in the project hierarchy, the included projects also had management team meetings. Typically, the participants in design project management team meetings were, apart from the project manager, the team leaders and a number of specialists and experts such as technical coordinators, a person responsible for the technical sub system, and a project administrator. Extensive progress reporting took place here as well.

Entire projects gather for meetings

Occasionally, managers tried to gather all members of a project or even a main project. These meetings were most often termed 'stand up' meetings (indicating short meetings). These meetings were either performed on a regular basis, or convened when information of critical importance needed to be announced.

We had a stand-up meeting going every week. It was a forum that was attended by about 50 persons each time. (Main project manager, Central Processor project)

The stand-up meetings were used by the managers to counteract the risk of having 'uninformed pockets' in the project and to make sure that as many members as possible remained updated. Often, the information distributed at these meetings concerned a new direction for the project or in the progress of sub-parts of the project.

Product demonstrations: Verdicts regarding performance

Demonstrations of the product to the customer provided an up to date evaluation of the project's progress. As such, these meetings identified necessary adjustments and offered directions for those adjustments.

Via product demonstrations, feedback from the customer was continuously and sometimes painfully looped back to the projects. The very existence of these kinds of meetings determined that the system was developed in a cautious manner including many testing activities in advance so that errors can be located.

Thus, apart from providing opportunities for the project to receive immediate feedback regarding the performance of the product, the product demonstrations tended to synchronize and coordinate the activities within the projects.

> Then, the customer came and had a look at the product. It was like participating in a final exam. We showed that the system was working. This was an activity that set the pace for the whole project. I think that most of us enjoyed it - that the one who was really going the use of the product came and listened to us and were interested in what we had done (Senior line manager, R&D organization hosting the Central Processor project)

In a way, these meetings were typical examples of announcement meetings. This is evident from the main project manager of the Central Processor project.

> The meetings where you discuss progress and content with the customer are very vital for us. One has to shape up a bit. Internally, we may mess around but with the customer you cannot do that. They are actually paying for a certain expectation. If one deviates from that, they will not be happy at all.

For the Central Processor project, an occasion later labeled the 'N-sund show' had an important impact upon the project and how Ericsson viewed it internally. Numerous problems confronted the project in its first years of operation external forces began to question if the product would function at all. The meeting with a potential customer provided an opportunity to show that this was not the case.

> We showed the machine at a very simple exhibition where all of Ericsson's top managers of were present. They could see that the machine actually lived, even if it was not ready to be delivered. It felt like our credibility had risen in the eyes of the

customer - we showed that that there would be a product within reasonable time. . (Main project manager, Central Processor project)

As a part of the contracted agreement with the customer, the Mobile system project performed three product demonstrations for the customer, where all were very formalized activities. The first demonstrations took place at the design projects' sites and demonstrated the sub systems of the product. The entire system was assembled and demonstrated during the second meeting at the project's main site. The third (and final) contracted demonstration took place during the equipment's installation at the customer's site.

Bridging managerial experience between projects

Knowledge transfer seminars were held in both organizations, during either the project's commencement or its closure ('summarizing meetings'). Both the Central Processor and the Mobile system projects used these types of seminars - both as guests and hosts. These meetings were primarily concerned with the transferal of managerial experiences.

> The purpose was partially to transfer knowledge from previous projects, but also to identify what could be done better in our project. (Quality coordinator, Mobile system project)

However there were considerable difficulties in utilizing the experience of prior projects. According to several project managers, these occasions rarely instigated substantial change in the forthcoming projects.

9.3.3 Work meetings: Synchronizing activities across projects and 'soft coordination'

At the work meetings, activities within and between subgroups were *synchronized* and problems formally *surfaced.*

A large number of issues were coordinated across the main projects. Examples of these issues were quality work, planning of testing and production procedures, and internal and external deliveries. Often one person bore responsibility for a particular issue in the main project, for example 'a delivery coordinator'.

Coordination of these activities called for a large number of formal meetings, such as quality seminars, delivery meetings, visits to the factory, and a great deal of contact across the different parts of the project.

> It saves time. Otherwise, everybody runs around and asks questions all the time. (Coordinator, Mobile system project)

> The main project's verification unit called all people involved in the deliveries to make a delivery plan. We had these meetings on a regular basis. There was a large party gathered, about 15-20 people. All relevant stakeholders took part. We meet

> regularly in order to see to that our plans were consistent with each other. (Project manager, Mobile system project)

Many of the section and department meetings could also be found among the work meetings within the administrating sub-system. These meetings often involved events where information was disseminated regarding matters common for their members.

> During our Friday meetings the technical director informs us about this and that. The whole department is gathered. We talk about how things are running in the project, the installations that have been made, and the latest news about the customer (Coordinator, Mobile system project)

Work meetings were also regularly held with the customer in order to synchronize work and exchange information. These meetings became increasingly important, the nearer the product approached its release. During these later stages, the customer's personnel became more involved in the project, especially when problems arose.

> We had meetings with the customer everyday where we worked through the results from the system test. (Sub project manager, Mobile system project)

During formal meetings that retained a social character, managers attempted to develop team spirit and encourage project members to bond together under relaxed conditions. The Central Processor project's newsletter announced a project pub. A contest was initiated with humorous interpretations and symbols of the project's aim were the pub's leading theme.

> Approximately a hundred people turned up for the thrilling conclusion of the Central processor summer Contest at the Central processor pub last Thursday. First prize was given to APZ system objects for their contribution 'Praying for 4 times'. (Excerpt from the Central Processor Express 15-97)

At another pub, the main project manager invited me to give a speech regarding organization culture. His purpose was to instigate a discussion on the different cultures present within the project and the possible tensions they created. After my presentation, the gathering continued under more relaxed conditions, where small groups held conversations were by while all enjoyed a beer.

Although a pub conveys an informal connotation, they were usually formally organized (by the project managers) and had the more or less explicit purpose of increasing contact between people and to encourage them to think and talk in about particular issues (for example about project culture). Hence, these types of meetings can be viewed as a form of 'soft coordination'. These meetings clearly attempted to imitate the atmosphere of informal social gatherings. However, this was usually difficult to achieve due to the formal hierarchy's presence, creating uncertainty and prompting the question: How

should I behave at these occasions? Am I at or outside work? Is it OK to be drunk?

9.3.4 Sensing the vibe and information exchange in the hallway

In hallway meetings, the content of conversations within the administrative sub-system was broad, covering almost any topic. However, it was characteristic for these hallway meetings that people *exchanged* rather than *reported* information as to the progress of their activities. Thus, hallway meetings that took place as conversations and cross talk around coffee machines, or between two office rooms when two persons bumped into each other, seemed important in gaining another type of information than that distributed during formal meetings. In many cases, hallway conversations served the role of being a post- or pre-meeting outside conference rooms and in conjunction with formal meetings, where the formal meeting and the contributions of the participants could be discussed. The hallway meetings were also important in that they provide the opportunity of managing matters instantly.

Managers and senior specialists also made regular office tours ('management by walking around') in order to *feel and sense the 'vibes'*, for example the mood of the designers, and to gain a first hand impression of how things were going.

> To walk around is really important. You get contact with others, and get to know what is really going on in the project. It provides a wider understanding of how things are running and why certain things are done, compared to what you get in more formal circumstances. (Project manager, Mobile system project)

> Walk around gives me a possibility to sense the vibes, and to get to know the organization (Project manager, Mobile system project)

The symbolic importance of being present, showing interest about the work performed by the designers, and to praise good performance were stressed by several project managers.

The walk around also opened up possibilities to informally circumvent formal machinery of the matrix organization. Thus, plans were prepared directly with the involved engineers in the hallway rather than taking the longer route via the 'resource owners', i.e. the line managers, in formal meetings.

> Frankly speaking, I did short-circuited many things and talked to the engineers in person instead of talking the longer route via the functional managers. I talked about my future plans regarding the project and how it affected them. My own line manager thought that I violated the rules many times (Project manager, Central Processor project)

The 'non-managers' of course also engaged in similar activities. Gossip around the coffee machine, in the smoking room, or the hallway were all common

places for people to 'sense the vibes' of various parts of the project organization.

9.3.5 Backstage preparations: Lobbying and informal rehearsals

During private meetings, preliminary ideas and tactics were discussed, evaluated, and changed in a relatively safe environment protected from public attention. The private one-on-one meetings in many ways retained the purpose of influencing each other's agenda before a unity among a collective of people could be performed at formal meetings. Through the investment in informal negotiations and preparation backstage, subsequent formal meetings became less difficult.

Before project managers or coordinators made announcements at formal meetings, sensitive or ambiguous matters were most often prepared in 'pre-meetings' backstage. Private meetings within the administrative sub-system served a number of functions, and can in sum be described as different ways of reducing the anxiety and uncertainty on the front stage. The absence of public attention implied that the conversation could take place without unnecessary attention to the decorum or an audience (people not engaged in the conversation but within visual or aural range). In turn, this encouraged people to speak more frankly than they otherwise would.

> These one-on-one conversations were important for building an understanding. Thereafter, they could be brought up in a larger and more formal forum. Most decisions were made this way. (Project manager, Mobile system project)

Occasionally, these conversations were harsh, as the rules of politeness did not apply to the same extent as the more public meetings. Most commonly however, high degrees of mutual trust between the involved participants meant that they could display more private and personal thoughts than they otherwise would.

As people exchanged what they actually thought, or saw, in the project organization, rather than what was expected of them to say or report, these meetings meant that the involved parties could create a reliable dialogue in terms of the project's progress. This also meant that action could be coordinated between individuals without having to worry about the opinions of others.

Furthermore, trustful relations often formed an important precondition for these types of private meetings to occur.

> L and I were on very on familiar terms. We could tell each other anything in a very open atmosphere (Deputy main project manager, Mobile system project)

A typical example of the backstage preparations within the administrating sub-system was the informal *lobbying* between two or thee project managers or coordinators at the main project level.

The private meetings also worked as *informal rehearsals,* where preparations took place prior to project stand-up meetings, main project meeting and the alike. Thus, possible scenarios for upcoming activities were imagined, alternatives developed and tried, agendas coordinated and synchronized, and the most unrealistic ideas omitted before they were presented on the formal (and thus officially quotable) scene.

> We divided the roles between us with regards to the focus we employed in the main project management group meetings. We discussed "what would happen if we did like this?", "Who does this affect?", "Which consequences will it have?" (Deputy main project manager, Mobile system project)

One example of where a more or less systemized schooling of people took place were the informal conversations taking place between newly recruited project managers and the director in charge of the project office at the R&D organization hosting the Mobile system project. Newly appointed project manager found many different situations novel. Thus, the conversations that took place between newly recruited project managers and the director in charge of the project office very much worked to socialize and enculture people into being competent project manager.

> Everyone that comes here (to the project office) needs to be taken down a peg or two. For all the projects so far, this has been the case. When they start, they are very edgy and clash with everybody around them. I tried to guide them in a certain direction. (Director of the project office, Mobile system project)

9.4. Allocating sub-system: Learning about and managing the different interests regarding the project

In chapter four, the process under which the two projects' boundaries and scope was defined, redefined and changed throughout the project was described as a tug-of-war. In this tug of war, a number of actors made use of numerous mechanisms to pull the project in a direction according to their interest.

Meetings that dealt with the boundary problems were in many ways related to a process in which the actors learned about different groups and their interests with regards to the project. Among different interest groups negotiations and trade-off were made, adjustments to changes worked out, and agreements occasionally reached on how to proceed.

In contrast to the operating and administrating sub-systems, the meetings within the allocating sub-system were polarized into the two ends on the

continuum of formalization. This implies that the large majority of meetings within the allocating sub-system either took place as private or announcement meetings. The most reasonable explanation behind this polarization of meetings was the sensitive nature of the boundary problems. High degrees of tension existed regarding the allocation of resources between different actors in the organizations. Therefore, meetings dealing with boundary problems needed to be managed with great care. Otherwise, misunderstanding or rumors could start strong chain reactions in the organization. The boundary problems were viewed to be too difficult and emotional for discussion in the relatively open work meetings, and too sensitive for discussion in the semi-public hallway meetings.

For both projects, the normal procedure of making agreements regarding resources and the scope was to first engage in unofficial negotiations here called 'backstage settlements'. Thereafter, agreements could be presented as a well-prepared decision in a formal meeting, for example at a project steering committee meeting.

Settlements were made in private meetings because less attention had to be given to what an audience was expecting from a person to fulfill their role. Such expectations could block the possibilities for making agreements where both actors are required to compromise. Thus, by negotiating in private meetings, the backstage settlements made it possible to reach pragmatic settlements.

However, occasionally the backstage settlements' procedure, as a preceding arrangement to formal meetings, was broken. In these cases, the issue (usually a demand for resources) was hastily raised at the announcement meetings. Due to the social order or etiquette of the front stage, the person confronted by the issue was put to a dilemma of either loose face or comply with the demands presented. This kind of action was most common when relations between the line and project managers were characterized by hostility.

The preparations necessary for such a drama was to create a situation where the majority of the participants (in terms of numbers or power) merged against one or a few individuals and compelled them to comply with certain demands. Most commonly, these coalitions were formed between the main project manager and a senior manager against a resource owner.

> If we had one poor line manager and 10 of us from the project, it was like we formed a train against the line manager. That is something I can see now. It created an enormous pressure to get something done, for example to get a resource that we needed. (Project manager, Central Processor project)

9.4.1 Announcement meetings: Enforcing and mobilizing commitment

An important function of the announcement meetings within the allocating sub-system was to mobilize commitment to the project. High degree of ambiguity regarding resources and time plans could be reduced if public promises were made to follow a certain route. Forcing people to make official statements in the presence of numerous witnesses often promoted commitment building. As a result of such public statements, it became difficult to renege on these promises at a later date. This also made people to become very careful when making statements there. Examples of meetings with the characteristics discussed above were the operative steering group meetings, change control boards, and the Dalarö and the Almåsa meetings (the latter two meetings will be presented separately, as they were located at the intersection of all sub-systems).

To arrange such meetings, it takes much preparation on beforehand. Statements made during operative steering group meetings, change control boards, and other meetings of this type, should foremost be viewed as the product of many informal conversations that took place outside the formal meetings, rather than something that was created within them. This means that statements and action, to a large extent, was prepared on previously, and the performances made there rather worked to confirm what already had been agreed upon.

> At this level, these meetings are very well prepared. It was item - decision, item - decision. (Project manager, Mobile system project)

> It is important to have these meetings. They have a symbolic value. It is about declaring truths and showing commitment officially. But, in reality, it is just a kind of role-play. Everything has already been set up in advance. (Senior manager, Central Processor project)

Change Control Board meetings

One example of an announcement meeting within the allocating sub-system was the Change Control Boards. These meetings were held both at the main project and project level for design projects. At the main project level, the Change Control Board meeting served to control the influence and implementation of new requirements, received after the project's inception. Therefore, reprioritizing became a main theme for these meetings.

Metaphorically speaking, the Change Control Board meetings functioned somewhat similar to a set of scales. Here, the stability of the project was balanced against the flexibility and adaptation needed to satisfy changing customer demands. The Change Control Board meeting's ideal outcome was to establish immediate acceptance or rejection of the demands for changes in

the product specification, and thereby reduce uncertainty regarding what is or is not included in the project.

> In the Change Control Board meeting, we tried to balance what was possible to do in the project without destroying the long-term goals aims. It was about balancing market demands against the stability of the project. It felt like we were balancing these two demands. It is about clear-cut yes or no decisions. Black or white. "Can we accept this demand, or not. What will it cost if we accept it?"- It is the market against the project, and one of us will win. (Deputy Main project manager, Mobile system project)

Project steering group meetings and senior management boards

External follow up and progress control of the projects were formally conducted in the project steering group meetings and, to some degree, on the senior management boards. The agendas of these meetings were broad, and included almost any issue related to the organization and ongoing projects. The broad agendas also meant that many people were required to participate to ensure their interests were guarded.

> Since anything can be brought up at these meetings, everybody needs to participate in them. (Senior manager, Mobile system project)

A 'Freudian slip' from one project manager clearly expressed the dynamics involved in project steering group meetings and those acts a project manager should perform to keep things running smooth.

> The purpose of the operating steering group meetings was to *report that everything is running well.* (Project manager, Mobile system project)

If a project manager, on the other hand, raised problems (such as deviations from plans) they often resulted in harsh reactions from the senior managers present at the project steering group meetings.

> My opinion is that the reactions from the steering group often became too strong. I think that they over reacted when problems arose. (Main project manager, Central Processor project)

Similarly, a senior manager reflected on the tactics appropriate in the meetings to gain control and produce the desired result.

> "Should I shut them up, or motivate them - that is the question"(Senior Manager, Mobile system project)

The aforementioned dynamics involved in the interplay between the project managers and the senior managers led to situation where all participants employed defensive tactics. From the perspective of the project managers, it therefore became an issue of importance to carefully reflect on what to report and what to suppress. The reports therefore became limited to matters that kept the project managers out of trouble.

> Basically, there are no project managers that go to the steering group to get help. Most often, the steering group means that the issue makes a hierarchical loop back to the project manager again (Senior manager, Central processor project)

9.4.2 Work meetings: Local adjustments of resources

In addition to meetings that dealt with boundary issues at the main project or project portfolio level, there were also a number of meetings conducted across the project-line interface at the local level, for example within a local design center. Adjustments were continuously needed to adjust the agreements made at the central level to the conditions emerging at the local level.

These meetings focused predominately on the daily allocation of resources, or "iteratively dimensioning the project" as one of the participating line managers expressed it. Local resource owners (typically a section and/or a department manager) met with project managers and sometimes an administrative specialist (such as a controller) to evaluate progress, scrutinize issues regarding financial and human resources, and to deal with conflicts between the line and the project organization.

9.4.3 Backstage settlements

As stated previously, the common and preferred procedure in the projects was to arrange agreements and decisions regarding project boundaries *outside* the formal meetings (e.g. project steering group meetings). Consequently, a significant amount of lobbying and informal contact took place between project managers, senior managers, and line managers (the resource owners).

> All the important meetings took place outside the steering group (Project manager, Mobile system project)

The private meetings varied from an open and relaxed chat to aggressive discussions containing threats.

The private meeting within the allocating sub-system seemed especially important for securing support for decisions raised during future formal meetings. However, the private meetings were not limited to preparatory negotiations prior to formal meetings. Sometimes, senior line managers spontaneously resolved issues without taking the longer route via the formal meetings. Or as one manager expressed it, deciding 'on the fly'. However, only manager with considerable formal power in the organization could take such action.

> Many of these politically sensitive issues were dealt with outside the formal steering groups. Regularly, we sat down after office hours for a chat with AW (the senior line manager) and discussed various issues and solutions. Many decisions have been taken by de facto outside the formal steering groups (Deputy main project manager, Central Processor project)

Private meetings were also used for deliver critique, for example if mistakes had been made within a unit delivering design work to the project. Thus, instead of confronting the line managers at formal steering committee meetings with critique that could cause embarrassment, informal channels were used. By doing so, it reduced the risk of conflict that later on may become costly in terms of low support.

> We never tried to nail people at the project steering group meetings or to raise sensitive issues. We always talked to the manager on before hand, so to speak. (Deputy main project manager, Mobile system project)

Secure back-up alternatives for products

In addition to the private meetings between project managers, senior managers and line managers, unofficial contacts were also taken between senior engineers and senior managers. Senior engineers and senior managers alike shared a common interest of having other product alternatives available than the one the organization was formally committed to. For the senior manager, alternatives could assist the reduction of risk if the official alternative would fail. For the engineer, alternatives could present technical challenges. Thus, senior engineers and senior managers occasionally met to discuss these kinds of issues in private meetings. One such example was the initiation of the Central Processor project in 1993.

> The entire idea about the project started in 1993 as an unofficial initiative. We were of small group of engineers that engaged in a kind of cellar activity writing a 'pre-pre' study report. (Project manager)

At this point, a giant platform project within Ericsson was still operating, and the central processor project prior to the one studied here was run as a final project of APZ processors. However, people in the organization began to receive signals that the giant platform project was not progressing. Therefore, an informal pre-study of another product generation of the APZ processor was initiated by a number of senior engineers who disagreed with the concept of the giant platform project. Thus, a number of meetings were conducted between experienced engineers in order to discuss how to further challenge the concept of the giant platform project.

> We invited those who had experience. Of course, we saw it as a great challenge to promote an alternative. (System manager, Central processor project)

Unofficial negotiations began amongst various business units. An external consultant was engaged to write the proposition, thereby avoiding the problem of having an employee working with an issue that was heading in another direction than that officially sanctioned.

> He (the consultant) sat in a cubbyhole writing the proposition. Clearly unofficial in other words! (System manager, Central processor project)

Later, a senior manager also informally sanctioned the activities regarding an alternative to the giant platform project, where many problems were accumulating at the time.

> What is important when doing unofficial work is to have someone to back up the development. You have to get an unofficial permission from powerful engineers and business units that they will be willing to lend support. These things are dealt with in an unofficial manner. In this case, I went to a top manager I knew well after nine months of working on the idea. He said, "go!" (System manager, Central processor project)

When the pre-study was prepared, it became an official alternative to the giant platform project. As a result, the Central Processor project was started in 1995.

9.5. Pulling the system together: Meetings as integrating mechanisms across sub-systems

For both projects, several meetings existed at the intersection between all three sub-systems. At these meetings, boundary problems, as well administrative and operative problems were dealt with. These meetings therefore worked as integrating mechanisms across the three sub-systems and the boundaries between the line and the project organization.

> During these meetings, we made the managers across project- and functional boundaries march to the same tune. (Main project manager, Central Processor project)

As such, they served the function of creating and maintaining a wide working agreement for the organization regarding the project and the necessary steps to assemble the product.

Similar to other procedures in other parts of the meeting system, the bulk of the settlements were not worked out at the ongoing formal meetings, rather during private meetings held beforehand. These formal meetings therefore served the role of hosting the agreements' symbolic and official 'handshaking'. Thus, many informal pre-meetings took place where negotiations and agreements were prepared and fine-tuned before it could be formally sanctioned.

> The test coordinator had always made sure that the important issues had support before we came to the Dalarö-meeting. Therefore, these meetings were rather comfortable. (Main project manager, Mobile system project)

For the Mobile system project, the formal meetings situated at the intersection between all three sub-systems were meetings included in the 'Dalarö-process'. The 'Dalarö process' was tightly connected to the major tollgate decisions made regarding the project. The process contained three different meetings

presented in chronological order, the Dalarö, Vaxholm and Möja meeting. These meetings were all named after the first conference sites used when the first project was launched in the organization.

The Dalarö meeting directs the activities of the other two meetings, as is was here the different stakeholder formally announced their acceptance of the product development plan. Thus the other two meetings thus served the function of ensuring that the operation ran according to the original plan launched at the Dalarö meeting. The Vaxholm meeting was held before the third tollgate and contained further specifications and details regarding the design performance at block levels. Finally the Möja meeting was held before the forth tollgate, and was considered to be the final checkpoint before implementation and acceptance activities could be started at the customer's site. The expected outcome from the Möja meeting was a day-to-day plan and an action point list of the remaining problems.

The Central Processor project involved two meetings and was similar in format, but less related to the tollgate process. Labeled 'Almåsa 1 and 2', it was named after the first location of the meeting in the same fashion as in the Mobile system project. The focus of the meetings was the agreements of the plan that would integrate the design work of the product. Later, when the time of delivery of the product came closer, the line-project coordination performed in the Almåsa meetings was transferred to another meeting format, the 'Central processor Friday meetings', dealing with matters requiring more immediate attention. In order to communicate a sense of urgency, the meetings were held very early every Friday morning.

At these meetings, the closest stakeholders in and around the project were gathered, often up to 20 to 30 persons. Typically, senior managers, resource owners, system experts, and people at the main project level participated. The aim was foremost to make decisions regarding a certain course of action and forcing a commitment from various actors.

> The meeting is about having all the stakeholders gathered in the same room, and thereby to coerce them to coordinate and synchronize their activities across the line- and project organization (Quality coordinator, Mobile system project).

In focus of these meetings was a plan illustrating how the project activities were integrated over time. For the Central Processor project, this type of plan was formed around a product anatomy and an integration plan that identified how and in what order the parts and sub systems should be integrated into a well working whole.

For the Mobile system project the amendment directive (AD) plan played a similar role. The AD plan described how a new (software) system releases were integrated into the total system and when the new amendments should be available from the design organization.

Acceptance of the plan also meant that an actor committed time and resources to the project. The ideal outcome of the meetings was to create a consensus and engender commitment for the most important issues.

> It is about never leaving any open items in the planning. To get 'the go-ahead' from everybody, that's the most important thing. (Director of the project office, Mobile system project)

One meeting in the Central Processor project (which I attended as an observer) was very much appreciated due to its unconventional format and was retrospectively rated one of the most innovative activities performed in the project. Line function-, project- and system-representatives together gathered to decide on the course of the project.

> It was an incredibly important meeting. At this meeting, we began to really capture the project, made plans for integration, and developed some structure. The whole meeting was a very good approach: to have the entire body of the system gathered at the same place – 'heart, lungs and stomach' so to speak (Project manager. Central Processor project)

For the first time, the participants agreed on an anatomy of the product (defining it various subsystems and components and how all these parts relate to each other) and how it should be integrated during the course of the project. Thus, a shared and accepted conceptualization of the product and a course of action began to emerge. The meeting gave rise to great expectations, and the participants "signed their agreements in blood" as one project manager stated it. The main project manager who convened the meeting, however, experienced the meeting as very chaotic as some projects were required to change their course, while others were unexpectedly appraised as being ahead of the timetable and others much more behind than expected.

9.6. Concluding notes to the chapter

In this chapter, the two dimensions developed in chapter six and seven (the three clusters and the four types of meetings) were combined into taxonomy of meetings for complex product development. Through this taxonomy, it was examined how meetings were used and interplayed to deal with the six problems defined in chapter four.

This chapter has shown that formal and informal meetings interplay with each other when dealing with obstacles occurring in the product development project.

From this perspective, formal meetings were arranged as smooth performances amongst a group of people, whereas the informal meetings relate to the backstage preparations needed before those front stage performances can be undertaken. More specifically, the ambiguities regarding

certain matters were reduced to the lowest possible level during informal meetings before they were then announced in formal meetings. Basically, surprises, neither in the form of content nor ceremony, were welcome in formal meetings. The achievements of announcement meetings should therefore be viewed as the consequential to many informal conversations.

This also means that problems were rarely solved in formal meetings, as participants were generally hesitant to express provoking, disturbing or unconsidered thoughts. Instead, the framing and solving of problems took place during informal meetings, and was then *presented* at formal meetings. The activities conducted during formal meetings must therefore be viewed as events that limit the possibilities of creativity and innovation. This is in direct contrast to the informal meetings that supplied an avenue for creativity and innovation.

In the total system of meetings, formal meetings 'enter' problems into formal existence (see for example the system emergency board in the Central processor project) and elevate certain sections of the thinking taking place in informal meetings into an official and formal level of the organizing process. This basically mirrors a learning process, in which certain acts become official routines over time. Formal meetings were also shown to be of great importance for temporary coupling the project tightly together across sub-systems, which works to integrate the activities of a project. The Dalarö meetings of the Mobile system project and the Almåsa meetings of the Central processor project are examples of meetings that were used in this way.

10. Two systems of meetings

The purpose of this chapter is to describe the differences of the two systems of meetings, when the projects are compared, and provide explanations for their occurrence. Foremost, explanations of these differences will be sought from the project characteristics described in chapter three (for a summary, see Exhibit 3-1, page 54).

The method employed for the calculations and descriptive statistics presented in this chapter deserves a specific comment. So far, the thesis has reported results based on the distribution of 224 different meetings collected from the two projects. In this chapter, however, each individual type of meeting has been weighted by how often it occurred during one year (for results of intervals between meetings, see chapter five). As the time intervals of meetings largely differ between the two projects, a simple count of the number of individual types of meetings in each project would be meaningless. Therefore, taking time intervals of meetings into account is the key information that makes comparisons between projects possible.

As will be described in this chapter, the Central Processor project engaged in much more formal *and* informal meetings than the Mobile system project. In fact, managers, coordinator and engineers alike in the Central Processor project engaged in approximately twice as many meetings than the same sub-groups of the Mobile system project. The Central Processor project also seemed much more pressed for time.

A metaphorical description of the meeting activities within the Central processor project is to represent them as an *ant-hill*, with individuals engaged in continuously ongoing encounters. For any individual member, the 'big picture' of these continuously ongoing interactions is impossible to grasp. Conversely, the Mobile system project appears as a more detached and less intensive meeting activity. A *pack of wolves*, where the members of the heard only gather occasionally, would perhaps be an appropriate metaphorical description of the Mobile system project's system of meetings.

Although the Central Processor project *on the whole* engaged in more meetings than the Mobile system project, there were also visible internal differences

within each of the two projects in terms of how different sub-groups made use of meetings.

In this chapter, three explanations will be provided for the differences between the two system of meetings: (1) the intensiveness of the work processes in terms of interdependencies, (2) type an degree of ambiguity present in the work processes, and (3) the adoption of a common tempo amongst the meetings within a system of meetings. Regarding ambiguities, findings suggest that ambiguous revelations affected different settings of the two projects: the allocating sub-system of the Mobile system project, and the operating sub-system of the Central Processor project. In these cases, private meetings served as means for absorbing the presence of local unrest and ambiguity.

10.1. Patterns present in the two systems of meetings

As illustrated by Exhibit 10-1, the Central Processor project participated, on average, in more than twice the number of meetings than the Mobile system project. This result holds true also for all three sub-groups examined. Thus, the managers, coordinators and engineers of the Central Processor project were all engaged in many more meetings, than the same sub-group of the Mobile system project. In fact, the engineers, who comprised the sub-group least engaged in meetings of the Central Processor project, were involved in 70 % more meetings than the coordinators of the Mobile system project, who were sub-group most engaged in meetings there.

Role	Central Processor project	Mobile system project
Coordinators	765	318
Managers	565	236
Engineers	546	215
Total average	595	247

Exhibit 10-1. Average number of meeting per year, sorted by project and role

Coordinators, on average, reported the highest numbers of meetings for both projects (see Exhibit 10-1 above). However, managers of both projects seem to have spent *more time* in meetings, due to the more time consuming character of the meetings they participated in[1].

[1] More specifically, the subgroups of the Mobile system project made use of meetings sorted by the dichotomous distinction between meeting flashes (less then 20 minutes) and lengthy meetings (exceeding 20 minutes) in the following way: engineers (28 % meeting flashes and 72 % lengthy meetings), coordinators (16 % / 84%), and

10.1.1 Meetings intervals and total number of meetings

The two projects differ from each other considerably when the average intervals between meetings are compared. While the average meeting of the Mobile system project took place twice a month, the equivalent interval of the Central Processor project was once a week. In fact, nearly all types of meetings of the Central Processor project was held at shorter intervals than the equivalent meeting type of the Mobile system project[2].

This pattern is also applicable when engineers, coordinators and managers of the two projects are compared.

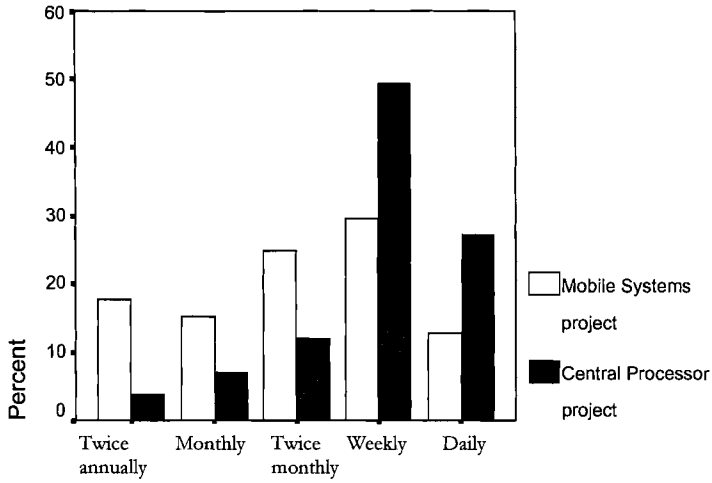


Exhibit 10-2. The distribution of meeting intervals for the two projects

Overall, the differences for intervals between individual meetings results in a dramatic deviation for the total number of meetings held in the two projects. While the respondents of the Mobile system project participated in

managers (10 % / 90%). In the Central processor project, the subgroups showed a similar internal pattern: engineers (55 % / 44 %), coordinators (53 % / 47 %), and managers (27 % / 73 %).

[2] Announcement meetings such as main project management meetings and intensive line-project coordination meetings were held weekly for the Central processor project, but every second week and less than monthly (respectively) for the Mobile system project. Work meetings such as section and departmental meetings were held, on average, every second week for the Mobile system project, and weekly for the Central processor project. Hallway meetings such as informal coaching of design work is an intensive daily activity for the Central processor project, but less so for the Mobile system project. Private meetings between project managers and senior managers were frequent (usually daily) in the Central processor project, but on average less than weekly in the Mobile system project.

approximately **7300** meetings a year, the respondents of the Central Processor project were engaged in approximately **13500**, which equates to nearly double.

10.1.2 Differences in problem focus

The problems most commonly focused on in meetings differed for the two projects (see chapter four and six regarding identified problems and the relationships between meetings and problems). Drawing on the results presented in chapter six, it is possible to calculate the average focus of the meetings for either of the projects. This type of measurement is here termed as the project's 'center of gravity' (see Exhibit 10-3 below).

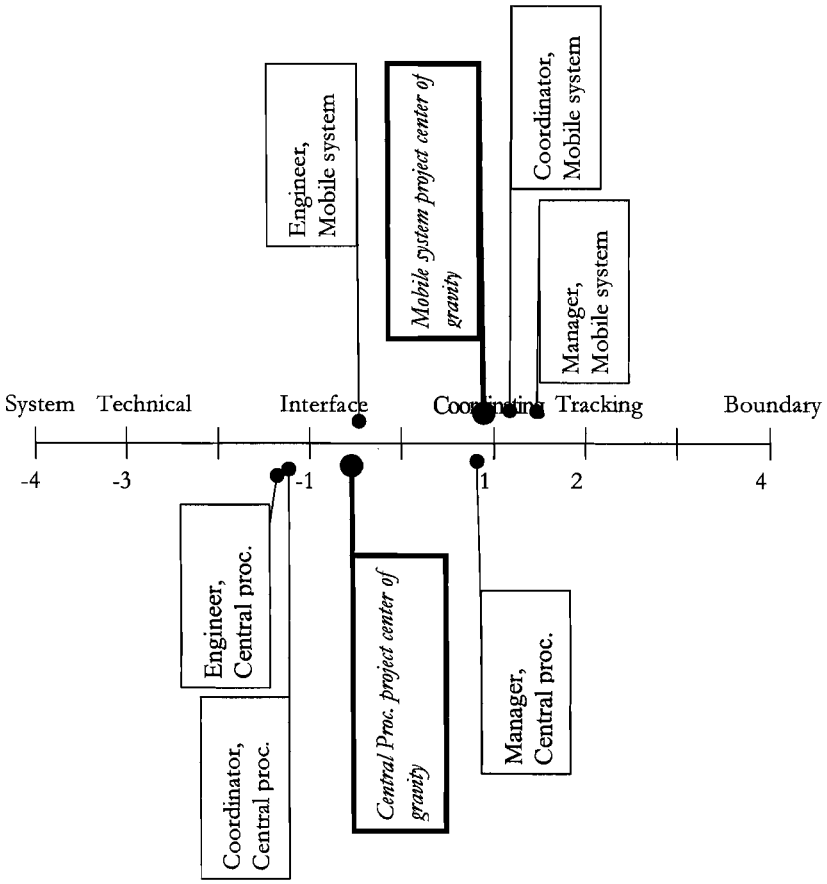


Exhibit 10-3. Problem orientation of the two projects

Note: For specific data, see endnotes to the chapter[α]

The center of gravity differed considerably when the two projects were compared. The Central processor project generally assumed a stronger

orientation towards meetings within the operating sub-system (that is, technical, interface, and system expert bottleneck problems), while the Mobile system project showed an orientation towards the allocating sub-system (see Exhibit 10-3 above). This pattern is valid for all sub groups within the projects. Thus, managers, coordinators, and engineers of the Central Processor project retained a stronger orientation towards the operating sub-system than the same groups in the Mobile system project.

Although the project different in their center of gravity with regards to the problems, the sub-group of both projects showed a rather expected sorted relatively each other. More specifically, the managers of both projects were orientated towards the allocating sub-system while the engineers towards the operating sub-system. The coordinators of the Mobile system project, however, shared more similarities with the managers than the engineers of the same project. For the Central Processor project, the situation was the opposite. Here, the coordinators had almost the same average focus as the engineers. This pattern suggests that the coordinators' role differed considerably between the projects.

10.1.3 Differences in the use of meeting types

The projects also deviated in how they made use of different types of meetings. The engineers of the Central Processor project participated in many more private meetings than the engineers of the Mobile system project. Regarding the managers, an opposite situation was present. Managers of the Mobile system project utilized private meetings more than managers of the Central Processor project. Furthermore, managers and coordinators of the Central Processor project used the hallway meetings to a greater extent than the managers and coordinators of the Mobile system project.

Meeting type	Engineers	Coordinators	Managers	Total
Announcement meetings	+	About same	+	+
Work meetings	+	+	+	+
Hallway meetings	+	+	+	+
Private meetings	+	-	-	About same

Exhibit 10-4. The Central Processor project's use of meeting types relative the Mobile system project.

Note: a plus (+) signifies the Central Processor project engagement in more meetings of a specific type, a minus (-) signifies less. For specific data, see endnotes to the chapter[β]

10.2. Explanation 1: The intensiveness of work processes

To a great extent, the overall differences in the amount of meetings that took place in the two project (approximately 7300 meetings a year in the Mobile systems project, and approximately 13500 in the Central processor project) can be explained by the shorter intervals between meeting occasions that the Central processor project employed. Thus, the Central processor project showed a more intensive work process, in terms of their meeting intervals, than the Mobile systems projects.

As described in the chapter three, the task complexity of the Central processor project was higher. More specifically and based on the reasoning provided by Thompson (1967), the task of developing an APZ processor demanded a scheme where the sub tasks (i.e. the development of sub systems) needed to relate to each other as both inputs and outputs implying a reciprocal interdependence. As such, the interrelated parties needed to communicate their requirements and respond to the needs of each other.

The Mobile System project, on the other hand, the project flow could best be described as one that was dominated by pooled interdependencies, that is, the work performed was interrelated only in that each sub system contributed to the overall goal. However, sequential interdependencies also existed, due to the fact that some activities were required to be performed before others.

Thus, on the overall level, greater intensiveness of the work process in the Central processor projects were transmitted into shorter intervals between meeting occasion as a way of coping with the reciprocal interdependences between work processes. In the end, this difference results in a system of meetings operating at a higher speed.

10.3. Explanation 2: Isolated areas of ambiguity were managed through private meetings

It has been shown that the two projects show several general differences regarding the structures of their systems of meetings. As discussed above, the Central processor project hosted more meetings of all types but for private meetings, much due to that they assumed shorter intervals between meetings. The Central processor project was also more oriented towards the technical design of the design object.

Regarding the private meetings, managers of the Mobile system project were more frequent users than the managers of the Central processor project. For the engineers, an opposite situation was present. The engineers of the Central processor project were more frequent users than the engineers of the Mobile system project. This pattern is also reflected in that the engineers of the

Central Processor project and the managers of the Mobile system project more often experienced that matters discussed during their meetings required immediate attention, compared to the same sub-group in the other project as well as other sub-groups of the same project (see endnotes [x]). The following discourse will further explore why these two sub-groups differed in this regard.

Seemingly the existence of many private meetings within a certain setting, suggests the prevalence of a high degree of ambiguity and confusion.

Exhibit 10-5 presents the most common meeting types for each project. The 'Informal coordination of design meetings' comprised approximately 23 % of all meetings conducted in the Central Processor project in comparison to 10 % for the Mobile system project. Internal lobbying between project managers (and coordinators) of the Mobile system project comprised nearly 24 % of the meetings taking place compared with less than 5% for the Central Processor project.

This points to that the need for informal means to absorb ambiguities regarding the technical design were much higher in the Central Processor project than in the Mobile systems project. Similarly, the unstable scope of the Mobile system project caused managers to deal with the situation via extensive internal lobbying (amongst project managers and between project managers and line managers).

	Mobile system project	**Central processor project**	**Total**
Informal coordination of design work via spontaneous interaction	10%	23%	26%
Project internal lobbying	24%	4%	11%
Other meetings	66%	73%	63%
Total	100%	100%	100%

Exhibit 10-5. Comparisons of the two most common meetings

The differences that this comparison displays are consistent with the findings previously exhibited regarding the two projects' use of meeting types and the focus on problems. Therefore, predominately the confusion within the allocating sub-system suggests that a sense of urgency existed amongst the managers in the Mobile system projects, while a similar situation was present within the operating sub-system among the engineers of the Central Processor project.

10.4. Explanation 3: Meetings adopting a common tempo

In addition to the reasoning above regarding the intensiveness of the work processes and the link between local ambiguities and meeting patterns, the process under which meetings adopt a common tempo in an organization can also shed some light on why the Central processor project engaged in many more meetings than the Mobile system project.

The process by which individuals, groups, or organizations adjust their tempo in order to suit the temporal conditions is by Ancona and Chong (1996) labeled as 'tempo entrainment'. This process is at work when the intervals between formal meetings (a pacesetter) constitute a time limit to enact other 'intermediate' meetings. Thus, if the project steering group meeting is held every second week, the intervals between the main project management meetings needs to be adjusted accordingly.

A senior manager may determine the pace for the meeting intervals by choosing a certain interval for the project steering group meeting. Reporting project progress on the steering group meetings requires a main project manager to collect this information at a main project management meeting prior to the steering group meeting. Thus, at different levels further down the hierarchy, the pace of meetings is adjusted to adhere with the pace of meetings higher up the hierarchy. This also seemed to occur in both projects.

As described earlier in this chapter (see page 179), the two projects differed when the intervals of meetings were compared. Thus, while the project steering group for the Central Processor project assembled every week, the project steering group of the Mobile system project only assembled every second week. This established the time limit for the main project management meetings. The main project management meeting assembled weekly in the Central Processor project and twice monthly in the Mobile system project. Furthermore, formal meetings at the team and project level often took place more than once a week in the Central Processor project, but retained longer intervals in the Mobile system meetings. Thus, it can be argued that the existence of a hierarchical tempo entrainment between formal meetings was applicable for both projects.

The pace of a formal meetings does not only set the pace for other formal meetings further down in the hierarchy, but also for many of the informal meetings. Accordingly, both the total number of informal meetings taking place was higher, and the interval between them shorter for the Central Processor project. The process under which meetings adjust their tempo in order to suit the temporal conditions may therefore serve as an additional explanation for the vast difference of the number of meetings conducted, when the two projects are compared.

The process of hierarchical tempo entrainment draws attention to *what* or *who* sets the initial pace for a system of meetings. Apparently, the two organizations seemed to differ in the degree which their senior managers' need to control the projects through formal means. As it has been argued here, a senior managers' choice for intervals between the steering group meetings may cause a chain reaction, that being the adjustment of meeting intervals further down the organizations' hierarchy.

In order to gain a better understanding of this issue, the historical development of the two R&D organizations hosting the projects needs to be considered. At the inception of the Mobile system project, the host organization successfully had launched and completed four large product development projects. Thus, the senior managers arrived at a point where the confidence was high regarding the organization's capacity for managing such an effort. As a consequence, the need for detailed control had decreased (see chapter three for more details).

On the other hand, the situation was quite different for the host organization of the Central Processor project. The Central Processor project was the first and the largest project conducted within the newly formed organization. Fast results were the main priority for the managing director and the Central Processor project became a target (see also chapter three on this issue). Thus, the managing director in charge of the R&D organization increased the control of the project, shortened deadlines for deliveries, and made the project the top of his the agenda. Accordingly, short intervals between the project steering group meetings were maintained to exert pressure on the projects and ensure progress. If decisions were not reached during these meetings, another meeting was often scheduled the very same evening or early the next morning.

10.5. Summarizing remarks to the chapter

The image that emerges from the comparative analysis is that the Central Processor project *as a whole* demonstrates evidence of a more intensive system of meetings, with a higher sense of urgency that consequently produced many meetings.

However, this situation was not applicable to all sections of the projects. Instead, *some* settings of *both* projects demonstrate evidence of a higher proportion of private meetings, tighter intervals between meetings, and more demands for immediate action in comparison with the other sections of the projects. Thus, one may speak of local pockets of ambiguity with great need for sense making. Interestingly, the location of these pockets of ambiguity differed between the projects.

The ambiguity of the technical design in the Central Processor project and the confusion that arose regarding the scope in the Mobile system project can be treated as one explanation why the specific settings of the two projects engaged in more meetings than other settings in the same project. For the Central processor project, the unclear definitions of the technical work process located at the operating sub-system forced engineers to participate in numerous private meetings with one another in order to resolve the resulting confusion. However, for the Mobile system project, the unstable definition of the scope forced the senior managers and the project managers to engage in private meetings in order to comprehend the dilemma. These local pockets of ambiguity present in the two systems of meetings are then rather consistent with the characteristics of the two projects.

10.5.1 Trust and time pressure

A low level of trust existed between the top managers of the organization hosting the Central processor project and those people (especially the engineers) carrying out the project. To impress the need for a faster pace, the project steering group meetings were scheduled with tight intervals. This set the pace for how often other formal meetings within the projects should occur. However, tight intervals between formal meetings also set tight intervals for informal meetings (before and after formal meetings) that resulted ultimately in a higher overall use of meetings.

10.5.2 Contingencies impacting a system of meetings

Exhibit 10-6 presents the project characteristics that can be treated as contingencies for the use and frequency of meetings.

On the overall level, greater intensiveness of the work process in the Central processor projects demanded more interaction to occur between the project members in order to cope with the reciprocal interdependences. The Mobile systems project, one the other was dominated by pooled and sequential interdependences, which thus required less interaction.

Furthermore, varying degrees of ambiguities suggest why certain sub-systems and settings within the two projects engaged in more meetings than other settings. In addition, the process of tempo entrainment and hard time pressure provides additional weight to the explanations for the differences in the structures of the two systems of meetings.

Thus, the results presented in this chapter suggest a strong relationship between the local situation (e.g. external and internal demands) experienced by the individual project and their use of meetings. Therefore the engineers of both project's reacted differently in terms of the use of meetings. This was

also the case for managers and coordinators. Thus, the local demands for interaction, the ambiguities experienced and the local habits of senior managers seemed to shape the system of meetings (for the projects as a whole and the subgroups within them) rather than occupational habits that certain groups of people share across organizations.

	Project characteristics ⟶	**Characteristics for the use of meetings**
Central processor project	More intensive work processes (reciprocal interdependencies)	More intensive interaction required
	Prevalent ambiguity located within the operating sub-system	More private meetings within the operating sub-system
	Lower level of trust between top mgr. and the project's personnel Higher time pressure	Shorter intervals between formal meetings
Mobile system project	Less intensive work processes (pooled and sequential interdependencies)	Less intensive interaction required
	Prevalent ambiguity located within allocating sub-system	More private meetings within the allocating sub-system
	More trust between top mgrs. and the project's personnel. Lower time pressure	Longer intervals between formal meetings

Exhibit 10-6. Contingencies impacting the two systems of meetings

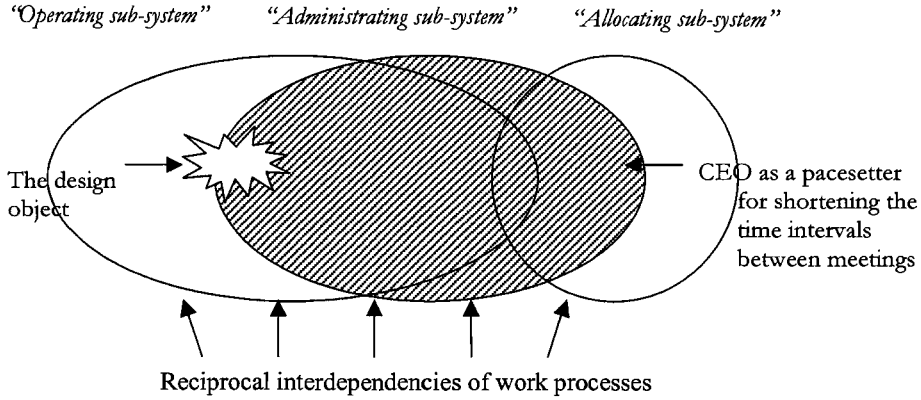
Furthermore, the results presented in this chapter do not confirm Mintzberg's (1973:44)[3] statement that managers differ fundamentally in their use of meetings from those they manage.

The results also suggest that formal and informal meetings were not substitutes for one another. Instead, the personnel of the Central Processor project participated in more informal meetings *on top of* the already larger numbers of formal meetings. Thus, the introduction of a formal meeting seems to require a number of informal meetings in order to work. These results contradict theories advocating that organizations are either dominated by organic or mechanic elements (see e.g. Burns and Stalker 1961), however the results are consistent with Schwartzman's (1989:37) argument that a "meeting almost always produces more meetings".

[3] "Unlike other workers, the manager does not leave the telephone or meeting to get back to work. Rather, these contacts *are* his work" (Mintzberg, 1973: 44)

In summary (see also Exhibit 10-7 below), the local pockets of confusion were predominately located within the operating sub-system of the Central Processor project resulting in more meetings (especially private meetings) than other areas of the project. The opposite could be said for the Mobile system project. Here, a pocket of confusion was located within the allocating sub-system. However, the more intensive work processes and pressure exerted by the managing director hosting the Central Processor project increased the intervals between meetings. Thus, in the case of the Central Processor project, two different combined forces generated more meetings than in the Mobile system project.

The Central Processor project



The Mobile system project

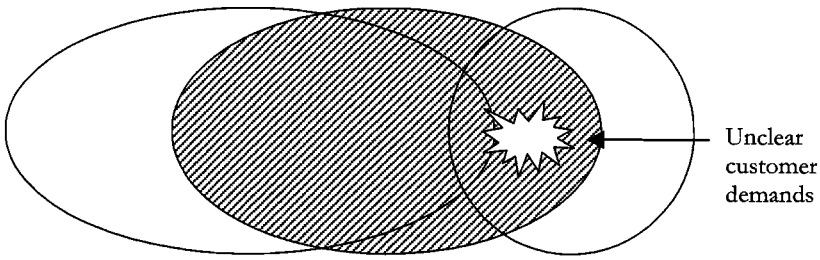


Exhibit 10-7. Identified forces that impacted the shape of the systems of meetings

Endnotes to the chapter

α

Role	Project	Mean	N	Std.
Managers	Mobile system project	1.3	85	1.7
	Central processor project	0.9	83	1.4
Coordinators	Mobile system project	1.1	33	1.6
	Central processor project	-1.1	29	1.6
Engineers	Mobile system project	-0.5	41	2.0
	Central processor project	-1.3	40	1.6
Total average	Mobile system project	0.8	159	1.9
	Central processor project	0.1	152	1.8

β

Role	Project		Announcement meetings	Work meetings	Hallway meetings	Private meetings	Total
Engineers	*MS*	N	340	544	1164	98	2146
		%	15.8%	25.3%	54.2%	4.6%	100 %
	CP	N	782	1616	2046	1560	6004
		%	13.0%	26.5%	34.1%	26.0%	100 %
Coordina-tors	*MS*	N	550	386	468	820	2224
		%	24.7%	17.9%	21.0%	36.9%	100 %
	CP	N	412	1632	2548		4592
		%	9.0%	35.5%	55.5%		100 %
Managers	*MS*	N	1183	702	104	1838	3827
		%	30.9%	18.3%	2.7%	48.0%	100 %
	CP	N	3141	1966	2808	1078	8993
		%	34.9%	21.9%	31.2%	12.0%	100 %
Total	*N*						27786

Note: MS = Mobile systems project, CP= Central Processor project

Project		Announcement meetings	Work meetings	Hallway meetings	Private meetings	Total
Mobile System	N	1671	1146	1736	2756	7309
	%	22.9%	15.7%	23.8%	37.7%	100.0%
Central Processor	N	2307	1426	7090	2638	13461
	%	17.1%	10.6%	52.7%	19.6%	100.0%
Total	N					20770

χ

Sub-group	Project		Requirements for action on issues raised in meetings: Short-range/ immediate	Varying	Long-range	Total
Engineers	Mobile systems	N	1098	652	396	2146
		%	51.2%	30.4%	18.5%	100.0%
	Central Processor	N	3468	2226	310	6004
		%	57.8%	37.1%	5.2%	100.0%
Coordinators	Mobile systems	N	718	1296	210	2224
		%	32.3%	58.3%	9.4%	100.0%
	Central Processor	N	3376	1036	180	4592
		%	73.5%	22.6%	3.9%	100.0%
Managers	Mobile systems	N	2330	1086	411	3827
		%	60.9%	28.4%	10.7%	100.0%
	Central Processor	N	4584	3536	873	8993
		%	51.0%	39.3%	9.7%	100.0%
Total		N				27786

Note: MS = Mobile systems project, CP= Central Processor project

11. Meetings as social texts: an additional reading of meeting observations

While I observed meetings in the two projects, some meetings appeared as 'all talk and no action'. As first, I became personally distressed as well as analytically perplexed when those engaged in the meetings would 'fail' to act on what seemed to be the most effective and obvious method of dealing with a problem. My spontaneous reaction to these 'nonsense activities' was that it seemed awkward and irrational of people to spend time on them, considering the tight time schedules of the projects they were engaged in. The participants were sometimes also puzzled by the seemingly irrational behavior during meetings.

However, instead of judging these behaviors as merely ineffective for the organizations, it seems more productive to pursue more reasonable explanations. By doing so, an additional understanding of meetings emerges: seemingly ineffective talk during meetings also serves an important function, not so much in terms of solving problems, but rather about the social system that the members of a project comprise.

This points to an exploration of the symbolic use of meetings as 'social texts' within organizations. Schwartzman's (1989) anthropological perspective and March and Olsens' (1976) work on decision and choices in organizations provide a framework for further discussion of meetings and their functions aside from managing problems. Schwartzman (1989) and March and Olsens (1976) advocate an understanding of meetings as a frame for two *simultaneous*, but in many ways *contradicting* processes: They facilitate the resolution or discussion of a problem (or more generally, the factual issue), but also provide participants with a legitimate way for negotiating, producing and examining the social system (Schwartzman 1989:36). In many ways, the former process has been focused on previously in this study, while this chapter will focused on the latter process.

Schwartzman (1989:128) states that meetings, in many ways, provide the perfect platform for 'social text' activities in organizations, because the discussion of social relationships can always be framed as 'business'. As such, all meetings act as important social occasions where social entities, relationships and roles are negotiated, interpreted, defined, represented, and reproduced (Schwartzman 1989:39).

Although not always conscious, meetings are in this way used by the individuals to 'see' the organization and their actions within it. Individuals also use meetings to read and see their place in the particular social system.

> "It is in meetings we come to know ourselves and our social system" (Schwartzman, 1989:314)

Meetings are therefore crucial settings for this type of 'seeing' and 'hearing' in organizations (Schwartzman, 1989:312). From this point of view, meetings produce 'organization', rather than organizations producing meetings (Schwartzman 1989:40-41).

Although Schwartzman (1989) and March and Olsen (1976) discuss a large number of issues relating to meetings as social text, I have chosen to concentrate on two that appear as more central: Seeing and reading the social system, and discerning others' expectations.

11.1. Reading the social system and oneself within it

A meeting is a very visible social text that individuals can interpret the social system to which they are affiliated, and their status within it. For example, in order to arrange a meeting with many or powerful participants, one also needs to be regarded by others as retaining the legitimate power to convene the meeting. Therefore, the attendance of meetings indicates much about the social order within the social system and my own place within it (Schwartzman 1989:279). In this regard, all meeting that involve many participants should be regarded as an important practical accomplishment.

Wilhelmsson (1998) provides an example of functions that meetings play as a social text. She asserts that an asymmetric/cooperative discourse type implies that all speakers learn the perspective of the most dominant person(s). The dominating person's knowledge and experience is further supported and subsequently learns to be dominant. Those who adjust themselves, learn to comply with authority and to practice subordination. The asymmetric/competitive discourse type implies that the dominant speakers learn how to persist and then hold on to their own assumptions. The superior/dominant person learns to actively dominate others in communicative situations. The subordinates learn that their ability to argue is

insufficient and may instead adopt silent opposition in communicative situations (Wilhelmsson, 1998: 266).

Thus, even though actions of and within organizations may be motivated by a variety of objectives, such as problem solving, they emerge through processes of social interactions that are shaped by the social structure. In this way, the basic building block of all social systems is the repeated face-to-face interaction (i.e. the meetings) among its members (Collins 1987). Thus, meetings also make up a framework for the analysis of statuses within a social structure. As argued by Merton, 'status' implies a position in a social system involving designated rights and obligations and 'role' defines the behavior oriented to the patterned expectations of others.

> In these terms, status and roles become concepts serving to connect culturally defined expectations with the patterned conduct and relationships that make up a social structure (Merton 1957:110).

Even subtle procedures such as the arrival of participants to a meeting may reveal much about an individual's status in the social system. Schwartzman states that the arrival procedure often forms a 'prestige auction' and refers to an example given by Block (1971 cited in Schwartzman 1989:284):

The actual time of the procedure was always set three or four hours too early, and as for many Merina occasions, great skill was required by those who wanted to arrive at the right time, at the right place. Nobody wanted to arrive too early, but obviously it would not do to arrive too late. The influence of a person is at stake in maneuvers of this kind, and his [sic] effectiveness at such a meeting depends on his appearing at the right time to give the impression that the meeting is starting because of his arrival. This involves a lot of waiting about in the nearby houses and sending children to spy out the land and report back. As if by magic the [elders] all appear at once at a time little related to the original appointed hour. This custom is a part of the prestige auction that is apart of these meetings (Block, 1971:47-48 as referenced in Schwartzman 1989:284)

11.1.1 Example: The exercising of status at the Senior Management board

The senior management meeting is a typical announcement meeting located within the allocating sub-system. Thus, many issues discussed there related to scope and resources of the organization. Approximately 15 persons were regular participants of the meetings. Depending on the prevailing issues, others could also participate, usually to make presentations of specific issues. A senior manager and not the CEO chaired the meeting.

The meeting was located in a conference room opposite the CEO's private office, and appeared to be a rather typical location for top management meetings. The conference room's layout included: elegant furniture in dark well polished wood, a large oval table in the middle of the room suitable for approximately 20 people, and another 10 to 12 chairs lined up against one of the walls intended to be used by the non regular participants of the meetings (see also Exhibit 11-1 below). It was from one of these chairs against the wall that I conducted my observations. A whiteboard and projector (for visual slides) was situated at the short end of the room.

The senior management board meeting is about to start. It's a couple of minutes to 3 PM. Present so far are a large group of young, strikingly well dressed people in their mid 20's. Similar to myself, they are also sitting on the line of 'guest chairs' beside the actual meeting table. Several minutes past three, people begin to sit themselves down around the table. Others, apparently the most senior managers present so far, walk around in the hallway outside the meeting room, engaging in one-on-one conversations around the coffee machine or making phone calls on their cellular phones.

Those in the hallway regularly go back and forth to the entrance of the conference room to take a look at the middle of the conference table and then conduct a search around the room. A minute later I understand why. In the middle of the of the conference table, the CEO of the company takes his seat. The people in the hallway are quick to do so as well.

The meeting starts with the chairman announcing the first issue on the agenda: a presentation of how the procedures for recruiting and retaining personnel can be improved. The presentation will be made by a group of trainees approaching the end of their first year of employment.

The chairman points to one person in the group "I want you to make the presentation". The person does not offer anything at first, but to judge from his face, he is somewhat startled: "Well, ahh, we have chosen two people in our group to make the presentation"

The chairman replays: "Ok, I was joking a little. But one theme that we were discussing in one of your workshops a couple of weeks ago, was a manager's ability to act on the spot, without preparations. So, who have you chosen to make the presentation?"

Two persons from the trainee group, one woman and one man are already standing at the visual slide projector and state loudly "We are in charge of the presentation"

The presentation is very well prepared, in English in order to increase the difficulties, and aided by well designed PowerPoint images. The trainees are clearly the best dressed at the meeting and seem nervous about the task in front of them. Those sitting on the 'side bench' are fidgeting about in their seats. The sense that there is a performance is being enacted is evident. After all, this is something that comes close to a graduation ceremony.

The presentation ends after 30 minutes. The chairman concludes with some comments regarding the procedure that led the trainees to make this presentation and signals the CEO. The CEO does not say anything at first. After several seconds have passed, he seems to realize that it is expected that he make some comments about the presentation. On the basis of the presentation, he emphasizes two suggestions as possible actions to be undertaken by the company. Then, he phrases a couple of questions to the trainees on how the company should act in order to utilize their experience. The trainees answer politely.

Several other people begin to ask questions of the group of trainees. Those who make their voices heard all retain top management positions in the organization, except for one person. One man asks a question that could be interpreted as if the company was not doing what it should for the new recruits. Some participants

around the table begin to mumble, with low, but fully recognizable voices. The trainees do not get time to answer the question before another question has been formulated by one of the senior managers.

Beside this 'incident', all questions were phrased with a polite interest and concern for the work conducted by the group. None of them question the quality of the work. The answers following the questions are in most cases, simply guessed, even before they are formulated. It seems important that all at the table join in a mutual effort to make the presentation appear to be well performed.

The presentation ends with the CEO telling the human resource manager to carefully follow up of the result. The human resource manager is nodding her head, and says, "I will take responsibility for that". Then, the chairman announces a 10-minute coffee break

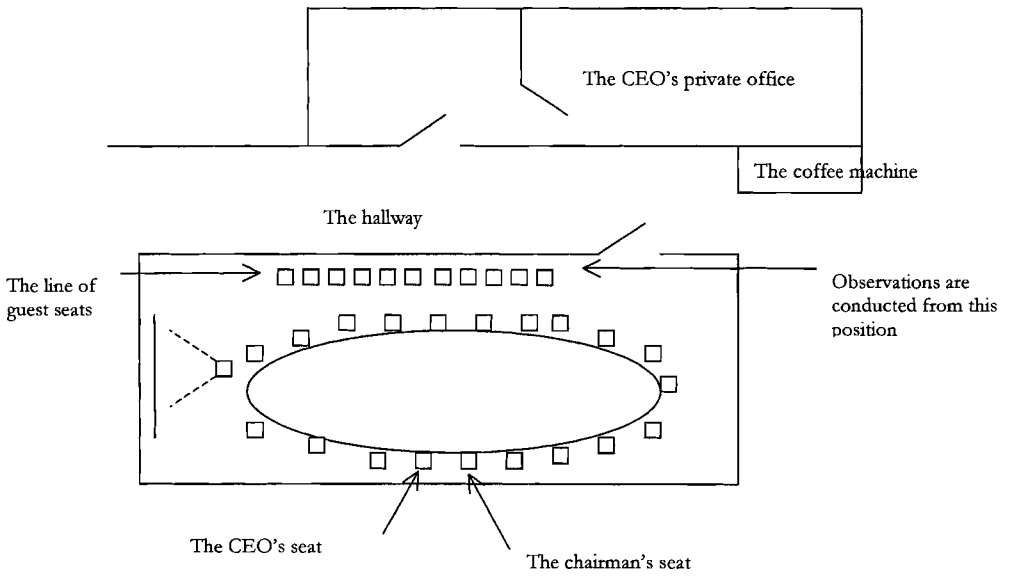


Exhibit 11-1. The location of the senior management meeting

11.1.2 Status signaling at work

It is suggested that the meeting's format was rather ill suited to making intelligent deliberations regarding resources and scope of the organization. It consisted of a large group of people with little in common. The very formal and hierarchical structure of talk order combined with an almost solemn atmosphere limited the possibility of expressing novel thoughts.

Despite the restricted format, those in the organization were eager to gaining access to the meeting, either as regular attendants, or to make presentations as guests. This addresses that the meeting was vitally important, but perhaps not so much for discussions and decisions regarding scope and resources, but rather to signal status in the social system.

In the case presented above, a number of symbols of status were displayed. In line with this reasoning, the right of participating in the meetings seems much more important (to a degree that the only way of excluding people are to retire them) than to act in an effective manner during the meetings.

Thus, it is suggested that the right to participate confers much of the status. Therefore most of the signaling of status has already taken place by virtue of the invitation list, long before the meeting begins.

However, immediately prior to the start of the meeting, another form of status signaling and relational process was at work – the hallway chatting and the arrival and seating procedure. Thus, as Schwartzman (1989:124) has noted, the hallway chats before formal meetings provide individuals with opportunities to exchange gossip, trade information, and to engage in 'pre-meetings'. However, the meeting arrival procedure also bears vital information about who arrives with whom, communicates alliance and friendship patterns, the seating patterns that are chosen, and perhaps most importantly, whose arrival signals the start of the meeting. In many meetings, as was the case for the meeting above, a waiting game takes place prior to the meetings start. In other words, waiting for the 'right' person to arrive.

For the senior management meeting, the non-regular participants arrived first. They consisted of the trainee group, and retained the lowest status of those attending the meeting. A further manifestation of the social status was also visible by the seating arrangements. The non-regular members, the guests, do not sit around the table, but on a line of chairs against the wall. Of course this would not have been the case if the guests were invited senior managers from another company.

The next group to arrive consisted of a number of people with a regular invitation to the meetings with non-senior positions (for example specialists who head a small department or others with rather unclear roles). At this time, most of the senior managers were located in the hallway outside the conference room, engaged in small talk, telephone conversations or drinking coffee that gave them the appearance of looking busy while simultaneously monitoring where the CEO would sit when he arrived. The arrival of the CEO signaled the start of the meeting, and everybody was seated within a few seconds.

At the senior management meeting another more obvious signifier of status was the participant's right to airtime, and the sequential order that they spoke. For the senior management meeting, the hierarchical talk-order was clear but unarticulated. First the CEO and chairman spoke, followed by the other senior managers. Other participants did not speak unless they were directly asked a question by one of the seniors. There was only one exception to this rule; the participant questioning whether the company was doing all it could for the

new recruits. In order to 'save' the situation, other participants offered an amount of mumbling and one of the senior managers made a quick formulation of another question. These responses suggest that the speaker was not a legitimate speaker. Later, after the meeting, this conclusion was confirmed by descriptions made of the person. He was described to me as one with an unclear role in the organization. Also his right to participate in the senior management board was informally called in question. The 'mumbling' that followed from his comment announced that the status order was once again reestablished in the meeting and reproduced in the social system.

11.1.3 Concerns of the meeting are the symbolic content rather than the decision-making

As the above example illustrates, efficient decision making at the meeting was difficult to achieve. Instead, problem solving or problem management seemed to be of relatively low importance for many of its participants. Thus, a greater concern of the meeting was the symbolic content of the meeting, rather then the discussions and making of decisions regarding scope and resources. As the senior management board meeting is *the* place to be seen and heard in the organization, symbolic issues of status become of special important.

11.2. Discerning others' expectations

For any meeting, people are involved in a situation where actors attempt to meet the expectations that other participants have of them (March and Olsen 1976). Whether or not others are physically present, people act and modify their actions as if they were.

For the projects studied in this study, it was common that one individual shouldered a number of roles. A person may, for example, act both as a project manager and a line manager. When to act from which role, in which meeting, is then something that may vary from time to time, depending on the expectations of the participants in the specific meeting. Thus, participants in these multi-project environments experienced high levels of ambiguity in terms of their own and other's roles.

According to March and Olsen (1976:48-50), people tend ask themselves three questions in order to find out what is expected in order to 'do their job': (1) What am I/which role do I have? (2) What do people expect from such a role? and (3) What may be suitable for a person as me to behave in this situation? They illustrate it with the following example:

Step 1: What am I?	I am the rector.
Step 2: What do rectors do?	They go to meetings.

However, when a manager was away on a business trip, which happened rather often, the situation became even more ambiguous as someone else (who otherwise performed another role) usually stepped in and acted on their behalf. *Thus, there were often many more roles than participants present at formal meeting.* This of course creates complexity, much more so than the example by March and Olsen illustrated above: If it is unclear which roles others are performing, then it also becomes difficult to determine that which others expect.

Therefore the process of determining role expectations was both a complex and central issue for the R&D organizations studied in this thesis. It was central because many roles were constantly under-defined due to their shifting and multiple duties. In order to clarify the role-play for formal meetings, people both explicitly and implicitly attempted to interpret one another in order to determine what expectations others retained.

11.2.1 Example: A chat in the hallway before the start of a project steering group meeting

The empirical example below is one that previously has been used in chapter seven. The situation took place when I was about to observe a project steering committee meeting. Due to a delay in the meeting scheduled in the same conference room before us, a group of people had gathered in the hallway outside the entrance.

One of the people in the hallway looks through the window and points at his watch in order to call to attention the fact that we were all waiting. While we were waiting, the following conversation took place:

The senior manager (and chairman of the upcoming meeting): "But wait now, you are both project manager, section manager, and assistant department manager. Which hat are you wearing today? What kind of directives do you want?"

(People gathered in the hallway begin to laugh)

The project manager (etc.) replaying: "I play John today [the department manager]. He is away."

The senior manager: "Ok, then I know."

A few minutes later, the meeting begins. The chairman presents the agenda. Then somebody asks: "Are you Roy today?" Later, another says "I am playing Johan today". A third person, a senior manager, presents himself by saying "Today, at this meeting, I will only act as myself', indicating that he is not participating in the meeting in his formal role as a manager.

11.2.2 Difficulties of discerning others' expectations in a complex social system

The example above suggests that formal meetings are similar to theatrical events where rehearsals must take place beforehand in order to achieve the correct appearance on stage.

What seems to be the case is that in meetings, people act according to the expectations of others. For a chairman, such as the senior manager in the example above, expectations of other were of course an issue of special importance, as he was the person most carefully observed by the others during the meetings.

When the senior manager confronted the other person who bore various roles (at least four at this meeting), role expectations were examined. The final statements rather explicitly (although framed within the jargon of humor) dealt with clarifying the expectations on the senior manager: "What kind of directives do you want?"

Through an informal chat in the hallway before entering the conference room, an attempt was made to decrease the level of ambiguity and confusion about the role expectations within the subsequent formal meeting

11.3. Final remarks to the chapter

This chapter has provided a complementing view, framing meetings as an important means for the project members to negotiate, produce and examine the social system that the members of a project comprise.

This points to the importance of meetings as sense making events of the social system and its order, because they are the organization "*writ small*" (Schwartzman 1989:39). In meetings, participants are provided with concrete experiences of the social system and the organization. Thus, people observe situations and occasions at the micro-level, and then make sense of them as components of an abstract supra-structure (such as an organization, a process, a hierarchy, and so forth). As such, a meeting can be viewed as a micro-cosmos of its larger entity, and a powerful ongoing social symbol of the organization. This implies that the meetings produce 'organization', rather than the organization producing meetings.

The social textual feature of meetings may in fact retain specific relevance for project activities. During a project, the personnel are enlisted and withdraw throughout its process. This also means that the social system is constantly unstable and subject to change. For these under-defined organizations, regulations of status and expectations have to be constantly rediscovered, interpreted, and negotiated. Permeating the project entire organization,

meetings constitute stages for defining and interpreting the social system. Subtle intimations for those who deviate too far from the prescribed course, faces and inflections are studied and interpreted, status negotiated and given a concrete formation, borders between people built, and performances prepared and performed. By participating in meetings, participants depart with experiences from the system's social order, the borders of it, and the relations within it.

12. The role of meetings in complex product development

One of the most critical challenges for an organization engaging in complex product development is to manage a balancing act between innovation and control. This chapter will focus on how this balancing act is played out and facilitated through the interplay between numerous face-to-face meetings during different phases of a product development effort.

This chapter will begin with a discussion regarding the contributions from the present study in relation to the socio-technical discourse on non-routine work.

This study emphasizes the interplay that takes place within a system of meetings when dealing with obstacles and problems that occur during a product development process. Hitherto, the socio-technical literature has not addressed this perspective on meetings within organizations. Instead, different types of meetings have been treated as entities exclusive of one another. This switch of perspective, i.e. analysing the meetings' interplay instead of their separated appearance, give rise to new insights regarding the role different types of meetings in terms of balancing innovation and control in a product development context.

Secondly, the chapter attempts to develop a theory explaining the role of meetings in complex product development. This theory illustrates how a system of meetings enables both innovation and control when learning about ambiguous issues. This part also contains a discussion of the causes for a system to collapse in terms of a rapid increase in the number of meetings taking place. Thereafter, advice is tendered for managers involved in complex product development as to the required method in order to profit from an efficiently functioning system of meetings. Furthermore, to avoid the risk of a collapsing system, especially in times of crisis, some methods should be exercised and others avoided.

Finally, three further areas are outlined for future empirical and theoretical inquiries that are tightly connected to the ideas expressed in this chapter.

12.1. Contributions in relation to the socio-technical field of research

In summary, the socio-technical discourse stresses the importance of communicative and reflective practices (e.g. meetings) in organizations experiencing many non-routine events as a mean for reducing the level of ambiguity associated with problematic issues entering such a system (Pava, 1983a: 58 and 126; Pasmore and Gurley 1991:369-370). To analyze the partially undefined texture of a task that is exposed to many non-routine events, the socio-technical line of thought has focused on three elements: the ambiguous topic itself, the forums or meetings in which the topics are deliberated, and the participants involved. The idea behind this theory is that better ideas will be produced as an outcome of adequate configurations between topics, forums, and people.

This study supports the main framework of the socio-technical theory regarding the analysis of non-routine work. The multitude of meeting types that were present in the two projects indicates that many different types of meetings were necessary to deal with the ambiguous and ill-defined problems that arose there. In this sense, many meetings can be seen as the cost of having to find solutions to complex, ill-structured problems. The importance of meetings applies to managers as well as any other member of a product development effort. In these organizations, work to a large degree becomes meetings, regardless of hierarchical position.

This study, however, presents considerations regarding previous statements made within the socio-technical discourse on non-routine work about the effectiveness of formal and informal meetings, the typology of meetings employed, and the causes of variation in the use of meetings.

12.1.1 A system of many meetings

A major critique of previous research is that potentially misleading conclusions can be drawn about the effectiveness of meetings, while employing a perspective of different types of meetings as entities independent of each other (e.g. formal and informal meetings are not viewed to be interrelated phenomena). For example, the treatment of formal and informal meetings as separated entities in Purser et al.'s (1992) article led to the conclusion that small, informal meetings were regarded as superior to formal meetings for enabling learning among participants. In contrast, asymmetric, and formal meetings with many participants were viewed to be ineffective in the same regard because of their low interactivity and unequal distribution of 'say'.

While this study further supports the argument that informal meetings play a vital role for promoting learning among participating individuals, it departs

from the understanding that formal and asymmetric meetings are solely ineffective, as one may read Purser et al. (1992). In fact a large organization operating with only informal meetings would be likely to dissolve.

This study instead emphasizes the interplay between different types of meetings during task accomplishments within a system of many meetings. For such a system of meetings, formal and informal meetings by definition mirror one another, and should therefore be analyzed as interrelated phenomena. From this perspective of meetings, the learning taking place in informal meetings can be viewed as a partial result from activities conducted in formal meetings.

12.1.2 Towards a more differentiated typology of meetings

Regarding the typologies of meetings, this study suggests a more differentiated formation than the one proposed by Pava (i.e. "structured, semi-structured or unstructured" (1983a: 128), and Purser et al. (1992:15) ("formal or informal"). The meetings that took place in the two examined projects were so diverse that they would loose much of their richness if captured into dichotomous classes of meetings (e.g. formal and informal).

Building upon Goffman (1963:15-20) and Dalton's work (1959:219), this study instead proposes a more exhaustive formation of concepts in which meetings can be sorted into four types according to formality and the amount of discipline prescribed. Presented in a decreasing order of formalization, they are announcement-, work-, hallway- and private meetings. Meetings can also be sorted according to the content of their conversations, which in this study resulted in three clusters. These clusters of meetings were labeled according to the problems that they managed, and essentially followed Thompson's (1967) idea of organizational levels with different duties: the operating sub-system, the administrating sub-system, and the allocating sub-system.

By combining the two dimensions of meeting organization and meeting content, a taxonomy of meetings for complex product development has been established that includes twelve different classes. Basically, this taxonomy illustrates the different components of the meeting systems within the two projects examined in this thesis.

12.1.3 Causes for variations in the use of meetings

As argued by Pava (1983a), Stebbins & Shani (1995), and Purser et al. (1992), a number of contingencies have been identified that impact on the use of meetings within an organization. Pava (1983a: 59) asserted that the more important the problem, the more frequent use of meetings. Furthermore, he also stated that the more politically sensitive the problem, the more people

tend to deliberate on it in less formal meetings, because of the tensions it would give rise to during more formal meetings. Also issues of time may impact upon how people use meetings. Both Stebbins & Shani (1995) and Purser et al. (1992) have asserted that time pressure and tight deadlines reduce communication, due to less slack in the organization.

This study has shown that two projects of a similar size may differ much in their overall use of meetings (i.e. their system of meetings). Furthermore, high levels of ambiguity were shown to proliferate the occurrence of many private and hallway meetings. Thus, the statements made by Pava (1983a: 50) regarding the impact that a topic's sensitivity and importance has on the occurrence of meetings could be further clarified. The study's findings indicate that while ambiguity often creates a more intensive use of private- and hallway meetings, i.e. informal meetings, uncertainty leads to a more intensive use of announcement- and work meetings, i.e. formal meetings.

Regarding the pressures on time, this study suggests another effect than that asserted by Stebbins & Shani (1995) and Purser et al. (1992). The findings in this study indicate that time pressure easily causes more, and not less meetings. The explanation behind this pattern can be found in the hierarchical dependence between meetings (i.e. reporting upwards and informing downwards). This dependence means that meetings downward are required to adapt their rhythms to those meetings higher up in the hierarchy. Thus, if time pressure is manifested by a senior manager through the introduction of shorter time intervals between meetings that take place in the upper level of the hierarchy, it will have a strong impact on the tempo of all other meetings further down in the project organization. This issue is related to how rhythms in organizations (see Ancona and Chong 1996) adapt to a common tempo. Such pacing applies to both informal and formal meetings. This is due to the fact that the informal meetings has to occur in-between formal meetings, in order to make the preparations necessary before a formal meeting can be performed. Thus, a change of the time intervals for one type of meeting may easily lead to strong chain reaction represented by many more meeting activities for the organization as a whole.

In addition ambiguity and time pressure, this study also proposes that (based on the reasoning provided by Thompson, 1967) the degree of interdependence between work processes within a project will impact on the speed that system of meetings operates at. More specifically, shorter intervals between meeting occasions will be required for work processes that are reciprocally interdependent, in comparison to those that operate under pooled or sequential conditions.

12.2. Towards a theory of meetings in complex product development

As discussed in the introduction, this study employs the perspective of organizations engaging in complex product development as tension systems, where the dominant tension is between innovation and control (Weick 1995:72-73). If complex product development is to be performed effectively, the challenge is to manage a balancing act between *individual action and creativity,* on one hand, and *collaboration and control,* on the other ensuring that ideas, knowledge and information retrieved by their parts can be pooled into an integrated whole.

This study proposes that this balancing act is facilitated through the interplay between numerous face-to-face meetings. Within such a system of meetings, the interplay between different types of meetings transforms ambiguous events into issues carrying a workable level of certainty through organizational learning and routinization. As such, formal as well as informal meetings enable an organization to cope with paradoxical demands present in complex product development.

The model can be viewed as an attempt to illustrate how organic and bureaucratic elements operate in conjunction with one another. While several have pointed out that, theoretically speaking, complex tasks *should* require both organic and mechanistic elements to perform effectively (Brown and Eisenhardt 1997; Sheremata 2000), there has been some difficulties in providing empirical examples of how such contradicting forces actually may operate side by side (Nord and Tucker 1987:347).

The idea underpinning the theory displayed here is that whether issues are uncertain or ambiguous, the means for managing them may differ. While uncertainty can be defined as an absence of information, ambiguity is one of confusion (Weick 1995: 98-99). High levels of uncertainty can therefore be reduced by asking questions to which information is acquired (Daft and Lengel 1986: 556). Information is not the solution for ambiguous events because the necessary frames and interpretations are missing. Therefore, while uncertainty can be managed by increasing the amount of information available, ambiguous situations need to be interpreted, framed and made sense of before additional information appears meaningful (Daft and Lengel 1986). In other words, elements of uncertainty can be managed by activities of control that add information regarding the matter, ambiguity calls for innovation of meaning that frames the situation at hand.

12.2.1 Four meeting types interplay

As previously stated in this chapter, meetings can be sorted into four classes (announcement-, work-, hallway- and private meetings), based upon the formality and discipline employed within them.

The stage metaphor, where a front- and a back region are important components (see Goffman 1959), describes the relations and interplay between these types of meetings. In general, it could be said that announcement meetings, relative to the private meetings, constitute a stage fronting the audience and the private meeting constitute a region to which the audience are out of visual range. The other two types, work meetings and hallway meetings, can be seen as connecting links between the two opposite positions.

This study proposes a view that a meeting's capacity varies in terms of innovation and control. High levels of control relates to those meetings that create predetermined behavior (i.e. certainty). On the other hand, a meeting's capacity for housing ambiguity and multiple perspectives on matters denotes a high level of innovation.

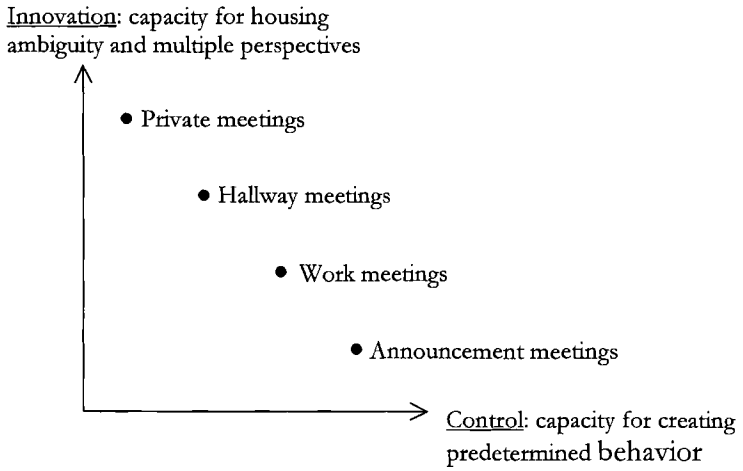


Exhibit 12-1. The meeting types and their varying capacities

The multiple perspectives necessary for making novel and innovative interpretations are afforded in private meetings. Thus, they retain the highest capacity for innovation. These meetings lack of control also causes participants to be more willing to initiate and express novel ideas.

At the other end of the scale, announcement meetings can be found. In these meetings, the highest degree of control is employed resulting in the prevalence

of pre-determined behavior. Similarly participants only express matters that they were sure of and/or were willing to be quoted on. In between, hallway and work meetings can be found.

The hallway and private meetings comprise an arena that facilitates the perception of complex and ambiguous issues and gives rise to innovative interpretations in order to manage them. In relation to the formal meetings, hallway and private meetings also work to liberate the level of control employed in the formal meetings.

When issues have been defined and interpreted, announcement- and work meetings are used to elevate and enter the issues into a formal existence. Then, formal claims for action can be made in which people are organized around the solving of a specific and recognized problem. This also means that procedures for dealing with specific issues over time may become official routines of the organization. Thus, formal meetings serve a controlling and structuring function.

12.2.2 Meeting dynamics within a system of meetings

When an organization encounters an ambiguous issue, such as a subtle anomaly appearing in error reports from the lab, or a vague sense that the customer is unsure about the scope of the project, then these issues will be discussed and made sense of via informal private meetings that involve few participants. As a result of these informal meetings, the 'fuzziness' of the issue decreases. In the hallway, the issue begins to appear as 'thing-like' and referred to by a common label (e.g. 'the stinker' or 'the scope issue'). Various methods to deal with it are also discussed. Now, the understanding of the issue has matured to a level making that makes it possible to formally recognize in a formal work meeting. Gradually, awareness of the issue and the demands it requires is indoctrinated into the organization's formal infrastructure. Solution alternatives are developed and decisions reached in order to solve them. Claims are made for certain action to be taken. Standard operating procedures and routines begin to evolve so that similar issues in the future can be dealt with methods derived from a precedent. As a result of this movement from informal to more formal circumstances, a workable level of certainty is gradually established via the interplay of the four types of meetings. The movement of issues from less to more formal circumstances means that this system operates as an organizational learning process for each ambiguous issue entering the system.

A system of meetings interplay to achieve organizational learning through routinization

The dynamics of increased formalization are not limited to the issue level, but can also be detected in the more long-term changes in the use of different types of meetings within a project (see also Engwall and Westling 2001).

For a product development project, the inception comprises a phase where many issues appear as ambiguous. To deal with a massive presence of ambiguities, private meetings involving trustworthy colleagues are intensively used. These meetings enable sense making about the issues and how to deal with them. Examples of these informal meetings during the early stages of the project are contacts between system experts that initiate preliminary action for the structuring of the technical system into subsystems. At this stage, although many formal meetings do exist, these meetings often operate inefficiently and are riddled with conflicts due to their low propensity for housing ambiguity and multiple perspectives.

As definitions and interpretations begin to arise regarding many of the ambiguous issues, the project moves into a state that is dominated by uncertainty resulting in an increased need for problem solving activities performed in formal meetings.

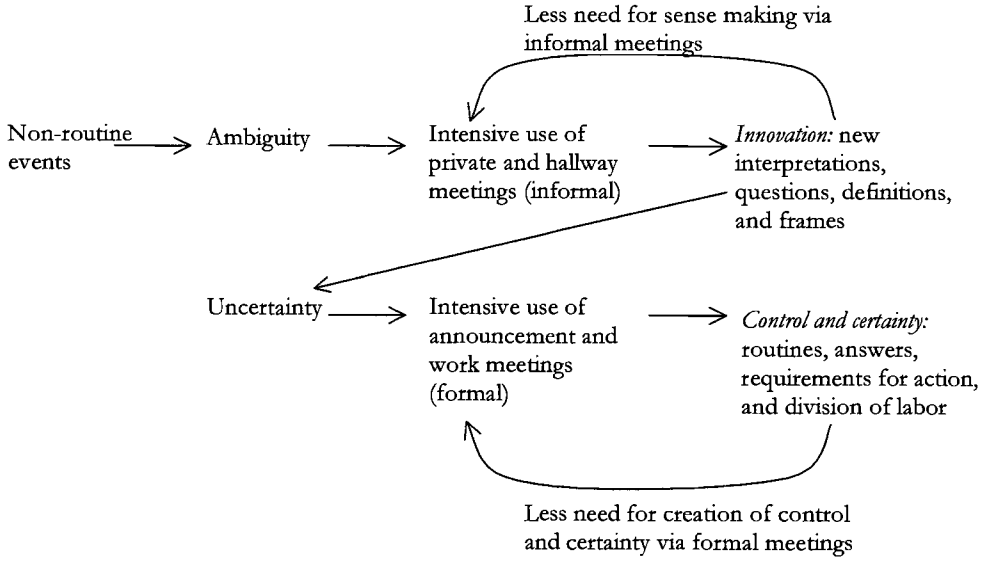


Exhibit 12-2. How a system of meetings interplay to achieve organizational learning through routinization

Thus, this study proposes that a product development project often develops from a situation dominated by ambiguous issues which are identified, framed,

and defined in private and hallway meetings, to one where uncertainty calls for problems solving in formal meetings. Therefore the system could be termed a self-regulating system, in that creation of meaning decreases the need for informal meetings while production of control and certainty decreases the need for formal meetings.

A system of meetings heading towards collapse

So far, this discussion has focused on a system of meetings that regulates its own equilibrium. However, seemingly limited interventions may create a situation in which the system begins to expand at an exponential rate in terms of the number of meetings taking place. Ultimately, the organization is bound to collapse. What can cause an imbalance in the system is the use of formal meetings to deal with ambiguity. As stated earlier, adding information can reduce uncertainty. Ambiguity, on the other hand, calls for sense making.

When a project suffers from the shock of ambiguity, many managers instinctive reaction is to counteract it by attempting to regain control. Under most circumstances, this struggle for control is represented by a course of action within an arena where the manager retains full discretion to act: formal meetings. Thus, more formal meetings are introduced and existing meetings are operated with shorter intervals in order to regain control over the situation.

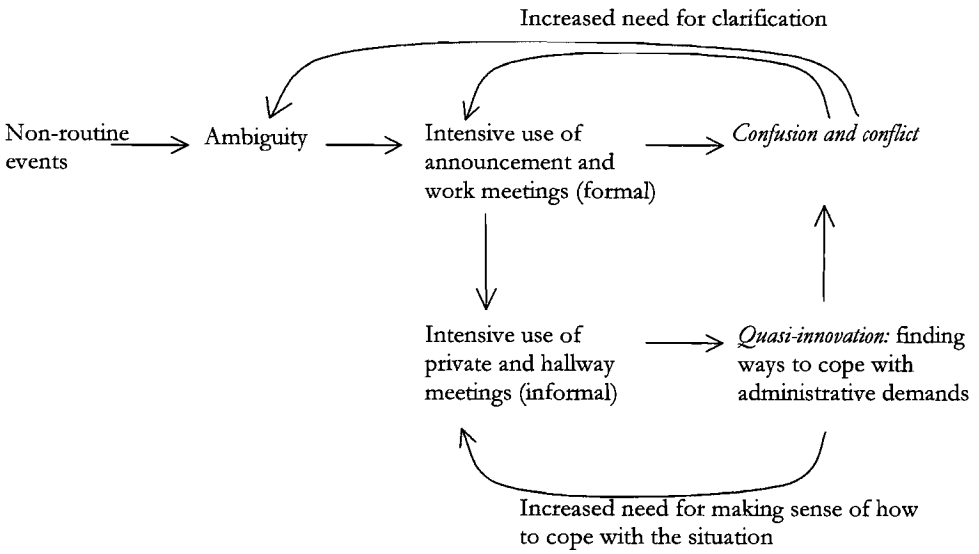


Exhibit 12-3. A system of meetings heading towards collapse

However, by increasing the time resources devoted to formal meetings, the manager treats the problem of ambiguity as if it was a problem of uncertainty.

Findings in this study suggest that this method of intervention increase the level of ambiguity, instead of (as was the manager's intention) to decrease it. The system becomes unbalanced with several reinforcing loops that add to the number of meetings taking place in the organization.

The formal meetings' low capacity for housing multiple perspectives and ambiguity determines that they become susceptible to a prevalence of conflicts if used to deal with ambiguous matters. Thus, formal meetings begin to instigate conflict and confusion instead of control and certainty. As a result, clarifications are requested, demanding even more formal meetings. Furthermore, the hierarchical dependence between meetings (i.e. reporting upwards and informing downwards) determine that meetings downward in the organization begin to adapt their rhythms to those higher up that were directly affected by the manager's intervention (in terms of shorter intervals between meeting occasions).

To deal with the demands for information that follow from an increased use of formal meetings, the need for informal meetings increase. In these informal meetings, unofficial methods are created to cope with the additional administrative demands that follow from an increased use of formal meetings. Examples of common 'quasi-innovations' are the production of progress reports that are very loosely coupled to actual activities. These are intended to satisfy demands for information, but in reality they compound conflicts and confusion within the project (see also chapter four regarding the tracking problem). In this type of situation where confusion reigns, convening even more formal meetings may be the only action that appears appropriate for many managers. The multitudinous meetings begin to drain life from the project, as less time and effort is devoted to activities that contribute to the actual development of the product. Thus, a vicious cycle is created in which both the system of meetings and the project head towards collapse.

Two routes for how a system of meetings may develop over time

To summarize, Exhibit 12-4 illustrates two different scenarios, a learning and an expanding system of meetings, and how they may develop in an organization.

A *learning system* of meetings regulates itself through sense making and routinization. For a balanced system, complex and time-limited product development efforts are likely to develop from a situation requiring innovation taking place during informal meetings to deal with confusion and ambiguity, and then to a state of uncertainty managed through control in formal meetings. This metamorphosis, from an innovative to control orientation, mirrors that learning occurs in the project. In many cases, this alteration in the balance between innovation and control occurs approximately halfway

through the project. While additional ambiguous issues usually continue to emerge in a product development project until the time of delivery, they normally do so at a diminishing rate (see Engwall & Westling, 2001). This indicates that the need for private and hallway meetings will decrease over time. Similarly, as more and more certainty is produced from the formal meetings, the need for their existence will also decrease.

An *expanding system* of meetings is one where a vicious circle has started with increasingly more and more formal and informal meetings. The general perception is one of disorder. A manager's initiative to increase the number of formal meetings (either by introducing new ones or through shortening the interval between existing ones) high up the hierarchy as a way to gain control and counteract ambiguity makes up the starting point of the vicious circle. As a result, both the formal and the informal meetings begin to proliferate at in increasing rate because of the confusion and conflicts that the use of formal meetings retains if applied to an ambiguous situation. The situation sketched out in example B illustrates a project in administrative crisis. In practice, this often corresponds to the situation when a project manager is replaced.

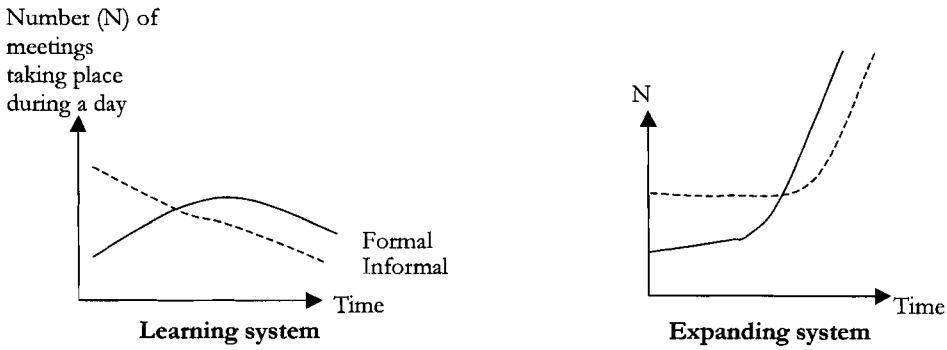


Exhibit 12-4. Learning and expanding systems of meetings

12.3. Practical implications

From recognition of an anomaly in the lab to solved problems and developed routines for future problem solving, innovative interpretation as well as collaboration and control that pool ideas into a coherent whole are required. For an organization engaging in complex product development, a great variety of the types of meetings is an important asset that organizes this balancing act between innovation and control.

In association with the aforementioned scenarios (see Exhibit 12-4), two suggestions will be posited below that address the practical side of managing

complex product development. These are advices for managing the sensitive early period, and ways to alter the direction of an expanding meeting system.

12.3.1 Allow time for innovations to occur

In this chapter, it has been argued that the adequate combination of meeting types is contingent on whether a project is in its inception facing ambiguity, or nearing its midway phase when it confronts a high degree of uncertainty.

During the project's early period, it is important to allow an appropriate amount of time for a self-organized process of many informal meetings in which meaning is produced to counteract ambiguities associated with the product. During this phase, formal meetings should chiefly be used as a receptacle for ideas, interpretation, and definitions developed during informal meetings. Formal meetings may also serve as a trigger for informal conversations to take place regarding particular topics. Regarding the latter, conversations held in informal meetings often produce an antithesis to the statements made in formal meetings, only to be synthesized at a later stage. Rather bold statements from the manager during formal meetings may therefore work to fuel discussions held informally. However, the manager should then be sensitive to and learn from the interpretations and ideas that arise from the informal meetings before formal action is taken. Without taking the longer route via informal meetings, ambiguities will remain unresolved and formal action will literally appear meaningless.

12.3.2 Advice for altering the direction of an expanding meeting system

The below paragraph will discuss actions that can potentially alter the direction of a system of meetings heading toward collapse, that is, when formal and informal meetings expand at an increasing rate.

As argued previously, counteracting ambiguity by introducing more control does not decrease the level of ambiguity. This is due to the fact that more structure and control does not enable identification, definitions and framing of ambiguous problems. However, the idea of managing ambiguity with control is often discussed and relates to a notion commonly found in the popular discourse about meetings. There, it is often expressed that one should tighten the leash on formal meetings by introducing more structure, distincter purpose and aims, and force participants to comply with the pre-made agenda, in order to counteract the confusion that commonly exists. For example, an article in the Ericsson internal newspaper *Kontakten* ('the contact') on the 7th of April 2002 (pages 6-7) contained exactly that idea. However, argued here, this type of action is detrimental when ambiguity is the problem. This is because it

creates a need for even more meetings as well as 'quasi-innovations' to design ways of coping with the situation.

To alter the direction of an expanding meeting system infected with 'quasi-innovations', a change must instead take place that designates the time previously spent on 'non-sense' activities to those that enables sense making about the ambiguity at hand. Thus, when ambiguity arises, rather than increasing the rate of formal meetings, a manager should do the opposite: decrease the number of formal meetings taking place, for example through a prolongation of their intervals. A manager should simultaneously stop the production of progress reports and other types of administrative requests that the formal meetings had previously generated. In those formal meetings still running, the manager should advocate his own view more clearly and invite others to an inquiry about the same (see Argyris 1990 regarding advocacy and inquiry). This type of approach will set the agenda for many informal meetings and the system would begin to produce the pursued meaning that was previously lacking. When the level of confusion and conflict begin to decrease in formal meetings, this should be interpreted as an indication that sufficient meaning regarding the matter has arisen and the level of ambiguity has been reduced. A balance in the system of meetings begins to develop. Thus, the project will now enter a stage dominated by uncertainty in which formal meetings begin to appear as meaningful activities of problem solving.

12.4. Suggestions for future research

Departing from my own experience, portraying organizations through their meetings has been a fruitful way to conduct organizational research. While numerous issues of often discussed in organizational theory become visible in meetings, for example power struggles, clash of different realities, subordination and superiority, coordination and integration, and so forth, this part will concentrate on proposing ideas for future research that is tightly connected to the ideas expressed in this chapter, implying that the focus of attention will be given to the system level of meetings.

Foremost, further empirical studies are needed to examine the hypothesis regarding the functions of a system of meetings serving as mechanisms that balances the contradicting needs for innovation and control. Are the hypotheses regarding the system of meetings also valid in other settings engaged in complex product development?

Studies of other empirical settings where complex knowledge work is performed would also be beneficial to examine the extent that the findings of this study could be generalized. For example, do a firm of solicitors operate

under similar conditions as the members of a product development project with regards to the meetings they make use of?

Furthermore, empirical examples are needed regarding the manager's role in relation to a system of meetings. What types of action make the system stay balanced, and what action is needed to alter and expanding system of meetings? Does a balanced system change in a self-regulated manner, as proposed here, or does it need interventions from a manager? If it does require managerial interventions, what role should the manager assume in order to gradually transform the meeting system of an organization to meet the demands of specific situations?

Appendix: The 224 meetings included in the study

Groups of meetings	Individual types of meetings included
Senior management meetings and strategic steering committees	1.1 Line Management Group 1.2 Line management group 1.3 Management group X-location 1.13 Product and Marketing Steering Group 1.14 Ericsson Steering Group for Hardware modernization
Product councils and other formal meetings regarding system design	1.16 Product Council Mobile system 1.17 Product Council - Mobile Base Station 1.18 Product Council APZ 1.19 Product Council MRS 1.20 Product Council Central Processor System 1.23 Product Council Methods at A-company 1.24 System Capacity Group 3.83 Formal inspection when technical document are ready 3.84 Formal technical inspection/review 3.85 Formal technical inspection/review 3.86 Formal inspection when technical document are ready 3.87 Technical review/inspection
Meetings regarding improvement activities	1.25 Quality Assurance Board meeting 1.27 Project Methods Group 1.28 Team Group
Project steering and follow up meetings	2.1 Projects reporting to XY/Z line management 2.10 MBS Project Follow up meeting 2.11 Budget Follow up meeting 2.2 Thursday forum - Projects reporting to Line management 2.3. Formal status follow up meetings with the sponsor 2.4 Integration and Verification Project steering group 2.5 Project steering group 2.6 CPG project steering group 2.7 Project Steering meeting N-sund 2.8 Operative Steering Group for Mobile system project 2.9 Operative Steering Group for Central Processor project

Centralized intensive project-line coordination meetings	2.15 The 'Dalarö' process 2.16 Almåsa 2.17 Central Processor Friday
Main project management meetings	3.1 Main Project Management Team meeting - Mobile system project 3.2 Main Project Management Group meeting - Central Processor project 3.3 Contacts with FOA project manager 3.4 Reduced Project Management Team meeting - Central Processor project
Change Control Board	3.5 Change Control Board - Mobile system project 3.6 Change Control Board - Central Processor project 3.7 SS project Change Control Board
Project management meetings	3.10 FOA Project management meeting 3.11 SW Project management meeting 3.12 MBS project management meeting 3.13 Packet Data project management meeting 3.14 MRS project management meeting 3.15 OSS project management meeting 3.16 Verification & Integration project management meeting 3.17 Phone meeting with X-country 3.18 IPU project management meeting 3.19 SPU management meeting 3.20 Follow up on teams - ROT 3.21 Follow up on teams - ROT 3.22 Risk analysis at FOA project 3.9 MIP project management meeting
Meetings where the entire projects gather	3.23 Work meeting within Indus sub project 3.24 FOA Sub project meeting 3.25 IPU Forum 3.26 SS project meeting 3.27 CPG project meeting 3.28 RPH project meeting 3.29 FOA project information meeting 3.30 FOA sub project meeting 3.31 Friday information 3.32 SS Project information meeting 3.33 CPG Project seminar 3.34 IPU Morning meeting 'Info' 3.35 SPU Lunch meeting 3.36 Central Processor Main project Stand up meeting 3.37 MAS Sub project stand up meeting 3.38 Stand up meeting at SPU project

Formal training & knowledge transfer seminars	3.93 Seminar 3.94 Special training 3.95 Short Feedback Loop - SLOOP 3.96 Intermediate meeting between projects for System Management 3.97 N-sund seminar
Formal meetings with customers regarding contract	4.2 Formal contract meeting with customer
Formal demonstrations of product for customers	4.5 Customer Demo. 3 meeting 4.6 Road Show Hardware modernization 4.7 N-sund product Show 4.8 Customer Demo. 1 meeting
Participation in other project's steering committees	4.3 Steering Group towards B-company 4.4 Project Meeting Lincoln, B-company
Subcontractor management meetings	4.1 Subcontractor meeting
Section- and department meetings	1.4 Cross sectional meeting between project office and product and market section 1.5 Department meeting – A-company 1.6 AR/VS Section meeting - A-company 1.7 ZD/LF Section meeting - A-company 1.8 JT/TP Section meeting - A-company 1.9 ZD/JT Section meeting - A-company 3.31 Friday information
Section meetings at the project office	1.10 Project Office section meeting - A-company
Technology oriented section meetings	1.11 B/SH Section meeting - B-company 1.12 MIP Section meeting - B-company
Reference and advisory group meetings	2.18 System Capacity Reference Group for APZ 2.19 Indus project reference group 2.20 SPU project reference group 2.21 CPS Sub project advisory council 2.22 MAS Sub project advisory council
Local project-line coordination and resource planning meetings	2.12 SS Project/line co-ordination 2.13 Project coordination Forum - Line management group invites project manager 2.14 Resource planning
Pubs and other planned social activities	3.39 Organized Pub 3.40 Planned non work team activities 3.40b Friday coffee

Team meetings	3.41 Team meeting within SS 3.42 IPU Core 1 Meeting 3.43 Team meeting Radio Network Reg. within MRS 3.44 IPU 1 Team meeting 3.45 Team meeting within MRS 3.46 ASIC Team meeting 3.47 Simulation Team meeting 3.48 Team meeting SW 3.49 Team meeting within RPH
System Emergency Board	3.63 System Emergency Board - Central Processor project 3.64 System Emergency Board - Mobile system
Coordination meetings regarding activities on main project level	3.50 Visits to the N-sund factory 3.51 Follow up on what design that has been released for testing - AD 3.52 Meeting prior to release of design for testing - AD 3.53 Test coordination meeting 3.54 Test coordination meeting 3.55 Test coordination meeting 3.56 Hard ware coordination meeting 3.57 Simulation system status meeting 3.58 Internal Delivery meeting 3.59 Delivery planning meeting 3.60 Mobile system Quality seminar 3.61 Quality Road Show 3.62 Verification Expert Group meeting
Technical discussions	3.65 IPU project technical coordination meeting 3.66 Technical coordination forum 3.67 Technical Expert Group meeting 3.68 Central Processor Hard Ware - CPHW 3.69 Technical discussion meeting 3.70 Error handling meeting 3.71 Formal error handling meeting for Modification Handling System 3.72 Stinker analysis 3.73 Root Cause analysis 3.74 Configuration Control Board 3.75 Implementation Proposal (IP) / feasibility meeting 3.76 Official work meeting about requirements 3.77 System Coordination meeting 3.78 Meeting within project system group 3.79 System Capacity Forum 3.80 System Forum Packet Data project 3.81 System Forum MBS 3.82 System Forum for small Base station

Coordination and information exchange with customers	4.10 Pre delivery meeting with customer 4.11 Customer meeting regarding system test 4.12 Contact with Ericsson X-country 4.9 Contact meeting with Ericsson X-country regarding function and platform test
Informal gossip whispering with colleagues at the section	7.26 Morning prayer at system 9.2 Smoking room 9.3 Lunch room 9.7 The coffee room 9.8 The coffee machine
Informal coordination of design work through spontaneous interaction	7.10 Valhalla meeting room 7.11 Informal on the flight back and forth to Stockholm 7.12 Talk about solutions to technical problems during lunch 7.13 Spontaneous Interaction 7.14 Spontaneous Interaction 7.15 Spontaneous Interaction 7.16 Spontaneous Interaction 7.17 Personal contact 7.18 Sub project daily interaction 7.19 Interactive design work 7.20 Informal contacts with designers 7.21 Informal negotiation with system manager 7.22 Informal technical document work meeting 7.23 Informal error handling meeting 7.24 Unofficial work meeting about requirements 7.25 'Mole' activities on Packet Data 7.7 Talk in the corridor after the IPU morning meeting
Management by walking around	7.29 Walk around Asgard work area 7.30 Walking around 7.31 Walk around at the G-köping office
Technical surveillance by walking around	7.27 Walking around - Spontaneous Interaction 7.28 Walking around
Spontaneous discussions with project members	9.10 Coffee break 9.12 Coffee break 9.4 Lunch table 9.5 Lunch 9.6 Lunch 9.9 Coffee talk
Ad hoc coordination meetings between projects	7.32 Informal INDUS sub project meeting 7.45 Coffee meeting coordination Test - Basic test 7.46 Self initiated contact with design personnel 7.47 Phone contact during testing phase with test personnel 7.48 Daily phone contact with design projects 7.49 Coordination with other sub projects

Informal coaching and correction of technical work	3.88 Formal technical inspection/review 7.3 Help/examination of technical documents 7.4 Help/examination of technical documents 7.5 Informal technical review 7.6 Clean room - examination of code
Unofficial management group meetings	5.1 Informal line management group 5.2 Old line management group
Informal learning dialogues	7.1 Dialogue with the prior project's Hardware Coordinator 8.1 Conversation with J 9.1 Spontaneous meeting in my room 9.1b Dialogue with M
Lobbying/unofficial meetings between project and line managers	6.10 Informal negotiation with line manager regarding resources 6.11 Informal contact with the section manager 6.4 Informal meeting with the department manager and the main project manager 6.5 Informal contact between FOA-project manager and local CEO 6.6 Informal contact with line manager 6.7 Informal meeting with the new sponsor/line manager 6.8 Informal meeting with line managers 6.9 Resource planning unofficial
Project internal lobbying	7.33 Informal meeting with the main project managers 7.34 Informal contact with Main project manager 7.35 Informal contact with project managers 7.36 Contact with the test coordinator 7.38 Informal conversation the system manager and the technical coordinator 7.39 Lobbying 7.40 Planning/check up with the main project manager 7.41 Lobbying - Individual contact with project managers 7.42 Contact with HN 7.43 Informal contact with GJ 7.44 Informal contact with the main project managers 7.44b Talk on the flight back and forth to G-köping
Cross-talk in team rooms	7.8 Our room 7.9 Talk in our room
Informal customer contact	8.2 Informal pre delivery meeting with customer 8.3 Informal contract meeting with customer

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