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Helena Karsten

University of Jyväskylä, Finland, HelenaKarsten@emailaddressnotknown

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“It’s like everyone working around the same desk”: Organisational Readings of Lotus Notes

Helena Karsten

*Department of Computer Science and Information Systems, University of Jyväskylä
FIN-40351 Jyväskylä, Finland*

Abstract

New applications are often utilised only limitedly. With groupware, the users need to form also mutual conceptions of the co-operative purpose and possible uses of these applications. Lotus Notes™ is acknowledged to exhibit these difficulties. Interviews with Notes users demonstrate that individual interpretations vary considerably, also between users of the same application. The goal of this study is to explore variation in individual interpretations and to find shared meanings—if possible—within user groups. Structuration theory is used as the conceptual vehicle to aid in widening the search to the socially construct-

ed nature of these meanings: how people have constructed their conceptions in their work setting. The norms prevailing, the resources available and the interpretations evoked influence this meaning construction. Roots of variation and similarities can be found in how the conceptions have been formed gradually—even though single instances might look like a flash of insight—in interaction.

Keywords: software adoption, CSCW, groupware, Lotus Notes, social construction, meaning, structuration theory

1. Introduction

Substantial changes can be made in work practices through the adoption of information technology. However, new applications can be difficult to understand and assimilate into one's work and hence their utilisation can be limited (Kling & Iacono 1989, Orlikowski 1992). The changes become less than intended. If analogies for the applications can be found in 'real life', the adoption becomes somewhat easier, albeit with a risk of over-simplification and misunderstanding (Spiro *et al.* 1989). Novel conceptualisations, sometimes in the form of metaphors, can be the wanted sources of profound change (Walsh & Ungson 1991) as the technology and the work practices are faced in a new way.

Pinch & Bijker (1989) claim that interaction with technology gives room for different interpretations of it, and that such interpretations, by varying degrees, are shaped and constrained by the various groups' purpose, context, power, knowledge base, and the artefact itself. This social constructionist view points to the way interpretations of technology are formed in the social context. Studying how and under what circumstances the interpretations are formed can lead both to understanding the limited nature of conceptualisations and to unveiling how the novel, imaginative conceptualisations have been reached (Floyd 1992).

When work demands co-operation, one could assume that introducing an application to support co-operation would be rather straightforward. Unfortunately, this seems not to be the case, see e.g., (Grudin 1991). Faced with groupware, users need to shift their interpretations from the familiar ones to novel readings

to appreciate the co-operative nature of these applications, the interdependencies in work (Schmidt & Bannon 1992). Orlikowski's (1992) findings suggest that when people neither understand nor appreciate the co-operative nature of groupware, it will be interpreted as an instance of some more familiar technology and used accordingly. This can result in counter-productive and uncooperative practice and low levels of use. An illustration by Grudin (1989) of the required shift is the difference between using single-user applications together (such as word processors with the possibility to access the same files) and participating in the use of a multi-user, co-operative application (such as a co-authoring tool). In the former, the interdependence must be dealt with separately by work arrangements, in the latter the co-operative nature is inherent in the application.

In this study we proceed from an assumption that a sufficiently shared understanding of the purpose and functionality of groupware in its particular organisational context is a prerequisite for its co-operative use. The shared understanding does not necessarily need to be articulated explicitly, it can also be conveyed by co-operative work practice. The starting point of this study were the startlingly differing statements of groupware users, constantly encountered even within a single group. We focus on these differences within groups. *How is it that people who do the same kind of work in the same organisational context with the same tools, still understand (and accordingly use and tell about) them in such different ways?*

Earlier studies of this are few. The main focus has been on similarities within groups (DeSanctis & Poole 1994,

Fulk 1993, Orlikowski & Gash 1994) or organisations (Barley 1986, Bullen & Bennett 1990) and differences between them. Two studies by Mackay (1988 and 1990) focus on groups as formed by individuals. In a study of electronic mail use Mackay (1988) claims that use is diverse because of the users' preferences but does not examine in depth the background of these preferences. In her study of software customisation (Mackay 1990) as a co-adaptive phenomenon (human behaviour affects environment and vice versa), she points out that the users' perceptions of software affect what they try to accomplish, under a complex set of influences. In this study we share Mackay's interest in individuals as active actors and also recognise the complex mutual interaction of user's perceptions and uses of software in a given context.

We look at how eleven people, in three groups (with three in the first group and four in each of the other two sites), told about how they had approached and appropriated a new piece of groupware technology, Lotus Notes, and what their view of the technology and the applications were during the interviews. Their characterisations of Lotus Notes varied considerably. This variation led to exploration of what kind of conceptions of technology could be found behind these characterisations, how each conception had been formed, and whether shared meanings were being established. These socially constructed meanings (Berger & Luckmann 1967) are reflected in how users talk about the applications and in how the applications are used for individual or co-operative purposes.

The conceptual vehicle to investigate the process of the social construction is structuration theory (Giddens 1979 &

1984). It is used to find answers to questions such as: *How are the meanings of technology constructed in action and interaction? Can an individual's interpretation of technology be better understood when viewed in the light of the resources used? What kind of a role is played by the norms which a group or individual is subject to or draws upon?*

The application platform studied, Lotus Notes, is described first. Because of the subtlety and richness of structuration theory, this is then described at some length in Section 3, followed by the methods in Section 4. In Sections 5, 6 and 7 the three cases are described. In Section 8 the cases are summarised and compared using the concepts and principles outlined. Finally, we discuss the insights gained from this endeavour and outline some conclusions for both research and practice.

2. What is Lotus Notes?

The focal application used in this study, Lotus Notes, has been a widely-used platform for developing different-time/different-place groupware applications (Ellis *et al.* 1991). As a product, it started to evolve from the ideas of a distributed conferencing application (many to many communication) and a bulletin board (one-to-many communication) to provide information sharing services by replicating databases over networks (De-Jean 1990). A database in Notes is "a collection of related forms or semi-structured documents, organised through views that sort or categorise information" (Kawell *et al.* 1992, p. 227). The directly accessible additional functions include electronic mail, an editor, full

TABLE 1. Types of Notes applications (Lotus Development Corporation 1993, pp. 1-4-1-5 in italics)

<i>Types of Applications</i>	<i>Examples</i>	<i>Discussed in this study</i>
<i>Broadcast Applications</i> • fairly static information, sometimes time-critical, that need to be available to a wide variety of people	<i>Meeting Agendas and Minutes</i> <i>Company Newsletters</i>	News service (case 2) • news-type databases, peer group information databases, price-graph databases
<i>Reference Applications</i> • documents are meant to be used as a consolidated reference library	<i>Policies and Procedures Handbook</i> <i>Software Code Library</i>	Quality Handbook (case 3) • current, previous and working versions of rules and directions Test Tracking (case 1) • the customer database in the application
<i>Tracking Applications</i> • information is continuously updated, usually highly interactive, with many users contributing to gathering information	<i>Project Tracking</i> <i>Employee History</i> <i>Help Desk Call Tracking</i> • with problem descriptions, status information and possible solutions	Test Tracking (case 1) • follow-up on the status of testing orders and customers
<i>Discussion Applications</i> • support both structured and unstructured group communication	<i>Brainstorming Database</i> <i>Feedback or Opinion Database</i> <i>Customer Support</i> • frequently asked questions with answers	
<i>Workflow Applications</i> • use macros to automate tasks, such as routing forms, sending reminders, or automatically performing periodic updates	<i>Conference Room Schedule</i> <i>Training Program Management</i> • from registration to invoicing	Test Tracking (case 1) • flow of the testing order and results

text search capabilities, and macros to run background operations (Bannon 1993)

Notes differs from other client-server tools in two major ways. The adjustable replication mechanisms allow for distributing work while maintaining facilities for co-operation. The Notes documents can act as carriers of several different types of data, either included in

the document or residing in separate databases linked by pointers. According to the interviews and discussions at the case companies, most of their Notes applications could not have been developed with another tool as easily or the result would have been clumsier. Some examples of typical applications are listed in Table 1.

Notes includes capabilities to develop several different types of applications to support co-operation. DeMichelis (1990) has characterised the nature of co-operation with three dimensions: coordination, communication and collaboration. Although this characterisation is not comprehensive, with Notes it is illustrative. Electronic mail, the broadcast applications and the discussion applications all emphasise the communication dimension. Tracking and workflow applications are typically related to co-ordination. Collaboration is the widest characterisation of the three: the focus is on working together to achieve a shared goal. Almost any Notes application can be used for this purpose.

Notes is often seen to be difficult to understand and to describe, see e.g., (Bannon 1993, Smith 1992). Use of Notes has therefore often been limited and it has only slowly spread into organisations. It is difficult to find familiar analogies for Notes. The border between Notes as a product and Notes applications is not as clear as it is in 'conventional' application platforms—this is also noted by Heikkinen (1995). Complexity and modifiability make Notes different from most other programs used. The complex ones tend to be non-modifiable (such as pricing and inventory systems) and the modifiable ones tend to be simple (word processing, spreadsheets).

As Orlikowski (1992) points out, how users understood Notes was mainly influenced by the kind and amount of information about the product and by the nature and form of training received. Bullen & Bennett (1990) share a similar view of initial expectations persisting. Most users, also most of the interviewees, have been introduced to Notes dur-

ing a demonstration of a particular application and of the basic tools. They also have had training and guidebooks available and talked with, for example, superiors, the application developers and the Value Added Resellers (VARs). In the following discussion, care is taken to point out these elements to distinguish quoting from subjects' own characterisations.

3. Structuration Theory and Meaning Construction

Structuration theory (Cohen 1989, Giddens 1979 & 1984) is used here as a sensitising device in widening the scope of the study into the social construction of technology, acknowledging the adaptations to information systems, see e.g. (Orlikowski & Robey 1991, Walsham 1993) and to groupware (Lyytinen & Ngwenyama 1992). The reason behind this choice is the richness and the subtlety of the theory: it encompasses the whole arena of human action and interaction, with a focus on three structural dimensions that guide action: signification, domination and legitimation. Its comprehensiveness makes it suitable to support multi-dimensional explorations into the social construction of meaning.

Some other approaches that could have been used in this exploration would have left the institutional elements in the background and focused on observing work practice (e.g. ethnography: Hammersley & Atkinson 1983) or gone deeper into the use of language (by analysing conversations: see e.g. Schlegloff 1991). A benefit of these approaches would be increased sensitivity and possibly a richer description of the conceptions. Both

approaches have practical problems of access to appropriate data. But, more importantly, the question of socially constructed meanings leads the discussion to explore the guiding structures within which the meanings are formed, and the process of this meaning formation. For this, structuration theory is a more powerful instrument for thought.

The institutionalised features of social systems are called structural properties. They can be seen as rules of interpreting meaning and enforcing norms and as resources in the exercise of power. The sets of rules and resources drawn upon in action are called structures. The main principle of structuration theory is the duality of structure and action. Our actions are enabled and constrained by the structures. These structures do not exist as themselves, only as instantiations in action and as memory traces in the actors' minds. Structures are reproduced, modified, and created in action.

Human beings as knowledgeable agents act intentionally and reflect upon their actions. Intentional action can be influenced by unacknowledged conditions and have unintended consequences and indirect effects. These can lead to changes in the structures and hence the consequent actions. A prerequisite of intentional action is discursive knowledge: that actors are able to explain their actions. Much of an individual's knowledge is, however, tacit: actors can do more than they can say. This practical knowledge is essential in reproducing structures.

The main focus of this study is the structures of signification that enable our communications. From the structure point of view, our significations are conveyed by our interpretive schemes that

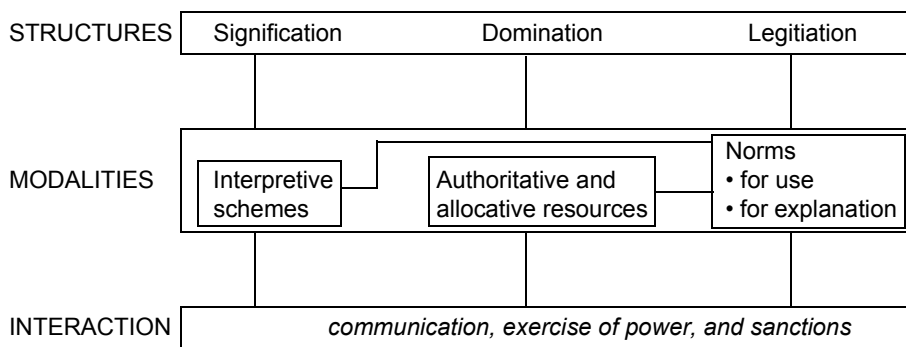
represent institutional rules of social interaction. From the point of action these structures are represented as modalities, as interpretive schemes that the actor employs in the constitution of interaction. People draw on the assumptions, knowledge, or rules which may be embedded in the IS, to perform or to modify their tasks. Action in turn can create new structures of meaning that can alter institutionalised practices.

The two other dimensions that Giddens brings out are the structures of domination and legitimation. In action, human beings exercise power by drawing on the structures of domination. Access to power is gained by the use of resources. Allocative resources (or facilities) give power over material, and authoritative resources give power over people. An insight of Giddens (discussed at length in Giddens 1979) is that power is never uni-directional. By this dialectic of control: "all forms of dependence offer some resources whereby those who are subordinate can influence the activities of their superiors" (Giddens 1984, p.16). The structures of signification and domination are bounded by the structures of legitimation. Norms drawn on the structures of legitimation guide actions and provide justifications for them by sanctioning or entitling them.

These three views of signification, domination and legitimation are only separable analytically. In this study, this intertwining is used to enrich the picture of meaning construction—or construction of interpretive schemes—by interrelating the analyses of meaning, power and norms. The elements and their relationships are summarised in Figure 1 and are now discussed with examples.

■
H. Karsten 8

FIGURE 1. Elements of structuration to focus analysis. Modified from (Giddens 1984, p. 29).



In each instance of meaning construction, previous understanding, resources available and norms surrounding the situation are present in the modalities on which the actor draws in constructing or modifying the structures of signification. Authoritative resources give the actor power over the actions of co-workers, superiors, or application developers. An example of this is that a user can give a question and get an answer to it or request a change in the application and have it made. In an interaction situation authoritative resources also delineate how others have power over the actor. For example, participating in a training or application evaluation session can be made mandatory by a superior.

Allocative resources can include command over hardware and software, access to training and guidebooks, access to the applications, and previous experience with computing. Without access to allocative facilities the use of applications would not be possible. Appropriate resources make using the applications and talking about them easier. Without authoritative resources, ac-

cess to allocative resources can be controlled perhaps by persons who don't know the situation or the application. Access to resources that aid in meaning formation can speed the process of understanding.

The norms as interpreted by the actor form the boundaries for meaning construction. Limiting or enabling norms include, among others, those of 'usefulness' of an application as perceived by the user and the norms posed by others regarding the expected manner of use. The norms of explanation reflect, for example, how users perceive themselves, the profession's norms of explanation, or what the user assumes the interviewer to expect as answers. All these can change constantly during action and interaction.

In formulating a meaning attributed to something, the actor at the same time makes an interpretation of it and thereby "may alter the form of its application" (Giddens 1984, p. 23). In interaction, meanings are discursively formulated—said and heard—and through this process mutual understandings can be reached, for example to facilitate co-op-

eration (Schmidt & Bannon 1992). Each person uses his or her own interpretive schemes, facilities and norms in this negotiation process. Although each person's rules and resources are different and constantly changing, structures of meaning that are sufficiently shared to enable co-operation, can be reached in interaction.

In any social practice the actors need the basic knowledge of 'how to go on': Giddens (1984, p. 4) calls this mutual knowledge. It is incorporated in interactions but not necessarily directly accessible to the consciousness of the actors. In cognitive psychology similar concepts are often called 'schemas' and in the recent socio-cognitive literature 'frames'. Schemas and frames are, however, more of the nature of common beliefs, a valid interpretation of something, whereas mutual knowledge is a basic human necessity to make action possible. Schemas and frames have been connected with interpretive schemes of Giddens (Orlikowski & Gash 1994). The problem with this is that interpretive schemes only convey the structures of signification. An alternative would be to transfer the focus to the structures. Shared meanings can be seen as those structures of signification that are (or are becoming) institutionalised, as rules constituted by the agents in that particular context (Giddens 1984, p. 18).

In empirical analysis of meaning construction (Giddens 1984, pp. 297-298), the expressions studied reflect the informant's structures of signification. However, what seems to point to shared structures of signification can be a misunderstanding or mere lip-service; the expressions may have been imposed upon the actor by powerful persons or by

strong norms, reflecting the prevailing shared structures of domination and legitimation. In all cases, the actors, the persons stating their views of what something is, are acting within mutually influencing structures of signification, domination and legitimation.

In this study we focus on what and how the informants told about Notes and its use. We look into communication of and by Notes; exercise of power related with Notes, and sanctioning associated with the uses of Notes. The purpose is to learn about the meanings attributed to Notes, the variation in these conceptions and possibly shared features therein. We will use the modalities of interpretive schemes, resources and norms to look into the structures, the rules and resources that facilitate or constrain meaning construction in each case. Our assumption is that by looking into meaning construction as a social process from the three analytic viewpoints, the variation in the accounts can be traced and thereby shared elements found. As a process, the construction of shared conceptions is anticipated to be gradual—even though single instances might look like a flash of insight. In this process, interpretive schemes aid as knowledge is pushed into the discursive consciousness, the limits of the norms are probed and access to resources—either legitimated or through dialectic of control—enables or constrains forming and testing of different interpretations.

4. Methods

The cases described here form a part of a larger study covering seven sites in five companies. Access to these companies

was gained through a CSCW Special Interest Group, two Value Added Resellers (VARs), and personal contacts. All companies except one allowed only 'one-shot' studies (Yin 1989); the single longitudinal study, lasting several years, will be reported later. The cases for this study were selected based on two reasons. First, the application(s) had to have several users that could be interviewed, in order to compare prevailing conceptions of Notes. Second, the Notes applications had to be recently implemented so that the users could still think—and tell—about the applications as 'discrete artefacts' (Tyre & Orlikowski 1992).

The three cases chosen also represent a variety of settings, applications and users. In Case One (three informants), a Notes application is used to track testing assignments in a laboratory, and the application emphasises co-ordination. In Case Two (four informants), Notes is used to disseminate news bulletins and as electronic mail, to help communication. In Case Three (four informants), a new Quality System for a manufacturing company was built using Notes to store and organise the Quality Handbook documents. The system supports collaboration in preparing and revising the documents.

First the sites were visited and background material on the companies was collected. During these visits unstructured interviews (not tape-recorded) were conducted with the application developers or system support people available. These people usually demonstrated the key applications and the major one of these was then chosen for this study. All applications had more users than those interviewed. The users to be interviewed were selected on the basis that they had

also other contacts with each other besides the application. The secretary in Case Three is an exception: she meets the other three only rarely but was included in the study to give a contrast in terms of resources. None of the users interviewed had used a CSCW application before.

The semi-structured (tape-recorded) user interviews, the main body of data for this study, were conducted during late spring and early summer of 1993. The interviews included questions about the person's background, tasks, and experiences with computers in addition to the IT-related topics that concerned Notes as a product, the applications used and the process of integrating these into one's own work. Observing actual work using the applications could have given more context for studying the interview statements and perhaps provided a way into the theories-in-use, but this was not possible. The applications in use contained confidential data (all cases) and the use was situation-dependent (Case One; Case Two except the librarian; Case Three except the quality supervisor).

The analysis of the meanings of Notes is based on all gathered data. Several definitions or descriptions of both Notes as a product and of the applications used were found in the interviews. The quotations presented are derived from these, and attempt to give a concise and illustrative view into how the informants saw Notes. The English translation of the quotations was done by the author. The selection of the quotations and the translations were presented back to each interviewee with the original interview transcript for checking and approval.

The inductive analysis (Patton 1980) of constructed meanings uses the concepts presented. The definitions and descriptions given of Notes formed the basis for studying the interpretations. The resources that could enable or limit interpretations were synthesised from the interviews or observed during the first visit or the subsequent interview visits. The norms regarding the use and explanation of Notes were found in the interviews, in the background materials, and by observation. These perspectives were then compared against each other to find explanations for the definitions and descriptions of Notes.

The data in this study does not yield a full longitudinal analysis of how understanding has changed over a long period of time. Only a short slice of the present with reflections from the past was available. The analysis of how each person and group had come to the understandings they had at the time of the interviews is therefore, of necessity, reconstructed. It was notable, however, that even during the interviews the actors reflected on their interpretations and experimented with different explanations—either prompted by questions or on their own initiative. In some cases this process of structural adjustment as a result of discursive formulation (Giddens 1984, p. 23) was so clearly articulated that it was possible to describe and analyse here (see especially the librarian and the second production engineer below). Instances where the interview situation clearly influenced the statements are also discussed with the help of other data available (see Case One).

5. Case One: The Test Tracking Application

5.1. Description

The materials testing department of a research institution performed tests for in-house projects and for outside customers. As a consequence of a customer satisfaction survey, the Notes Test Tracking application was developed in an attempt to make the service faster and more reliable by tracking the assignments and automating parts of the test report generation. The management could now follow the testing activity more closely. A major bottleneck, an overworked secretary needing several days to type a report, could now be bypassed.

A small testing group was selected to be the pilot users of this application. The informants in this study are a tester in the group, its foreman and the head of the whole testing department. Informal discussions were also conducted with the previous head, who now used the application as a customer database in his new marketing position. The customer survey was conducted during spring, the application was developed during the next summer and autumn and the group started its use during the next winter, some four months prior to the interviews. The application was still new and only partially in use. If the interviews had been conducted later (the department manager: “within a year we will have all this under control”) the interviewees would have had more words and more experiences for telling about the application and Notes.

With the Test Tracking application, when a testing order and the materials to be tested came from a customer, the fore-

man inputted or updated the customer data and filled in the assignment form and marked which tests were to be carried out. For each test the application generated a form that inherited the customer and assignment information. The tester, who performed the tests on the materials, filled in the initial test results on these forms. The program calculated the final test results that were then printed. The foreman wrote a verbal summary of the results in the test report, printed it, added the test forms as appendices, signed it and sent it for review by the department manager. If the customer requested, the foreman faxed the initial results as soon as they were available, and then the actual test report was then mailed later with the invoice.

With the manual system, the testing group could adjust their tasks and roles relatively freely, based on their long experience and their current work load. The Notes application imposed an order of tasks with its embedded hierarchy. This resulted in co-ordination problems and limited the usability of the system. For example, the tester might know what tests needed to be done for a customer and how to do them, but could not do them before the foreman had filled in the assignment form and marked the tests to be done. The foreman was often too busy to do this part before the tests. The tester therefore could go back to using the old forms and a pocket calculator, leaving the test results for the foreman to fill in.

All three had limited training and experience with computers. Their current computing resources were modest; old, slow and often shared with others. Their PC's were placed inconveniently: on a side desk several meters from the test machines, on a side table in the fore-

man's office, and behind the head of the department on a corner of a paper-loaded desk. Talk about the system concentrated on practical problems in using the application or on problem situations where the actual work was conducted more flexibly than the application supported. Therefore the knowledge about the application was more centred around its limits than its possibilities in supporting the testing function. Also this could be seen in the partial and reluctant use of the system:

"I must admit that in the background, for all of us there is some kind of reluctance [to use the system], but why, I don't know." (the department manager)

The tester had vocational school education and had been doing his present work for 24 years. He had no training in computing and found typing difficult. He had been assisted by a short step-by-step guide and occasional help from somebody nearby. For him, the real test report was the one he filled in by hand by the test machines. The only function where he saw the new system possibly doing better than the old arrangement was in calculating the results, where he admitted that one can make mistakes with a pocket calculator. He also described Notes using a calculation-analogy and only showed the workflow and the database aspects of the application. The tester's knowledge of Notes was practical and partial: he could show and explain how he and the others used the application, but he still lacked words to tell about the application and about Notes in general.

"... well, it is a kind of a calculation-based computer program. Or is it? I think

it is.” (laughs and continues by showing and telling how the program works)

The foreman was an engineer and had led the testing group for 19 years. He had some training in computing but very little prior experience. His understanding of the system was much supported by sharing an office with the application developer and getting help from him whenever needed. He would have liked to have extensive training in Notes and in the application use. The foreman admitted that the availability of customer information and information about prior tests had made it easier to fill out the testing assignments. He showed discursive knowledge of the application, but only practical knowledge of Notes in general.

“I don’t know, but I would imagine that this begins with the [customer] register there. [...] and as I follow the program, for example [description of the steps] this stored information that is there forms the basis and it takes from there the stuff that is available and then I fill in the rest. You can get from there what there is.”

The head of the department was a graduate engineer with an industry background. He had worked for the institute for two years and had been nominated head of this department four months earlier. He was not keen on computing. His lack of interest was evident in the thinness of his definition, indicating that his general computing knowledge was still to a large extent tacit. However, he was able to tell about Notes and knew the application well. He had participated as the user representative in the application development project but still found that the application needed revising. He could use the system for tracking the tests and

customers and for supporting others, but used these possibilities only occasionally. He was expected to supervise the use of the system but he had not imposed it upon the others because of his own lukewarm attitude. He understood the norms on the floor and did not want to demand something from others that he was not particularly happy with himself. In his opinion the application was overkill for their problems.

“Notes is many notes (a joke). Do you mean Lotus Notes? It is an information system. I only see certain windows, forms and I see how it functions, and the customer data bases and what one can get out from there. This system gives a possibility to track the testing assignments. I have used it less than would have been possible.”

“It feels complicated for its purpose. [...] If you compare it with just taking a customer template (in a word processor) and just filling in the numbers to make the report, then this system is considerably clumsier. [...] The benefit of this application is that the data is automatically copied from one form to another and there are several of them [...] we all want to type as little as possible.”

5.2. Analysis

The analysis of this case required more background knowledge than the two to follow. The descriptions above are rather vague and exhibit hesitance. They seem to be formulated for the interviewer. A preliminary visit to the site and learning the testing terminology and procedures prior to the interviews made the discussions easier. In addition, the interviews were rather slow-paced, allowing time for the informants to show and tell in several different ways. This resulted in

repetitions (e.g., the informant told about one problem several times) which both helped the informants to reach the kind of description they were satisfied with (“at least I think it is”) and gave clues as to what they held as important in the application and in their work.

Signification, interpretive schemes.

The newness of the application and the inexperience of everybody with computers set limits on how sophisticated the descriptions could be and also how much the group members could discuss the application. All three interviewees exhibited some shared understanding of the workflow aspect of the Test Tracking application: the tester showed the procedures, the foreman described them and the head of the department hinted at what he could do if he wanted to. The foreman and the department head also pointed to the customer database as a valuable source of information. All three told about problems with the application. What else could be done with Notes was not discussed nor showed although at least the foreman and the head of the department had been exposed to demonstrations and discussions of different uses of Notes. The way the three told about the application reflected their only slowly growing interest in it. Everybody emphasised the feature that could be most useful to him, where the application could serve best as a resource.

Legitimation, norms.

It had been legitimate for these three persons to consider computers as ‘not for us’, but the group was now accepting that learning and using them was necessary. This on-going norm change was a result of several factors. Computers were

becoming an unavoidable resource, non-use was on the way to becoming illegitimate. Interest in and use of advanced information technology was the predominant norm at the research institute and outsiders saw the Test Tracking application as advanced. All in the group accepted that the testing process could be speeded up with the application—if not now, then at least when in full use. This view was also supported by the management. The application had legitimation for and from the institute and colleagues and thus gave the group the possibility to make norm changes regarding use and explanation.

Domination.

The structure of domination the institute had imposed upon the team was a very hierarchical one: even the three informants here were on three levels, with the tester at the bottom, then the foreman with several testers in his group, and then the head of the department with several groups. How the actual work was conducted broke these hierarchical layers and depended upon the considerable resources of professional skills in the group: domination was based upon expertise. The tester worked quite independently and took care of a large share of the tests. The foreman shared tasks both with the tester (performing tests) and the manager (taking care of customers). The actual working practices were accordingly flexible. Even though there was a clear basic flow of work, it was supplemented with situation-dependent detours. If the application had been designed to follow the actual practices and acknowledged the skills and the flexibility in the group, it might have been easier to use and also accepted better. Non-use

can here be seen as a way of exercising dialectic of control.

Resources and norms.

The resources available to the group correspond to the hierarchical structure in the institute: those higher in hierarchy have more say in what resources they have for their own work. The testing group was kept busy with tests. All of them had very little training in computing and they had had no chance to practise at leisure. Their computers were even lent to others higher in the hierarchy when more urgent needs arose. Even though the management enforced the use of the system, their own conflicting norms of tying access to resources to hierarchical position created barriers to the resources given for the group.

Interpretive schemes, resources and norms

The question of resources was, however, slightly more complicated than this. The tester clearly needed and asked for more training and a faster computer. But the foreman, who had access to support by sharing the office with the application developer, still would have liked to have further, extensive training. He had a computer but had lent it to the application developer, perhaps because he saw the developer needed it more than he himself. The foreman maybe saw the application as something more complex than it was, or it can be that he was exhibiting his norm of professionalism also in computer use: he wanted to manage his tools well. The department manager expressed his opinions clearly: he saw the application still lacking and would have liked to have it modified but at the moment could not allocate funds for that

work. The Testing Tracking application as it was now was of secondary importance—the resources it gave to the group did not serve them well enough. Without the outside push its use might have been minimal.

Allocative and authoritative resources are thus a necessary but not sufficient prerequisite for use and discussion of Notes. The prevalent norms also regard access to resources. What can be said about Notes and the Test Tracking application is enabled and constrained by resources and by norms: interaction takes place according to the rules whose enforcement is dependent on resources in each particular situation.

6. Case Two: The News Service

6.1. Description

The company is a large multi-national, with an affluent past. Due to the recession and over-capacity in one of its main areas of business, it had made a sizeable deficit during the previous fiscal year. The old norm of business efficiency was supplemented with the norm of cost-cutting. The first Notes applications were built about 18 months earlier in an attempt to find a cheaper and more effective channel for distributing the news-type information that the information services department was either entering into the Executive Information System, sending as faxes, or mailing. The department also wanted to transfer some of the responsibility of filtering the news to the readers, thereby reducing their own work load. Four news-type databases, peer group information databases, and price-

graph databases were in full use, implemented about a year earlier.

This case is the opposite to Case One in terms of resources available. Because of the past affluence, the physical resources—computers, networks, printers—set no limitations to the use of Notes. All interviewees were also experienced computer users, with mainframe, PC programs, and electronic mail. They had had time to explore Notes, and information and training from a VAR. The informants chosen were amongst the first users and application developers of Information Services applications. The business analyst and the information systems specialist had been proponents of Notes in the company and were used to telling what Notes was about. The librarian and the manager were lone users, but well supported by these two. All four had had ample opportunity to build a shared understanding of Notes and of their own applications.

The business analyst inputted news into two Notes databases, gathered information about key businesses, and prepared reports for top management. She read widely—including about CSCW beyond her immediate needs—to support her broad professional expertise. She had grasped the essence and the vocabulary to speak about Notes. Her knowledge was clearly discursive and she also used it to achieve change. For example, she had helped the IT specialist to develop new applications and during the time of the interview was starting to develop a tracking application for another group by herself. She saw Notes as an Executive Information System (EIS) for a wider audience, for the professional level in the company. This view motivated her to promote Notes. She saw it as a

tool to help in the economic crisis the firm was facing, and as being in alignment with the current company norms. However, she was in favour of economy in expression, supported by the norms of her profession, and gave a compact definition.

“Notes is a program to promote group work, actually a communications program. Why not also a program for storing information.”

The IT specialist is included here because she constantly interacted with others and shared the office with the business analyst. She was economical in her efforts and an engineer at heart: she solved problems and found easier ways. Her focus was on application development but she was also familiar with the terminology and the needs of the information services department. Time was her most scarce resource and therefore she had to prioritise the support she could give to others and to limit her exploration of new application areas. In explaining Notes, she used computing terminology, but when asked about benefits, the concepts of the information services department. Note that she also brought up the two-way communication aspect of Notes in this second characterisation.

(1) “... an application development tool. A data communications oriented application development tool.”

(2) “... the possibility to communicate here [within Notes], comment the news or send queries directly or via the application, that is one major issue.”

The librarian was a traditional information services professional. She filtered several outside information services dai-

ly and selected news items for the Notes databases. She admitted her reluctance to change, to assimilate new tools. This was in contradiction to her actions, though. She used several programs daily, including Notes, and learned new ones as they became available. She had also participated in the Notes efforts as a user representative from the beginning and had given the developers feedback on the applications. Her explanation of this contradiction was the usefulness of Notes: if it had not supported her work so well, she claims she would not have adopted it so quickly. However, another possible explanation that could be deduced from the interview (but not presented to her for reconfirmation) is that this was the outcome of a sequence of unintended consequences of intentional actions. Thus, she initially agreed to go and see a demonstration to be able to resist it better. Instead, she saw some usefulness in the product for her work and had to change her interpretation. Then the applications were developed and she had a say in them. Because they were tailored to her needs, when she tried them, she then found them easy to use. Again a re-adjustment of the interpretation was needed.

Her knowledge was more discursive than she was willing to admit, reflecting her norm of focusing on work, not on tools. Her definition went from the familiar elements of the personal productivity programs she had used to bring out the one-to-many communication function of the program. To clarify how Notes could shift the responsibility for information selection to users, she used the term bulletin board as a metaphor, and also explained what it meant in this case. The metaphor was close to her

work of making news bulletins and pinning them on 'real' bulletin boards. It made the benefits of the application clear to herself and to her department.

"Notes is a versatile productivity program and also a communications program. Very many different kinds of information can be put in there and it is easy to build [applications]. A kind of a bulletin board in the sense that we don't need to make copies of news bulletins but can tell the Notes users that they can read them whenever they feel like it. In that respect it is a good help and very important in distributing the information acquired for the company to as many people as possible. Electronic mail also."

The planning manager was the sole user of Notes in his own department, a tester and an initiator of applications for the information services department. Even though he had all the possible resources available and was aware of the possibilities of Notes, he had not pushed to widen the scope of his use nor had he marketed it to others. He suspected that his colleagues did not use Notes because others did not (critical mass) or could not use it because they worked off-line, maybe abroad. Only inputting data increases work but not necessarily direct benefit, and the planning manager believed that the benefit should be more even. He also had doubts about having classified information in Notes databases.

For himself, the planning manager preferred face-to-face contact to mediated communication. He could print out interesting documents and take them personally to the colleague he thought could use the information. He had assimilated Notes to be one channel amongst many, and it had already lost its separate character for him.

■
H. Karsten 18

“Well (laughs), what is it, for me it is—I know one can do very many things with it—but for me it is primarily a channel for vacuuming information for myself ... I use Notes to receive information, but I do not utilise its possibilities to share information further to others.”

6.2. Analysis

On the surface Case Two appears to be ideal: shared meanings have been formed over time in interaction, use of the applications is smooth and Notes is integrated into everybody's work. All interviewees were able to explain what Notes is and what benefit the news applications bring to their work. But why is Notes use still limited to these few news applications? What deters these influential, knowledgeable people from widening the use of Notes to areas where they see it as beneficial?

Signification, interpretive schemes

All four interviewed were able to give a conceptual definition of Notes and a description of their own applications. Everybody was also aware of the other capabilities of Notes and gave descriptions of possible applications. The major focus of their explanations was on the communication aspect of their applications: they saw it as an efficient way of disseminating information to the business. Their interpretations varied according to their use of Notes and also according to their own role in introducing Notes in the company, but a shared conception of the news service applications existed. The business analyst emphasised the possibilities of Notes use for the company, displaying a somewhat wider view of Notes than the others. The discussions of these four focused more on future users

and future applications than their own current ones.

Legitimation and norms

Since the News applications had been ‘merely automated versions of the old information channels’, the company did not oppose them. In their competitive business, timely information was crucial. One change that was happening was the transfer from passive information recipients to giving the responsibility of selection to the readers of the news. This had caused no conflicts, at least not yet.

The organisation of the firm was efficient. Notes was seen to be in alignment with the new cost-cutting norm. Everybody knew her or his tasks and was reluctant to take other ones if the benefits were not tangible. The task-centredness was interpreted differently by different people: for example, the planning manager did not see inputting data into Notes as his task, especially when his colleagues did not do that either. On the other hand, the business analyst also worked in information system development with Notes, in an area that was only indirectly hers. The central norms of business efficiency were clearly visible in the words and actions of both, but still resulted in different type of Notes use due to different interpretations of its meaning to oneself and to the company.

Domination and resources

The company norms were not against Notes use, but there was no official support for it either. Expansion of Notes depended on individuals such as the four persons here. The resources available to these four had not presented limits to their understanding or use of Notes. All claimed that they had had sufficient

training and help in Notes use. The double load that the business analyst and the librarian had to carry when they distributed the news through an extra channel, Notes, was not seen as burdensome by them. Transferring news into Notes was made half-automatic with the help of macros and the Notes documents could be transferred to other applications. The future promise of wider use was also mentioned. The four were pushed for time and had different priorities for their tasks, but did not mention Notes as adding to their work considerably. The IT specialist and the business analyst would have liked to devote more time to Notes application development, if they had had time.

Interpretation, resources and norms

All gave clear accounts of Notes and how they used it. Despite these supporting elements, Notes use was limited to the news applications—although there were ideas and plans for new types of applications. Even though the head of the Information Services department had been the initiator and supporter of the Notes projects, the lack of official support on a corporate level limited the resources that could be allocated to Notes application development. All four had primary jobs and Notes was used only to the extent that it was seen to support that work. As the applications were now, they satisfied their users and were already part of the everyday life of these four interviewees. New users and areas of use outside Information Services could have been a way to expand Notes use also within the applications in use.

In summary, the power these four had was limited only to their own work. Expanding Notes use would have meant

changes on the corporate level regarding interpretation of importance of Notes for the company. Through that, resources could have been re-allocated to support including new groups and the necessary norm changes could have arisen to give basis for this. Later developments in the firm tell that Notes spread first in small areas such as described above and then slowly gained acceptance on higher and higher corporate levels. The corporate management sees it now as the main communication tool for the company.

7. Case Three: The Quality Handbook

7.1. Description

In the forestry industry, increased competition had brought an interest in quality certificates for both the products and the processes. In order to get certification, the company must be audited. To be able to audit the rules and directions used, they need to be documented in a Quality Handbook (QH), including current, previous and working versions of the directions. In this company there were eleven separate Quality Handbooks for each of the plants around the country plus one for the central administration, with the same standard of quality throughout. The Quality System (QS) application supported organising, versioning, and revising the rules and the directions. The QS was seen by the management as a means of controlling the QH compilation and expediting the process. Uniformity and traceability are the key norms in the Quality System. Parts of each QS were also accessible to other sites to support uniformity. Because of the urgency of

the endeavour, the quality project had had strong management support and access to the best available personnel.

The QS application was developed by a computing professional in the central administration, about 400 km away from the plant visited here. New computers were acquired for most QS users. The four in this study had each had a personal computer for a while before the application and also used it for other purposes. The two engineers had had extensive experience with computing during their college training. The secretary and the quality supervisor had taken part in computing courses at work.

The QS was installed during winter and spring, 3-6 months prior to the interviews. The secretary in the central administration was the first, due to her closeness to the application developer. At the plant, the quality supervisor was the first user, and the production engineers joined about a month later. The installations at the plant were made by a local support person. During the previous fall the engineers had had training in the graphical interface. The QS training session was about a month after the installation. Guidebooks were also passed out at the same time. This delay irritated the three persons at the plant because they had had to put time and effort into experimenting on their own. For this they had needed what one production engineer called 'courage':

"If one just has the courage to experiment, one usually gains something, if nothing else then at least something to complain about."

Production engineer 1 was responsible for half of the production at the plant. Running the production demanded most

of his time and the QS was an addition to it, although an important one. However, based on his initiative, the application developer had made forms to prepare bulletins and meeting minutes with less time and effort than before. This extra benefit with the possibility to transfer binary files as mail attachments had compensated for some of the time demands. He had seen a demonstration of Notes and of the application prior to its launch and had been able to give feedback to the application developer. His authority over the application developer came from his position as a production engineer, and perhaps to some degree from his knowledge of computing: he knew what to ask and from whom. His description of Notes was practical and application-focused, but he could also see Notes as a tool for building applications. His emphasis was on the added productivity for himself and for all in the QS project.

"... I haven't been able to experiment with all the different kinds of applications yet, the only thing I have done with it is this ISO9002 Quality System documentation. [Then describes also how he uses Notes as a word processor for certain short documents, about sending faxes and about transferring binary files as attachments to electronic mail messages.] Other kinds of applications could be built also."

Production engineer 2 was overwhelmed with the tight time schedule of the QS in the midst of busy production. He used Notes in much the same way as the first production engineer. He began talking about Notes by using familiar components, but then when telling about how Notes had changed work, he talked in terms of a vivid metaphor of everyone sitting around the same desk and work-

ing on the same documents, despite being in different places at different times. The desk metaphor could be traced to an internal audit meeting the week before where his suggestion about some documents was rejected because his idea was so different from what others had done. He then realised the benefit of the QS: with it he could see how others had written their documents and discuss the why's and how's with them. This is an example of an unintended consequence of intended action: the interpretation of a collection of productivity programs (cf. the first production engineer) was challenged in interaction (during the meeting) by an unintended consequence (rejection of his ideas) of intended action (of contributing with a good idea). When his private ideas to improve the QS were rejected, he needed to form a re-interpretation. This process of forming interpretations was also discernible during the interview:

“... how should it be described, it is maybe an archiving program, at least that is what I use it for. Then there is the electronic mail and plenty of others. In the Quality System it keeps the papers in their slots and archives the old versions. This can be a bit of a biased view, but this came into my mind first. It is also a kind of mailbox. It also has features that people can use to discuss, a bulletin board system. Then it also is a word processor with templates. You can send faxes from there. It is a bit like one of those multi-functional programs.

Everybody can like—who is in the same network—write the same papers. Earlier we had information as one's own files in separate LANs. Now it is like people are like all sitting around the same desk and we can work on the same documents.”

Quality supervisor was a technician who was responsible for the Quality System at the plant and for training the floor level personnel to follow the rules. He was selected for the job from amongst the foremen at the plant. He still shared the office with the current foreman, but saw the new assignment as a path upwards. With him there was the widest gap between the resources he would need and those he had command over. He had learned the system by himself, by trial and error, as the first person to use it at the plant. Due to his earlier ‘low status’ he had no direct channel to the application developer. He was dependent on the local support person for both system administration and for passing questions to the application developer. The benefits of the QS application for him were that he could keep the documents organised with it and that he could follow other plants’ QS projects. In due course it was planned that the shop floor would be equipped with Notes workstations and this would mean that he would no longer need to print out and distribute each version of each directive to about 100 folders spread out in the plant. This promise of future ease in work was an important motivator. His succinct definition included the usefulness of the application for him now and the long path to learn it.

“Notes is a program to manage documents, a very good one for that, now that I have learned it.”

The secretary in the central administration had been with the quality project from the beginning. She was responsible for entering the documents from the administration into the QS. Her main areas of work were management of organisational charts and directives, administra-

tion of training workshops and being a personal secretary to one of the managers. She strongly emphasised productivity, efficiency and task division. She also was able to enforce task division: the Notes application developers worked on the same floor as she and she could get their assistance immediately when she needed it. Where this authority stems from remains a question: it could be her strong and outspoken personality, her long tenure, her access to personnel information through her work tasks, or her being the secretary to an influential manager. She was taught use of the system during an one-to-one session. She had read some of the manuals, but showed rather than told about her applications. Her knowledge was mostly practical. Her definition traced back to her early experiences and discussions with the computer support persons about the system.

“I think it is a document management system. I know that it is used also for word processing, but in my opinion it is not good for that, I cannot get a good grasp on it as [a word processor].”

7.2. Analysis

Signification, interpretive schemes

The focus of the descriptions in Case Three was the QS, the main application. All shared the conception of document management that was the core of the QS. Three persons also brought up the personal productivity functions. These clearly point to Notes as a useful resource, both for collaboration and for individual work. However, the explanations were limited to this one shared application and to the productivity functions. Even though all had access to sev-

eral company-wide applications, other possible uses were only briefly mentioned, if at all. This focus aligns with the norm of efficiency and with the limited time available for anything else besides core tasks.

Domination, resources

Production pressure limited the time available for Notes use. The Quality Handbook project had deadlines: all directives needed to be thoroughly reviewed before the scheduled audit and therefore the documents had to be put into the QS as soon as possible. Notes was seen a valuable help in managing the documents. For the production engineers it was also a personal productivity tool. For the secretary Notes was a versatile tool.

The misalignment of training and support with the start of the project slowed learning and using Notes. The allocative resources of ‘courage’ to experiment and previous experience with computers enabled exploration of the possibilities. Geographical proximity helped the secretary to access the training and support she needed. Positional proximity—similar organisational position, similar education, similar language—gave the two production engineers access to the application developer. However, the hierarchy and task division in the company discouraged the users at the plant from directly pressuring the application developer. The quality supervisor was both geographically and positionally distant from the application developer and therefore used as intermediary to approach her.

Legitimation, norms

As a manufacturing company the corporation naturally valued high throughput. The customers required that the company comply to quality standards which thus became a source for legitimating the whole Quality Handbook project. The corporation worked smoothly according to well-defined standard operating procedures and employed clear task division. Notes use was legitimate as the tool upon which the QS was built. Other uses were supported as long as they increased efficiency. The corporate management interpreted the Quality System (and Notes as the platform) as vital for winning sales in the competitive market. The four users here agreed with this view, but their interpretation was more that the QS was something required by the corporation: an addition to their work, with possible benefits later. The benefits of personal productivity tools were immediate for those who used them and gave additional support for Notes use.

Interpretation, resources and norms

The usefulness of Notes as the platform for the QS application was becoming clearer to the users. Even though the QS had been imposed on them from the management, the insights gained during the use (especially the second production engineer and the quality supervisor) and the extras (the first production engineer and the secretary) had led to a shared view of Notes as a good document management system for their use. The differences in emphases were traceable to different tasks and different uses of Notes. New possible uses of Notes were seen to be a matter for the future, after the current busy QH project.

8. Summary of the Cases

In the descriptions and analyses of the cases, a multitude of contextual and processual factors in meaning construction were exposed. The conceptions of the applications and the platform they are built on are constructed—purposefully modified—and not just adopted. Each individual forms her or his conception of technology based on rules and resources at her or his disposal. Interaction about the application and about Notes expands with experience and with access to more words. This is clearly related to the resources available. Interaction and the variations in interpretations are traceable to work and to norms guiding that work: the norms form the boundaries within which interpretation takes place. In this summary, the focus is on comparing the cases to trace the emergence of shared elements.

Even though the descriptions and definitions looked quite different on the surface, similarities in conceptions could be found. The focus of the shared conceptions ranges from features of the particular applications (Cases One and Three) to tools in Notes (Case Three) to different types of applications and Notes as the platform to develop them (Cases Two and Three) as the use and discussion about the application(s) and Notes expands with experience. The processes of forming conceptions in groups seem to become similar over time. This can be one more indicator to support the theory of different groups having different ‘technological frames’ (Orlikowski & Gash 1994) through which they interpret technology. Collective learning, as Fiol (1994) points out, involves developing enough consensus around diverse inter-

TABLE 2. Meaning construction and shared meanings

	<i>1. Test Tracking</i>	<i>2. News Service</i>	<i>3. Quality System</i>
Focus on shared conceptions	Features of the application (work Flow, customer database)	All applications in use, Notes as a platform for communication applications	Feature of the application: document management. Tools in Notes
Interpretive schemes	Different: procedural, descriptive, modeltype	Similar: binding the tasks and Notes	Similar about document management, differences otherwise
Interaction about Notes and the application(s)	Centered on problems	About possible new applications	About possibilities of Notes and the QS application
Variation in interpretations	Clear, but difficult to pinpoint due to vagueness of explanations	Traceable to current work and possibilities in near future	Small due to the focus on the QS
Analogies, metaphores	Using a calculator, but [Notes is] more accurate (tester)	Posting news on a bulletin board (librarian)	Working around the same desk (second production engineer)

pretations for organised action to result. The way she sees it as happening is by development of shared forms while holding different pictures—in our words, developing shared conceptions and interpretive frames while giving different explanations.

Notes use was only seldom compared to other tools, with only the tester’s (Case One) analogy to a calculator. Two people used metaphors to convey their meaning: the librarian illustrated the news applications by a bulletin board and the second production engineer by the metaphor of working around the same desk. The calculator analogy seemed to be not very helpful in expanding the scope of use for the tester. However, the other explanations given by those who used metaphors were rich, confirming the different character of

analogies and metaphors (Spiro *et al.* 1989).

The structures of domination and legitimation greatly influenced the accessibility of both authoritative and allocative resources. For example, the quality supervisor (Case Three) had no direct access to the application developer due to his ‘low’ position in the hierarchy and by his having no proximity (based on education or status) to her. The task-based, professional social structure in Case Two had had a positive influence on availability of resources, even maintained during the economical crisis. The contradictory structures of domination in Case One—hierarchy vs. customer satisfaction—put strains on the access to resources and also caused confusion in interpretation of the importance of the Test Tracking application.

TABLE 3. Resources as influencing interpretation

	<i>1. Test Tracking</i>	<i>2. News Service</i>	<i>3. Quality System</i>
Domination	Hierarchical organisation vs. professional expertise	Divisional organisation and professional expertise	High throughput vs. the quality movement
Resources	Availability dependent on position. Meagre.	Availability dependent on task. Sufficient.	Availability dependent on management priority and resource proximity
Use in interaction	Reluctant	Limited, but careful	Efficient
Variation in uses	According to the work flow	Use differs according to tasks	Similar reg. QS, personal tasks vary

Use of the application and Notes was reluctant in Case One and limited but efficient in the other two cases. Variations in use within groups were based on tasks as a whole and on the tasks planned to be done with Notes. Co-operation in Notes use occurred to the extent that there was co-operation in work. Only in Case Two there were ideas of further possibilities of co-operation (given by the business analyst and the IT specialist).

Legitimation was gained from outside in Cases One and Three and from within the group in Case Two. In Case Two the initiator and main supporter was the head of the Information Services department, who also controlled the resources available for the group. When the legitimation came from outside the group, the application was easily disowned but not necessarily unused, if the structures of domination were supportive of use.

A norm conflict taking place in each group. Notes and the applications can have been amongst the causes for this. In Case One, the Test Tracking application was interpreted by outsiders as up-to-

date technology, on a par with the high professional standards of the research institute. The norm conflict was pushing the group to revise their earlier negative views and to study IT. In Case Two, the whole idea of Information Services as providing the right information to the right people at the right time was changing into providing resources of information to be used when needed. The idea was slowly emerging, taking place with the expansion of these News Service applications in the organisation. In Case Three, the daily production demands clashed with the time demands of inputting and editing the QS documents. The group dealt with this by working harder and longer days in the hope of having the project over.

In summary, the shared elements of the social structures—or the structural properties of the social systems—were formed along with the use and interaction processes in duality of action. Each dimension of structuration—signification, domination, legitimation—could be seen to shed light on the process and are useful as analytical devices. The com-

TABLE 4. Legitimation and norms

	<i>1. Test Tracking</i>	<i>2. News Service</i>	<i>3. Quality System</i>
Legitimation	From outside the group	From within the group	From markets to top management to everybody
Norms	Resistance to computers vs. new requirements for being a professional	Right information to right people vs. easily accessible and modifiable information	Efficiently run functions vs. future benefit with the QS as legitimated by management
Sanctioning	Non-use will cause embarrassment if exposed	Built into daily routine, avoiding increases work load	Busy project, check points to trace progress and enforce uniformity
Variation in being target of sanctions	All tasks need to be done; all but foreman can circumvent the application	Producers from news consumers, builders from producers and consumers	All equally responsible, each for their share of documents

plexity of meaning formation can be disentangled by focusing on these three dimensions, but only as mutually interrelating and influencing.

9. Discussion and Conclusions

The key idea of structuration theory, the duality of action, was used here for probing how applications and their understanding are inseparable. When users use and talk about applications, they at the same time construct and reconstruct their understandings. They also construct and reconstruct what the applications are and invent words to describe them. Understanding cannot be separated from what is being understood. Applications are not 'ready' when they are installed on the users' workstations, but constantly (re)-constructed. How the application is un-

derstood and talked about guides its use and how that will evolve. How the application is used and further developed guides how it is understood. In facilitating the expected changes of new IT, this constant construction and reconstruction has the two faces of Janus: it enables adjusting the understandings and forming a shared view but at the same time sets limits to understanding.

Variations in conceptions of IT can be traced back to the use and explanation of IT. Each person uses applications differently and talks about them differently, based on her or his structures of signification, domination and legitimation. In use and in interaction these are re-constructed. Shared conceptions evolve during interaction. For one person, they are the similarities in structures between people in the interacting group. For the group, they are its structural properties,

the elements being institutionalised within it.

In practice, forming shared meanings is a gradual process during which the interpretation is pushed into the discursive consciousness, where the limits of the norms are tested and changed, and resources are exploited to the extent the norms and interpretations permit. During this process different expressions—such as metaphors—are arrived at, with embedded norms and reflected power-relations.

9.1. *Implications for practice*

Lotus Notes is both complex and modifiable. The demands it poses on its users are different from those of simple or rigid software. The path to understand Notes goes from understanding one application—shared or personal—to understanding a variety of applications and to grasping the nature of the group support these applications provide. The final step is understanding the possibilities of Notes as an application platform for shared and personal applications.

How an application is understood is related to how it is used and how it can be used. The use of a particular application can be anticipated by tracing the processes of meaning formation of its users: what kind of possibilities and constraints structural elements have imposed upon them and how they can re-structure these in action and interaction. By expanding the scope of observation into the dimensions of signification, domination and legitimation, these possibilities and constraints can be identified. Orchestrating a 'successful implementation' would thus imply amplifying possibilities and diminishing constraints along the way. The norm conflicts that the introduction of

new technology seems to bring about need to be addressed. The resources must be in alignment with the demands of the situation. For interpretation, one single important facilitator appears to be the construction of fruitful metaphors.

Strongly held interpretations with readily made explanations can be limiters for expanding creative Notes use. A clear and concise explanation (such as given by the business analyst and the IT specialist) can limit the speaker's and the listener's imagination. As also Heikkinen (1995) has noted, those who are used to explain Notes and their applications to others, tend to form a firmly held interpretation that directs also their own use. To break off from this may need an impulse, a change in the context of interpretation. On the other hand agency, the reflexive nature of the actor, gives a possibility to reform the meanings through self-reflection.

If we look into the three cases in this study, we note that the longer the group has been using Notes and telling about it, the easier the explanations are to find. Interviewees in Case Two have the explanations ready (except the librarian). Case Three informants hesitate somewhat but can formulate comparable explanations. In Case One, finding explanations is tedious and the informants prefer to show-and-tell or describe their own use. It can be assumed that even though the use in Case Two was stable during the time of the interviews, the group will eventually find new uses and expanded interpretations. This assumption can be studied with the longitudinal case: When shared meanings have been formed in interaction and are stabilised, the group will eventually invent new uses for Notes (constraints permitting) and through

them again new interpretations to be shared. The meaning construction will continue through self-reflection, action and interaction.

Separating application development from its use leads into two processes of meaning formation: that by application developers and that by users. Joining them is a prerequisite for the users to use the applications as intended and for the application developers to build what is needed. If the users have no previous conception of the application and its uses, they also have no means to state requirements for it. As we have seen—most clearly with the librarian and the second production engineer—the possibilities of the application and of Notes emerge in use as the meanings are constructed and re-constructed. Therefore the requirements for new applications and the ideas of novel ways to use existing applications cannot be discerned fully by communication and co-ordination during conventional requirements analysis (Reisin 1992) but only as emerging in the use processes. As the application is used, its requirements are re-created.

9.2. *Implications for research*

This study has three main contributions. It traces the roots of variations in how a single application is interpreted within its user group to the individually constructed meanings of each user. As an individual agent, each user forms her or his conceptions based on interactions with the application. The second contribution is discerning the interplay of shared and individual elements in this. In co-operation, the participants need to form shared conceptions of the task and tools at hand. This also takes place in interaction, through a gradual process of meaning

formation, enabled or constrained by the structural properties of the social system. The third contribution is that in order to understand a process of meaning construction, it must be placed in context. The three dimensions of signification, domination and legitimation, as distinguished by structuration theory, give a useful vehicle for this expansion.

This study is limited with respect to how the actual process of meaning formation can be traced. A longitudinal analysis of meaning construction would alleviate this problem. A new issue would be the different uses and interpretations one person and a group goes through. The inferences made here are based on interviews and background study, with no observation of actual use. The interplay of action and interaction is therefore based on interpreting accounts of it. Direct observation with Notes can be made by tracing its use from log files. Direct observation at the site can be problematic because Notes applications are often used like electronic mail: at regular intervals and when a need arises. To have sufficient exposure to Notes use would demand spending considerable time at the site.

The approach used in this study can also be expanded to other types of applications. Studying how a particular technology is constructed can help in modifying and utilising (or abandoning) it. The process of meaning construction, even though individual, can be interfered with by giving necessary information, providing possibilities to gain experience (and thus re-form conceptions) and opportunities to re-adjust norms. Having a shared understanding of an application is also useful with conventional applications: as understanding influences use,

similar understanding can support similar use.

To conclude, the conceptions of technology form gradually. When an application is used or talked about, its meaning is being formed. As discussed above with each person and case, the norms prevailing, the resources available and the interpretations evoked influence the process of meaning construction. The constructed meaning in turn guides how the application is used and talked about. The shared elements of these meanings are constructed when applications are used and discussed together.

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