The Social Construction and Visualisation of a New Norwegian Offshore Installation

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Abstract: This paper exemplifies how to make aggregated descriptions or requirements of work processes to serve as references or resources for future situated actions in the operations of a new oil installation It describes a joint organisational and IT-development process of a CSCW-application that supports personel in their daily preparations for operations. The paper discusses how the organisational members themselves were empowered to describe the proper format of representation, with activities, products, roles, responsibilities and co-ordination mechanisms in general.

Introduction

An important research issue in CSCW has been to study how collaborative systems can be instrumental in reducing the complexity of co-ordinating co-operative activities often individually conducted but yet interdependent (Schmidt, 1996). CSCW as a field has also been devoted to exploring how computer based systems can improve the ability of co-operating actors in articulating their activities (Winograd 1994, Malone 1995) To develop and implement reasonable conceptual and structural units to express activities, tasks, interdependence and responsibilities in a flexible and well-integrated manner has been a challenge The problem has often been that the underlying protocol has been too rigid, not accessible or not modifiable These protocols have therefore not been able to handle situated actions (Suchman 1987; 1994, Randall 1995b) and the flexibility and unpredictability of real life practice.

Norne is a new oil production ship being put into operations by Statoil[1] in mid 1997. This new installation is different from former permanent concrete and steel constructed giants that up to now mainly have inhabited the Norwegian Continental Shelf. Norne has a very lean organisation, about 1/3 compared to its older counterparts Still, it is the same functions (production of oil) and these must be more efficient in Norne The Norne onshore support organisation is placed in Northern Norway, Harstad In addition, Norne needs technical support from centralised Statoil units in Stavanger, Trondheim and Bergen (500-1100 km away), and external vendor support on production and maintenance from both inside and outside of Norway. In order to achieve their goals Norne will have to challenge present work practice and develop new ways of working, not only on the boat itself, but also with regard to onshore-offshore co-operation inside Statoil and through vendor co-operation outside Statoil. The newly employed Norne people have diverse operational backgrounds from other parts of the company and are bringing their old experience and expertise with them into the new installation This past experience is vital. However, it is important to reflect upon how Norne can improve present practice, and there must be developed contexts where new communities of practice in Norne can discuss a potentially new practice In essence, Norne will have to create a new operational reality based on the potential and restraints in their business context The new "Norne reality" will cover more formal aspects as procedures, structures and more informal aspects like informal work patterns, culture and attitudes

In this paper we try to show how it is possible to make formal aggregated descriptions or requirements to serve as references or resources for future situated actions in operations A flowchart method is used for the purpose of planning the operational phase of the Norne installation, enabling the organisational members themselves to describe the proper format of representation, activities, products, roles, responsibilities and co-ordination mechanisms in general In viewing the development of "structure" as an organisational development or empowerment process, we try to avoid falling into the many traps of formal and rigid representations of work-flow. We will focus on the social construction of the new work processes Further, how this organisational development process was combined with the design and implementation of a CSCW-application that supports Norne personel in their daily preparations for operations. This integrated approach can be seen as the process of change of an organisation, in which organisation and technology are designed and developed jointly in a task- and need- oriented way by the members affected· e g the organisational members affected consider the existing problems, search and evaluate the problems' causes, and consider measures to solve the problems (Hartmann, 1994 in Wulf, 1995). Some features of the application will be presented including some preliminary conclusions on how this work has helped Norne in achieving their business objectives.

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[1] Statoil is the state oil company of Norway Primary activities are exploration of new oil and gas fields, operation and maintenance of a number of offshore oil and gas production installations, operation and maintenance of refineries, transportation, marketing and distribution of intermediate and end products

The Construction of Norne Work Processes

This R&D-project that started in December 1995 had the following scope·

- To help Norne develop their most important work processes in operations, by acting as facilitators in the Norne organisation, i e. providing a method for describing work processes and perform process support during an organisational development process

- Develop a groupware application that would be used as an operative enterprise model, including an overall description of Nornes main work processes and products and, down to the daily checklists in operations, in order to develop some shared representations of Nornes operating philosophy

As a consequence of the scope, we were to help Norne develop scenarios for how to use CSCW-applications in operations (groupware and desk top conferencing systems). For the Norne personel the challenge have been how the development of a future operational structure or practice can be an organisational development process where the organisational members themselves describe the ideal "to be"-situation in operations. In February 1996 we arranged a workshop with Norne personnel, both managers and operators/technicians. The idea was to make them reflect on their work processes, start discussing what had been already described so far in an operating philosophy document, and identify their most important work processes. We used considerable time to discuss what a work process was Here we followed a pragmatic BPR-definition (Hammer and Champy, 1993) and defined work processes as a collection of activities that takes one or more kinds of input and creates an output that is of value to a customer. The main challenge was to discuss which of the processes did not have any proper products and customers and question if Norne had to do these activities at all. This discussion went on beyond that meeting, through the winter of 1996 at all levels in the Norne organisation, and the end result was an overall enterprise model[2] with the following processes.

Norne has three main physical processes, with defined products There is an oil reservoir, with special characteristics that contains oil with specific properties. Norne has a production and injection system that offer you possibilities and restraints based on its technical construction. There is also a product shipment process since Norne must export the oil that has been processed onboard to a market These three main physical processes are the main conditions the Norne organisation must operate under and comprises their value chain In order to

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[2] An enterprise model is defined as a model of what the enterprise intends to accomplish and how, and is a way of understanding complex social organisation by constructing models (Rumbaugh 1993) Norne defined an enterprise model as a model of what they want to accomplish and how to function when in operations It contains basic elements and necessary decomposition of activities, roles and specifies information requirements to activities

operate the physical processes in the most effective manner, Norne personnel developed 16 main work processes. These processes are: operations, maintenance, modifications, technical support, accomodation (on board), logistics, marine operations, emergency preparedness, human resource, finance, quality, reservoir management, health, environment and safety (HES) and procurement, to mention the most important This model had its weaknesses which we will return to later, but it enabled the organisation to consolidate on the most important business objectives

For each of these work processes Norne personel were chosen as process owners The role of a Norne process owner was to involve other people in the Norne organisation in order to describe the defined process. The people that were chosen came from different levels in the organisation, from supervisors to operators and technicians. However, some supervisors were not "ripe enough" for the idea. When picking out people we wanted the process owner to be a person that would be work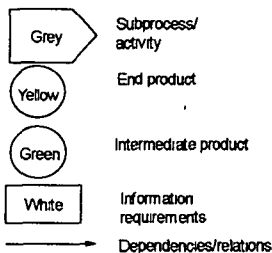ing with the process in operations, who would know the process and who had basic communication and facilitator skills When these persons were chosen we helped them in the process of establishing a facilitator role for their process We taught them some basic facilitator skills, how to create involvement, how to use problem solving techniques and gave them a basic introduction to our methodology

The methodology is very simple, based on simplified flowchart symbols and has been used in Norwegian work research in different versions since the late 1960's (Thorsrud, 1969). They grey box (figure 1) signifies the activities within a process (e g. within maintenance to create a work order) There are products associated with the processes. For maintenance the end product is technical condition re-established, while an intermediate product can be a created work order Linked to products and processes you have information requirements, e g. to the sub process create work order one information requirement is access to the plant management system. Finally, there are also dependencies between processes and products on different scales that can be addressed by using arrows between the objects Some small changes were done compared to old flowchart symbols to indicate that we did not deal with technical systems here

Figure 1. Description of flowchart symbols

Grey — Subprocess/activity

Yellow — End product

Green — Intermediate product

White — Information requirements

———▶ Dependencies/relations

These symbols were then combined in order to create the Norne work processes An example from maintenance shows this more in detail The first sketches were made on paper in groups. The typical situation like e g, maintenance, was that the process owner gathered 5-6 of his or her people in a full day workshop to design the overall maintenance process. Here they would discuss activities, roles, products and dependencies using the above methodology. Researchers participated as facilitators and assisted when needed Our job was to follow up the defined processowners, check if they did the work that they committed themselves to, and help them in their own processes and workshops

We also reviewed the maps to make sure that the processes were not duplicated, and that dependencies between different processes were taken care of.

Some guiding principles were developed The Statoil division which Norne belongs to is ISO-certified and the quality system that Norne is part of will in most cases describe work processes good enough for Norne's purpose In cases where Norne will have to work differently or deviate from the ISO-standard, this will have to be described in more detail This meant that Norne should use flowcharts in cases where they felt that going through the work process roles and responsibilities could give them substantial improvements in performance. Norne personel decided to describe tasks that they knew they would have problems with based on earlier experiences, e.g communication onshore-offshore The constructed maintenance process (figure 2) shows some of the features described.
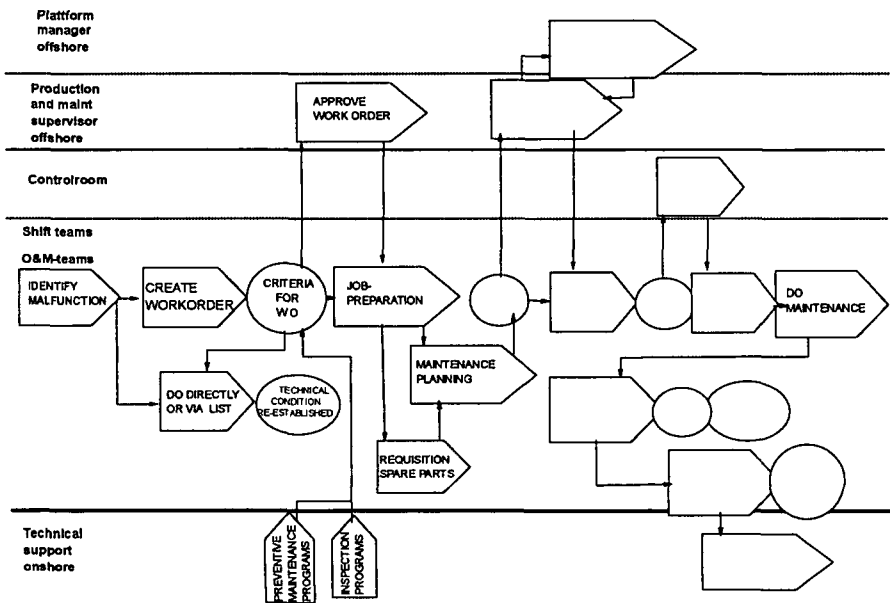

Figure 2 Flowchart of Norne maintenance work process (principal sketch, simplified)

We will not elaborate this process chart in detail, but describe some important aspects of it, to illustrate our approach as an organisational development process The traditional way of describing maintenance in the oil industry is to write a procedure that regulates activities, and many of these activities must be based on strict procedures because accidents can have disastrous effects on people onboard the installation and on the environment. Described here are different roles in the Norne organisation that take part in the maintenance process, from the different levels offshore to technical support onshore The more the arrows and the sub processes passes over the lines, the more bureacratic the process becomes In order

to avoid bureaucracy in the maintenance process, Norne decided that most of the maintenance should de done by the shift teams and operations and maintenance teams, with minimum interference from others In the maintenance process, to write, wait and approve work orders requires considerable time This has to do with the health hazard, since you must control what kinds of work is conducted at different locations on the installation However, Norne has taken measures to reduce their maintenance work orders by 75%, by differentiating between different kinds of work orders. Much of the maintenance work is rather simple (with no potential hazard) and can be done by the teams without work orders To be able to do so they had to design teams based on system responsibilities that can self-organise, instead of having a traditional disciplinary responsibility. Specific technicians are given the responsibility to both operate and maintain their defined technical systems and within that area they have large autonomy The rest 25% of work orders that is hazardous or requires more skilled expertise must follow an approval process and involve the control room on the installation and platform management It took several discussions and iterations before the process found its final form

The first process maps were written on paper, but as the charts became more and more described as "finished" by the Norne people, the map was re-drawn in LOTUS FREELANCE GRAPHICS (graphical slide presentation tool) and incorporated in a LOTUS NOTES release 3 discussion database (either by us or by process owners). A simple graphical editor was chosen to avoid creating too detailed maps. All maps should be confined within one presentation slide (see figure 2) and cover the overall description of the process. The further discussion would continue in the group informally When the maps became digitalised it was possible to create improvement proposals in the NOTES database to every process. Now, process owners could follow up each others work more simply, and it became easier to see duplicated work and dependencies that were created Most Norne personnel had used NOTES before in their former jobs and engineers and technicians were relatively eager to use the discussion database. The use of discussion databases was also a strategic decision in order to let Norne personnel become familiar with electronic work, something they expected they would benefit from when in operations.

The Groupware Application

A basic premise for the project was to be able to help Norne personel visualise what a potentially new organisation could look like, and help them to develop shared representations of such a new organisation. They wanted a Norne overall enterprise model, a Norne workspace with an intuitive interface to enable Norne people not only to find the information they need in their daily work, but also to develop a coherent understanding of what Norne is and its basic work processes. The intention was that the organisation should co-evolve together with the groupware application. Processowners and helpers felt that the old release 3 Notes

database could not do this properly The representations that we called work process charts or maps (figure 2) were incorporated in a LOTUS NOTES release 4 database Through the use of hypertext/media and "hotspots" we made links to information and additional computer systems needed in the work processes (since Norne personnel themselves defined information requirements connected to activities in their development of the process charts) The point of entry of the application is a graphical presentation of the overall Norne enterprise model, from there you can click further down to the different work processes like maintenance (previously seen in figure 2) The representation of the maintenance process has a number of "hot spots" with hyperlinks (figure 3). The flowchart itself may not always give enough information regarding the process. You can see what is hidden behind the boxes by clicking further down to a more detailed textual description of the box, start up the plant maintenance computer system, access Statoil ISO-procedures that regulate maintenance and read electronic copies of operational manuals, access vendor information on WWW, select small unfinished maintenance jobs, and write improvement proposals to any of the work processes
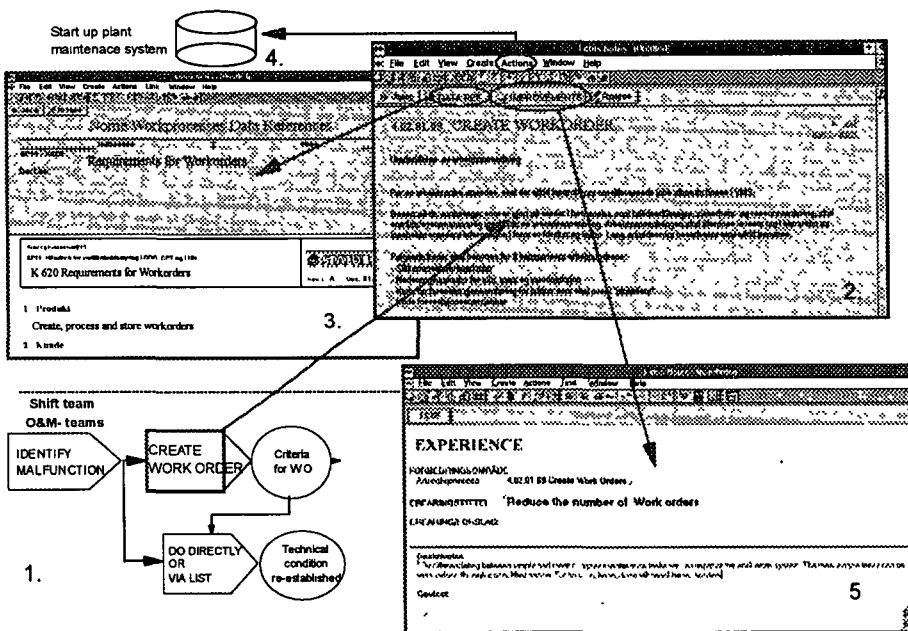

Figure 3 A detail of the maintenance work process, where you can open more detailed information about work orders in Norne, read Statoil ISO-procedures on work orders, open the plant management system and write improvement proposals related to work orders

The CSCW-design and Implementation Process

Our design strategy was to start with an existing system like LOTUS NOTES, to be able to evaluate the use of the system under real working conditions and see how the system could improve Norne's work processes along the way, and train for operations. We decided to use Statoil's existing computer network infrastructure to minimise technical support during the prototyping process. NOTES is the groupware standard of the corporation and is widely used in Statoil, we therefore chose NOTES as the platform. NOTES Release 4 had the necessary technical flexibility we needed. Norne was appointed a pilot by Statoil general management and Statoil Data (Statoil's IT-division) made available the necessary technical infrastructure (NOTES release 4, test servers), NOTES R 4 programming or coding skills and technical support along the way.

The design process closely coincides with a co-operative and constructive design philosophy (Klöckner, 1995) and participatory design (Schuler, 1993). Evolutionary prototyping approaches presume close connections to participant situations of use (Schuler 1993, Klöckner 1995). A preliminary groupware prototype in release 3 of NOTES was used from the start by the process owners and a core of their helpers. NOTES release 4 was installed in May 1996 and as much as possible of the activities in preparations for operations were done via the application, even though it was run in a test environment. Since we were using standardised software we felt it was our responsibility to tell the users about the potential of the technology by developing user scenarios. In what possible directions could the new development move? It was the strategy to view the groupware application as an "actor" or "actant" with specific values and perspectives in the process (Latour 1987). Reflection is important when dealing with standardised groupware, since LOTUS NOTES must be regarded as a socially shaped technology. Both database structure and the metaphors of paper based work flow gives NOTES both potentials and restraints in use. Reflection on these issues was necessary for Norne in order to avoid seeing LOTUS NOTES as objective and fixed. Any software technology will have embedded categories whether implicit or explicit, and the aim was to discover, discuss and even accept the limits of these categories. In order to reduce the importance of the embedded NOTES categories, we tried to design new categories together with the Norne organisation, using flowchart symbols that they were familiar with. These are also categories but are understood by technicians/engineers and make a chaotic social world understandable for them This is an issue we will re-visit later in the paper

In the Norne case we spent considerable time on fieldwork, to become acquainted with the Norne people in their own environment. Here we used short ethnographic fieldworks (Hughes 1995, Randall 1995a; 1995b), workshops with users, debriefings and prototyping as methods However, as a contrast to traditional descriptive ethnography, this was also an interventionist project, because in Norne we worked as mediators (Okamura et al., 1994)

In May 1996 with the introduction of NOTES release 4 Norne had the overall structure of the application, with the main work processes. We gradually increased the number of users as Norne recruited new personnel. Changes and improvements in the application were handled during our weekly fieldworks in the Norne organisation. Larger changes in the functionality were discussed with the process owners in summit meetings. Daily support and small changes were handled informally either via our fieldwork or via the "hot" telephone line directly to our programmer. The process owners continued to design the flowcharts in LOTUS FREELANCE GRAPHICS. The old release 3 database was incorporated as a module in the release 4 NOTES application. Process owners could detail their maps as they were used to do. When they were finished, they flagged them ready for transfer. They were imported as bitmaps in the presentation module as a part of the enterprise model. When this was done the processowner or a helper could write textual descriptions and link up ISO-procedures to each "hot spot" (or box defined in the process chart).

From any work process it was possible to create improvement proposals, via a button at each process chart. Anybody in Norne could give comments to any process or sub-process. It became the responsibility of each process owner to enter the improvement proposal module to track proposals regarding his/her process, and on a regular basis discuss these proposals together with helpers or other people in the Norne organisation that it might be of interest to. The process owner could dismiss the proposal or implement it directly if it was a small change, e.g. change in text. If the proposal was complicated and had consequences for other processes, as the work order example mentioned earlier, it had to be discussed by management or with other process owners before it could be implemented. When the process maps had to be changed, the process owner made the changes in the discussion database module and the programmer re-imported a new revised bitmap into the presentation module. Improvement proposals became the first attempt to create a system for continuous improvement in Norne.

In the fall of 1996, Norne gradually took over more and more of the responsibility, both for the development and improvement of the work processes and the maintenance or development of the CSCW-application. A group of super-users in Norne operations were coached to perform simple maintenance and improvements on the application. At the end of December 1996 the research project came to an end and we withdrew, enabling Norne to take full responsibility of the further development themselves, together with Statoil Data.

A critical reflection on the CSCW-design and implementation process

In the world of engineers and technicians flowcharts are a well-known technique to describe "system" phenomena and dependencies Over the years this has been a fruitful method to understand the composition and decomposition of technical

systems. There are a number of problems associated with using this machine like metaphor to understand organisational phenomena   Lucy Suchman (1994, 188) claims that the inscriptions of formal representations of action in technical systems transforms the debate more clearly into a contest in how our relations to each other are ordered and by whom, and that those who are committed to an reproduction of an established institutional order might try to replace the contested moral ground of organisational commitment and accountability with a scheme of standardised, universalistic categories, administered through technologies implemented on the desktop   In his answer to Suchman, Terry Winograd (Winograd, 1994) regarding the critique of speech act theory and THE COORDINATOR, says that no systematic account can fully capture the richness of mental life, social interaction, and he claims that the guiding question is not if you have taken account of all human behaviour, but if you can design to augment peoples capacity to act

We share Winograds pragmatic position, since the main objective was to enable a flexible structure that was effective for co-ordination within Norne   However, the following structure became as Winograd states (Winograd 1994, 195)   not an imposition of control for authoritarian motives but a necessity for continued operation, and the question was not whether to impose standardised regimes, but how to do it appropriately   In a potentially hazardous environment like an oil installation this structure is necessary for continued operation. We also argue that using or imposing one system of categorisation does not necessarily displace other possible constructions of the situation   Flowchart representations can be used to pinpoint important issues in the preparation for operations in Norne, but other aspects must be brought forward in the process of reflection and fieldwork to cover other issues that this rationale does not envision   The post-modern stance of Gareth Morgan (Morgan, 1986) is important here, that seeing the phenomena from different perspectives will improve the understanding of the whole   A structural and rationalistic perspective will give a partial but important picture, and human resource, political and cultural perspectives makes it possible to understand the setting as a social system, with communities of practice, local knowledge and inevitable power struggles   We need to do as Thomas Malone (Malone, 1995) argues, learn the art of applying categories well, avoid rigid devotion to a particular set of categories, and find and support useful patterns of interaction

Both Winograd and Suchman agree in their discussion on the fact that organisational design succeeds when it is grounded in the context and experience of those who live in the situation. Most engineers and technicians do not have sophisticated knowledge and vocabulary to address organisational phenomena in sociological or anthropological terms. If the people themselves should create the workplace in which they will be working in the future, as is the case in Norne, they need a "practical" method that makes sense based on their prior understanding of the world   The flowchart with its weaknesses at least enables them to talk about organisational problems, roles, responsibilities, apparently irrational phenomena, relations between phenomena and discuss what measures can be taken to improve the situation   This use of "black boxes" becomes useful as what Gregory Bateson (Bateson, 1972) called "heuristic devices"   It is not necessary to know the exact

content of a black box to have a pragmatic discussion of relations of "black boxes" at a more aggregated level Even though people interpret the "black boxes" differently this is less of a problem when people come from a relatively joint Statoil culture and have been working with the same things in operations for years To describe, discuss the boxes and their content in new communities of practice enables a better understanding of a new potential operational practice.

As an industrial anthropologist I see the apparent easiness in the use of "black boxes" It takes for granted the notion of a systematic world with formal, rational and structural perspectives of enterprises as techno-economic systems per se. Organisations not only consist of identifiable system relations, objects that can be decomposed or substituted, logistic systems and workflow. There is a possibility that too much focus on these issues will set frames for a "machine"-like perspective on the world, where the latest fashion depicts the enterprise as a computer like construction A major problem of such an understanding of the organisation is that the social system tends to become a "remaining factor" It views the social aspects as "what is left", that could be put on top of the rational process in terms of "criterias for success", when all the formal objectives, roles and responsibilities have been settled

A rational perspective does not address how people in the organisation adjust, interpret and behave in daily working situations, what Erving Goffman (Goffman, 1961) titled "secondary adjustments" as a response to the formal requirements of officials and supervisors This rational approach is useless to describe the development of local knowledge and the importance of communities of practice As a consequence, it does not show vital social processes in the organisation like, informal networks, team building processes, intuition, learning and motivational processes It therefore ignores tacit knowledge and work as a social activity, with its focus on workflow instead of "the flow of work" To understand the work context then becomes of decicive importance, and deals with aspects complementary to the process perspective (Randall, 1995a, 1995b).

Since the Norne organisation was in preparations for operations it was very difficult to do a traditional workplace study and study Norne people in their real setting in operations However, we have conducted several shorter ethnographic studies before on older oil installations (Borstad 1993, Hepsø 1997) so we have a rather clear picture of the "flow of work". The fieldwork that was conducted in the Norne organisation one or two days every week from February to December 1996, could only indicate how Norne functioned in its present preparations for operations

In order to start the discussion on the future organisation of Norne in operations we chose to use flowchart symbols to describe social phenomena since this was a way of representing organisational issues that the people in the Norne organisation both understood and found constructive. Before the project started we discussed some overall requirements with Norne management and operators/technicians We agreed to stick to the following premises and address these issues continually throughout the process if and when they were broken:

- Norne wants to remove as many of the detailed procedures as possible that regulate work offshore, standard Statoil ISO-procedures that only give minimal requirements will be enough
- Norne have competent personnel on all levels that are eager to take responsibility, supervision is not an issue
- We will not tell competent people how to do the work they are skilled to do As a consequence, we make aggregated descriptions of work flow, and do not go into details
- Automation no, quality of working life yes ..

To summarise, the aim was to make aggregated descriptions or requirements, and the flowcharts were looked upon as resources for future situated actions in operations, a general reference for orientation purposes and self organisation In order to open the "black boxes", we stressed the other aspects through our participation as mediators in the process description workshops, via informal discussions with groups and members during our fieldwork days in the Norne organisation An example of this can be that one of us asks what does this box contain, like the box "create work order" on figure 2 and 3. The context is an informal discussion with a Norne process owner and four of his helpers. The start of a dialogue on this issue went like this·

Anthropologist	"Take a look at the "create work order" sub-process. I know from past fieldworks I have conducted that the "bureaucracy" with work orders take considerable time. You have said that Norne will try to reduce the number of work orders with 75% How do you plan to do this when you are in operation, since both you and me know that it is easy to fall back on old practice ?"
Process owner:	"You have seen our criterias to differentiate between work orders, they are fairly clear However, I do agree that we have to do something more than just define these criterias, these things will not happen by themselves."
Anthropologist·	"How do you plan to do this?"
Process owner.	"Good question ! We have already taken measures to present this way of thinking during our presentation to new recruited Norne people Another idea is to live by and learn from the usage of these principles during our commissioning phase I think this is the only way we can make Norne personnel understand what this really is about."
Process owner	(Addressing his four colleagues) "I want you to help me plan how we can take steps to live by these principles before we come into operations "

In similar situations the dialogue that developed by discussing the content of the boxes, enabled them to discuss roles and responsibilities In essence, it helped the groups to reflect upon their culture and what should be Norne's "rules of the game" but not to describe in detail how the work should be done. Our combined focus on formalism and dialogue uses a double level language (Robinson, 1991) There was a restrictive formalism in flowcharts and computer representations. Understanding, interpretations and changing items at the formal level were mediated by

conversations on a cultural level, giving power and meaning to the formal representations We agree with Mike Robinson (Robinson, 1991) that computer support is valuable in so far as it facilitates the separation between the formal and the cultural.

It becomes very difficult to describe the methodology that has been employed here If we are to take Davenports (Davenport, 1993) definition of process design it will match our work fairly well A holistic approach that looks at most dimensions of an organisation's activities, take steps to design the future, envision new work strategies, do the actual process design activity and lastly take part in the implementation of the change with all its complex, technological, human and organisational consequences However, our approach also deviates from that of BPR. We use the concepts of BPR when we talk about defining the value adding processes of the Norne organisation Processes, value chains, products and work flow are definitely terms associated with BPR. In order to problematise BPR as a systematic solution to business problems we have coupled it with ethnographic descriptions and a constructive evolutionary design Through dialogue and via the reflective process we have opened the "black boxes" and tried to address the issues that in most BPR-methodology is considered a remaining factor. To delineate and say what is a value adding process is not a simple issue as we have discussed. We have not focused on measurement in itself, since we believe that this would restrict the internal process in Norne The interventionist perspective employed here is not special for BPR, but has a long tradition in the action research schools of organisational theory (Argyris 1978, Schein 1987, Whyte 1991).

What Has Norne Learned so Far: the Use of the Work Processes and the CSCW-application?

Norne has up to March 1997 had almost a years' experience with the design of work processes and the incorporated versions of the flowcharts in the NOTES application Norne is not in production yet and we can only speculate on future usage in operations However, some preliminary conclusions can be made on how the use of this application changed their ideas on how they plan to operate the installation and how it has eased their work in preparations for operations Around 90 of totally 110 in the Norne organisation have up to now been defined as users

One important observation is that it is the people in operations offshore that has found most use of the application, and less the staff support units onshore This is mainly because of a need for detailed asyncronous communication offshore. Status information must be shared between weekly arriving and departing personnel as well as between day and night shifts.

The timing was perfect since they needed a systematic approach to co-ordinate many ongoing activities that had just started Managers and process owners in operations/maintenance discovered benefits in using the application in their preparations This does not only cover the flow charts themselves, but very much how you can link up information to the process maps The operation manuals of

starting and shutting down the technical systems have been incorporated into the application, these have always been paper based up to now. Another problem has been the version handling of these and other procedures, now there are only one electronic copy that is always updated Other procedures related to operations that used to be in different NOTES databases are linked up, which indicates that the workers do not need to spend time finding this information Finding the right information has become an increasing problem in Statoil, with over 3000 NOTES databases The idea implemented here has been to describe the formal process and then link up the information needed to perform that job and let the process owner have the responsibility of updating and improving the links. As a consequence other computer systems (the plant maintenance system, the technical information system and vendor information on WWW) are linked up via the Norne NOTES application

On the lowest level in the organisation, checklists for the maintenance of the technical systems are also incorporated in the application These weekly check lists that regulate what technical systems should be maintained, by whom, at what time interval, and with a short description of the work itself, was not intended to be a part of the application in the first place When using the application the Norne personnel found new potential functionality that created larger dependency.

We have discovered that the application is highly important for training the newly employed personnel. The simple symbols in the enterprise model from bottom to top enable the newcomers to understand more of the ideal Norne model of operations. The alternative would have been an operational philosophy document or a set of procedures. Although the graphics is fancy for a newcomer, the super user finds them increasingly boring to use He or she wants to go directly into the sub-process they need in their daily work To be able to do this we have developed a separate collapsible view without graphics However, the superuser also uses the graphics when he/she enters a process not known in detail. The technician would use the graphic navigator to go to the financing process and the budgeting sub-process

This CSCW-application is therefore conceived by Norne as a navigation device, a superstructure or an information and communication backbone that Norne people can use in their daily work and for orienting themselves in relations to a number of another computer systems and NOTES databases Norne personnel do not interpret the application to be a work flow system, even though some flowchart symbols have been used They see it as a structured way of representing work processes, representations or resources made available that up to now have been hidden in paper based strategies and procedures In our case we tried to align interested people in the organisation from the very start, via strong and committed management support, and devoted process owners. Finally, the Norne personnel themselves designed their processes The evolutionary development of the application created dependencies in the Norne organisation, since it became their preparations for operations project. With respect to ISO and Norwegian petroleum authorities inspections they are dependent on this application to show how they will operate A preliminary conclusion is that Norne has gradually taken over the

application and Norne operations offshore will not function without the application Norne has also incorporated the application in their process for continous improvement.

In Statoil we have been trying to build rigorous enterprise models for years, with complicated modelling tools. Very few have been used by the organisational members themselves (Christensen, 1995). What has made Norne different is that we have used simple standardised technology already in use in Norne operations We have tried to build a collective representation of Norne's operational model based on input from the Norne organisation, a model of their own construction Hopefully this will enable Norne to develop some shared representations of their future operational practice, and that the use of the application perhaps will be less important when they have internalised these representations in operations. This is not because of the application alone, but would be the consequence of a larger organisational development process

Acknowledgements

References

Argyris, C. and Schòn, D. (1978): *Organizational Learning: A Theory of Action Perspective*, Reading, Mass.

Bateson, G. (1973) *Steps to an Ecology of Mind*, Ballantine Books, New York.

Borstad, A.J., Hepsø, V., Onarheim, J., Tvedte, B. Aune, A..B. and Engelsen, K. (1993): "Experience Transfer in Statoil", *Proceedings of IPCC'93-IEEE International Professional Communication Conference, October 1993*, Philadelphia PA., IEEE .

Christensen, L. C., Johansen, B. W, Midjo, N., Onarheim, J., Syvertsen, T G, and Totland, T, (1995): "Enterprise Modeling - Practices and Perspectives", *Proceedings of the Ninth Annual ASME Engineering Database Symposium*, Boston, Mass.

Davenport, T. H. (1993): *Process Innovation: Reengineering Work Through Information Tecnology*, Harvard Business Press, Boston, Mass.

Goffman, E (1961): *Asylums,* Anchor Books, New York

Hammer, M. and Champy, J. (1993): *Re-engineering the Corporation: A Manifesto for Business Revolutions,* Nicholas Bealey Publishing, New Work.

Hepsø, V. (1997): "CSCW-Design and Implementation of Experience Transfer in Organisational Networks", in: Mambrey, P., Paetau, M., Prinz, W., Wulf, V., *Self Organization: A Challenge to CSCW,* forthcoming.

Hughes, J., King, V., Rodden, T. and Anderson, H. (1995): "The Role of Ethnography in Interactive Systems Design", *Interactions,* Vol 11.2, April.

Klöckner, K., Mambrey, P., Sohlenkamp, M., Prinz W., Fuchs, L., Kolvenbach, S.,Pankoke-Babatz, U. and Syri, A. (1995): "POLITeam: Bridging the Gap between Bonn and Berlin for and with the Users", *Proceedings of the ECSCW 95,* Kluwer Academic Publishers.

Latour, B. (1987): *Science in Action: How to Follow Scientists and Engineers Through Society,* Harvard University Press, Cambridge.

Malone, T W. (1995)· "Commentary on Suchman Article and Winograd Response", in *CSCW,* vol. 3, No 1.

Morgan, G (1986). *Images of Organisations,* Sage, Beverly Hills

Okamura, K., Fujimoto, M., Orlikowski W.,J. and Yates J., (1994): "Helping CSCW Applications Succeed: The Role of Mediators in the Context of Use", *Proceedings of CSCW 94,* ACM Press, NewYork.

Randall, D W. (1995a). "A Comment on Lucy Suchman's: Do Categories Have Politics", *CSCW,* vol 3, No 1.

Randall, D.W., Rouncefield, M. and Hughes, J. A. (1995b): "Chalk and Cheese: BPR and ethnomethodologically informed ethnography in CSCW", in *Proceedings of the ECSCW 95,* Kluwer Academic Publishers.

Robinson, M. (1991) "Double-Level Languages and Co-operative Working " *AI & Society* 5 34-60

Rumbaugh, J. (1993) "Objects in the Constitution- Enterprise Modeling", *Journal on Object-Oriented Programming,* pp 18-24, January.

Schmidt, K and Simone, C. (1996). "Coordination Mechanisms. Towards a Conceptual Foundation of CSCW System Design", *CSCW,* vol 5, No 2/3

Schein, E.H. (1987): *The Clinical Perspective in Fieldwork,* Sage Qualitative Research Methods Series No 5 Sage, Ca.

Schuler, D. and Namioka, A. (eds) (1993): *Participatory Design: principles and practice,* Hillsdale New Jersey NJ.

Suchman, L. (1987): *Plans and Situated Actions. The Problem of Human-machine Communication,* Cambridge University Press Cambridge.

Suchman, L., (1994): Do Cathegories have Politics, *CSCW,* vol 2, No 3

Thorsrud, E. and Emery, F. (1969): *Form and Content in Industrial Democracy,* Tavistock, London,

Whyte, W. F. (ed) (1991): *Participatory Action Research,* Sage Ca.

Winograd, T. (1994): "Categories, Disciplins and Social Coordination", *CSCW,* vol 2, No 3.

Wulf V. and Rohde M. (1995): "Towards an Integrated Organization and Technology Development", in *Proceedings of the Symposium on Designing Interactive Systems,* ACM-Press, New York.