Work Practice Characteristics:
A Framework for Understanding Complex Issues of Groupware Integration

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Abstract

Integrating groupware in work practices poses a range of interrelated problems comprising organisational and technological issues. These are complex issues, since they derive from the combined influence of a range of heterogeneous elements and emergent phenomena in the intersection of groupware and work practice. To understand these issues a framework of characteristics is identified and termed work practice characteristics to describe important aspects of the hybrid configuration of groupware and situated work practices. Drawing on concepts and work practice studies in the field of computer supported cooperative work (CSCW) the paper argues that the interrelations of heterogeneous elements and emergent phenomena arising from the integration of groupware in practice should be made visible from a perspective encompassing both the social and the technical. Two cases from an empirical investigation of how groupware is employed to support new ways of working in a large European financial organisation are analysed to illustrate situations with high and low integration of groupware. The framework of work practice characteristics is discussed in the light of these findings and implications for further work practice research are drawn.

Keywords

Work practice characteristics, distributed work, cooperation, groupware, CSCW

Introduction

The employment of groupware to enable cooperation and coordination in geographically distributed groups, so-called virtual organisations, is not easily achieved. A range of organisational and social, as well as technological aspects have to be taken into account (Orlikowski 1993, Grudin 1994, Luff et al. 2000, Henriksen et al. 2002). Within the research field of Computer Supported Cooperative Work (CSCW) it is widely acknowledged that achieving coordination of collaboration with the integration of generic groupware applications is a difficult matter (Schmidt & Bannon 1992, Robinson 1993, Bowers 1994, Schmidt & Simone 1996, Bowker et al. 1997, Tellioglu & Wagner 1997, Berg 1999, Schmidt & Wagner 2002, Aanestad 2003). This paper argues in accordance with detailed studies of actual work

practices within this research field that it is insufficient to look for a singular element to remedy this situation, since the difficulty derives from the combined influence of a range of elements in the intersection of groupware and work practice.

Trying to achieve cooperation with groupware presents complex issues of interrelated heterogeneous elements and emergent phenomena. However, such statements are too general to be of help in assessing and managing actual employment of groupware. We need to lay open and analyse the complex interdependencies of such hybrid configurations. Without aiming at a "factor/variable analysis", this paper revolves around the research question: *What are the work practice characteristics shaping the integration of groupware in the performance of cooperative work?* Two cases are examined by paying attention to the efforts to integrate a generic groupware application under different circumstances. The descriptive analysis encompassing both organisational and technological aspects illustrates their interrelation and significance for the achieved degree of integration of groupware.

The findings from the two cases representing a recurrent task and short-term development project are drawn from an empirical investigation of how a generic groupware application is employed in a large European financial organisation in order to support geographically distributed working groups. These are analysed to provide two sets of work practice characteristics and these two instantiations serve to illustrate extremes at either end of a continuum spanning from high integration to virtually no integration, thus extending a framework for investigations of the complex issues of the integration of groupware and work practices. From an interventionist point of view there are many ways to go about increasing the integration, but it is impossible to identify one singular characteristic as determining the outcome, since they are interrelated and heavily dependent on the situated and thus emergent work practice.

The following sections provide an outline of the theoretical background and related research followed by a description of the conducted research method. Hereafter we give a brief description of the overall starting point for deploying groupware in a large international financial corporation, which we refer to as "Beta" (a pseudonym), and provide more detailed accounts of each of the two cases: A project in charge of replacing a vital infrastructure in one of the corporate headquarters and its foreign subsidiaries, and the translation section in charge of producing corporate financial reports. The findings from the cases are then exposed through the framework of work practice characteristics. Subsequently the framework is discussed in the light of these findings and implications for further work practice research are drawn in the concluding section.

Theoretical background and related research

The framework of work practice characteristics is developed from empirical material complemented by research findings from the CSCW field. It comprises a range of characteristics that make up the configurations of the groupware and the work practices seen from a sociotechnical perspective emphasising the integration of technological artefacts as constitutive parts of cooperative work practices (Schmidt & Simone 1996, Schmidt & Wagner 2002, Aanestad 2003). Previous research has shown, that the integration of groupware in

work practices is an achievement involving both organisational and technological aspects, and the developed concepts enter into the research framework presented here.

As a basic condition for the achievement of cooperation with groupware changes in work practice coincide with an appropriation of the technology. These processes have been studied as tailoring by other authors (Mørch 1995, Kahler 2001), while the effects of introducing new technologies in organisations have been analysed by emphasising the importance of the transformations occurring during employment over extended periods of time (Berg 1999, Henriksen et al. 2002). The topic of the character of work and the division of labour has received substantial attention in studies of collaborative work, i. e. literature reviews on distributed work and the organisational context of telecommuting identify a framework from an organisational perspective (Bélanger et al. 1998, 2002). However such a framework with categories mainly on a macro-level can be detailed in an empirically based contribution identifying relations between characteristics that shape the work practice on a smaller scale.

One way of describing the different elements of a work practice is found in ethnographically informed work practice research (Luff et al. 2000). A particular approach to the framing of such descriptions in a scalable way is the so-called pattern languages (Erickson 2000a, 2000b, Martin et al. 2001). This approach tries to systematise and compare findings from different field studies using an analogy to design patterns used within software engineering when identifying typical arrangements and actions, such as "DOING A WALKABOUT (i.e. wandering through the work areas to see what others are up to)" (Erickson 2000a:365). These patterns are on many different scales and the two cases of the present paper could be described as large-scale patterns: RECURRENT TASK and SHORT-TERM DEVELOPMENT PROJECT. The work practice characteristics could then be seen as a way of detailing each of these patterns by specifying a number of attributes.

Another argument for the level of detail of the different categories of the framework proposed here is that each of them is shifting and highly dependent on other work practice characteristics. Thus the relations among characteristics become crucial to describe. An example of this kind of relation is the discrepancies of those who receive the benefit of investment in the groupware and those who do extra work to make it work (Grudin 1994). However given the heterogeneous engineering required to integrate groupware in work practices it is insufficient to focus on a singular characteristic, since the articulation work might go unnoticed or be outweighed by other characteristics (Bowers 1994:296). Like the difficulties in supporting articulation work (Schmidt & Bannon 1992), so are the benefits of employing groupware difficult to grasp in singular characteristics, since a special feature of groupware or cooperative technologies in general is the 'unanticipated consequences' of their employment (Robinson 1993). One of these 'side effects' is discussed as the groupware 'creating an overview' of the cooperative processes. This is very difficult to achieve in a complex environment, but with integrated groupware in place, the members in a working group are able to cope with complex coordination because of the reduction in the complexity that such an overview affords each member (Tellioglu & Wagner 1997, Berg 1999).

Research Method

This primarily qualitative study was conducted in Beta during 2000-2002, and it is part of the DIWA research program (www.diwa.dk) investigating the design and use of interactive web-based applications supporting geographically distributed work practices. The research method comprises participant observation and tape-recorded interviews supplemented by document analysis, a survey and http-log analysis. Our analyses of this material were reported and discussed with informants and constitute the basis of the research presented in this paper. The categorisations of the proposed framework are results of lengthy discussions in our research group attempting to uncover how coordination with groupware is constituted and achieved in practice. The aim is to describe conditions of possibility for the emergence of certain configurations of interrelated heterogeneous elements where integration of groupware occurs in actual practice. In the two cases the observed characteristics differ widely and they are specifically chosen to illustrate two extremes of groupware integration. The purpose is not to describe success and appoint reasons for failure, but to explore the different configurations and gain an understanding of the complex issues of integrating generic groupware applications in work practice. Paying attention to articulation work such as 'the work to make the network work' (Bowers 1994) reveals several interrelated factors influencing the achieved integration, rather than a singular reason. The work practice characteristics express the degree of integration of the groupware and are as all categorisations inadequate on certain levels of granularity. However on the level of actual work practices they reveal the interrelations and mutual constitution of heterogeneous elements and thus help to understand the complex issues of achieving groupware integration.

The Organisation: Beta

The organisation is one of the leading financial corporations in Europe. The corporation is a result of a recent merger involving several financial companies with headquarters throughout Northern Europe. The national organisations of the former companies have been merged into corporate sections and a new kind of cross-border development projects have been initiated. The geographical distribution of the members of the sections and projects created requests for an infrastructure to support communication, since Beta at the time of the merger had no secure e-mail infrastructures, no local area network to exchanges files on, and no corporate intranet. The merged department responsible for internal communications took upon itself to find a solution to the problem. The generic groupware application: Lotus QuickPlace^{TM} (referred to as QP in the following) was chosen as the standard application to support communication within geographically distributed corporate projects and organisational sections of Beta. An important reason for this choice was that IT operations of one of the merged organisations had good experiences with Lotus products. To establish QP as a secure Web-based workspace requires very little interference with the existing IT infrastructure. Besides a customised logo for every page of the application, QP has been deployed in the generic standard configuration leaving it up to the users for themselves to decide how to appropriate it for their local work practices. This way of introducing an off-the-shelf product is remarkable given the precedence of educating users with extensive training programs and the prevalent way of formalising conduct with standard operating procedures in Beta.

The Groupware Application: Lotus QuickPlace

Since its introduction in the summer of 2000 the use of QP in Beta has increased rapidly: One and a half year after the initial deployment of QP more than 100 active QPs were in use comprising in total about 2000 active users and almost 20 Gb of documents. QP is a browser-based groupware application akin to BSCW (bscw.gmd.de), the latter especially familiar within academia (Bentley et al. 1997), offering a workspace with facilities for sharing and co-authoring documents, exchanging files, and supporting discussions, calendar, e-mail-notifications independent of differences in geographical location. A QP is structured as a room with folders (containing documents, web-pages, files etc.). QP is a generic application (Bansler & Havn 1994), which means that it needs to be appropriated to the specific cooperation of the group of users. The standard configuration of a QP offers some basic facilities for discussion, calendar, user administration, index, search tool, and a tutorial. The person(s) with manager rights of a newly installed QP must start by designing an initial structure setting up a home page and creating and naming folders accessible in the QP and then invite other users granting them access rights as manager, author or reader. The users of a specific QP can be granted either so called 'manager rights' (i.e. function as system administrators, and can change the structure of the QP, invite new users, change access rights, etc.), author rights (can read from the QP and upload documents and files), or reader rights, (thus only able to download and read documents). In the two situations described in the following cases this work of setting up the initial structure and inviting others is primarily done by the leader of the group, thus functioning as both 'system administrator' and 'section/project manager'.

Employing Groupware in a Recurrent Task

The production of the financial reports of Beta involves translations of an English master into different languages, since the completed financial reports are to be released simultaneously to several stock exchanges and the press in several countries. The master document is itself a result of an intricate process involving many parts of Beta. Only at the last minute it reaches its final state since corrections occur several times up to the deadline. This requires new versions of the English master to be distributed during the translation process. These changes to the documents have to be coordinated very tightly within the group of translators to ensure a correct and consistent result. During the preparation and translation of the final documents, the information is highly confidential. Emailing drafts by the Internet is considered insecure and prior to the introduction of QP, drafts (often more than 50 pages long) were exchanged by fax. Fax proved to be a very cumbersome infrastructure to handle this complex coordination. QP transforms the coordinating work by mediating mutual dependencies when exchanging documents, since in addition to performing the tedious footwork of keeping track of the versioning, an overview is provided of the entire translation process. Employing QP in this way has lead to a substantial reduction in the complexity of coordination compared to the fax transmissions – both among the translators and for others outside the section responsible for the publication of the final financial report.

The manager of the translation section has put substantial effort into appropriating the technology to the work practice of the translators. With the introduction of QP he produced

guidelines for the proper use of the QP and on occasions phoned up people to persuade them to use the QP. In our understanding this has proven instrumental in promoting the use of the QP, since in his position he can act as personnel manager, section manager, and manager of QP as well as a facilitator. Even when the issue of security was resolved with a company-wide internal e-mail infrastructure, the versioning of the translated documents is too complex to be handled with e-mails, as he states: "E-mail is a mess for this purpose!"

Integrating QP as part of the work practice required restructuring routines and explicit agreements on how to use the application alongside tailoring of the artefact. The recurrence of the translation of the financial reports every three months creates an opportunity for reconsidering the use of QP, since it provides occasions for evaluation and re-design. The character of work is well suited for the integration of the groupware, since the context for carrying out the recurrent task is relatively well known and the stable membership makes it more rewarding to focus the efforts to make the groupware work.

Employing Groupware in a Short-term Development Project

In Beta an elaborate way of organising development projects for change processes has been implemented. All projects are organised aiming at an overall 6 months time box. Development projects present a highly complex work setting, both geographically distributed and managerially heterogeneous. The conditions for performing coordination work within a development project are thus relatively diverse and shifting compared to the recurrent task, since the tasks and members change from one project to the next. Thus collaborating on the subject matter of the project requires a great deal of coordination including negotiations of the means and goals of the project itself.

The project members get together at meetings regularly and the main body of coordination of the project work takes place at these occasions. These meetings also provided occasions for clarifications and agreements on how to proceed with the project work. The type of work in this kind of project that seeks find solutions to issues across organisational and national boundaries has a character of negotiating and deciding on future standards as well as preferred ways of working. This can prove difficult in an unfamiliar setting. How to go about presenting the local practices can be a difficult matter of exploration through trial-and-error and discovering new problems along the way. This of course varies between projects, but in this case of a development project set up to replace a crucial infrastructure, all participants are in uncharted land and are not able to lay all the cards on the table straightaway.

The project leader and an assistant from the Internal communications department tried to convince the other project members to employ QP for some of the coordination. Due to a number of reasons, particularly the weak management position, limited resources and even technical difficulties, the groupware was not integrated in the work practice at all. QP remains a nice-to-have for the project members in order to get their work done, since other means for coordinating work such as e-mail and phone are more immediately gratifying. The case demonstrates how difficult it can be to integrate groupware in the work practices of a development project. Agreeing on a new ways of getting work done with QP meets several barriers, while the familiar conventions work fine. The tight timeframe of the project also puts

a limit on how much is invested in the deployment and maintenance of a groupware application, since returns are not evident immediately.

Discussion

Work practice Characteristic	Recurrent task	Short-term development project
Character of Work	Time critical predefined procedures for keeping track of documents and propagating last minute revisions	Development work identifying and negotiating issues as well as practical problem solving
Objective and deadline	Translate financial reports by fixed date (every quarter)	Replace infrastructure within time-box (half year)
Mutual interdependencies	Strong	Weak
Accountability	Social and managerial	Task focused
Organisation	Corporate section dispersed geographically	Interdisciplinary project team mainly co-located
Management position	Section leader is personnel manager	Project leader among experts
Membership	Continuous	Transient
Facilitator	Present and active in section	Limited resources available
Groupware Contents	Status of work process	Access to assorted material
Structure of contents	Providing overview of document versioning in assigned rooms and folders	Default folder structure only slightly modified for project without any clear ordering
Evaluation and re-design	In between iterative task	Difficult within time-box
Surrounding infrastructures	Few document exchanges via e-mail, but it was employed along with phone to facilitate	Meetings and phone for coordination and e-mail for documents exchange
Return of Investment	High	Low
Perceived need by	All section members	Nobody
Dependency	Critical	None
Complexity of coordination	Substantial reduction	Status quo

Table 1. The framework of work practice characteristics applied to the recurrent task and the short-term development project.

The framework of work practice characteristics presented in Table 1, developed from the analysis of the two cases, represents a way of examining situations where groupware is

employed or might be appropriate to introduce. The context for the groupware employment is diverse and multifaceted as described earlier and the categories highlight different aspects of the complex relationships characterising the work practice. Striving to understand how groupware works, each category can be seen as circumstantial evidence strongly suggesting, but not determining the outcome of the attempts to employ groupware. The framework is proposed as a resource for assessment prior to the employment of such technology and analyses of how the situated cooperation with groupware unfolds in real time.

The objective and timeframe of the cooperation are important aspects of the character of work since they determine the overall conditions for employing the groupware. The degree of stability of the work practice forms the background for the efforts to appropriate the groupware and in that process change these same work practices. The mutual interdependencies - that is how dependent one member is on the work of other members within the group - are results of the agreements and division of labour and the way they are mediated by the groupware is crucial to the integration. How the members are held accountable to the procedures of the cooperation either by management or by colleagues is equally crucial (Schmidt & Simone 1996:180). The short-term development project members had a hard time finding out how to cooperate and what project issues to deal with and before getting around to move parts of their interactions onto the groupware the project was drawing to end. Contrary to this experience the accountability in the translation section was reinforced by the regular collaboration and relatively stable surroundings of the team members.

The organisation and geographical distribution of members is a significant work practice characteristic, since it can be the prime motivation for considering groupware in the first place, as in the case of the merger resulting in the Beta organisation. In the recurrent task the cross-national collaboration of the translators located in each country required a secure infrastructure. QP proved to be the solution and was integrated into their work practice in such a way, that it was also used when the translation team meet to do the final translation in one headquarter during the last few hectic days before deadline. The practice of coordinating work by exchanging documents via QP thus also worked when co-located. Quite to the opposite in the development project the co-location of the members in one country with a few satellite members elsewhere was a barrier to the integration of QP, since meetings, phone conversations, and e-mail mediated the coordination. Not least the availability of other project members by simply walking up to their desk to settle matters made it difficult to introduce groupware. However the institutional context can provide other incentives for the efforts to integrate the groupware. The presence of a facilitator that can act as a mediator is helpful in advocating, explaining and evaluating the groupware. The case of the translation section shows this especially since the manager is able to function as a kind of systems administrator thus being able to redesign and tune the technology to the work practice (Henriksen et al. 2002). The familiarity with the technology and the work procedures by the individual members is also important, since the short-term project shows how the unfamiliar terrain and ad-hoc working conditions made people rely on well known forms of coordination, not including the groupware.

The resulting content of the groupware and its structuring are emergent characteristics, since occurrences of certain combinations of characteristics leading to specific use-patterns can be seen as effects of the interactions and expectations of the group members. The many (or in the case of the development project few) transactions with the groupware produce 'side

effects' that are dependent on the accumulation of documents and their quality. If contents are updated and easily retrievable the general expectation of the group members is to find relevant documents and also be able to keep track of the status of the work here, as is in the case of the recurrent task. If this is not kept up the use-pattern of exchanging documents via the groupware will not stabilise. In the case of the project the QP contained material that was not current, so group members had to check with each other by means of the surrounding infrastructure and ended up exchanging current documents via e-mail instead. The possibility of evaluation and re-design of the groupware is highly influential on the integration of the technology in specific work practices, since it furthers the necessary appropriation of the generic groupware application. Transforming the technology and the work practice making them more attuned to each other turns out to be a prime requisite for the achievement of cooperation with the integration of groupware.

The work practice characteristics specifying the return of investment are emergent, shifting and highly dependent on the work practice characteristics identified above. These characteristics specified as the overall return of investment, the perceived need, dependency and complexity of the coordination shows that discrepancies of those who benefit from the groupware and those who do articulation work to make it work might inhibit the groupware integration. In the case of the translation section the entire group benefited from the investment in the employment of groupware, and it became a critical infrastructure for the cooperation, while the short-term development project did not achieve integration. The entire set of work practice characteristics contributes to explaining these outcomes. The limited time and resources and the availability of other means of coordinating work made it very difficult to introduce groupware to the short-term development project, while the organisation and coherency of the group performing the recurrent task coupled with a resourceful facilitator lead to the creation of an overview of the translation process and reducing the complexity of the coordination.

Conclusion: Implications for Research

Despite different ways of coordinating work the collaboration in the development project and the recurrent task produced the desired results using an ensemble of technologies. The two cases are not chosen to show a success and a failure, but serve to demonstrate how the integration of groupware differs due to different hybrid configurations expressed by the work practice characteristics.

Recognising that singular factors do not determine the emergent use-patterns of integrated groupware leads to a broader investigation of the interplay of heterogeneous elements in the hybrid configurations of specific work practices. Such an approach requires detailed studies of work practice characteristics and an orientation towards how technology unfolds over time with transformations occurring to both technology and work practices.

These enquiries lay open the convoluted interdependencies of collaborative work in a way that allows for discussion and comparison of individual cases that might lead to more general insights for CSCW. Describing and analysing yet more occasions for the emergence of integrated groupware to identify the work practice characteristics of these configurations

could elaborate the proposed framework by describing a range of intermediary values found in other combinations of work practice characteristics.

The achievement of cooperation with groupware in the form of integration with work practice requires considerable amounts of articulation work. An understanding of how this integration comes about might further these endeavours in research and practice. The framework comprising both organisational and technological aspects of work practice is a step towards a research approach detailing the circumstances for the employment of groupware and the achievement of integration.

Acknowledgements

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