Emergent Use-Patterns: Studying the Integration of Groupware in a Networked Organisation

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Abstract. When a networked organisation chooses to invest a considerable amount of resources in deploying a groupware application the reasons and goals can vary. No matter why the groupware was initially deployed it is in general very difficult to monitor and evaluate how it is actually used and integrated with the work practice. This research-in-progress investigates the possibilities of evaluating the integration by characterising emergent use-patterns. We have studied the deployment and use of a generic web based groupware application – Lotus QuickPlace (QP) – in a large networked organisation distributed throughout Scandinavia and elsewhere. We have employed a research method comprising different data-gathering techniques – interview, participant observation, document analysis, survey, and http-log analysis – in an attempt to analyse how the groupware is used and which general use-patterns emerge after deployment. The ongoing research has been carried out since the initial installation of the application in summer 2000, and has identified different types of general use-patterns, which have emerged in the subsequent use of the groupware in the organisation. We examine four cases of QP use and describe the emergent use-pattern in each case. Characterising factors of these four use-patterns are discussed in order to show some preliminary findings of this approach and discuss future research efforts.

1 Introduction

It has for a number of years been acknowledged that introducing groupware in an organisation is far from a trivial task and that it requires attention not only to the implementation of the technology but also to a range of organisational and social factors (Bullen and Bennet, 1990; Orlikowski, 1992;

Grudin, 1994). The aim of this research-in-progress is to investigate how to characterise an emergent use-pattern, and as part of this research to grapple with the methodological question of how to elicit a use-pattern when dealing with web-based groupware in geographically distributed organizations, particularly with the quantitative data-gathering techniques of log-analysis and questionnaire. At this stage it is a purely descriptive endeavor, since we are not searching for relations of cause and effect. Instead we come up with what we choose to call emergent use-patterns that depict, how specific groups of people use the web-based groupware in particular work practices. Use-patterns of the groupware emerge out the disorderly chaotic mess of the huge number of transactions recorded in a http-log. They can be compared to 'genres of organizational communication' (Yates & Orlikowski, 1992). Typical examples are use of the groupware for centralized publishing, project archive or collaboration. We use the term: 'emergent' in the sense of a state of continual change that reflects the 'unpredictable' appropriation of generic systems put to use in networked organizations (Truex, Baskerville & Klein, 1999).

In order for a groupware application to be integrated, the introduction and implementation of the application need to comprise a number of organisational and social factors (Grudin, 1994): It must address a real need of group members; they should have a clear understanding of a mature use of the application and the positive impacts on the work practice; training and facilitation might be necessary, and perhaps even preparations to prevent premature rejection. As a multi-user application groupware is much more difficult to evaluate than single-user applications, and studying a full implementation is challenging, when trying to "reliably capture complex, but important social, motivational, economic, and political dynamics." (Grudin, 1994:100). This paper contributes with an outline of an approach responding to this challenge.

The mutual agreements on how to use a groupware application often entail changes in work organisation and practice. These processes have been discussed by other authors as accommodating new artefacts in existing work practices (e.g. Blomberg, Suchman & Trigg, 1996), or tailoring (Mørch 1995; Kahler, 2001), while yet others describe the consequences of introducing new technologies in organisations (Orlikowski, 1992 & 2000; Bansler et al., 2000).

The purpose of employing groupware for distributed work is to make possible complex collaboration. With integrated groupware and work practice the actors are able to cope with the complex conditions for coordination in the geographically distributed working groups of a networked organisation. Group-ware supports a complex work practice with a substantial reduction of the complexity of coordination for each actor thus "affording an increase in complexity of the work practice without a simultaneous increase in complexity in individual interactions." Berg (1999:391). Orlikowski (2000) uses the term technology-in-practice to emphasise the importance of the practical use situation of groupware. The challenge is to grasp the intricate relation between this duality of changes, when studying. In sum, we define the tailoring of a generic groupware application along with the transformation of current work practices as complementary processes that integrate the groupware and the work practices in the organisation.

In the following, we first provide a brief description of the conducted research method, the Beta organisation itself, and the overall starting-point for deploying the groupware application. Then, we give a more detailed account of each of the four cases: The corporate communications department as an organisational unit, a special interest group, a development project, and the translation section in charge of producing corporate financial reports. The groupware application in question: LOTUS QUICKPLACE release 2 (www.lotus.com/quickplace) is referred to as QP in the following.

2 Research Method

The study is part of a research programme investigating the design and use of web-based applications supporting geographically distributed work practices. The research method comprises a mixture of quantitative and qualitative data-gathering techniques in order to grasp the complexity of the coordination of the work along with an understanding of how the of the groupware is integrated. In Beta three projects and two organisational units have been studied in detail by combining several data-gathering techniques: Interviews, Participant observation, Document analysis, Survey with questionnaire, Http-log analysis.

The diverse data-gathering techniques of the studies support and complement each other and present us with an immense amount of raw material to be analysed. Several combinations of the techniques were used to elicit the findings. The interviews, participant observation and document analysis provided the 'rich' descriptions of the four cases, while the survey and log-analysis supplemented each other in sorting out the large number of other QPs in use in the organisation Due to limited space we only describe and refer to one instance of an organisational unit, project, special interest group and recurrent task. These four cases illustrate how the groupware application was introduced in a large financial organisation in order to support working groups distributed throughout Scandinavia. For reasons of anonymity we call the corporation 'Beta'.

Seven interviews have been conducted during spring 2001, each lasting between one and two hours. The interviewees were managers and selected users of the QPs. All the interviews were structured using an interview guide, which was sent to the interviewee beforehand. The interviews were tape-recorded, and later transcribed ad verbatim. The interviews were further analysed using an affinity diagramming technique and combined with material gathered during participant observation of two projects and the recurrent task. Document analysis has described all 90 QPs resident in March 2001 and yielded a detailed analysis of the structure and content of the four QPs of the cases described in this paper. Each QP consists of a number of rooms/folders containing documents that can be reached by a single URL. A log of all http transactions to and from the QP server that processes the URLs has been compiled and is still being analysed. The http-log documents various operations on the content of the QP such as when documents are created, read, or edited and by whom. Our analyses of this multi-faceted material were discussed with the informants and constitute the basis of the research presented in this paper.

3 The Beta Organisation and QP

Beta is one of the leading financial corporations in Scandinavia. The corporation is a result of a recent merger involving several financial companies from all four Scandinavian countries: Norway, Denmark, Sweden and Finland. The national organisations of the pre-merger companies have by now been transformed into corporate sections and a number of corporate development projects have been carried out. Prior to the merger the Danish company had undergone an organisational reengineering transforming it from a hierarchical line organisation to a matrix organisation implementing a networking logic (Castells, 1996:61f) with the motivation of making possible processes that "[t]reat geographically dispersed resources as though they were centralized" (Hammer, 1990:110). Since Beta

at the beginning had no secure mail infrastructures, no LAN to exchanges files on, and no corporate intranet, QP was chosen as the standard application to support these furthering of processes on a Scandinavian level.

QP is a browser-based groupware application of the 'virtual workspace' type offering a workspace with facilities for sharing and co-authoring documents, exchanging files, and supporting discussions, calendar, email-notifications etc. independent of differences in geographical location. As a platform independent tool to support communication QP requires virtually no integration with the existing IT infrastructure and offers secure Web-based groupware facilities. In addition, IT operations had good experiences with Lotus products. 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.

A QP is structured as a room with folders (containing documents, web-pages, files attached to documents etc.). There is the possibility to create new rooms inside or next to the first room. The users of a 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 users access rights, etc.), author rights (can read from the QP and upload documents and files), or read-only rights. Similar browser-based groupware applications are e.g. eRoom (www.eroom.com), Projectplace (www.projectplace.com), TeamNow (www.teamnow.com), and BSCW (bscw.gmd.de), the latter especially familiar within academia (Bentley et al., 1997).

QP is a generic system (Bansler and Havn, 1994), indicating it needs to be tailored to the specific work practice of the group of users. Besides a customised look of the application, QP has been deployed in Beta with the generic standard configuration and it is left to the projects and organisational units for themselves to decide how to appropriate and use it. 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 and rooms accessible in the QP. When this initial structure is in place the other users are invited granting them access rights as either manager, author or reader. In the four situations that the following cases describe this work is done by one of the senior staff, typically the leader of the group, thus conflating the roles of 'system administrator' and 'unit/group/project/personnel manager'. To distinguish the two kinds of 'managers' we refer to the former as 'managers of QP', since this is the labelling of QP-terminology.

4 Characterising Emergent Use-Patterns

The following four sub-sections (4.1-4.4) describe the different situations and the identified use-patterns in some detail along with the characterising factors identified in the http-log and survey, presented in figures no. 1. - 4. The final section (5) discusses and relates this material to certain issues of the future research efforts regarding how to study the integration of groupware across a range of use contexts as emergent use-patterns.

4.1 Using QP in an organisational unit

In Beta a very immediate way of using groupware systems is to support communication and coordination in the newly formed organisational unit such as an inter-Scandinavian department. Several of the first QPs in the organisation were initially used for this purpose. Units from the former organisations with overlapping functions were merged into corporate units. A QP was typically installed as an internal communication facility with the goal of decreasing the need for travelling for meetings, supporting synergy by sharing documents, and giving a possibility to "see what others were doing" in a distributed environment.

As an example a new corporate communication department was formed and made responsible for establishing the new corporate name, identity, and image, along with functions such as internal communication, media relations, advertising etc. The department was staffed with 80 employees distributed in four countries. Each new distributed organisational unit had to be established "from scratch". Managers and employees were physically located in the headquarters from the organisations that were involved in the merger. The staff did not know each other (across countries) and together they spanned multiple different organisational and domestic cultures.

After about one year the use activity in those QP was generally low. Only few members (e.g. less than 5%) of the QPs use it on a daily basis. A typical use is to upload a document that you created and that you anticipate others might have an interest in at some later date without knowing specifically who and when. Events that trigger a high temporary activity are publication of management minutes ("what was decided that might affect me?") and holiday lists ("was my holiday recorded as I wished?"). Only few activities in the units (and thus among all the users of the QP) have such a broad interest.

The need for decreasing travelling for meetings was not met for two basic reasons: Meetings are necessary in order to get to know each other; and a general aim for a meeting is to clarify and make decisions and generally decrease uncertainties. Both reasons were highly apparent when a new organisation is established and using QPs (and other technologies in general) cannot substitute meetings in this respect. Cooperation across the new distributed unit is non-existent or under establishment thus yielding efforts to support these activities even more complicated.
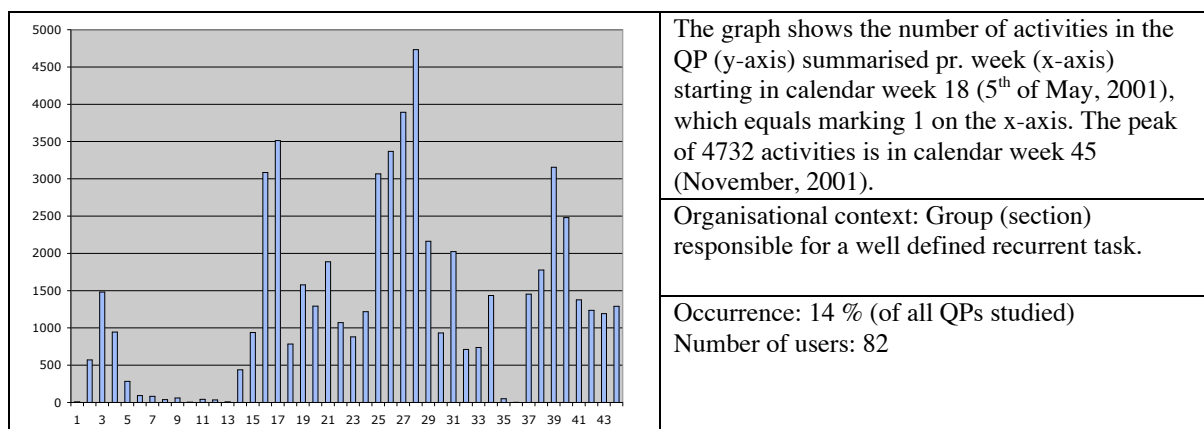
	The graph shows the number of activities in the QP (y-axis) summarised pr. week (x-axis) starting in calendar week 18 (5th of May, 2001), which equals marking 1 on the x-axis. The peak of 4732 activities is in calendar week 45 (November, 2001).
	Organisational context: Group (section) responsible for a well defined recurrent task.
	Occurrence: 14 % (of all QPs studied) Number of users: 82

Figure 1. Characterising factors of an organisational unit

4.2 Using QP in a special interest group

Special interest groups are defined as a network of practitioners sharing an interest in the same topic. Several special interest groups have been established in the Danish part of the organisation before the merger. Examples of such groups are project managers, organisational change facilitators, change consultants and experts within specific technological platforms such as Oracle, Java, and Notes. Members of the special interest groups are distributed organisationally as well as geographically to different projects and different (though mainly local) geographic settings.

The aim of supporting the special interest group was argued in knowledge management terms, for example by enhancing their possibilities for exchanging experiences and by building up a kind of "professional handbook" where their knowledge is represented in an accessible way for others outside the community. Management initiated a very ambitious organisational initiative in order to support the special interest groups. Every special interest group was allocated a "network driver". This person is 100% committed only to support and maintain the group. The network driver was the initiator, designer, manager, and main contributor to the groupware facilities of the special interest group. All network drivers from the different group were themselves organised in a special interest group for network drivers. Participation in the groups was a specific issue in the yearly review and wage negotiations.

The special interest groups have developed a tradition where they frequently met and discussed issues of common interest. These meetings were regarded as important, professional – and legitimate – "pauses" from the daily work. Looking at the groupware facilities of the different special interest groups one is struck by the different and highly creative lay-out for the different facilities. This reveals a need for a groupware facilities to support the identity of a group, although this is not necessarily an ideal solution for the a simultaneous provision of a library function for users outside the group. The drivers for each special interest group typically maintained a bulletin board with news and events of interest, an archive with profession specific articles, and a frequently asked questions list (FAQ). However the groupware clearly has a secondary function as compared to the meetings of the special interest group. Furthermore the groupware (focusing on general issues of interest) does not offer "tools" supporting the member's work practice. No functions are found that are used frequently as an integral part of work procedures. Being a member of the community, and using the groupware supporting this, thus has a low priority compared to the daily tasks and deadlines.
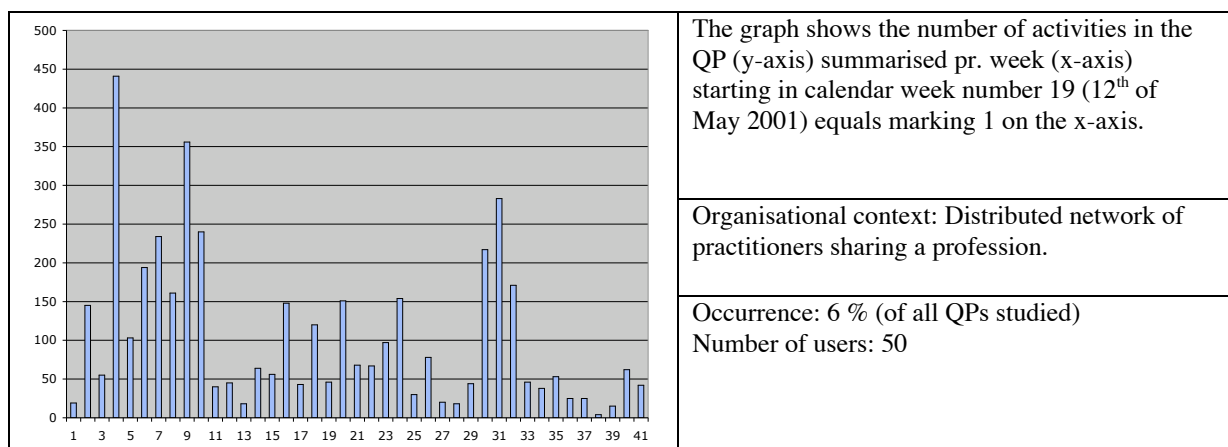

| The graph shows the number of activities in the QP (y-axis) summarised pr. week (x-axis) starting in calendar week number 19 (12th of May 2001) equals marking 1 on the x-axis. |
| Organisational context: Distributed network of practitioners sharing a profession. |
| Occurrence: 6 % (of all QPs studied) Number of users: 50 |

Figure 2. Characterising factors of a special interest group.

4.3 Using QP to support a recurrent task

The same group of people, who might be located in the same organisational unit, carries out a recurrent task in more or less the same way every time. This specific work task shapes the use of QP in particular ways. One such example is the production of the financial reports of Beta involves translations of an English master into the four languages of the different Scandinavian countries. The completed financial reports are to be released simultaneously to the stock exchanges and the press. The translation of the English master is initiated about one week before the release deadline. At this time the master is not in its final state and 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 have to be coordinated very tightly within the group of translators. During the preparation and translation of the final documents, the information is highly confidential. Emailing drafts by the internet was considered insecure and prior to the introduction of QP, fax transmissions were used to exchange drafts that often were more than 50 pages long. This involved a very complex coordination process with only a cumbersome infrastructure to support it. The original incentive to use QP for the coordination of the translation process was thus the complex security measures.

QP was originally chosen and set up by the manager of the translation section. The translation process is initiated upon receiving the almost final English master for the quarterly or yearly financial reports. The master document is distributed to the translators via a new room created for that purpose in the QP. The translators work in parallel on the texts and usually in different geographic locations. Once a year with the especially critical and extensive annual financial reports the translation takes place in one geographical setting while still using QP to coordinate the process. The frequent changes to the master document right up until the deadline have to be propagated throughout the section. When each translator has completed a part of the documents, he or she uploads it to QP with a specifically versioned name. It then becomes available to all others for their work and in this way the progression of the work becomes visible in QP. The way QP is used when the translation of financial reports takes place is an illustrative example of how complex work practice is carried out using QP.

The manager of the translation section has put substantial effort into tailoring the technology to the work practices of the translators. Other means such as fax transmissions were experienced as problematic while yet others were deemed inadequate, such as exchanging documents as attachments to e-mail. Even when the issue of security is resolved, 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!" With the introduction of QP he produced guidelines for the proper use of the QP and on occasions phoned up people to help and/or coerce 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 facilitator.

The recurrence of the translation of the financial reports every three months creates a 'naturally occurring' opportunity for reconsidering the use of QP. The experiences gained from the last translation session can be incorporated in the new routines. The recurrent task has an advantage in this respect, since it provides frequent occasions for evaluation and re-design, because the character of work is well defined and has been tried several times before. The context for carrying out the recurrent task is relatively well known and stable surroundings make it easier to focus the efforts on integrating the groupware.
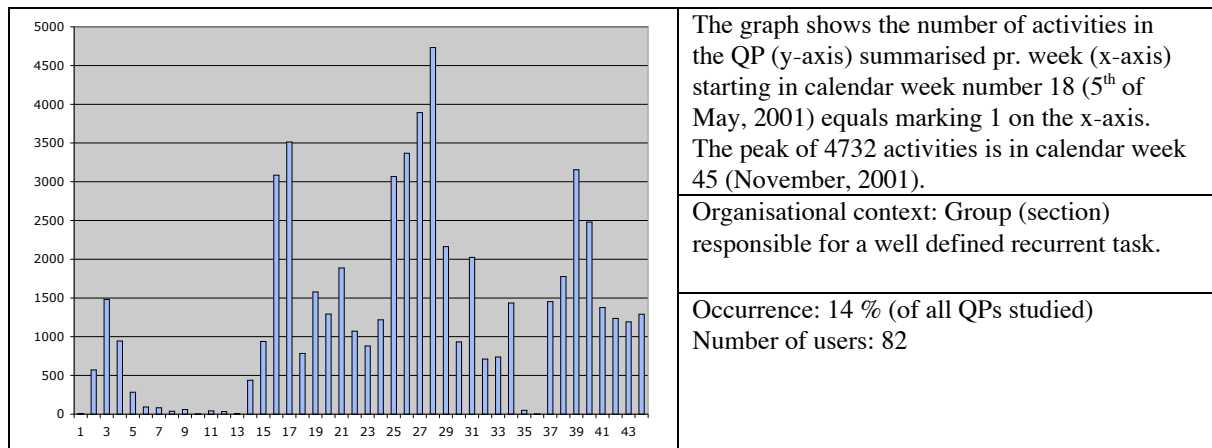
	The graph shows the number of activities in the QP (y-axis) summarised pr. week (x-axis) starting in calendar week number 18 (5th of May, 2001) equals marking 1 on the x-axis. The peak of 4732 activities is in calendar week 45 (November, 2001).
	Organisational context: Group (section) responsible for a well defined recurrent task.
	Occurrence: 14 % (of all QPs studied) Number of users: 82

Figure 3. Characterising factors of a recurrent task.

4.4 Using QP to support a development project

In Beta an elaborate way of organising distributed projects for change processes has been developed and 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 maintaining coordination 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.

In our example the project manager initiated QP for the "pre-study" phase of a project with the purpose of evaluating the possibility of creating a single customer security architecture across the Scandinavian countries. Thus the members of the project team were IT-specialists and managers of the IT-sections responsible for security from each national financial institution that went into the merger. The structure of the QP was related to specific issues that were the subject matter of the project. Examples of these are documents describing issues like Security and Infrastructure or deliverables like a 'Project Charter'. Working on the subject matter of the project requires a great deal of coordination work including negotiations of the means and goals of the project itself.

The use of the QP in the development project resembles a project archive where the results of the project were developed and maintained. The QP was, as expressed by the project manager "used as a place for documentation. Here is the collection of documents that are the result of our work." In this way QP primarily supported the post hoc documentation of the project work. QP is 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. However the project manager viewed the QP as a need-to-have when managing the issues and deliverables. The analyses of the use and the content of the QP shows that it functioned well as project documentation of the core issues of the project e.g. security issues affecting IT-systems of Beta.

The case demonstrates some of the difficulties in integrating groupware in the work practice of a development project with the tight timeframe of projects limiting how much is invested in the deployment and maintenance of QP.
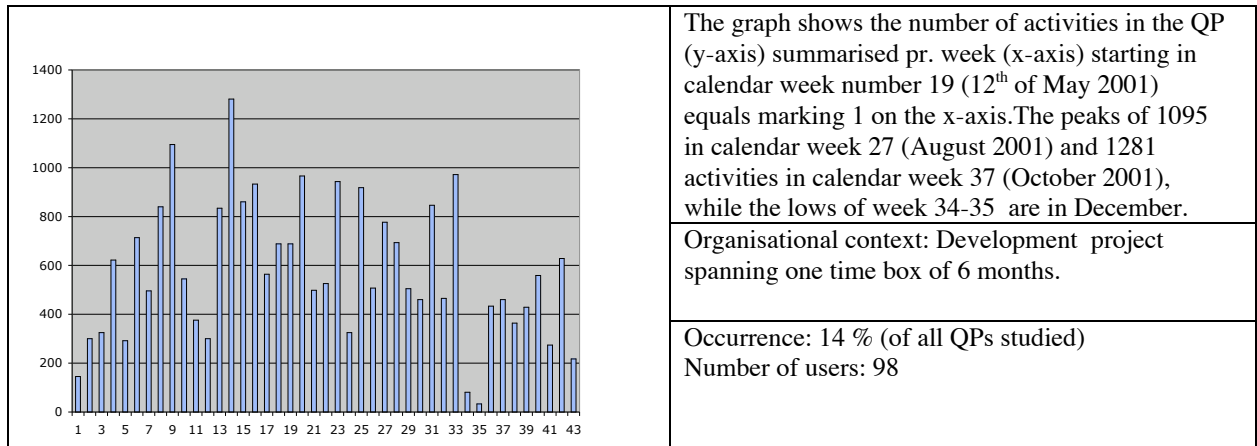
	The graph shows the number of activities in the QP (y-axis) summarised pr. week (x-axis) starting in calendar week number 19 (12th of May 2001) equals marking 1 on the x-axis.The peaks of 1095 in calendar week 27 (August 2001) and 1281 activities in calendar week 37 (October 2001), while the lows of week 34-35 are in December.
	Organisational context: Development project spanning one time box of 6 months.
	Occurrence: 14 % (of all QPs studied) Number of users: 98

Figure 4. Characterising factors of a development project.

5 Future research

The descriptions given above are the current status of the work-in-progress of eliciting and analysing emergent use-patterns. Combining data gathering techniques renders the use-patterns in different ways and represents it as statistic and textual descriptions. We are currently investigating, how the more quantitative approaches of the survey and log-analysis render use-patterns differently than the specific use-pattern described with qualitative methods such as interviews and observations. The use-patterns elicited are descriptive, saying little of cause and effect, but shows emergent phenomena in the total population of QPs employed in the organization. In the following, we discuss the findings represented in the content of figures 1-4 in terms of: What do the characterising factors tell of the use-pattern?

The graph showing use activity logged over time. The graphical representation of the use-patterns shows the level of activity, that is total amount of reading, uploading, deleting documents or searching, and re-designing the QP on the y-axis. We find this factor to be very promising as it shows the use-pattern in the organisational unit with a low level of activity generally only interrupted by short peaks of high activity, where all users (following an e-mail notification) enter QP to read a specific document i.e. the holiday lists or minutes from management meetings. This represents a use-pattern, which could be described as distribution of information of common interest from the center – management in this case – to the employees. The special interest group shows low activity reflecting little use of QP for knowledge sharing or "identity support" (which might be potential use-patterns in this case). The development project shows a sustained high use throughout most of the project and perhaps fading out towards the end. This reflects use of QP in relation to the activities of negotiating and documenting the issues and deliverables of the project. The recurrent task shows sustained levels of high use alternating with periods of inactivity. These coincide with the execution of the recurrent task. Here it is visible how the coordination and production of the final results of the groups work are tightly integrated with QP. Deriving use activity graphs from by the log-analyses is relatively easy but generalizing graphs to 'typical' use activities might in some cases be more problematic as untypical events must be identified (possible through interviews) and the graphs revised accordingly. Also we might run into problems of having multiple use-patterns logged within the same use activity.

Organisational context. This factor summarises on a very general level the context of the situation where QP is used and the most important organisational issues. We focus on specific issues that we find general and relevant in this respect. In the situation of the organisational unit it is important to note, that it is newly formed due to the merger. The members are geographically distributed and may never meet and many aspects of this new situation remain unknown to members: Who are the others? What are they doing? Are they organised in the same way as us? Typically these units are relatively large in numbers of users (see later). In the situation of the special interest group the users are all practitioners sharing a profession or have a professional interest in common. These groups are extremely loosely coupled, since they sometimes turn out to have very little in common. In the situation of the development project the six months time box sets some boundaries to the possibilities of integration of QP especially due to the limited of allocating of resources for facilitation and redesign during the project life cycle. In the situation of the recurrent task the well defined procedures are adjusted iteratively and tight integration of work practice and QP is given ample space. The accuracy and generalisability can be problematic as the resources required to perform a thorough investigation for organisational context are extremely high.

Occurrence. The most common situation for QP to be used in is the organisational unit, which accounts for half of the studied QPs, while a third of the active QPs are used to support recurrent tasks in or between the organisational units of Beta. Only one of eight QPs are used by development projects, which is kind of odd, since the original aim of introducing web-based groupware in form of QPs was to support the new inter-Scandinavian development projects. A fraction (1/16) of the QPs are used for special interest groups, this might be due to some of them sticking to their network meetings and intranet groupware facilities. This is very uncertain, since investigating for occurrence is based on a survey which might be biased/flawed and a survey also only gives a snapshot that might be considerably changed over a relatively short time.

Number of members. This factor gives some indication on how widespread and active a QP is. The factor can easily be qualifier to "# of active users" counting only users that have used the QP in certain ways and within a certain period of them. Showing the largest variation among QPs the organisational units have the largest QPs member wise. Some of these are actually substituting the corporate intranet (which is still not fully established). There are several QPs with smaller numbers of members as well. These show the tightest integration to work practice. The data that describe this factor can be almost automatically generated but the statistics produced are of limited value.

The findings discussed above are preliminary and further analyses are required. This first take on characterising emergent use-patterns will be elaborated and co-related to address the relevant issues and identify characterising factors for integrating groupware and work practices. Our future research of defining, eliciting, analysing, characterising, and generalising use-patterns is to be focused by the following three coupled strands:

- Which characterising factors (known and new ones) seem promising?
- Which combinations of data-gathering techniques seem promising to investigate further?
- Evaluation of the accuracy, bias, generalisability, adequacy and efficiency (bearing in mind the resources needed to investigate a factor with appropriate data-gathering techniques).

The aim with this focus is to develop approaches to evaluate the integration of groupware in terms of use-patterns that are operational in a broader institutional context. This means that an approach for

evaluating a use-pattern must be proven to have an appropriate balance between cost efficiency: data-gathering techniques involved must be effective and adequate even with bounded ressources, and accuracy: the related characterising factors are described reasonably accurately and provide a sufficient basis for eliciting relevant use-patterns.

How the research efforts on a longer term could develop guidelines for evaluating use-patterns (in terms of e.g. stability of use-patterns, drivers and barriers for establishing a specific use-pattern, how tight the groupware is integrated in current work practices, who is using the groupware and to what purpose, if the groupware is used according to the original intentions for deployment, etc.), is still an open question.

6 Acknowledgements

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